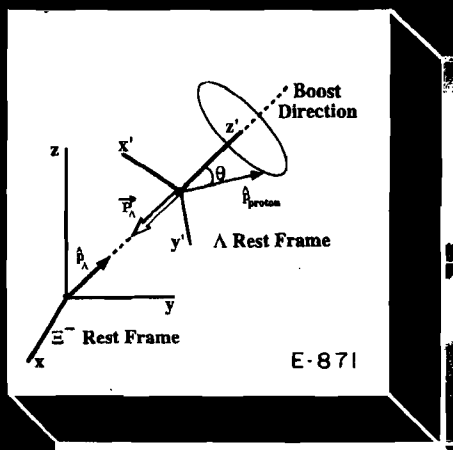
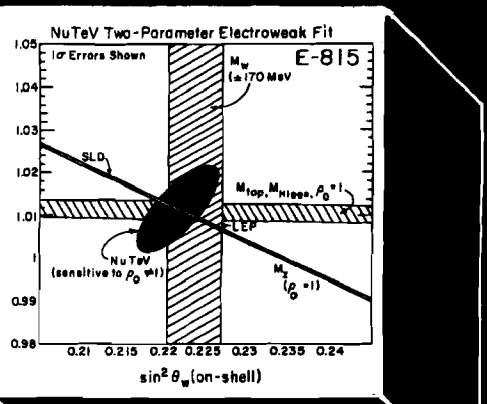
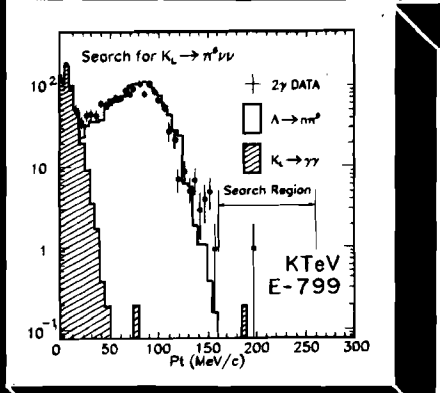
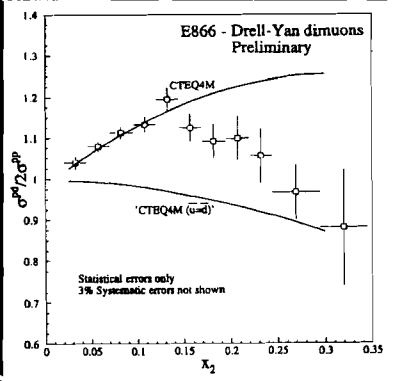
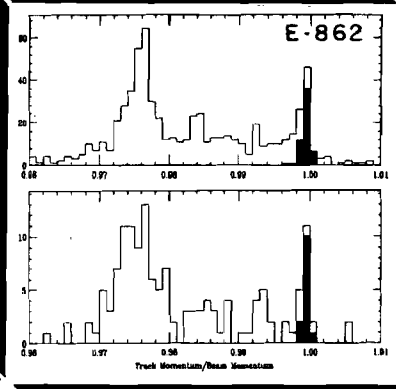
1998 Fermilab Research Program Workbook

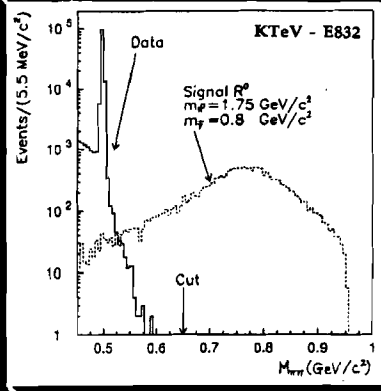


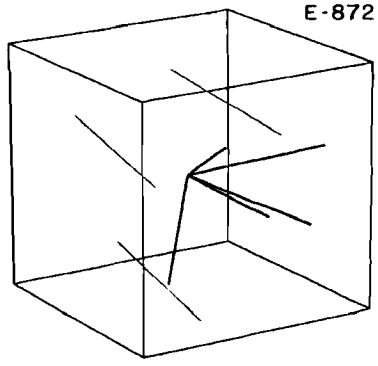


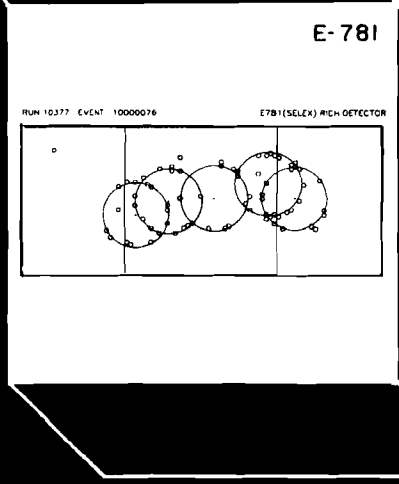


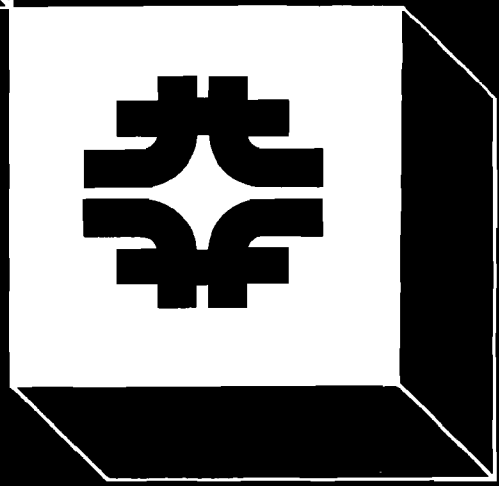












Fermilab Research Program 1998

Workbook

March, 1998

Roy Rubinstein

Fermi National Accelerator Laboratory
Batavia, Illinois

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INTRODUCTION

Now over two decades old, the Fermilab Research Program Workbook gives an annual view of the status of the Laboratory's program. The information contained is used by various individuals and organizations, including Fermilab's Physics Advisory Committee and the yearly US Department of Energy Annual Review of the Laboratory.

As introduced for the first time in the 1996 edition, we include significant experimental research activities in which Fermilab physicists are involved and which are not particle physics experiments using Fermilab accelerators. These include such activities as collaboration on the CMS experiment at the CERN LHC, and astrophysics experiments.

It is a pleasure to thank Angela Gonzales for the artwork, Jud Parker for the database upon which much of the Workbook is based, Taiji Yamanouchi for his interest in the project, and especially Jackie Coleman who made it all happen.

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SECTION I. STATISTICS ON FERMILAB PROPOSALS

The status of Fermilab proposals is summarized in this Section of the Workbook. All proposals are classified into one of the following categories:

	Categories	Definitions
Approved Proposals	Completed	Approved proposals that have completed data-taking.
	Remaining	Approved proposals either running or waiting for data-taking.
	Inactive	Approved proposals which are now unlikely to ever be completed.
Pending Proposals	Unconsidered	Relatively new proposals awaiting consideration
	Deferred	Proposals for which consideration has been postponed for a specific reason
	"Not Approved"	Proposals for which a conventional decision cannot be made.
Obsolete Proposals	Rejected	Proposals rejected from further consideration
	Withdrawn/Inactive	Proposals that were not considered at the request of the spokesperson or that are no longer being considered for other reasons.

At the present time, 902 proposals have been received. Table 1 and Figure 1 show the number of proposals in each category each year since 1970.

TABLE 1. STATUS OF PROPOSALS AT FERMILAB

	Aug. 1970	July 1971	July 1972	July 1973	July 1974	July 1975	July 1976	July 1977	July 1978	July 1979	July 1980	July 1981	July 1982	July 1983	July 1984	July 1985	July 1986	July 1987	July 1988	July 1989	July 1990	July 1991	July 1992	July 1993	Jul 1994	Jul 1995	Jul 1996	Jul 1997	Feb 1998
Completed and Data Analysis	0	0	0	16	57	97	152	190	234	248	264	278	295	297	300	310	324	326	339	341	348	355	383	389	389	389	396	396	403
Remaining and Inactive	21	53	70	75	89	121	100	82	57	52	41	41	29	33	43	48	39	42	34	43	38	34	20	24	28	30	25	34	30
Subtotals	21	53	70	91	146	218	252	272	291	300	305	319	324	330	343	358	363	368	373	384	386	389	403	413	417	419	421	430	433
Unconsidered	23	16	19	10	0	2	6	12	6	6	13	27	16	25	11	8	8	13	13	11	21	50	36	17	6	8	9	11	11
Deferred	29	35	39	43	54	45	25	24	11	2	10	7	9	11	2	0	1	0	0	0	0	0	2	3	1	1	0	0	0
"Not Approved"	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Subtotals	52	51	58	53	54	47	31	36	17	8	23	34	26	37	14	9	10	14	14	12	22	51	39	21	8	10	10	12	12
Rejected	8	15	20	42	65	85	135	166	185	189	191	210	221	229	231	234	236	237	239	241	242	243	245	247	251	250	250	250	251
Withdrawn/Inactive	1	33	35	47	61	71	80	93	114	127	131	139	147	149	159	163	166	168	169	168	169	170	173	191	196	198	201	202	206
Subtotals	9	48	55	89	126	156	215	259	299	316	322	349	368	378	390	397	402	405	408	409	411	413	418	438	447	448	451	452	457
TOTAL NUMBER OF PROPOSALS	82	152	183	233	326	421	498	567	607	624	650	702	718	745	747	764	775	787	795	805	819	853	860	872	872	877	882	894	902

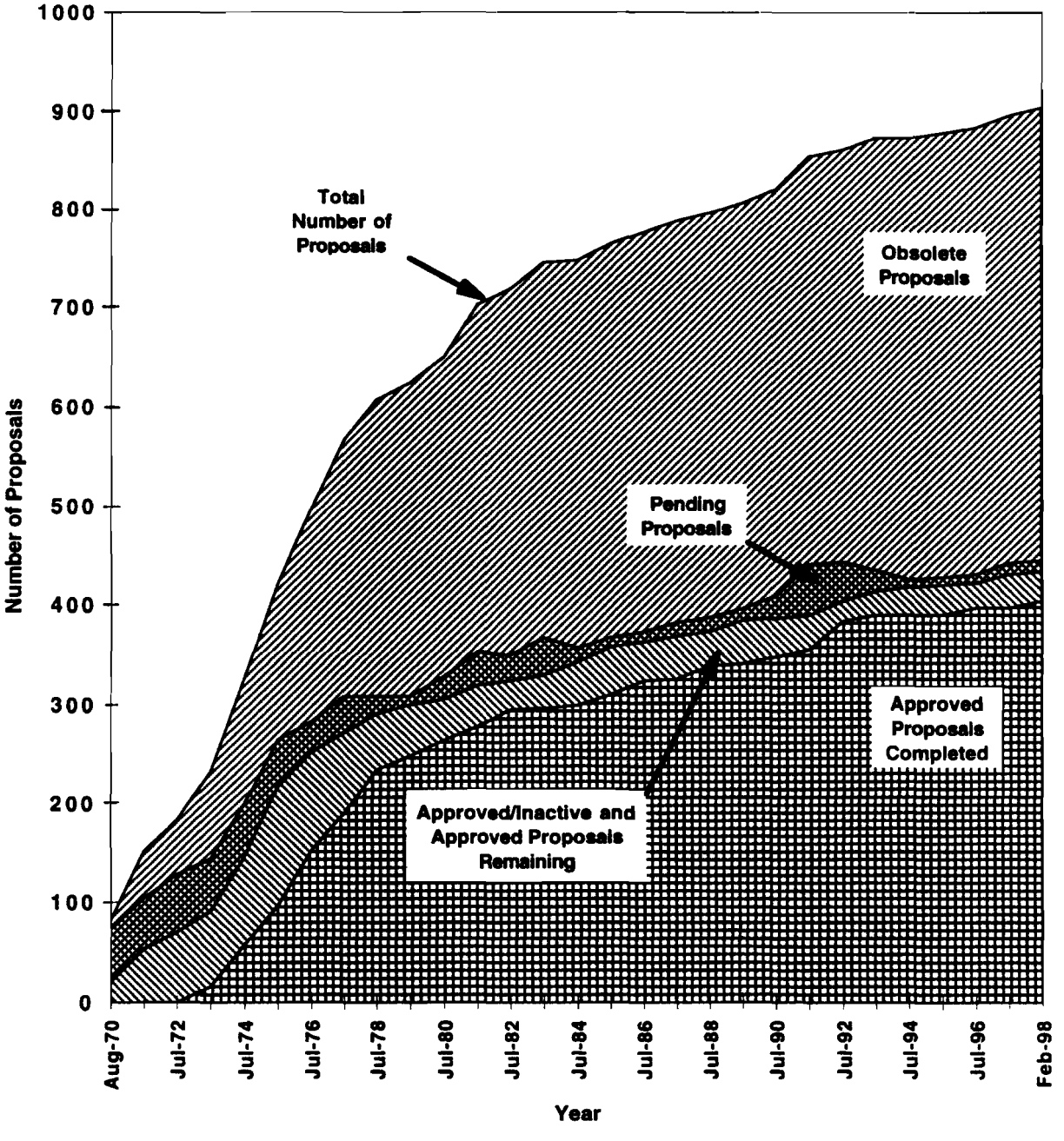

Figure 1. Growth of the Fermilab research program. The total number of approved experiments is obtained by adding the numbers shown as completed and those remaining and approved/inactive. Pending proposals are those which are unconsidered, deferred or "not approved;" obsolete proposals are rejected or withdrawn/inactive. Note that in this figure "Approved Proposals Completed" includes experiments still analyzing data.

SECTION II. ACCELERATOR PERFORMANCE

This Section gives summaries of Tevatron operation for the Collider runs of 1992-93 and 1994-96, and also the Fixed Target runs of 1990, 1991, and 1996-97. A Tevatron peak intensity of 2.86×10^{13} protons per pulse was achieved in 1997.

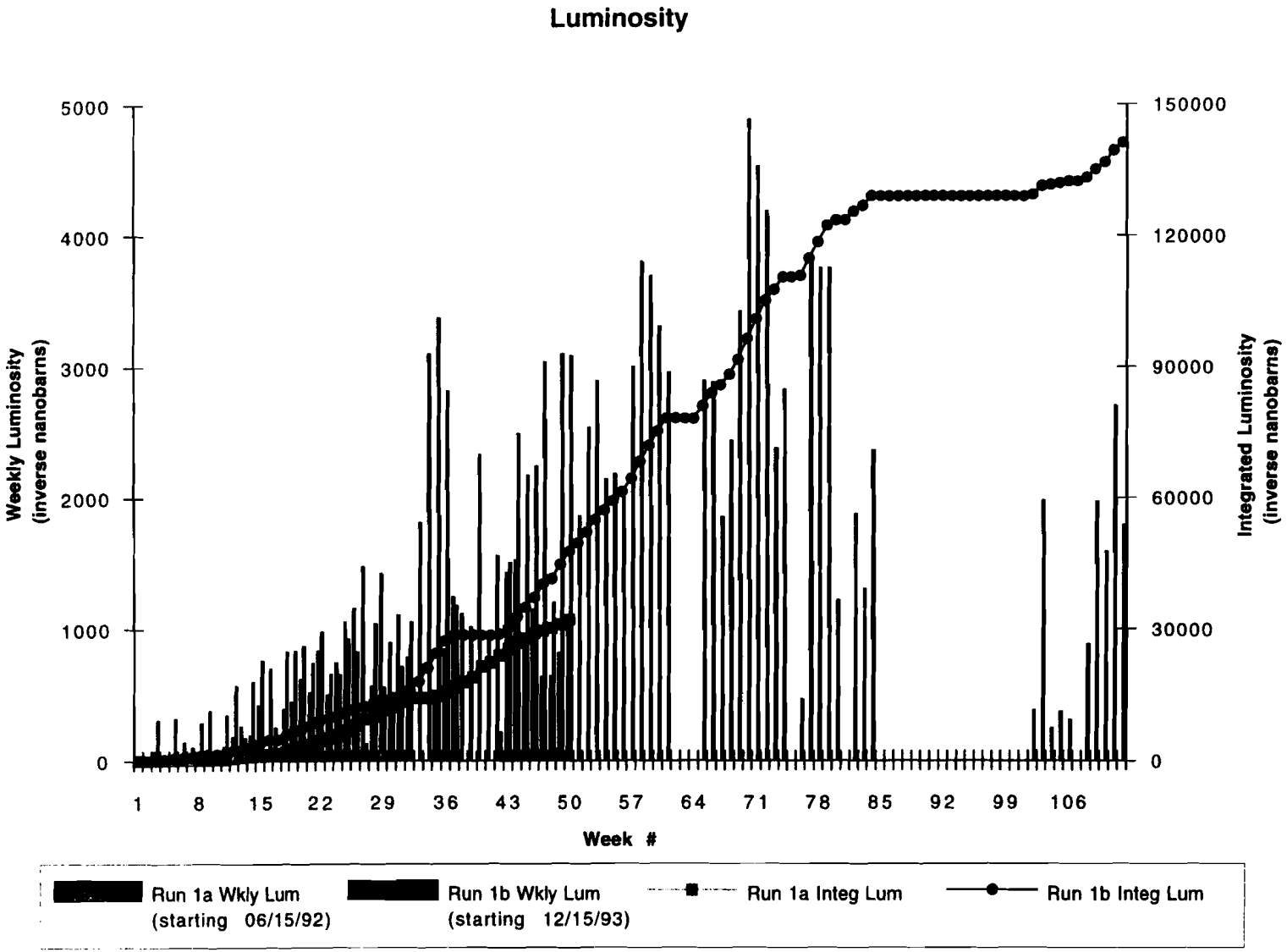

Figure 2. Tevatron Collider operation during the 1992-1993 and 1994-96 running periods - luminosity per week and integrated luminosity.

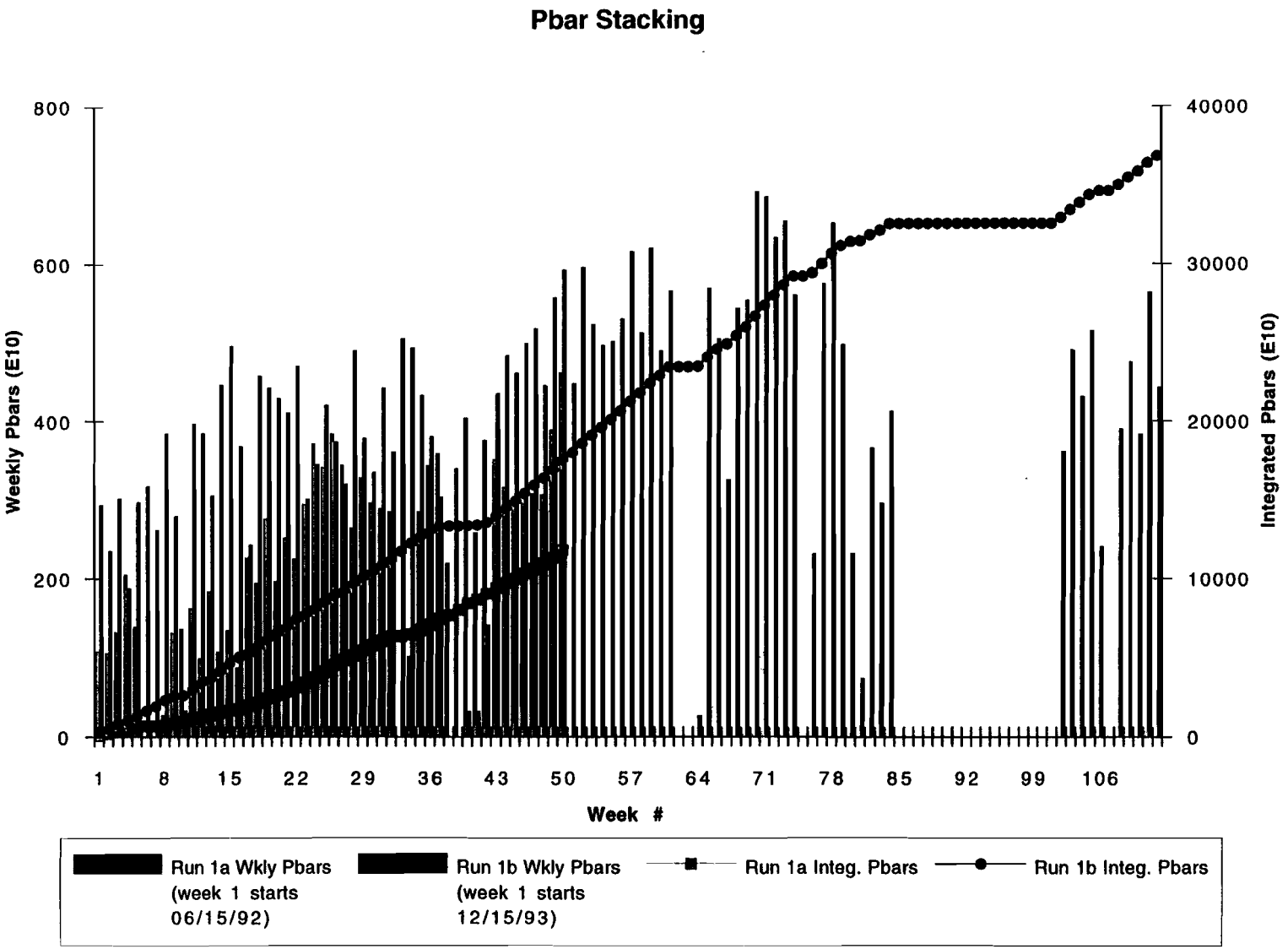

Figure 3. Tevatron Collider operation during the 1992-1993 and 1994-96 running periods - antiproton stacking per week and integrated stacking.

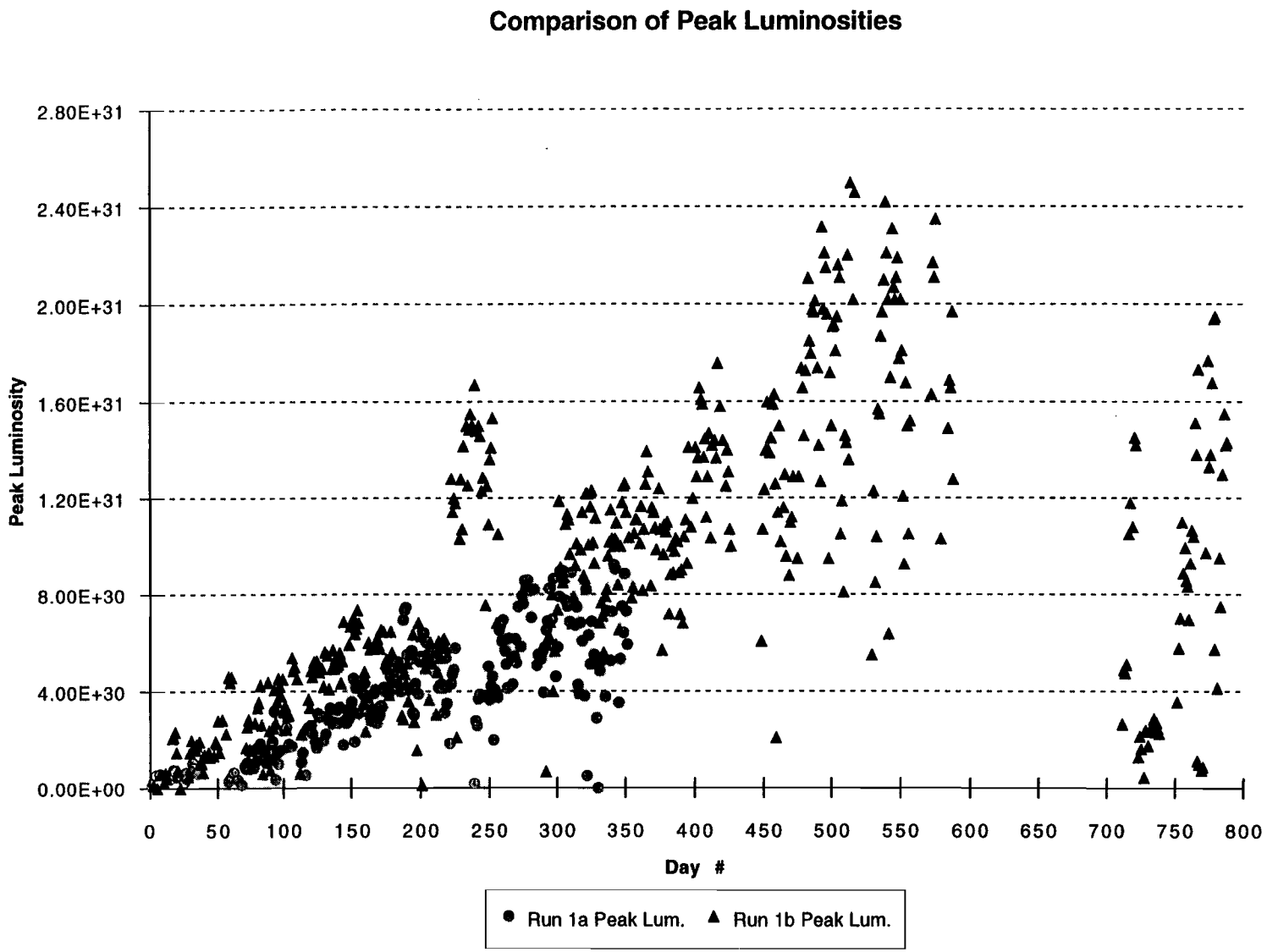

Figure 4. Tevatron Collider operation during the 1992-1993 and 1994-96 running periods - daily peak luminosity.

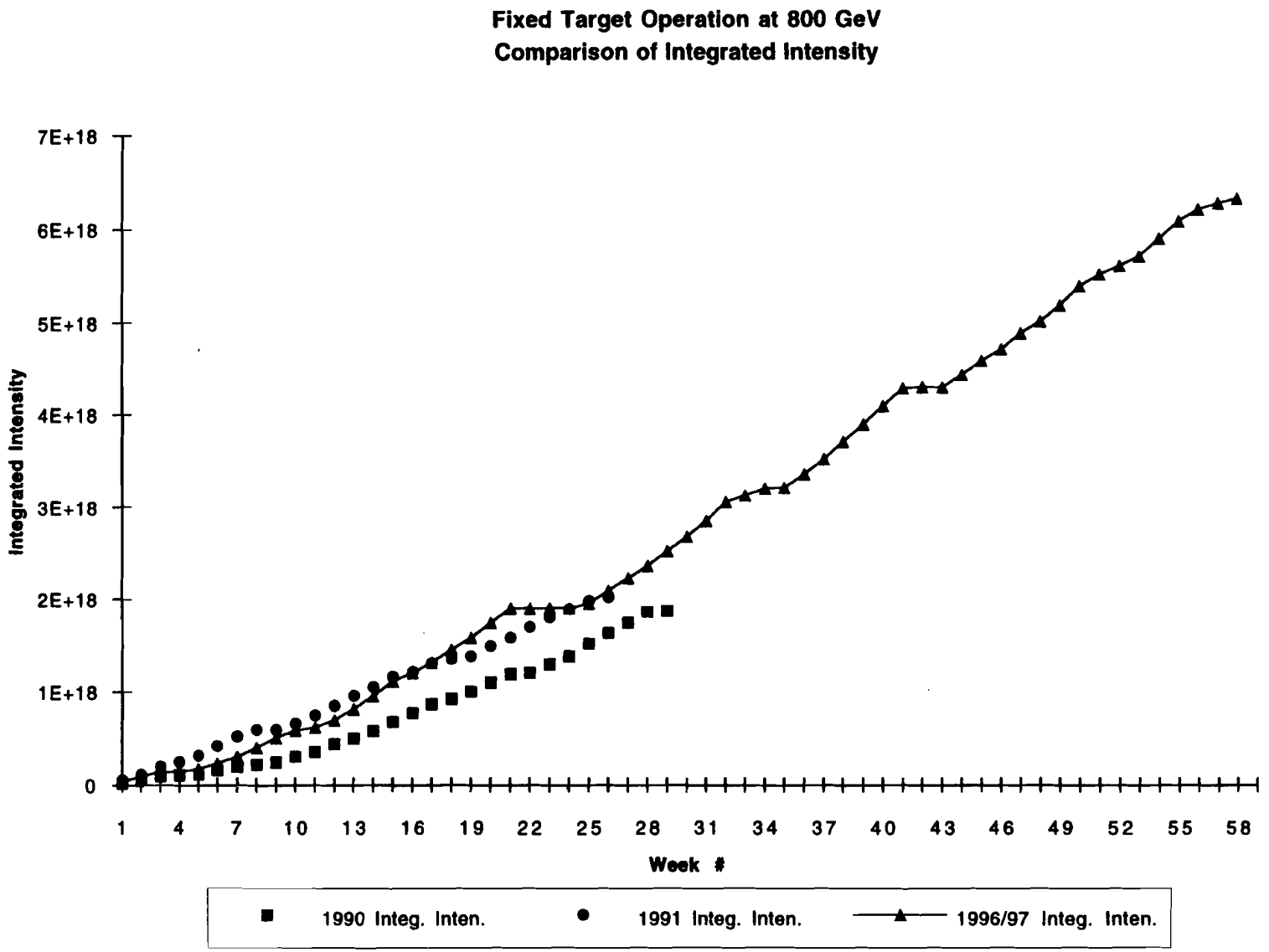

Figure 5. Integrated intensity for the 1990, 1991 and 1996-97 Fixed Target running periods.

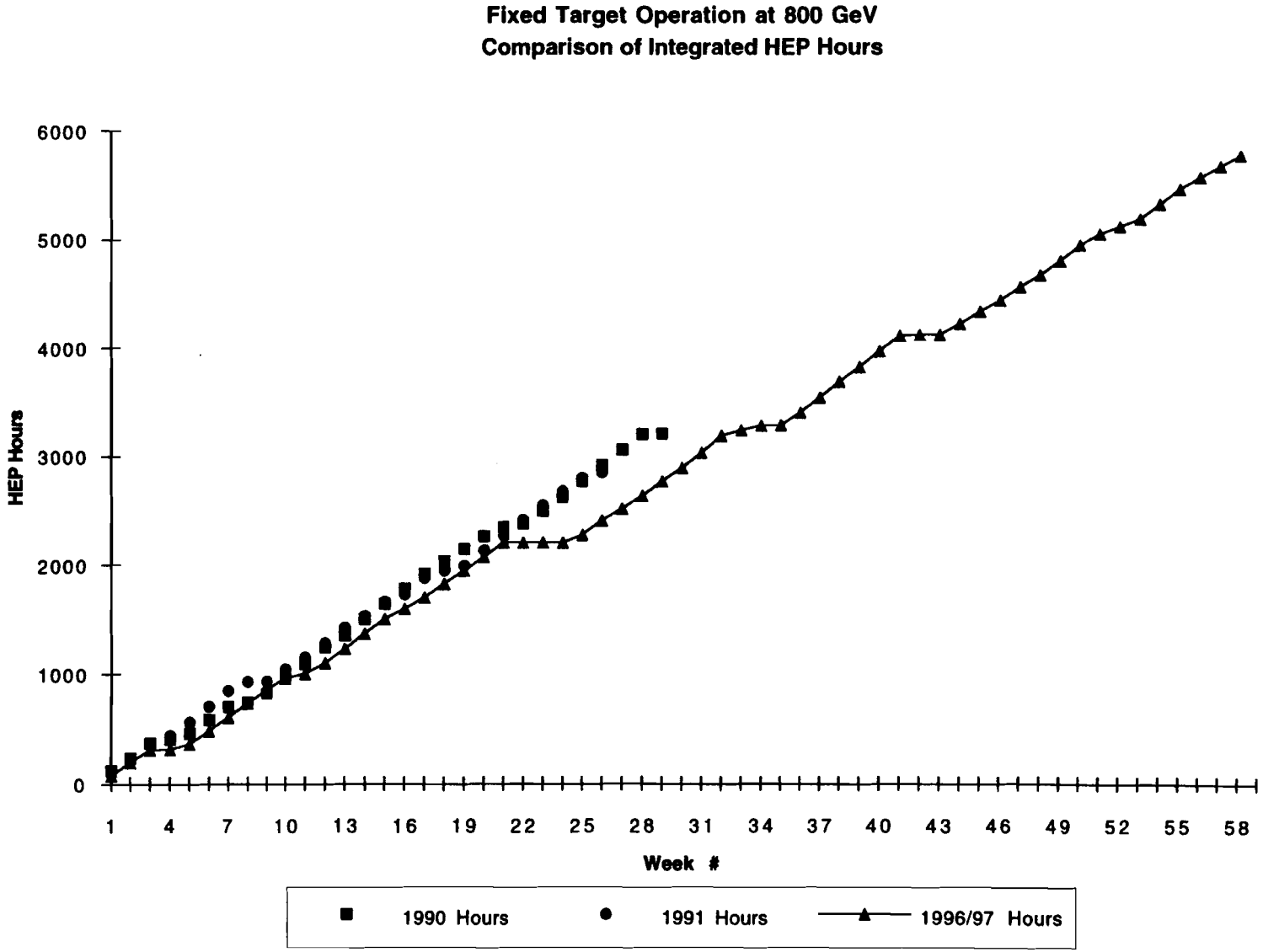

Figure 6. Integrated high energy physics hours for the 1990, 1991 and 1996-97 Fixed Target running periods.

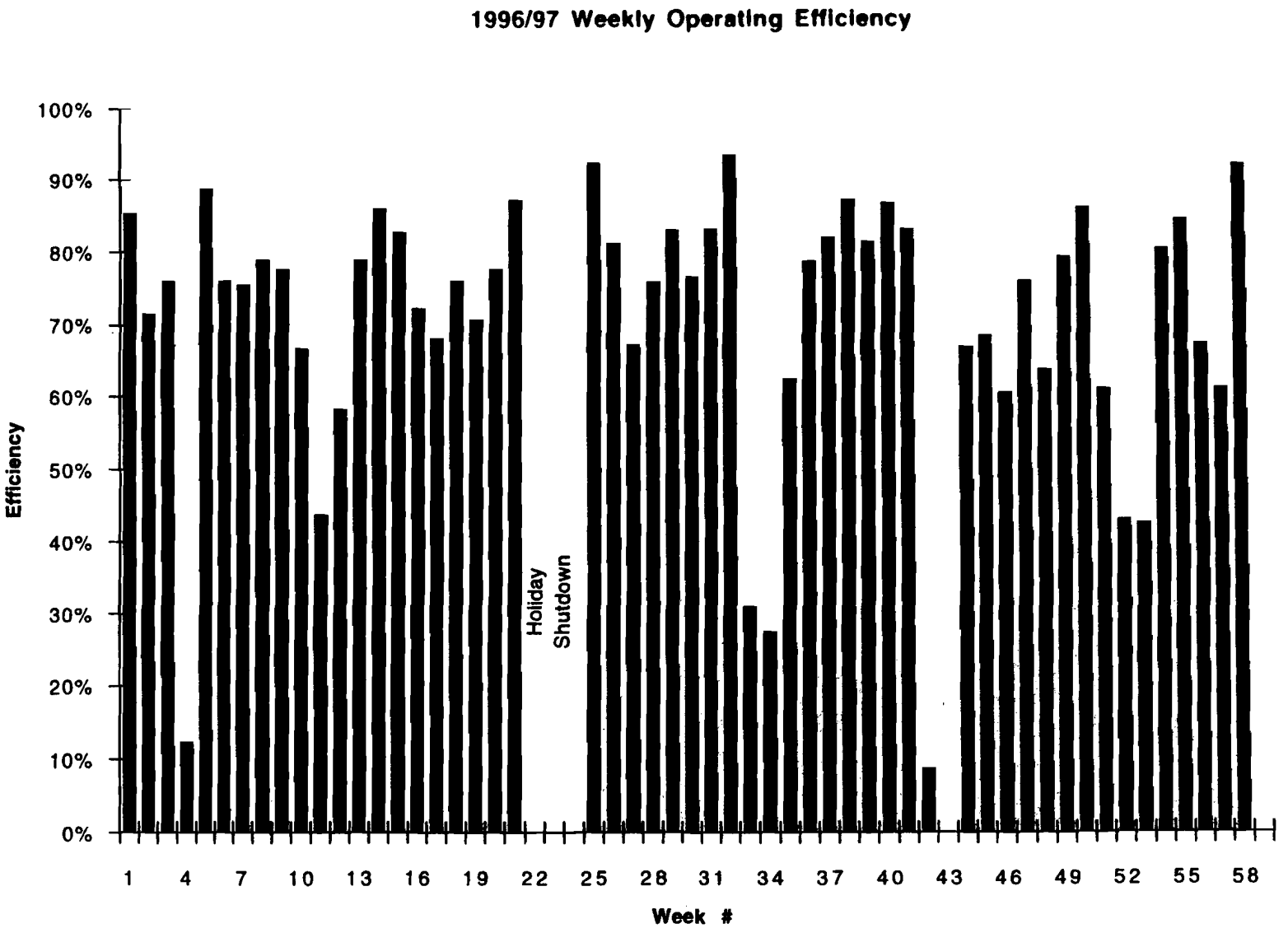

Figure 7. Weekly operating efficiency for the 1996-97 Fixed Target run.

SECTION III. FERMILAB BEAM PROPERTIES AND EXPERIMENT LOCATION

Table 2 gives properties of Fermilab beams; their location is shown in Figure 8. The locations of major experiments which ran in 1996-97, or which have not yet completed data-taking are shown in Figure 9 (Fixed Target) and Figure 10 (Collider and Accumulator). Figures 11-15 give some additional information on beam line particle fluxes (all for 800 GeV incident protons except where indicated).

TABLE 2. FERMILAB BEAM LINE PROPERTIES

Beam	Momentum Range (GeV/c)	$\pm\Delta p/p$ (%)	Production Angle (mr)	Solid Angle (μsr)	Particles	Flux per 10^{12} protons on target	at (GeV/c)	Comments
PW	800				p		800	Up to 1 x 10^{13} primary protons
						3×10^9 ν_e, ν_μ 1.5×10^8 ν_τ		Neutrino Beam
PB	500 (peak)	12		4	$e^- + e^+$	$\approx 3 \times 10^8$	250	Wide band charged and neutral beam also capable of K_L^0, p, and π.
PE	500 (peak)	2.1	0		π^+, K^+, p	$\approx 1.5 \times 10^9$	250	Maximum momentum for positives
			0	0.5	$\pi^-, K^-, \bar{p}$	$\approx 4 \times 10^7$	500	
PC	1000	16	0-3.5		π^-, K^-, Σ^- Ξ^-, Ω^-	3×10^7	600	Primary protons, neutral and charged hyperons
ME	1000 (peak)	0.1			p		1000	$\approx 4 \times 10^{12}$ primary protons
MP	200	9.0	0 ± 1.0		p	$\approx 10^7$	200	Polarized protons from 800 GeV primary.
					$\bar{p}$	$\approx 5 \times 10^5$		Polarized antiprotons from 800 GeV primary.
					π^-	1×10^5		(Average polarization expected $\approx$ 30%).
MC	150 (mean)	75-200 GeV	0 to $\pm$ 3.0	4.88	$\pi^-, \Sigma^-, \Xi^-, \Omega^-$, $\pi^+, p, \Sigma^+, \Xi^+$, $\overline{\Omega}^+$	4.3×10^9	150	Positive and negative secondary beams will use different targets.
MB	20-200	5.0	2.5		π, K	3×10^6	75-100	Requires MC beam dump.
					$e^\pm$	2×10^2	100	

Beam	Momentum Range (GeV/c)	$\pm\Delta p/p$ (%)	Production Angle (mr)	Solid Angle (μsr)	Particles	Flux per 10^{12} protons on target	at (GeV/c)	Comments
MT	80-245	5.0	0		Hadrons	1×10^6	75-245	Test beam
						500	25	
					$e^{\pm}$	500-2500	10-150	
MW	1000 (peak)	10	0-4		Primary p's	2×10^8		Beam transport to new multiparticle spectrometer; assumes 800 GeV on target
					p	1.3×10^8	500	
					π^+	2×10^7	500	
					K^+	4×10^6	500	
					π^-	2.7×10^7	500	
					K^-	8×10^5	500	
					$\bar{p}$	8×10^4	500	
NW	2-150	1.6	0	5	μ^-			Currently a test beam, intensity limited.
					π^-	$\approx 10^8$	≈ 150	
					e^-	$\approx 10^5$	≈ 100	
NC	250	10	0	5	$\nu / \bar{\nu}$	10^8	250	Sign-Selected Neutrino Beam.
						$0.5 \times 10^8\ \bar{\nu}/m^2$		
NE	1000				p	1×10^9	800	To Lab G.
NT	10-200	1.5	0-6	0.7	negative hadrons	$\approx 0.5 \times 10^6$	140	Test and calibration beam to Lab E, neutrino detector and Lab F.
	10-120	1.5			e^-	$\approx 10^3$	100	
NM (KTeV)	85 (mean)		4.0 - 5.8	0.25	K_L^0	$\approx 2 \times 10^7$		Neutral beam with 800 GeV primary protons.
					n	$\approx 4 \times 10^7$		

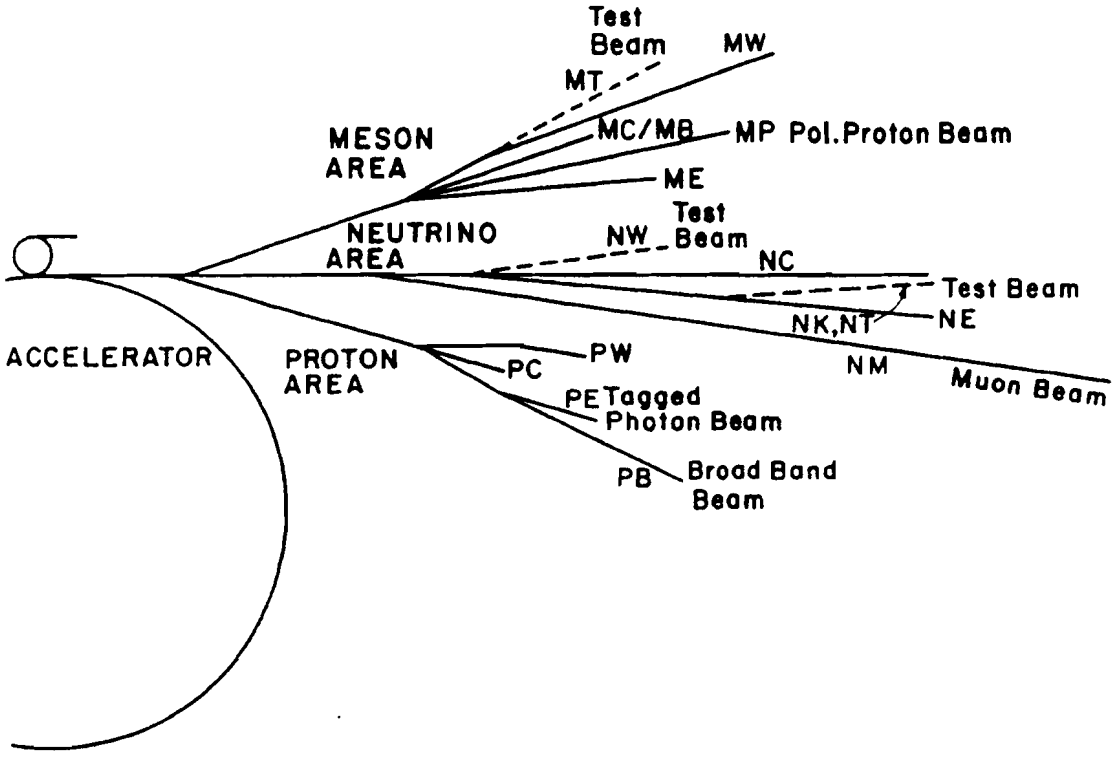

Figure 8. Layout of Fermilab Fixed Target beams. Properties of individual beams are given in Table 2.

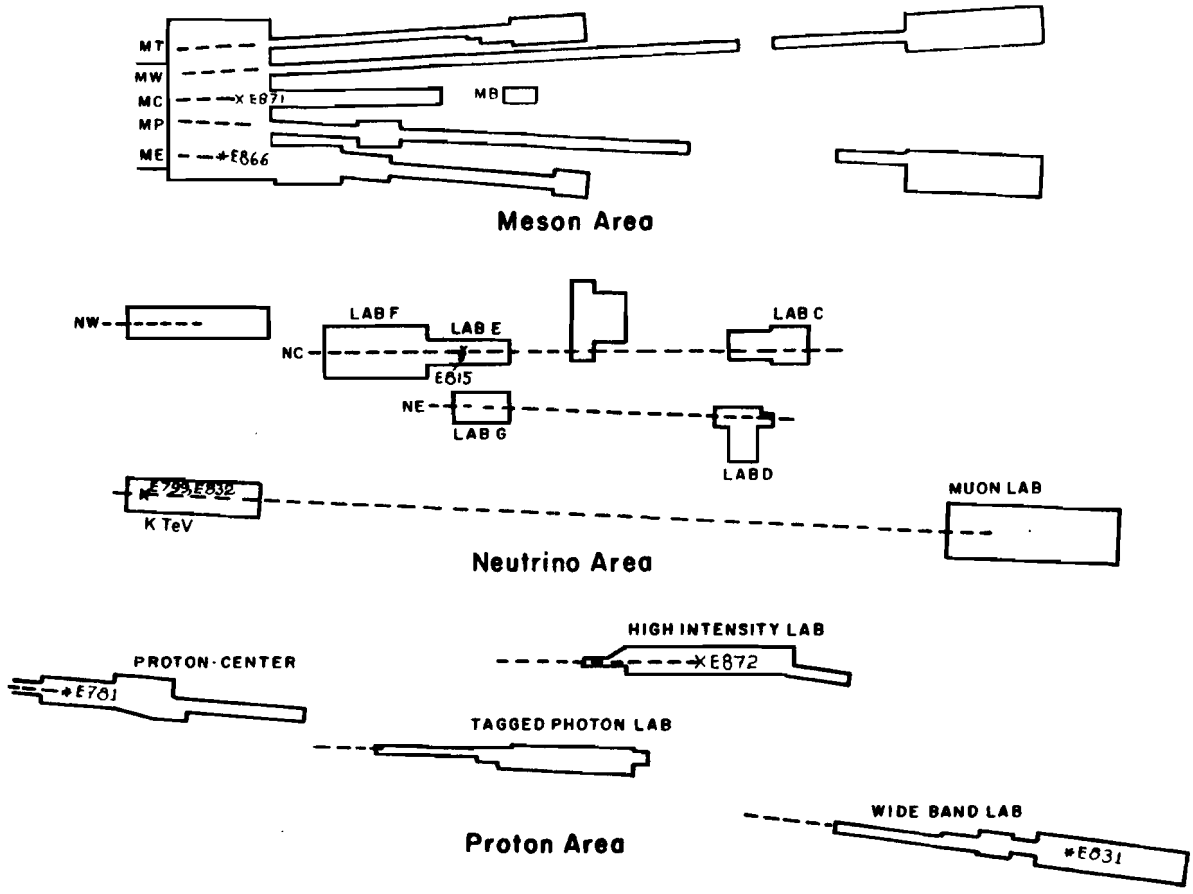

Figure 9. Schematic of the Fixed Target experimental areas with locations of major experiments which ran in the 1996-97 Fixed Target run. Not shown are future experiments E-803 and E-875, which will use a neutrino beam from the Main Injector. The drawings are not to scale.

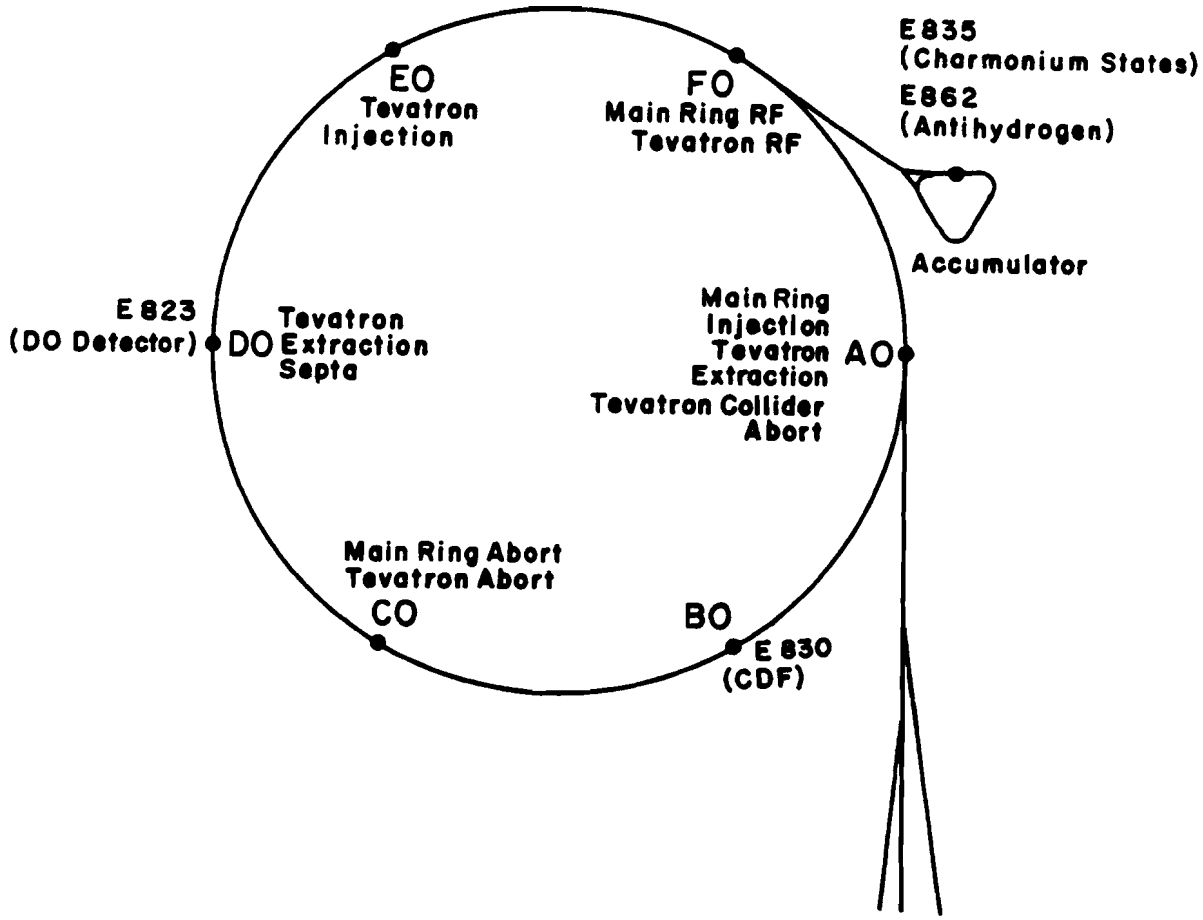

Figure 10. Locations in the Tevatron of the approved $p\bar{p}$ Collider experiments and the two experiments which used the Antiproton Accumulator during the 1996-97 Fixed Target run.

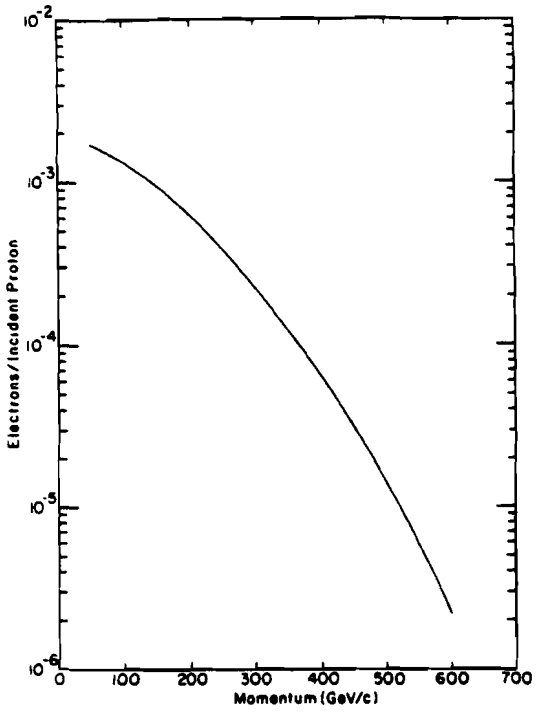

Figure 11.

Proton Area: Electron flux in the Proton Area Wide Band Beam; double band using a deuterium production target.

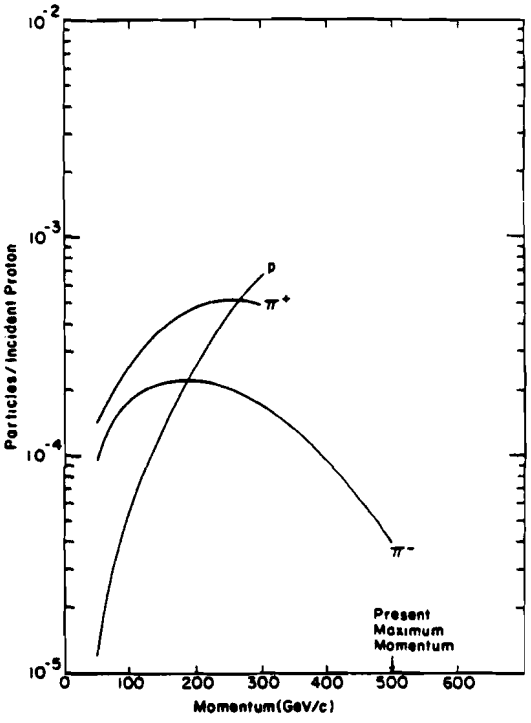

Figure 12.

Proton Area: Hadron flux in the Tagged Photon Laboratory.

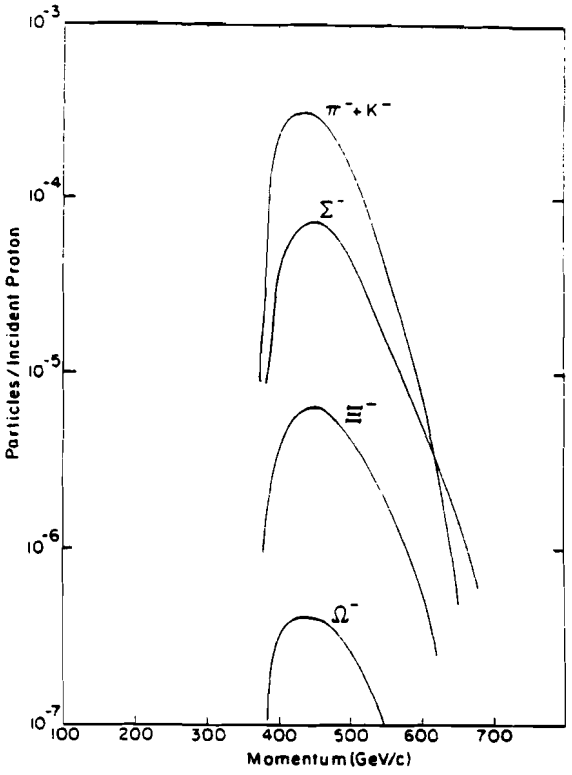

Figure 13.

Proton Area: Fluxes in the Proton Center Hyperon Facility.

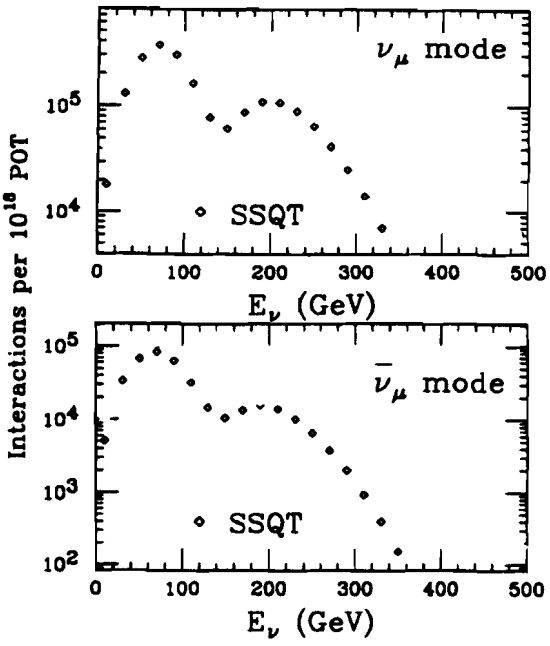

Figure 14.

Neutrino Area: Interaction rates inside a 50" radius at the Lab E detector from the E-815 sign-selected quadrupole triplet beam.

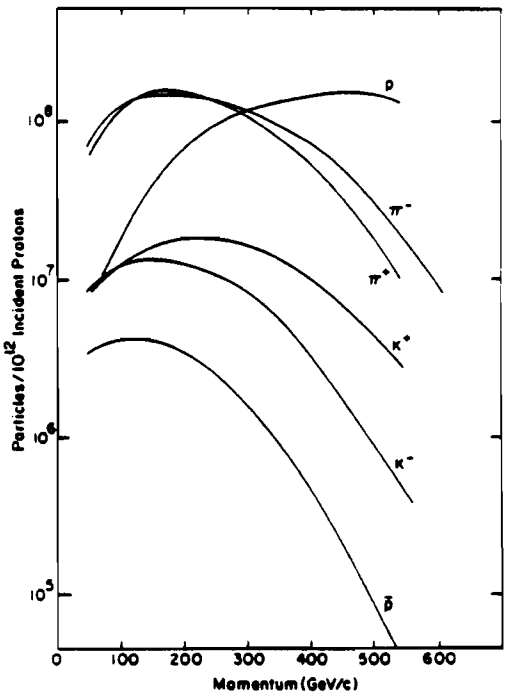

Figure 15.

Meson Area: Fluxes in the MW beam line. Production angle for negatives is zero degrees; for positives it is 1.4 mr.

SECTION IV. MAIN INJECTOR ERA

The Main Injector is now well under construction. Already two experiments using this 120/150 GeV high-intensity proton accelerator (E-803 and E-875, both on neutrino oscillations - see Section VIII) have been approved.

In this Section, we give some information on the expected Main Injector performance, and also preliminary estimates of some beam properties for experiments. Table 3 shows the number of 120 GeV protons/hour that can be expected from the Main Injector under various operating scenarios; the fast spill can be up to ~1 msec long, and slow spill will be one second. Figures 16, 17, 18 show expected fluxes of some neutrino and secondary hadron beams using the Main Injector.

It should be noted that there are some other future new experimental area possibilities under consideration. An example is the use of the 8 GeV Booster to produce a neutrino beam. Figure 19 gives a schematic illustration of some of these ideas.

Of course, not to be overlooked is the major impetus for the Main Injector. It will increase the performance of the Tevatron to luminosities of $\sim 1\times10^{32}cm^{-2}sec^{-1}$ in the Collider mode, and to over 5×10^{13} protons per ~20 sec spill every ~60 sec for fixed-target.

TABLE 3. PROTONS PER HOUR UNDER VARIOUS MODES OF OPERATION

Mode	Cycle Time	Protons/Hour		
		AP Target	Fast Spill	Slow Spill
Antiproton Production	1.466 sec	1.2×10^{16}	--	--
Fast Spill	1.866	--	5.8×10^{16}	--
Slow Spill	2.866	--	--	3.8×10^{16}
Mixed: AP+Fast Spill	2.000	0.9×10^{16}	4.5×10^{16}	--
Mixed: AP+Slow Spill	3.000	0.6×10^{16}	--	3.0×10^{16}

[Assumptions: 6×10^{10} protons per bunch; additional time is required for bunch manipulations and turning off magnetic switch at F17 in mixed modes.]

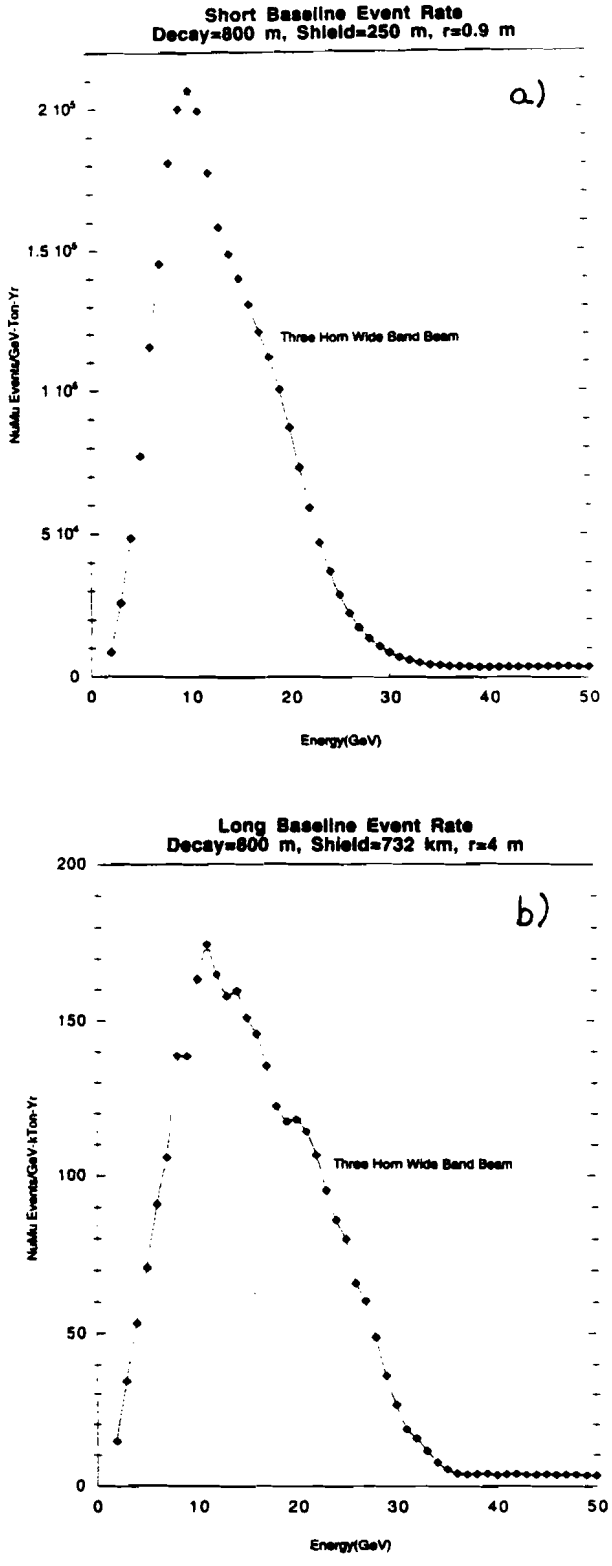

Figure 16. Main Injector, 120 GeV protons: Neutrino event rates for a) short-baseline (per ton), and b) long-baseline (per kton). One year is taken as 3.7×10^{20} incident protons.

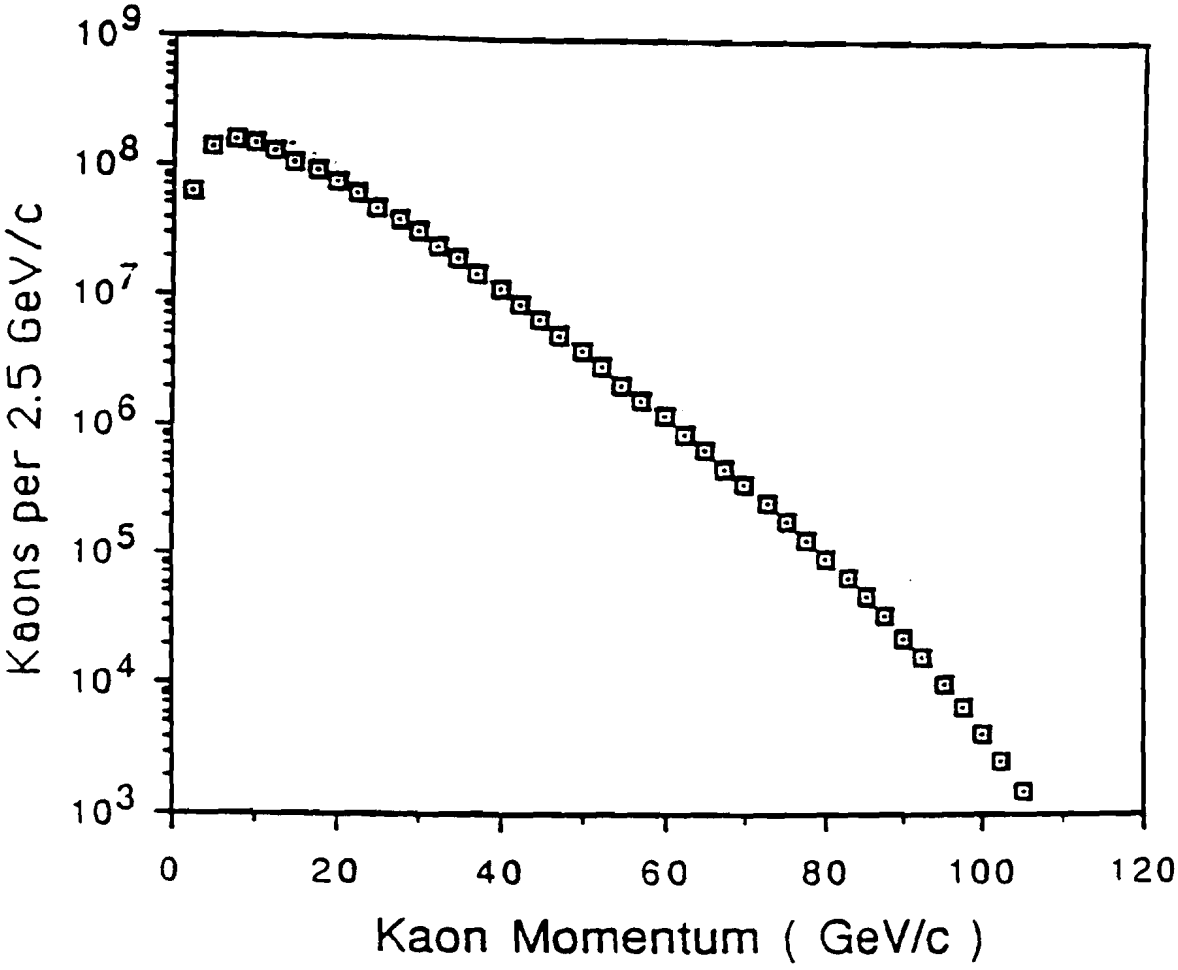

Figure 17. Main Injector: K^0 flux per 2.5 GeV assuming 3×10^{13} protons on a 50 cm target, 12 μstr beam, at 24 mrad targeting angle, including absorbers and filters.

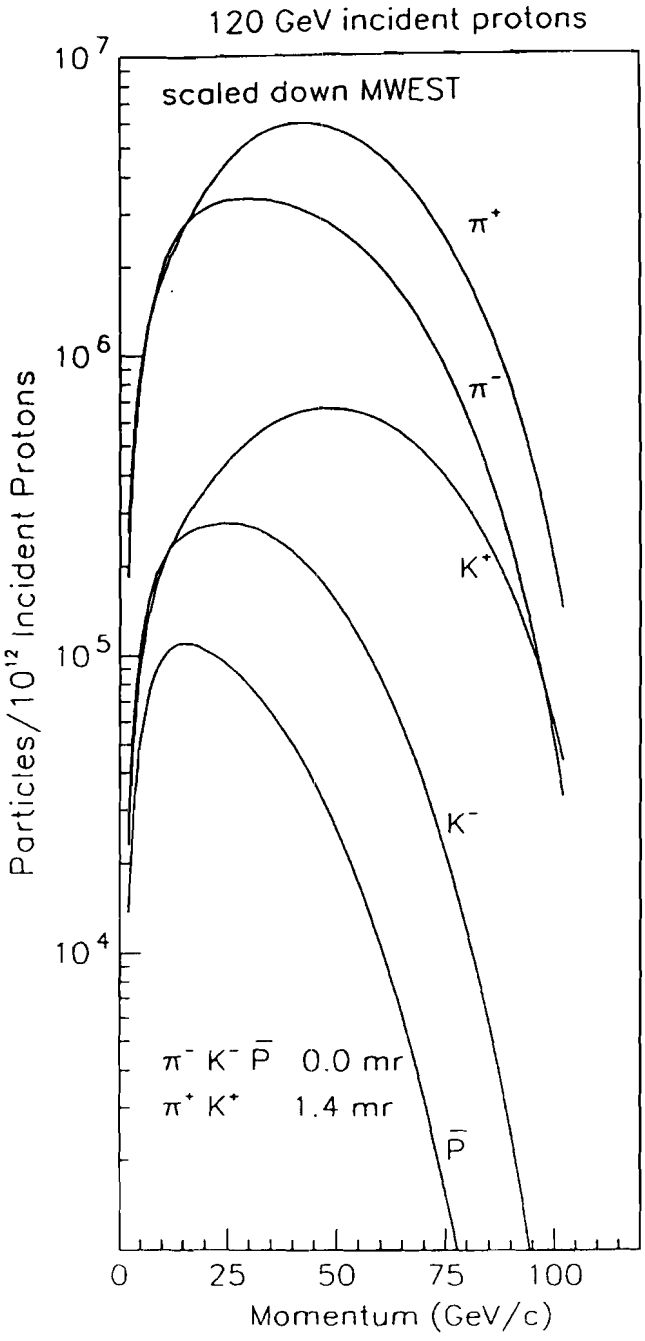

Figure 18. Main Injector: Fluxes in the MW beamline.

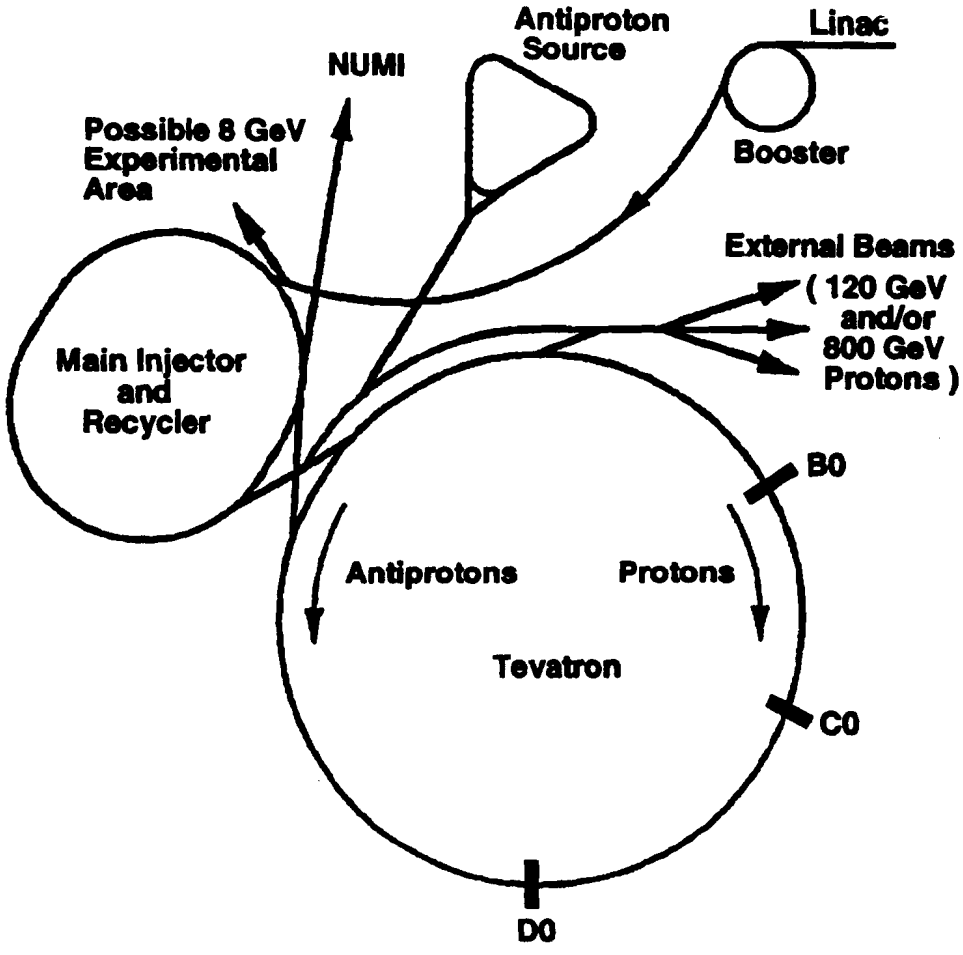

Figure 19. Schematic layout of possible future experimental areas.

SECTION V. FERMILAB COMPUTING FACILITIES

The computing services provided for high energy physics by the Computing Division focus on solving large physics problems (such as event reconstruction, Monte Carlo, and accelerator and magnet design) and providing support for experimental activities. There is currently heavy emphasis on systems required to reconstruct and analyze the data taken during the 1996-97 fixed-target run. Collider Run II will place large demands on computing, and preparations are being made to provide the computing required. Other projects at the Laboratory have large computing needs as well, and systems are available for them to use.

The systems currently supported centrally by the Computing Division include the Unix farms, FNALU (interactive and batch), CDF and D0 central computing systems, and KTeV and Sloan Digital Sky Survey central systems. Figures 20 and 21 show the current configuration of FNALU and its utilization over the past three years. The multiprocessor farm systems composed of commercial workstations dominate the installed computing capacity at the Lab and allow fast cost-effective event reconstruction. The current capacity of the farms is approximately 20,000 MIPS, which should be sufficient for the current needs of the Laboratory. Figure 22 shows the growth in farms utilization since 1991. Many thousands of additional MIPs are delivered by other systems for physics analysis and simulation. Many of these systems are housed in the Feynman Computing Center, along with tape libraries providing approximately 35 terabytes of robotically-accessible tape storage. The current configuration of the shared mass-storage system is shown in Figure 23. Several hundreds of terabytes of additional data reside in the tape vault. Hundreds of tape drives and multiple terabytes of spinning disk are also online at present. A small PC farm is in place and will likely be augmented next year.

State of the art high-speed networks glue the systems together and connect to the outside world. The LANs (local-area networks) facilitate access to the data by people on site, and the WANs (wide-area networks) enable world-wide collaboration to function efficiently. The Computing Division also supports a central mail server. A conceptual diagram of the lab's networking infrastructure is shown in Figure 24.

The data acquisition DART system used in the 1996-97 fixed-target run was extended for use as part of the MINOS, CDF and D0 Test Beam data acquisition systems.

The Computing Division is significantly involved in planning, managing, writing software, and acquiring, installing and integrating

hardware to acquire and analyze data from Collider Run II, starting in 2000. The data rates will be very large, leading to data sets of about 1 petabyte per inverse femtobarn of luminosity. The data volume, CPU power, networking, etc. will all be approximately a factor of 20 higher than for Run I. This poses a major challenge for the Computing Division, CDF, and D0 for the next five years and beyond.

The data acquisition system for the Sloan Digital Sky Survey (E-885) was deployed at Apache Point in New Mexico, and is being cycled nightly using simulated data while the camera and telescope are being completed.

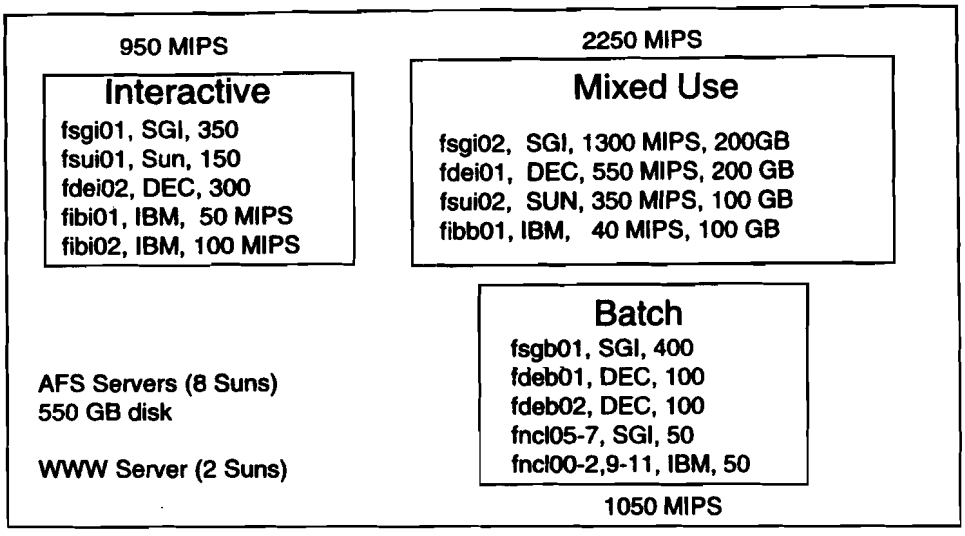

Figure 20. Current FNALU configuration.

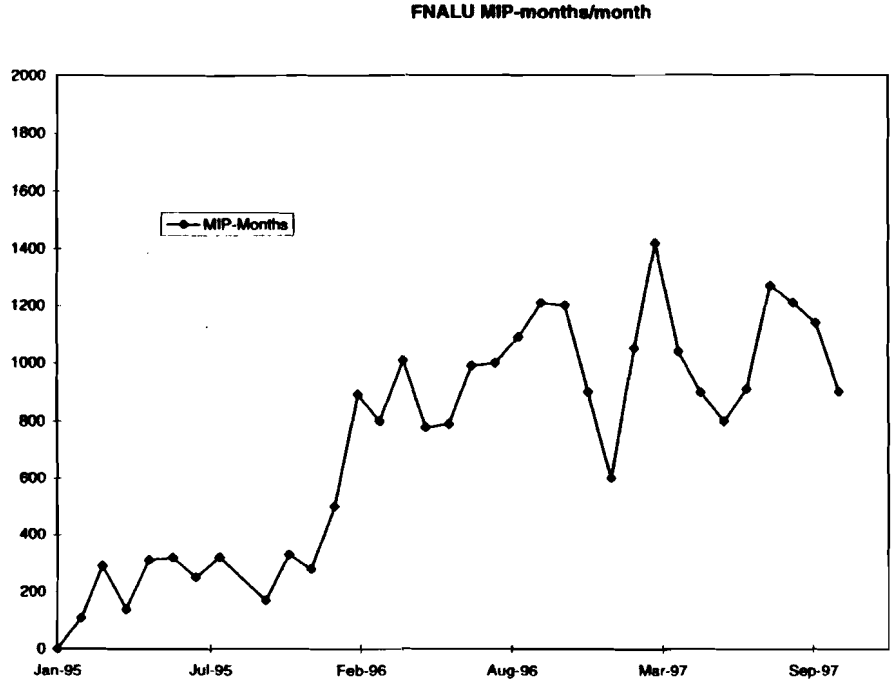

Figure 21. Computing delivered by FNALU in MIP-months/month 1995 through 1997.

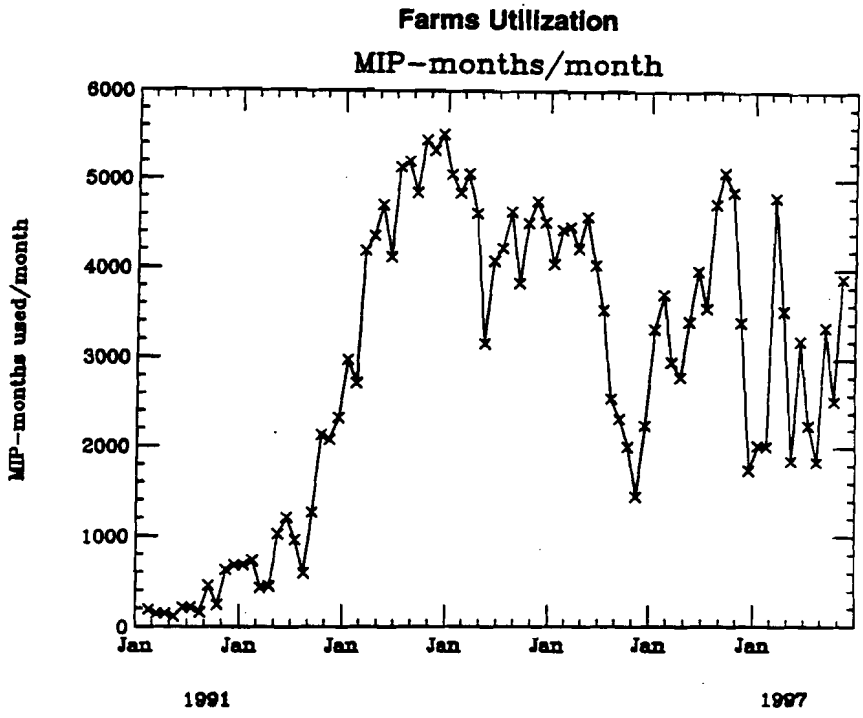

Figure 22. Growth in farms utililization since 1991.

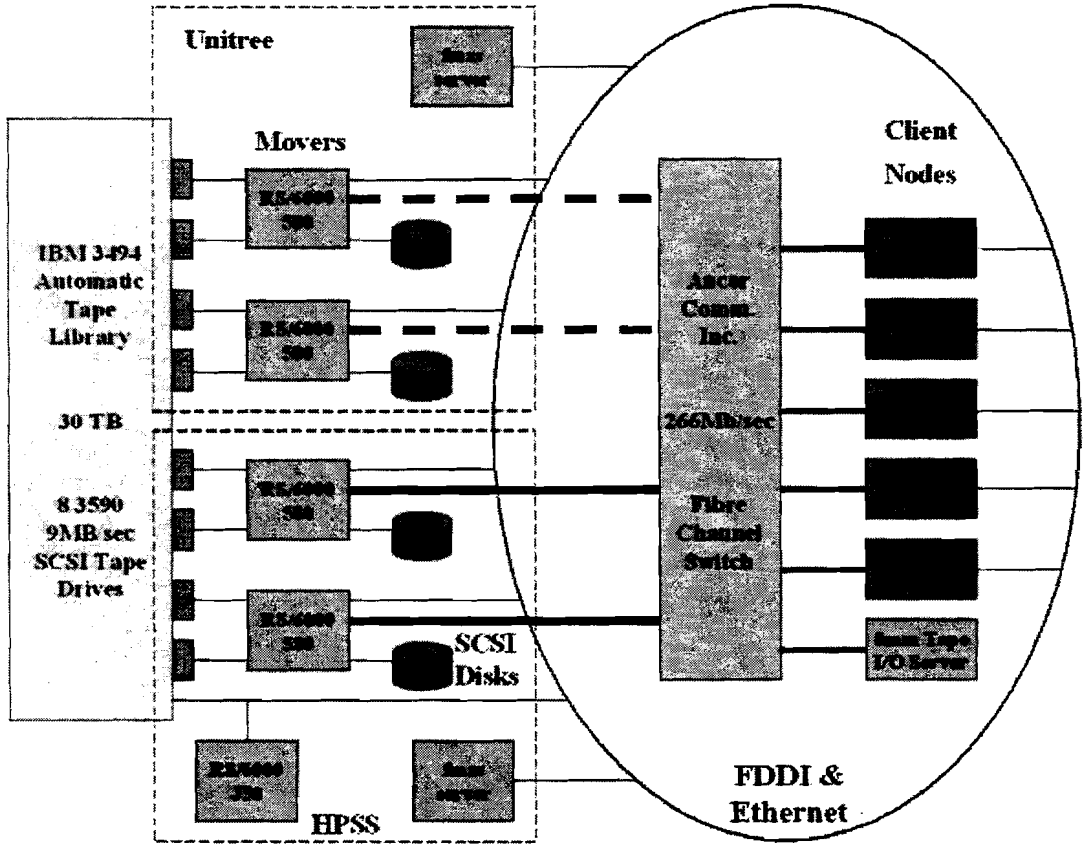

Figure 23. Current configuration of the shared mass-storage system.

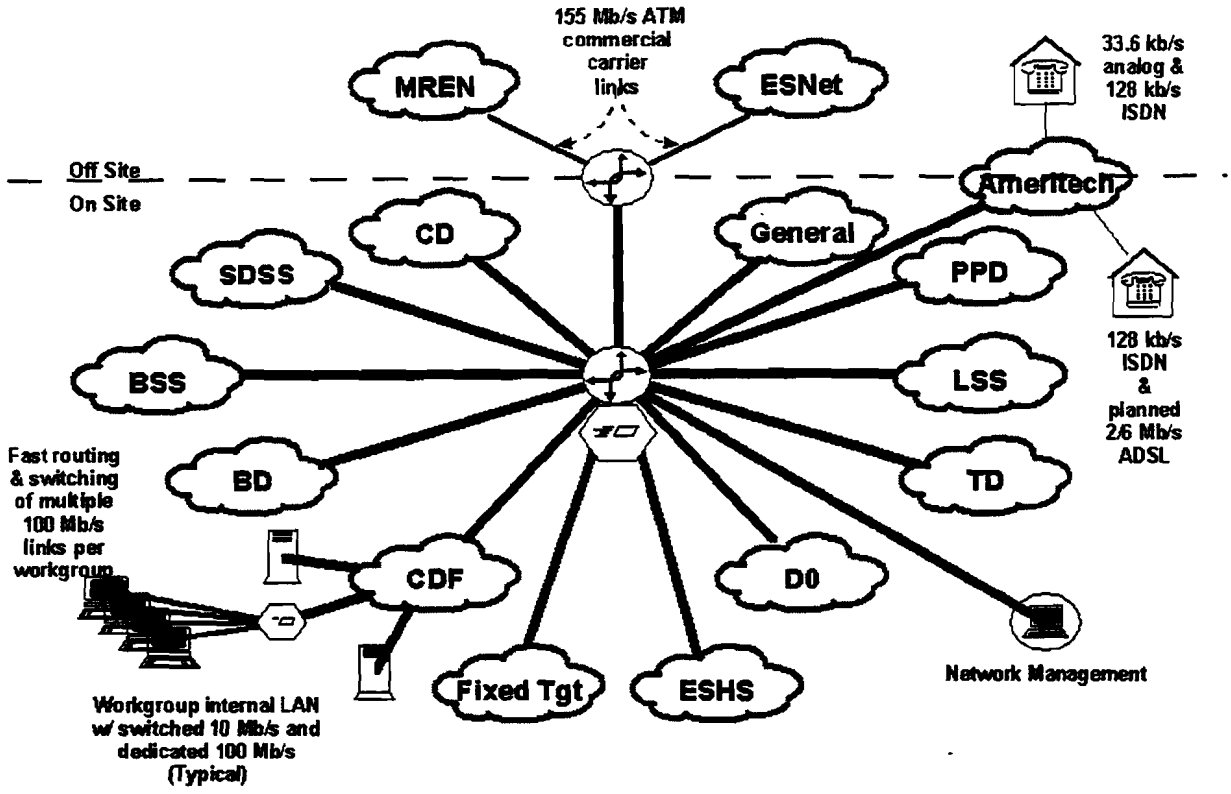

Figure 24. Conceptual diagram of Fermilab's networking infrastructure.

SECTION VI. MAJOR RESEARCH ACTIVITIES DURING 1997

Information on the Fermilab Research Program during 1997 is given in the following pages. Figure 25 shows when the experiments ran; Table 4 describes the major research activities in a little more detail.

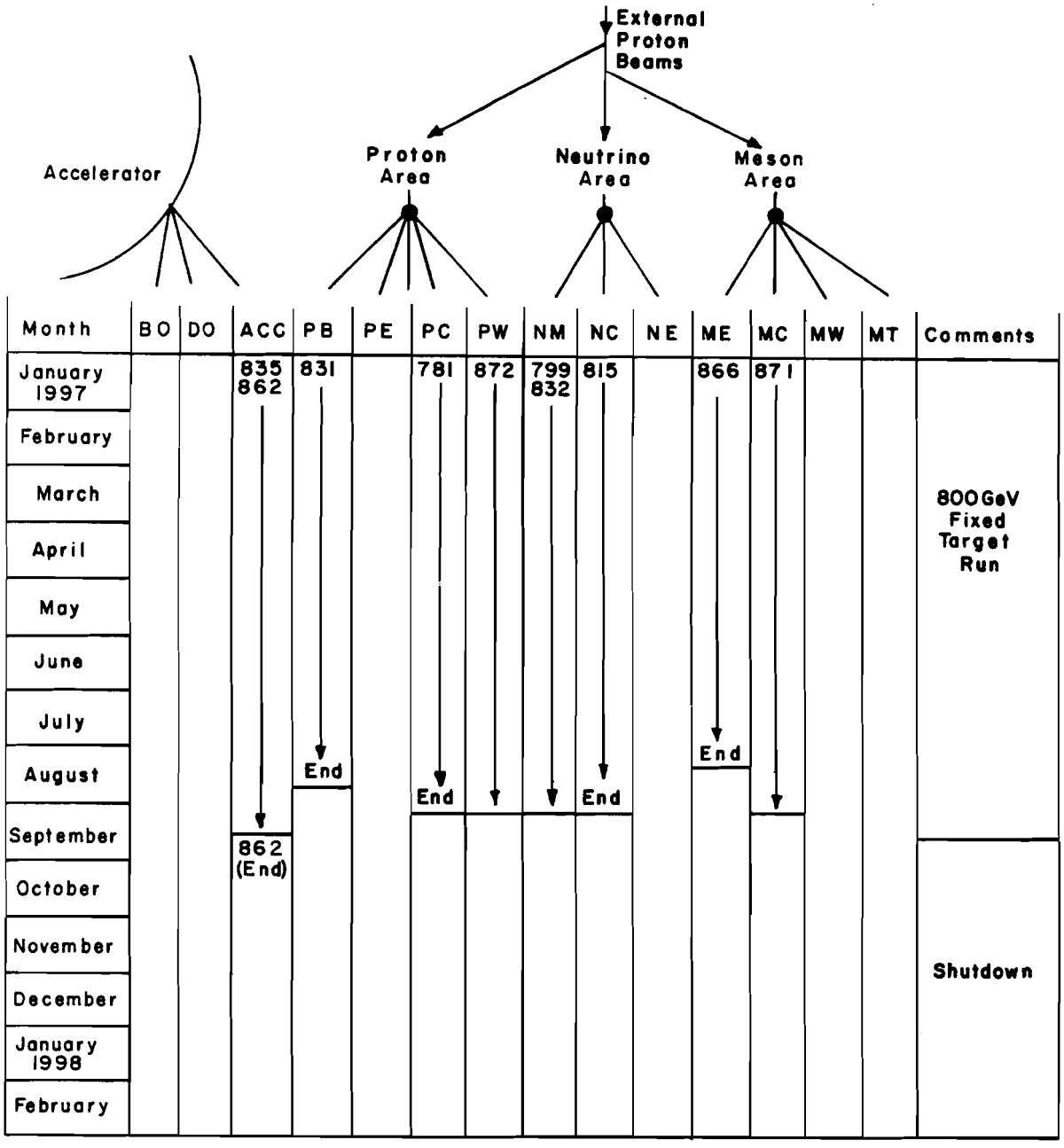

Figure 25. Major experiments running at Fermilab in 1997.

TABLE 4. DESCRIPTION OF MAJOR RESEARCH ACTIVITIES DURING 1997

EXP. #

ACCUMULATOR

835 Charmonium states - data-taking

862 Search for antihydrogen - data-taking

PROTON AREA

781 Charm baryon studies - setup and data-taking

831 Photoproduction of heavy quark states - data-taking

872 ν_τ charged-current interactions - setup and data-taking

NEUTRINO AREA

799 Rare K_L^0 decays - data-taking

815 Neutrino neutral- and charged-current interactions - data-taking

832 Search for direct CP violation in $K_L^0 \rightarrow 2\pi$ - data-taking

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MESON AREA

866 Measurement of $\bar{d}(x)/\bar{u}(x)$ in the proton - data-taking

871 Search for CP violation in Ξ and Λ decays - setup and data-taking

---

SECTION VII. FERMILAB RESEARCH PROGRAM

This Section contains information on the Fermilab research program for the next few years. The Situation Report, given on pages 40-41, is a summary of the current status of the experimental program. Figure 26, based on the Situation Report, illustrates by beam line the major approved experiments that have not yet completed data-taking by the beginning of 1998.

Fermi National Accelerator Laboratory
Experimental Program Situation Report as of February 20, 1998

The Experimental Program situation at Fermilab is summarized below. The experiments are listed by experimental area and beamline under categories which best describe their status as of February 20, 1998. The experimental area names are abbreviated as follows: Meson Area (**MA**); Neutrino Area (**NA**); Proton Area (**PA**); Collision Area (**COL**); Accumulator Ring (**ACCUM RING**); Debuncher Ring (**DBNCHR RING**); Booster Accelerator (**BOOSTR**); Unspecified (**UNSPEC BEAM**); Beam from the Main Injector (**MAIN INJECTOR**), and A0 Facility (**A0 Facility**).

Total number of approved experiments - 433

Beam Area & Line		Experiment	Spokesperson(s)	
A.	**EXPERIMENTS THAT ARE COMPLETED (378)**			
	(Note: Only experiments which were completed since January 1, 1996 are listed.)			
MA	MC	ETA00 & ETA+- PHASE DIFFERENCE #773	Gollin	
COL	B-0	COLLIDER DETECTOR #741	Shochet, Tollestrup	
	C-0	MAXIMUM ACCEPTANCE DETECTOR #T864	Bjorken, Taylor	
B.	**EXPERIMENTS THAT ARE ANALYZING DATA (25)**			**LAST RUN**
MA	ME	B-QUARK MESONS & BARYONS #789	Kaplan, Peng	JAN 8, 1992
		ANTI(U-QUARK)/ANTI(D-QUARK) DIST#866	Leitch	AUG 06, 1997
	MP	POLARIZED BEAM #704	Yokosawa	AUG 13, 1990
	MT	B PHYSICS TEST BEAM PROGRAM #T880	Butler, Stone	MAY 19, 1997
	MW	HADRON JETS #672A	Zieminski	JAN 8, 1992
		DIRECT PHOTON PRODUCTION #706	Slattery	JAN 8, 1992
		COSMIC RAY CALORIMETER CALIBRATION #T883	Adams	AUG 06, 1997
NA	NC	NEUTRINO #815	Bernstein, Shaevitz	SEP 05, 1997
	NM	TEVATRON MUON #665	Schellman	JAN 8, 1992
	NE	PARTICLE SEARCH #690	Knapp	JAN 8, 1992
PA	PE	PION & KAON CHARM PROD. #769	Appel	FEB 15, 1988
		HADROPRODUCTION HEAVY FLAVORS #791	Appel, Purohit	JAN 8, 1992
	PB	PHOTOPRODUCTION OF JETS #683	Corcoran	JAN 8, 1992
		PHOTOPRODUCTION OF CHARM AND B #687	Butler, Cumalat	JAN 8, 1992
		HEAVY QUARK PHOTOPRODUCTION #831	Cumalat, Moroni	AUG 25, 1997
	PC	LARGE-X BARYON SPECTROMETER #781	Russ	SEP 03, 1997
	PW	BEAUTY PRODUCTION BY PROTONS #771	Cox	JAN 8, 1992
COL	B-0	CDF UPGRADE #775	Carithers, Bellettini	FEB 20, 1996
		CDF HARD DIFFRACTION STUDIES #876	Albrow	FEB 20, 1996
	C-0	TEVATRON CRYSTAL EXTRACTION #853	Murphy	FEB 20, 1996
	D-0	D-0 DETECTOR #740	Grannis, Montgomery	FEB 20, 1996
	E-0	PBAR P ELASTIC SCATTERING #811	Orear	FEB 20, 1996
ACCUM RING		CHARMONIUM STATES #760	Cester	JAN 10, 1992
		ANTI-HYDROGEN DETECTION #862	Christian	SEP 18, 1997
		ANTIPROTON DECAY #868	Geer	JUL 24, 1995
C.	**EXPERIMENTS THAT ARE IN PROGRESS (5)**			
MA	MC	CP VIOLATION #871	Luk, Dukes	
NA	NM	CP VIOLATION #799	Arisaka, Tschirhart	
		CP VIOLATION #832	Blucher	
PA	PW	TAU NEUTRINO #872	Paolone	
ACCUM RING		CHARMONIUM STATES #835	Cester, Pordes	
G.	**OTHER APPROVED EXPERIMENTS (14)**			
COL	B-0	CDF UPGRADE #830	Carithers, Goshaw	
	D-0	D-0 DETECTOR UPGRADE #823	Montgomery, Weerts	
MAIN INJECTOR		NEUTRINO OSCILLATIONS #803	Reay	
		NEUTRINO OSCILLATIONS #875	Wojcicki	
OTHER		AUGER PROJECT R&D #881	Mantsch	
		SEARCH FOR LOW MASS MONOPOLES #882	Kalbfleisch	
		SLOAN DIGITAL SKY SURVEY #885	Kron	
		PET ACCELERATOR #887	Pasquinelli	
		DARK MATTER SEARCH #891	Dixon	
		CMS AT FERMILAB #892	Green	
		LHC ACCELERATOR #893	Strait	
		RECYCLER ELECTRON COOLING #901	Jackson	
A0 FACILITY		PICOSECOND X-RAY SOURCE #886	Melissinos, Colestock	
		PLASMA WAKE-FIELD ACCELERATOR TEST #890	Rosenzweig	

Fermi National Accelerator Laboratory
Experimental Program Situation Report as of February 20, 1998

(Continued)

PENDING PROPOSALS (11)

MA	MW	COSMIC RAY DETECTOR TEST #884	Kim
COL	C-0	BTeV #897	Butler, Stone
	D-0	D-0 FORWARD PROTON DETECTOR #900	Weerts, Montgomery
MAIN INJECTOR		KAON PHYSICS AT MAIN INJECTOR #804	Winstein
		P-BAR+NUCLEI STUDIES #888	Viola
		CPT TEST #894	Thomson
		RADIO COHERENCE TEST #896	Besson
		EXOTIC ATOMS #902	Ivanov
BOOSTR		NEUTRINOS AT THE BOOSTER #889	Abashian
		MiniBooNE #898	Conrad, Louis
OTHER		AXION SEARCH #877	Lee

MESON AREA

MC	871 Dukes / Luk	UC/Berkeley, Fermilab, Guanajuato, IIT, Lausanne, LBL, Michigan, New Mexico State, South Alabama, Taiwan, Virginia	CP Violation				

NEUTRINO AREA

NM	799 Arisaka / Tschirhart	Arizona, UCLA, UC/San Diego, Chicago, Colorado, Elmhurst, Fermilab, Osaka, Rice, Rutgers, Virginia, Wisconsin	Rare Kaon Decays	832 Blucher	Arizona, UCLA, UC/San Diego, Chicago, Colorado, Elmhurst, Fermilab, Osaka, Rice, Rutgers, Virginia, Wisconsin	CP Violation	

PROTON AREA

PW	872 Paolone	Aichi, Athens, UC/Davis, Changwon, Coll. de France, Fermilab, Gyeongsang, Kansas State, Kobe, Kon-kuk, Korean Nat'l, Minnesota, Nagoya, Osaka Sci. Ed. inst., Pittsburgh, South Carolina, Toho, Tufts, Utsunomiya	Tau Neutrinos

COLLIDER

B 0	830 Carithers / Goshaw	ANL, Bologna, Brandeis, UCLA, Chicago, Duke, Fermilab, Florida, Frascati, Geneva, Harvard, Hiroshima, Illinois, IPP/Canada, Johns Hopkins, Karlsruhe, KEK, LBNL, Michigan, Michigan State, MIT, New Mexico, Ohio State, Osaka City, Padova, Pennsylvania, Pisa, Pittsburgh, Purdue, Rochester, Rockefeller, Rutgers, Taiwan, Texas A&M, Texas Tech, Trieste/Udine, Tsukuba, Tufts, Waseda, Wisconsin, Yale	CDF Detector
D 0	823 Montgomery / Weerts	los Andes, Arizona, BNL, Boston, Brown, Buenos Aires, UC/Berkeley, UC/Davis, UC/Irvine, UC/Riverside, CBPF, Charles, Czech Acad. Sci., Czech Tech, CINVESTAV, Columbia, Delhi, Fermilab, Florida State, Hawaii, IHEP/Protvino, Illinois/Chicago, Indiana, INP/Krakow, Iowa State, ITEP, JINR, Kansas, Korea, Kyungsung, LBNL, Louisiana Tech, Maryland, Michigan, Michigan State, Moscow State, Nebraska, New York, Northeastern, Northern Illinois, Northwestern, Notre Dame, Oklahoma,Panjab, PNPI, Purdue, Rice, Rio de Janeiro, Rochester, Saclay, Seoul National, SUNY/Stony Brook, Tata, Texas A&M, Texas/Arlington	D0 Detector

ACCUMULATOR

	835 Cester / Pordes	UC/Irvine, Fermilab, Ferrara, Genova, Northwestern, Torino	Charmonium States

MAIN INJECTOR

Neutrino Beam	803 Reay	Aichi, Athens, UC/Davis, UCLA, Chonnam, Fermilab, Gifu, Gyeongsang, Hirosaki, IIT, Indiana, ITEP, Kansas State, Kinki, Kobe, KAIST, Korea, Michigan, Nagoya Inst. of Tech., Okayama, Osaka City, Osaka Commerce, Osaka Sci. Ed. Inst., Seoul, Soai, South Carolina, Technion, Toho, Tufts, Utsunomiya, Yokohama	Neutrino Oscillations	875 Wojcicki	ANL, Caltech, Columbia, Fermilab, IHEP/Beijing, IHEP/Protvino, Indiana, ITEP, JINR, Lebedev, LLNL, Minnesota, ORNL, Oxford, PNPI, Rutherford, Stanford, Sussex, Texas A&M, Texas/Austin, Tufts, Univ. Coll. London, Western Washington	Neutrino Oscillations

Figure 26. Fermilab experimental program. All major approved experiments that have not yet completed data-taking by the beginning of 1998 are shown here.

SECTION VIII. SUMMARIES OF APPROVED EXPERIMENTS

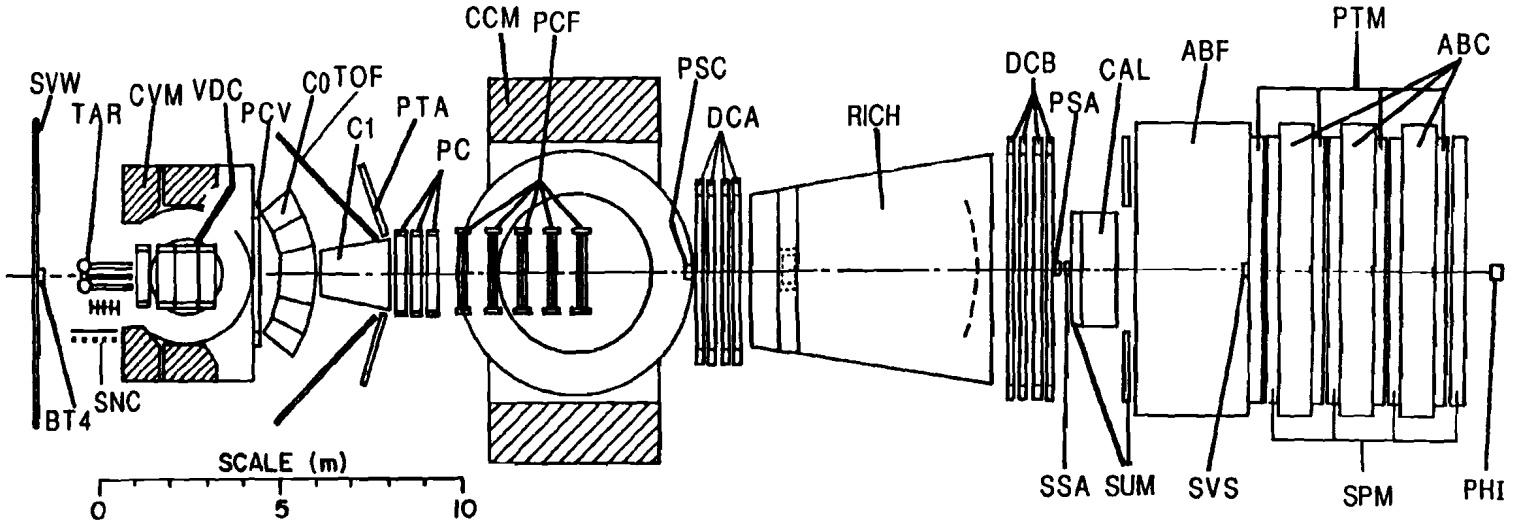
Summaries are given in this Section of major approved experiments which have not yet completed data-taking, and also those major experiments still carrying out a significant analysis effort. Most were prepared recently by the experiment spokesperson(s).

As discussed in the Introduction on page iii, now included in this Section are significant experimental physics activities in which Fermilab physicists are involved, but which are not particle physics experiments at Fermilab accelerators. Note that in the user/institution statistics given below, only the Fermilab physicists on these activities are included.

The number of users (physicists and graduate students) and institutions on the listed experiments are as follows; each user and institution is counted only once even if on more than one experiment.

	Number of Users	Number of Institutions
US institutions	1548	113
Non-US institutions	838	112

FERMILAB E665
MUON SPECTROMETER



SVW	7m x 3m Veto Counter Wall
BT4	Beam Tagging, Station 4
PBT	0.13m x 0.13m MWPC 6 Planes
SBT	0.13m x 0.18m Scintillation Counter Array
TAR	1m LH_2 + LD_2 + Solid Targets
SNC	Neutron Scintillators
CVM	CERN Vertex Magnet
VDC	Vertex Drift Chambers, 16 Planes
PCV	2.8m x 1m MWPC, 6 Planes
C0	144 Cell Threshold Cerenkov Counter
C1	58 Cell Threshold Cerenkov Counter
TOF	4.2m x 1.6m Scintillation TOF Arrays
PTA	2m x 2m Prop. Tube Arrays, 4 Planes
PC	2m x 2m MWPC, 12 Planes
CCM	Chicago Cyclotron Magnet
PCF	2m x 1m MWPC, 15 Planes
PSC	0.13m x 0.13m Small Angle MWPCs, 8 Planes
DCA	4m x 2m Drift Chambers, 8 Planes
RICH	Ring Imaging Cerenkov Counter
DCB	6m x 2m Drift Chambers, 8 Planes
PSA	0.13m x 0.13m Small Angle MWPCs, 8 Planes
SSA	0.13m x 0.13m Scintillation Counter Array
SUM	7m x 3m Scintillation Counter Array
CAL	3m x 3m EM Shower Calorimeter
ABF	7m x 3m x 3m Iron Absorber
SVS	0.23m x 0.3m Scintillation Counter Array
PTM	7m x 3m Prop. Tube Arrays, 8 Planes
SPM	7m x 3m Scintillation Counter Arrays
PHI	0.025m x 0.025m rf Phase Lock Scintillation Counters
ABC	0.9m Concrete Absorbers

E-665 (Schellman) Muon Scattering with Hadron Detection

ANL, UC/San Diego, Fermilab, Freiburg (Germany), Harvard, Illinois/Chicago, INP/Krakow (Poland), LLNL, Maryland, MIT, Max-Planck (Germany), Northwestern, Ohio, Pennsylvania, Washington, Wuppertal (Germany), Yale

Status: *Data Analysis*

The experiment studies the interactions of muons with average beam energies up to 500 GeV in various targets and with the capability of making detailed measurements of the hadrons that emerge from the collision vertex. To this end, the collaboration has combined two large magnets, the CERN Vertex Magnet (CVM) and the Chicago Cyclotron Magnet in a spectrometer that is as powerful as any known. We use this spectrometer in two basic, and for the most part complementary, ways to explore:

1) The properties of hadrons emerging from deep inelastic muon collisions in hydrogen and heavy nuclei. It is possible to study single quark fragmentation and jet physics in the same CM energy range as e^+e^- annihilation experiments which directly observe gluon radiation. In deep inelastic muon scattering, the fragmentation of the current and diquark jets (not seen in e^+e^-) can be measured relative to the precise knowledge of the exchanged virtual photon direction. By studying the A-dependence of these phenomena, we expect to learn new things about the propagation of quarks in nuclear matter and to use the nucleus as a length scale to study non-perturbative quantum chromodynamics.

2) Complementing the fragmentation studies are studies of the deep inelastic structure functions on the same nucleon and nuclear targets. Although the targets are relatively thin, the high incident muon energy makes this experiment particularly suited to the study of structure functions at small x_{Bj} (<0.02). This region is of great interest in the study of nucleon structure. Here, all experiments are limited by kinematics rather than rates, and the increased muon energy available at Fermilab automatically increases the available kinematic range.

The experiment took data for the first time during 1987-88 using deuterium, hydrogen and xenon targets. In 1990 the apparatus was supplemented with a tracking system of drift chambers inside the CVM to improve the pattern recognition capabilities and resolution of the spectrometer. With a new target system, allowing targets to be changed every 60 seconds, muon interactions in hydrogen, deuterium, carbon, calcium and lead were studied. During the 1991 fixed-target run, higher-luminosity studies of hydrogen and deuterium focussed on the difference between the quark content of neutrons and protons and on the structure of events at the highest center of mass energies yet available in muon-nucleon scattering experiments.

Efforts in 1996 concentrated on final publication of the 1990 and 1991 data samples. Other results include measurements of nuclear transparency in vector meson production, Bose-Einstein correlations and the A-dependence of jet production and fragmentation.

Publications

A Spectrometer for Muon Scattering at the Tevatron, M. R. Adams et al., Nucl. Instr. and Meth. A291, 533 (1990).

Distribution of Charged Hadrons Observed in Deep-Inelastic Muon-Deuterium Scattering at 400 GeV, M. R. Adams et al., Phys. Lett. B272, 163 (1991).

Saturation of Shadowing at Very Low x_{Bj}, M. R. Adams et al., Phys. Rev. Lett. 68, 3266 (1992).

Shadowing in the Muon-Xenon Inelastic Scattering Cross Section at 490 GeV, M. R. Adams et al., Phys. Lett. B287, 375 (1992).

First Measurement of Jet Production Rates in Deep-Inelastic Lepton-Proton Scattering, M. R. Adams et al., Phys. Rev. Lett. 69, 1026 (1992).

An Investigation of Bose-Einstein Correlations in Muon-Nucleon Interactions at 490 GeV, M. R. Adams et al., Phys. Lett. B308, 418 (1993).

Measurement of the Ratio σ_n/σ_p in Inelastic Muon-Nucleon Scattering at Very Low x and Q^2, M. R. Adams et al., Phys. Lett. B309, 477 (1993).

Perturbative QCD Effects Observed in 490 GeV Deep-Inelastic Muon Scattering, M. R. Adams et al., Phys. Rev. D48, 5057 (1993).

Q^2 Dependence of the Average Squared Transverse Energy of Jets in Deep-Inelastic Muon-Nucleon Scattering with Comparison to QCD Predictions, M. R. Adams et al., Phys. Rev. Lett. 72, 466 (1994).

Production of Charged Hadrons by Positive Muons on Deuterium and Xenon at 490 GeV, M. R. Adams et al., Z. Phys. C61, 179 (1994).

Scaled Energy (z) Distributions of Charged Hadrons Observed in Deep-Inelastic Muon Scattering at 490 GeV from Xenon and Deuterium Targets, M. R. Adams et al., Phys. Rev. D50, 1836 (1994).

Production of Neutral Strange Particles in Muon-Nucleon Scattering at 490 GeV, M. R. Adams et al., Z. Phys. C61, 539 (1994).

Large Density and Correlation Integrals in Deep-Inelastic Muon-Nucleon Scattering at 490 GeV, M. R. Adams et al., Phys. Lett. B335, 535 (1994).

Nuclear Shadowing, Diffractive Scattering and Low Momentum Protons in μXe Interactions at 490 GeV, M. R. Adams et al., Z. Phys. C65, 225 (1995).

Measurement of Nuclear Transparencies from Exclusive ρ^0 Meson Production in Muon-Nucleus Scattering at 470 GeV, M. R. Adams et al., Phys. Rev. Lett. 74, 1525 (1995).

Nuclear Decay Following Deep Inelastic Scattering of 470 GeV Muons, M. R. Adams et al., Phys. Rev. Lett. 74, 5198 (1995).

Measurement of the Ratio F_2^n/F_2^p in Muon-Nucleon Scattering at Small x and Q^2, M. R. Adams et al., Phys. Rev. Lett. 75, 1466 (1995).

Shadowing in Inelastic Muon Scattering Off Carbon, Calcium and Lead at Low x_{Bj}, M. R. Adams et al., Z. Physics C67, 403 (1995).

Measurement of the Gluon Distribution Function of the Nucleon Using Energy-Energy Angular Pattern in Deep-Inelastic Lepton Scattering, M. R. Adams et al., Z. Phys. C71, 391 (1996).

Proton and Deuteron Structure Functions in Muon Scattering at 470 GeV, M. R. Adams et al., Phys. Rev. D54, 3006 (1996).

Inclusive Single-Particle Distributions and Transverse Momenta of Forward Produced Charged Hadrons in Muon-Proton Scattering at 470 GeV, M. R. Adams et al., Z. Phys. C76, 441 (1997).

Diffractive Production of ρ^0 (770) Mesons in Muon-Proton Interactions at 470 GeV, Z. Phys. C74, 237 (1997).

Theses

E. Ramberg, University of Maryland, 1989.
P. Anthony, Massachusetts Institute of Technology, 1990.
M. Erdmann, University of Freiburg i.Br., 1990.
S. Magill, University of Illinois/Chicago, 1990.
D. Michael, Harvard University, 1990.
S. O'Day, University of Maryland, 1990.
J. Ryan, Massachusetts Institute of Technology, 1991.
A. Salvarani, University of California/San Diego, 1991.
S. Aid, University of Maryland, 1991.
A. Bhatti, University of Washington, 1991.
U. Ecker, Wuppertal, 1991.
D. Jansen, University of Washington, 1991.
A. Roser, Wuppertal, 1992.
M. Schmitt, Harvard University, 1991.
S. Söldner-Rembold, Technischen Universitaät München, 1992.
R. Kennedy, University of California at San Diego, 1992.
M. Baker, Massachusetts Institute of Technology, 1993.
J. Conrad, Harvard University, 1993.
D. Hantke, Technischen Universitaät Munchen, 1993.
H. Clark, Ohio State University, 1993.
M. Wilhelm, University of Freiburg, 1993.
R. Guo, University of Illinois/Chicago, 1994.
T. Carroll, University of Illinois/Chicago, 1994.
P. Spentzouris, Northwestern University, 1994.
W. Dougherty, University of Washington, 1994.
A. Kotwal, Harvard University, 1995.
P. Madden, University of California/San Diego, 1995.
A. Banerjee, University of Pennsylvania, 1995.

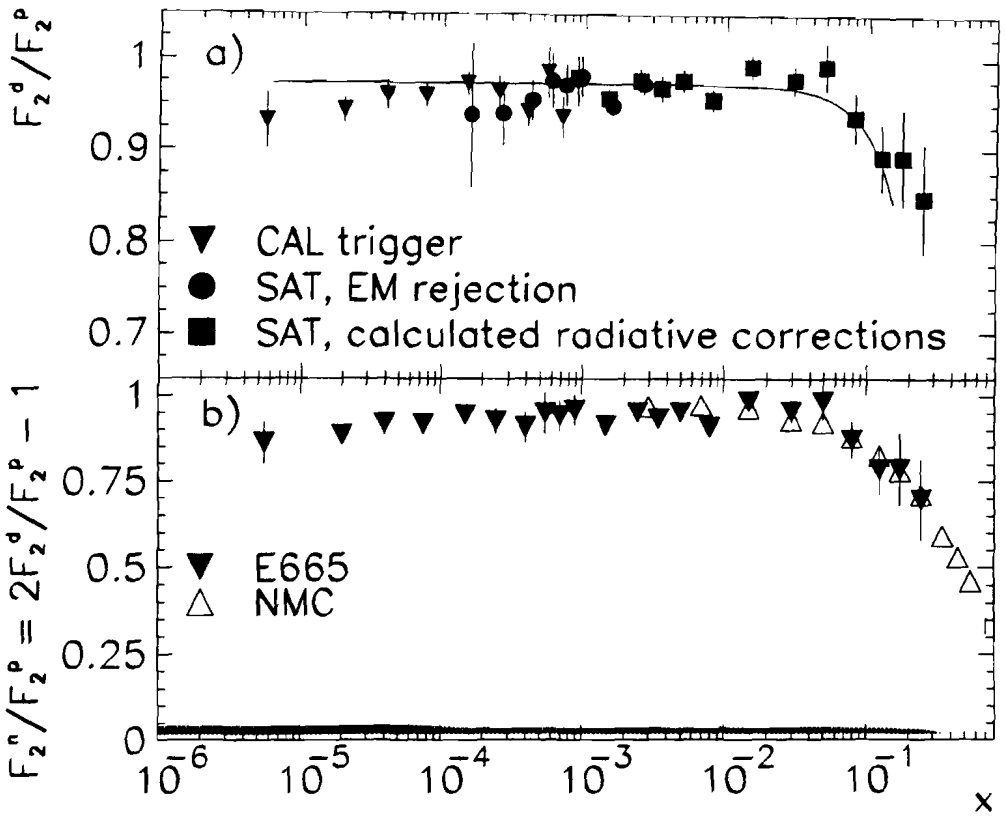


Figure 1. Final neutron-to-proton structure function ratio from the full 1991 data sample. The x region below 2×10^{-3} is unique to E-665.

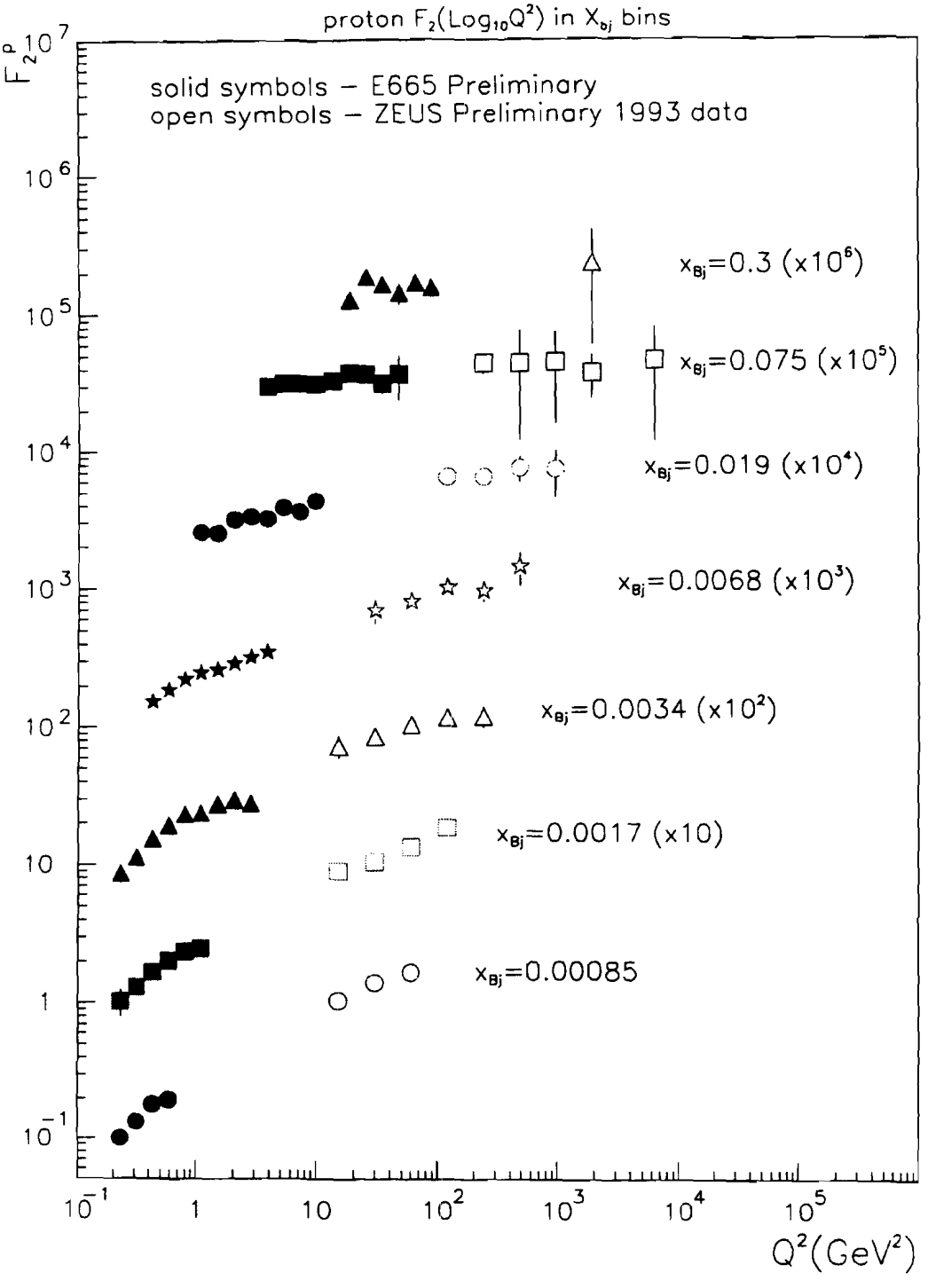
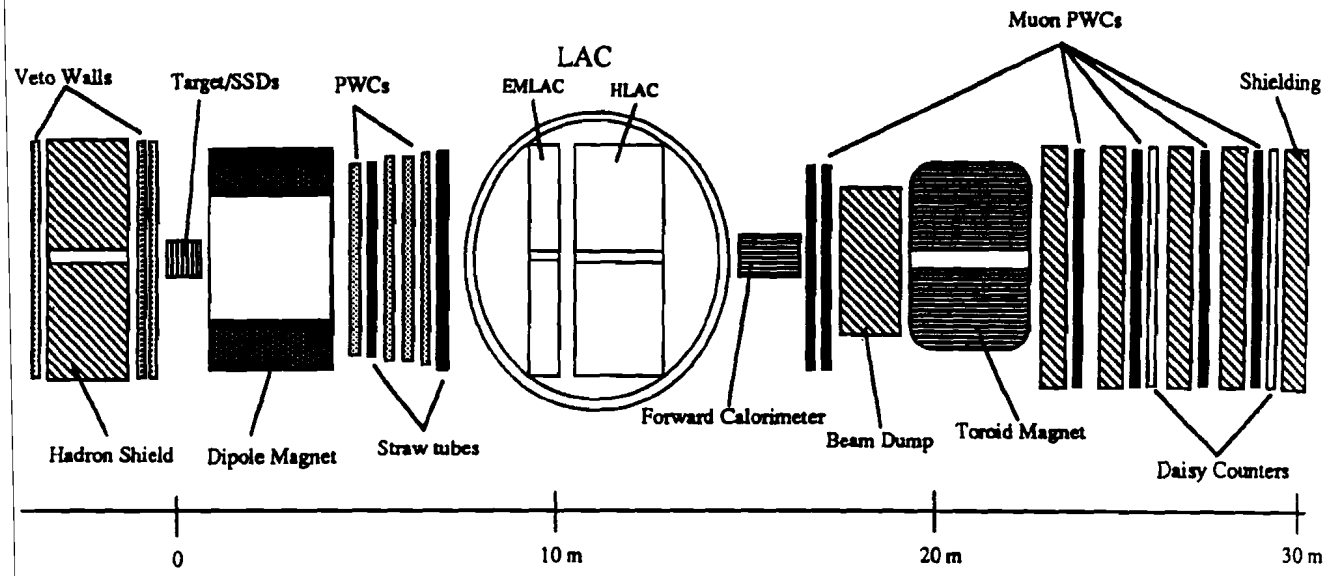


Figure 2. The structure function F_2 (x, Q^2) measured at low x and compared to HERA results.



The Meson-West apparatus.

E-672 (Zieminski) Study of Hadronic Final States in Association with High Mass Dimuons

Fermilab, IHEP/Protvino (Russia), Illinois/Chicago, Indiana, Louisville, Michigan/Flint

Status: *Data Analysis*

The aim of the E-672 experiment is to study hadronic processes yielding vector mesons (ρ/ω, ϕ, J/ψ, ψ')and high mass dimuon pairs (the trigger) and associated particles. The experiment shares the MW beam line, magnetic spectrometer and calorimetry with the E-706 experiment. The dimuon detector is located downstream of the forward hadronic calorimeter and consists of a toroid magnet, six PWC's with three or four planes each, two scintillator hodoscopes used in the dimuon pretrigger and pretrigger and trigger processors.

E-672 is an open geometry dimuon experiment. The geometrical acceptance for dimuon pairs produced in hA collisions at 530 GeV/c is approximately 20% and has a maximum for Feynman x = 0.25. The physics goals, which all are related to experimental tests of Quantum Chromodynamics, include:

(a) Production of χ states by observing their radiative decays into $J/\psi\gamma$ with gammas either converting into e^+e^- pairs inside the target or observed in the LAC;

(b) Production of b-quarks observed via their decays to J/ψ (inclusive and exclusive modes: $J/\psi K$, $J/\psi K^*$ and $J/\psi K^0$);

(c) General properties of the production of vector mesons (ρ/ω, ϕ, J/ψ, and ψ') and Drell-Yan pairs

- total and differential cross sections
- gluon structure function of the incident hadron
- production of associated charged and neutral particles
- dependence on the inelasticity of the collision
- the A-dependence of total and differential cross sections

(d) $J/\psi + n\pi$ spectroscopy (same for ϕ).

The first test/physics run of the experiment took place in 1987/88. Approximately 2000 J/ψ's were recorded and successfully reconstructed under various running conditions. Two papers were published: one on the A-dependence and another on properties of J/ψ production in π^- Be and pBe collisions at 530 GeV/c.

During the 1990 run we collected 5 million triggers with the 530 GeV/c π^- beam incident on Be and Cu targets. All triggers were processed through the off-line reconstruction. This gave us over 350,000 events with both muons originating from the target. The sample includes 13,000 reconstructed J/ψ events with J/ψ mass resolution better than 60 MeV/c^2 and over 500 ψ' events in the $\mu^+\mu^-$ and J/$\psi\pi^+\pi^-$ decay modes. It also contains approximately 15,000 ϕ events and 50,000 ρ/ω events. The quality of the data is far superior compared to the 1987/88 run due to extra tracking chambers, new SSD planes and reading out the LAC data without zero suppression.

We reconstructed over 100 $\chi \rightarrow$ J/ψ + e^+e^- decays and several hundred $\chi \rightarrow$ J/$\psi\gamma$ decays. A 10 MeV mass resolution enabled a clear separation of the χ (3510) and χ (3555) signals in the $\chi \rightarrow$ J/ψe^+e^- mode.

Several multivertex finding algorithms were developed. There are 73 events with J/ψ originating from well-separated vertices (3 sigma in transverse and longitudinal directions). Ten of the secondary vertices are outside the target region. We estimate that 26 $\pm$ 10 events are due to B $\rightarrow$ J/ψ X decay. We also observe five exclusive B $\rightarrow$ J/ψ K and B $\rightarrow$ J/ψ K* decays.

During the 1991 run we collected 10 million triggers with 515 GeV/c and 800 GeV/c protons incident on H, Be and Cu targets.

Publications

A-Dependence of J/ψ Production in π^--Nucleus Collisions at 530 GeV/c, S. Kartik et al., Phys. Rev. D41, 1 (1990).

Properties of J/ψ Production in π^-Be and pBe Collisions at 530 GeV/c, V. Abramov et al., FERMILAB-Pub-91/62-E (1991).

Bottom Production in pi-Be Collisions at 515 GeV/c, R. Jesik et al., Phys. Rev. Lett. 74, 495 (1995).

Production of J/ψ and ψ(2s) Mesons in π^-Be Collisions at 515 GeV/c, A. Gribushin et al., Phys. Rev. D53, 4723 (1996).

Production of Charmonium States in π^-Be Collisions at 515 GeV/c, V. Koreshev et al., Phys. Rev. Lett. 77, 4294 (1996).

Theses

S. Kartik, Indiana University, 1991.
R. Li, Indiana University, 1993.
R. Jesik, University of Illinois at Chicago, 1994.
F. Vaca, University of Illinois at Chicago, 1995.

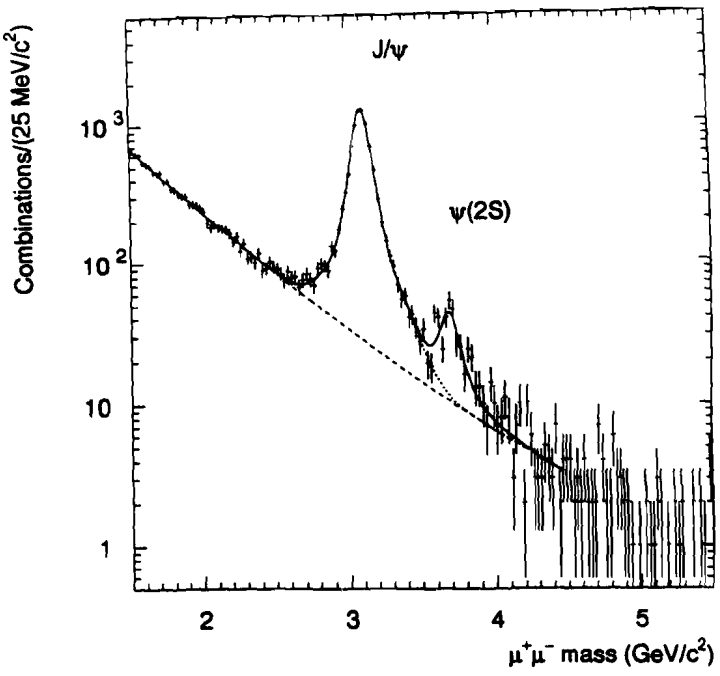


Figure 1. Invariant mass distribution for $\mu^+\mu^-$ pairs in the J/ψ mass region. The solid curve is a fit to the data; the dotted curve shows the J/ψ contribution, and the dashed curve shows the background contribution.

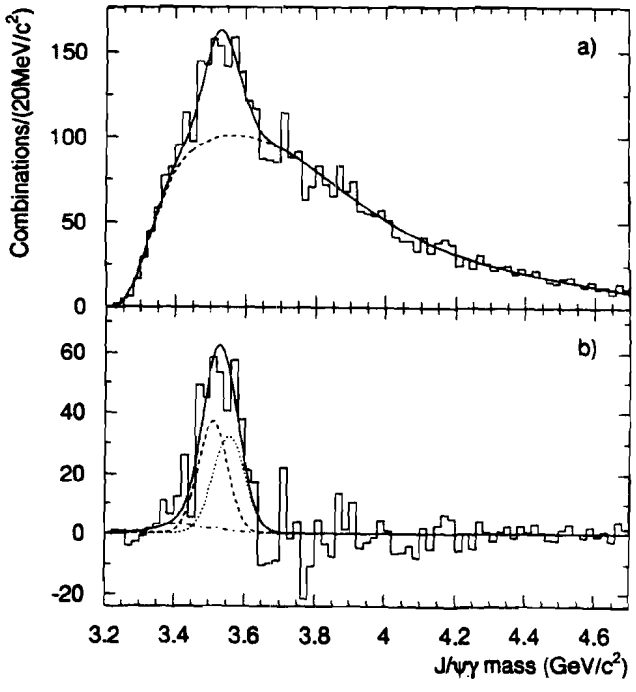


Figure 2. J/ψγ invariant mass for γ's detected in the EMLAC: (a) the solid curve shows the fit to the signals and background, the dashed curve illustrates the background contribution; (b) the background subtracted data and signals (solid curve), and the estimated contributions from χ_{c0} and ψ(2S) (dot-dash), χ_{c1}(dash), and χ_{c2}(dot).

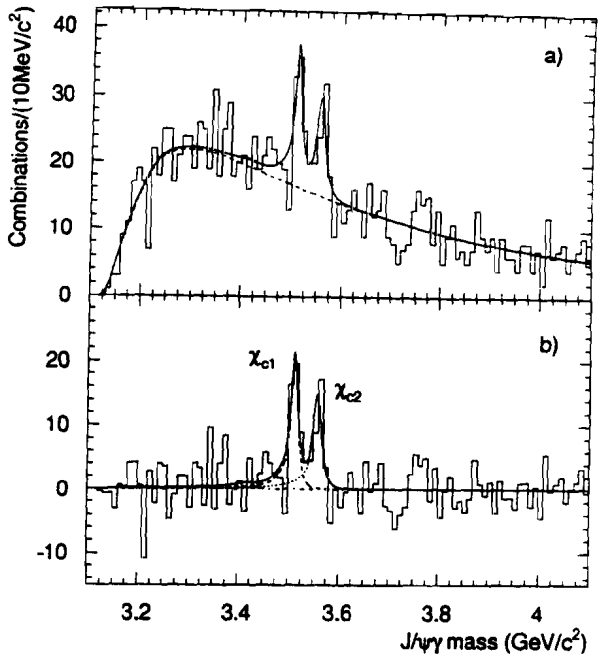


Figure 3. J/ψ invariant mass for γ's detected through conversions into e^+e^- pairs: (a) the solid curve shows the fit to the signals and background, the dashed curve shows the background contribution; (b) the background subtracted data and estimated contributions from χ_{c0} and ψ(2S) (dot-dash), χ_{c1}(dash), and χ_{c2}(dot).

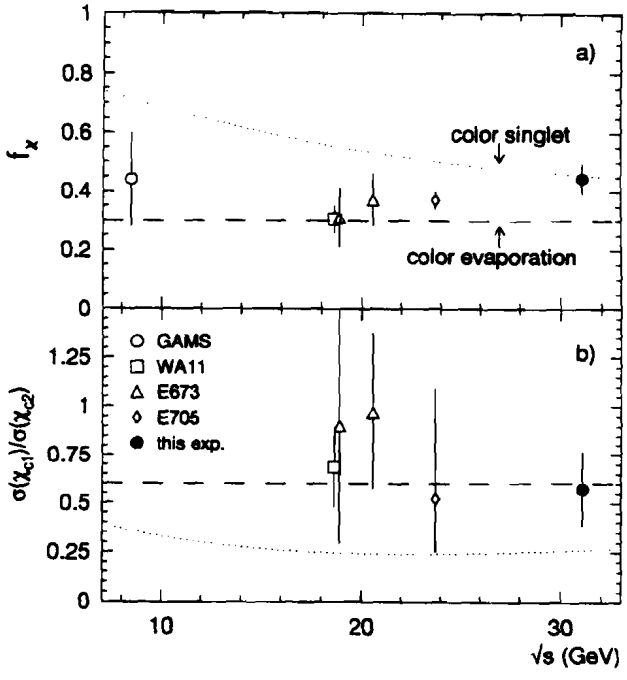
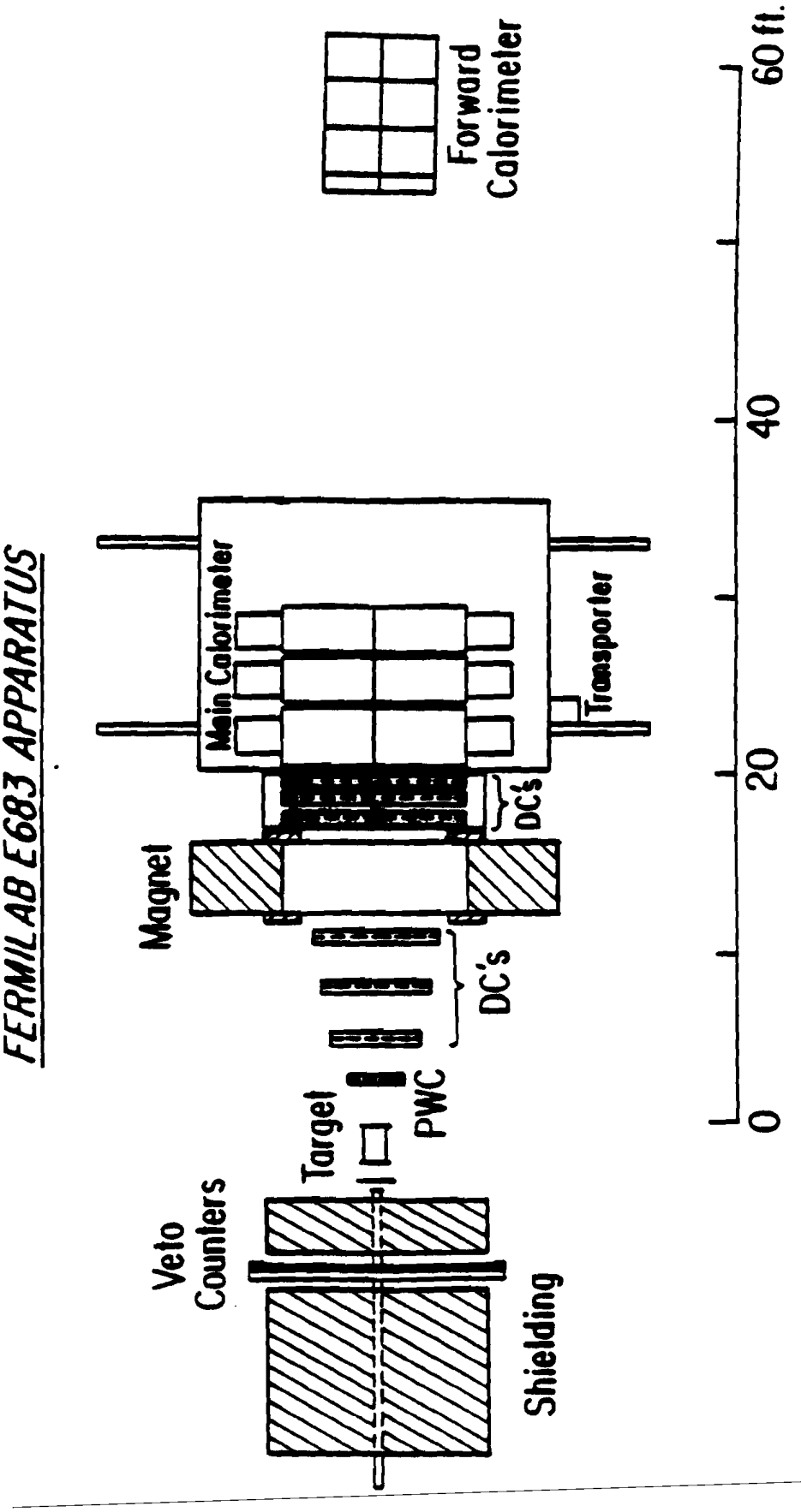


Figure 4. Dependence of (a) the fraction of J/ψ's coming from χ_c decays, and (b) the ratio of χ_{c1} to χ_{c2} cross sections, on the π^--nucleon center-of-mass energy. The error bars represent statistical and systematic uncertainties added in quadrature. Dashed lines show predictions of a color-evaporation model, dotted curves show predictions of a color-singlet model by Schuler (without K factors).


FERMILAB E683 APPARATUS
Forward Calorimeter
Main Calorimeter
Transporter
Magnet
DC's
DC's
Target
PWC
Veto Counters
Shielding
0
20
40
60 ft.

E-683 (Corcoran) Photoproduction of High P_t Jets

Ball State, Fermilab, Iowa, Maryland,
Michigan, Rice, Vanderbilt

Status: *Data Analysis*

This experiment is studying the photoproduction of high p_t jets in the Wide Band Photon Beam of the Tevatron. At first order, the QCD processes of interest are QCD Compton scattering ($\gamma q \rightarrow gq$) and photon-gluon fusion ($\gamma g \rightarrow q\bar{q}$). These processes are distinctive in that the photon couples directly to the hard scattering, giving all of its energy to the two high p_t jets, and leaving no beam jet. In addition to the direct processes, the resolved photon processes are expected to be important. In these processes, the photon is resolved into a virtual quark-antiquark pair, one of which then interacts with a parton in the target. For the resolved process, the photon behaves somewhat like a meson, but with a much harder structure function. In both the direct and resolved processes, the energy in the parton-parton frame is a large fraction of the total CM energy, and the beam jet is either missing entirely or small. Both of these features lead to an especially clean jet signal. Comparison of pion and photon data confirms that this is the case.

To higher orders in QCD, the distinction between direct and resolved processes becomes blurred. At our energies and Q^2, higher-order processes are expected to be important. Our data are consistent with this expectation in that the jet cross sections fall faster in p_t than leading-order QCD would predict, and our observed photon structure function is softer than leading-order QCD would suggest.

The A-dependence of jet production from heavy nuclei has been studied in E-683. The photon can produce partons deep inside a nucleus, allowing one to study the propagation of partons through nuclear matter. A photon beam is a clean probe of such processes. Significant A-dependent effects have been observed in our data.

Photons in the momentum range of 100 to 400 GeV/c were tagged with a momentum uncertainty of about 2%. A plan view of the apparatus is shown in the accompanying figure. It consists of a wide-angle magnetic spectrometer, the main calorimeter array, and a forward calorimeter. The spectrometer is composed of an SCM-105 magnet with 20 planes of drift chambers and PWC's. Vertexing and tracking efficiencies are about 80% for all targets. The main calorimeter is segmented in area and depth and consists of 528 modules forming 132 towers. The forward calorimeter measures the energy flow in the region from $\theta_{cm} = 0^o$ to about 20^o. The main calorimeter has a measured energy resolution of $35\%/\sqrt{E}$ for electromagnetic particles and $75\%/\sqrt{E}$ plus a 5% constant term for hadronic particles.

E-683 began taking data in June of 1991, when the fixed-target program resumed. Data-taking was complete in January of 1992. A total of about 10 million triggers were recorded, fairly equally divided between hydrogen, deuterium, and six different nuclear targets. Analysis is proceeding, both at Fermilab and at the various institutions.

To date five students have received M.S. degrees from work related to E-683, and four students have completed Ph.D. theses. Results have been presented at several conferences and workshops.

Publications

Detecting Beam Pileup for High-Rate Particle Beams, D. Lincoln and D. Naples, Nucl. Instr. and Meth. A332, 23 (1993).

Observation of Jet Production by Real Photons, D. Adams et al., Phys. Rev. Lett. 72, 2337 (1994).

A-Dependence of Photoproduced Dijets, D. Naples et al., Phys. Rev. Lett. 72, 2341 (1994).

A Hidden Bias in a Common Calorimeter Calibration Scheme, D. Lincoln, G. Morrow, and P. Kasper, Nucl. Instr. and Meth. A345, 449 (1994).

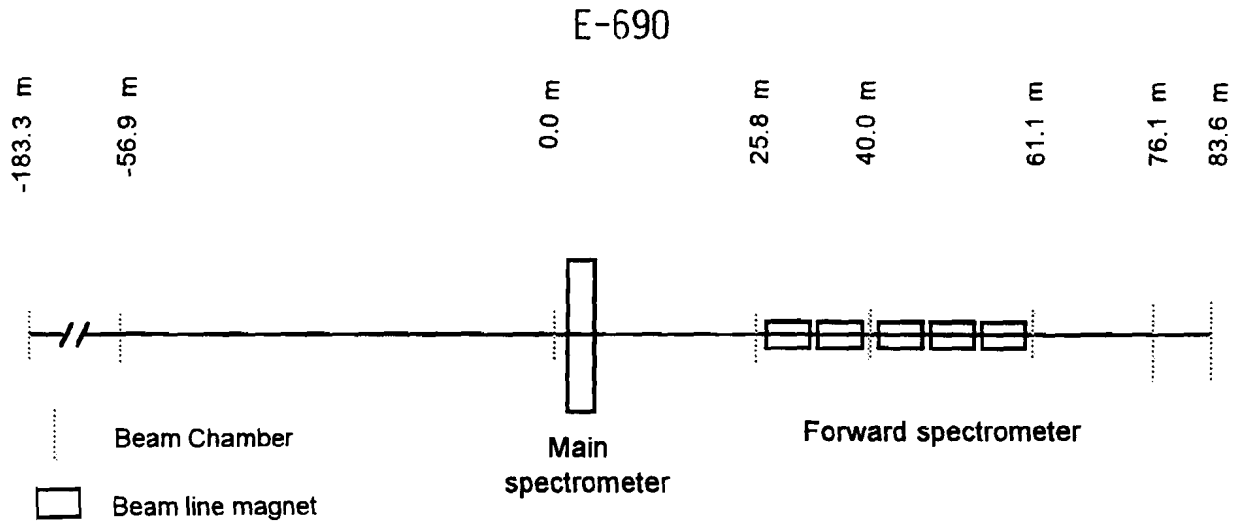
The Emergence of Jet Dominance in γ-P Interactions at Fixed-Target Energies, D. Alton et al., Phys. Rev. Rapid Communications D56, R5301 (1997).

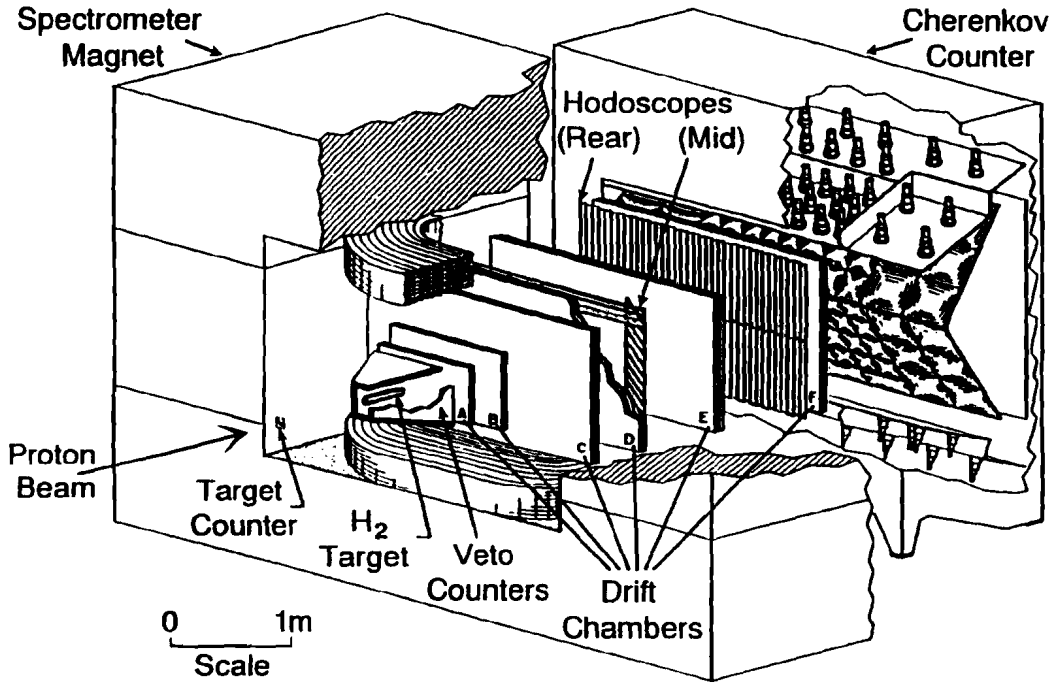
Ph.D. Theses

D. Naples, University of Maryland
D. Lincoln, Rice University
M. Traynor, Rice University
G. Morrow, Rice University

M. S. Theses

D. Lincoln, Rice University
M. Traynor, Rice University
G. Morrow, Rice University
W. Davis, Ball State University
D. Alton, Ball State University





Main Spectrometer

E-690 (Knapp) Study of Charm and Bottom Production

Columbia, Fermilab, Guanajuato (Mexico), Massachusetts, Texas A&M

Status: *Data Analysis*

This experiment studies proton diffraction, $pp \rightarrow pX$, with 800 GeV protons scattering from liquid hydrogen, measuring a diffracted forward proton in a forward beam spectrometer, and looking at the recoil system X in a magnetic spectrometer. The detector and its data acquisition system were designed to tolerate interaction rates on the order of 1 MHz, reading 100K events per second into a pipelined hardware processor, ultimately recording on tape more than 10K events per second of beam. In three months of running, we recorded more than 5 billion events, with periods of sustained running with 200K events per spill recorded, with a trigger requiring an incoming beam particle and an outgoing beam particle within the acceptance of the forward spectrometer but scattered out of the small beam envelope, in coincidence with at least one particle in the magnetic spectrometer.

The tracks were reconstructed with the hardware processor after the run, writing all raw data and track information out for every event, and selecting candidates for momentum balance for a secondary output. All events are now running through a vertex reconstruction program that reconstructs every event in as much detail as possible, writing out everything along with a secondary output containing candidates for complete event reconstruction and events with identified strange particles. We estimate a final yield of a few hundred million reconstructed V^0's and more than ten million fully reconstructed events, recorded with good resolution and a geometric acceptance that favors diffractive production of heavy particles.

Our analysis efforts are focusing on diffraction of heavy particles: antibaryons, strange particles, charm particles, ... and on particle spectroscopy. With high statistics for a large number of exclusive reactions, we can determine production cross-sections and parameters of many resonances. For example, in double Pomeron production, $pp \rightarrow ppM$, we have large clean signals in meson resonances that have been considered candidates for non-$q\text{-}\bar{q}$ mesons. For the general study of heavy particle production in diffraction, we have the opportunity to perform doubly inclusive measurements for a variety of heavy particles: measuring the momentum of the scattered forward proton and the momentum of a particular heavy particle type. Along with the measurements of exclusive reaction cross sections and distributions, this will allow detailed modeling of diffractive production in pp interactions, which could, for example, be compared with diffraction in deep inelastic ep scattering.

Publications

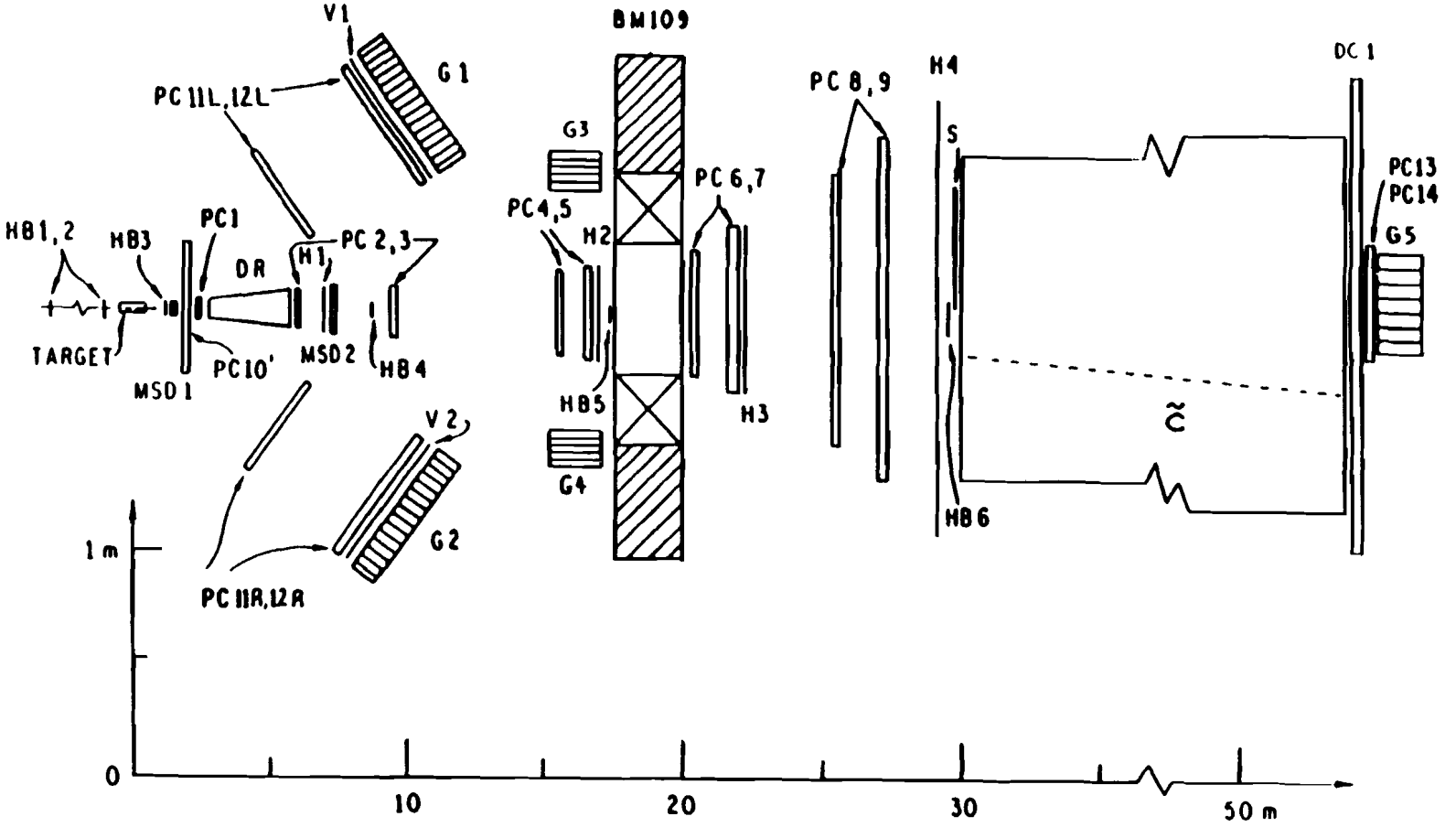
Light-Meson Spectroscopy in Fermilab Experiment E-690, A. Gara et al., Il Nuovo Cimento 107A, 1847 (1994).

Partial Wave Analysis of the Centrally Produced K_SK_S System at 800 GeV/c, FERMILAB-Pub-97/233-E, July 1997, submitted to Phys. Rev. Lett.

Spin Parity Analysis of the Centrally Produced $K^0K\pi$ System at 800 GeV/c, FERMILAB-Pub-97/275-E, August 1997, submitted to Phys. Rev. Lett.

Theses

S. Lee, University of Massachusetts/Amherst, 1994.
M. Sosa, Universidad de Guanajuato, 1996.
M. Reyes, CINVESTAV, 1996.
K. Markianos, University of Massachusetts/Amherst, 1997.


V1
G1
PC 11L,12L
BM109
G3
PC 8,9
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DC 1
PC 6,7
PC13
PC14
PC4,5
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G5
HB1,2
HB3
PC1
PC 2,3
DR
H1
TARGET
IB
MSD1
PC10'
MSD2
HB4
HB5
H3
G4
HB6
V2
G2
PC 11R,12R
1 m
0
10
20
30
50 m

E-704 (Yokosawa) Experiments with the Polarized Beam Facility

ANL, Fermilab, Hiroshima (Japan), IHEP/Protvino (Russia), Iowa, Kyoto (Japan), Kyoto Education (Japan), Kyoto Sangyo (Japan), LANL, LAPP/Annecy (France), Northwestern, Univ. of Occup. & Env. Health (Japan), Rice, Saclay (France), Trieste (Italy), Udine (Italy)

Status: *Data Analysis*

Experiment 581, Construction of a Polarized Beam Facility and Measurement of the Beam Polarization by Polarimeters, has obtained initial data on the properties of the new polarized beam.

Completion of a 200-GeV/c conventional-magnet beam line allowed observation of polarized protons and polarized antiprotons from decaying lambdas and antilambdas, respectively. A beam tagging system and two polarimeters, using the Primakoff effect and Coulomb-nuclear interference, measured the beam polarization during the 1987-1988 TeV-II period. Measured beam polarization was consistent with the designed value.

Experiment 704, the Integrated Proposal on First Round Experiments with the Polarized Beam Facility, constitutes a proposal to simultaneously perform substantial parts of previously proposed Experiments 674, 676, 677 and 678. The first 1200 hours of beam time for E-704 were allocated as follows:

1) First 300 hours for $\Delta\sigma_L^{Tot}(pp)$ including tuning.

2) 300 hours for $\Delta\sigma_L^{Tot}(\bar{p}p)$

The experimenters intend to explore the spin dependence of the interactions in a global way using a straightforward experiment which measures the difference in pp and $\bar{p}p$ total cross sections between the states with helicities of target and beam parallel and antiparallel. Experience shows that an accuracy of ± 100 microbarns can easily be achieved. A longitudinally-polarized proton target in a superconducting solenoid was used with the polarized beam during the 1990 fixed-target period. The data are being analyzed.

3) 600 hours for simultaneous measurements using a hydrogen target for A_N in large-$p_\perp$ π^0, large-x π's, lambda and sigma-zero production.

Studies of the inclusive production of neutral pions around $x_F \approx 0$ and large $p_\perp$ of neutral and charged pions at large x, and of $\Lambda^0(K^0)$ and Σ^0 at large x_F were carried out simultaneously. These measurements investigate the spin effects as a function of x_F and $p_\perp$. Interpretation of the polarization of Λ^0 and Σ^0 produced inclusively from an unpolarized initial state has given rise to extensive discussion about the origin of this polarization. It is expected that

information on spin transfer from initial to final states in these reactions will enlighten the debate.

Elements of the existing polarization monitor were used in conjunction with new detectors in E-704. Two large calorimeters, each consisting of 500 lead-glass cells, detected photons from the π^0-decay. The magnetic spectrometer with proportional and drift chamber systems observed the $\pi^{\pm}$ and Λ^0 and Σ^0 decay products.

The technique for measuring single spin asymmetries in hadron production was considerably improved over the previous experiments since the polarized beam allowed the use of a liquid hydrogen target.

A paper on "Spin Transfer in Inclusive Λ Production by Transversely Polarized Protons" appeared in Phys. Rev. Lett. D_{NN} reaches large positive values of about 30% at high x_F and $p_\perp$ ~1.0 GeV as shown in Figure 1. This result indicates a large spin transfer from the incident polarized proton to the outgoing Λ.

A paper on "Measurement of Single Spin Asymmetry in η-Meson Production in $p^\uparrow p$ and $\bar{p}^\uparrow p$ Interactions in the Beam Fragmentation Region at 200 Gev/c" is complete and will be sent for publication. The average value of the asymmetry over the x_F region $0.4<x_F<0.7$ is $A_N = 17 \pm 5\%$. The asymmetry in $\bar{p}^\uparrow p$ interactions is consistent with zero. Within the error bars, the experimental result is consistent with the prediction of the Berliner model.

Publications

Analyzing Power-Measurement in Inclusive π^0 Production at High x_F, B. E. Bonner et al., Phys. Rev. Lett. 61, 1918 (1988).

Polarized-Proton and -Antiproton Beams at Fermilab and Associated Experiments, A. Yokosawa, Int. Journal of Modern Physics A, Vol. 3, No. 12, 2753 (1988).

Analyzing Power-Measurements of Coulomb-Nuclear Interference with the Polarized-Proton and -Antiproton Beams at 185 GeV/c, N. Akchurin et al., Phys. Lett. B229, 299 (1989).

Measurement of the Analyzing Power in the Primakoff Process with a High-Energy Polarized Proton Beam, D. C. Carey et al., Phys. Rev. Lett. 64, 357 (1990).

The Design and Performance of the FNAL High-Energy Polarized-Beam Facility, D. P. Grosnick et al., Nucl. Instr. Meth. in Phys. Research, A290, 269 (1990).

First Results for the Two-Spin Parameter A_{LL} in π^0 Production by 200-GeV Polarized Protons and Antiprotons, D. L. Adams et al., Phys. Lett. B261, 197 (1991).

Comparison of Spin Asymmetries and Cross Sections in π^0 Production by 200-GeV Polarized Antiprotons and Protons, D. L. Adams et al., Phys. Lett. B261, 201 (1991).

Analyzing Power in Inclusive π^+ and π^- Production at High x_F with a 200 GeV Polarized Proton Beam, D. L. Adams et al., Phys. Lett. B264, 462 (1991).

High-x_t Single-Spin Asymmetry in π^0 and η Production at $x_F = 0$ by 200 GeV Polarized Antiprotons and Protons, D. L. Adams et al., Phys. Lett. B276, 531 (1992).

Large-x_F Spin Asymmetry in π^0 Production by 200-GeV Polarized Protons, D. L. Adams et al., Zeit Physik C 56, 181 (1992).

Analyzing-Power Measurement of pp Elastic Scattering in the Coulomb-Nuclear Interference Region with the 200-GeV/c Polarized-Proton Beam at Fermilab, N. Akchurin et al., Phys. Rev. D48, 3026 (1993).

Measurement of the Double-Spin Asymmetry A_{LL} for Inclusive Multi-Gamma Pair Production with 200 GeV/c Polarized Proton Beam and Polarized Proton Target, D. L. Adams et al., Phys. Lett. B336, 269 (1994).

Measurement of Single-Spin Asymmetry for Direct Photon Production in pp Collisions at 200 GeV/c, D. L. Adams et al., Phys. Lett. B345, 569 (1995).

Measurement of Lambda Production with 200 GeV/c Polarized Proton Beam, D. L. Adams et al., Phys. Rev. Lett. 75, 3073 (1995).

Single Spin Asymmetries and Invariant Cross Sections of the High-Transverse Momentum Inclusive π^0 Production in 200 GeV/c pp and $\bar{p}p$ Interactions, D. L. Adams et al., Phys. Rev. D53, 4747 (1996).

Single Spin Asymmetries in Inclusive Charged Pion Production by Transversely Polarized Antiprotons, A. Bravar et al., Phys. Rev. Lett. 77, 2626 (1996).

Measurement of the Difference in the Total Cross Section for Antiparallel and Parallel Longitudinal Spins and a Measurement of Parity Nonconservation with Incident Protons and Antiprotons at 200 GeV/c, D. P. Grosnick et al., Phys. Rev. D55, 1159 (1997).

Measurement of the Depolarization Parameter (D_{NN}) in Lambda Production in Proton-Proton Interactions Using a 200 GeV Transversely Polarized Proton Beam, A. Bravar et al., Phys. Rev. Lett. 78, 4003 (1997).

Papers Being Prepared

Measurement of Single Spin Asymmetry in η-Meson Production in $p^{\uparrow}p$ and $\bar{p}^{\uparrow}p$ Interactions in the Beam Fragmentation Region at 200 GeV/c.

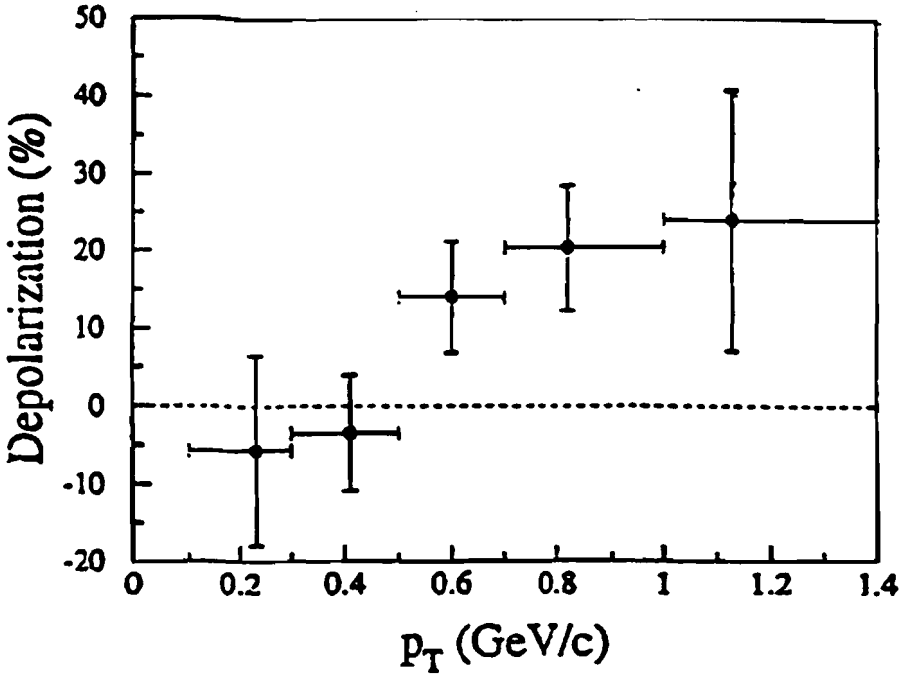
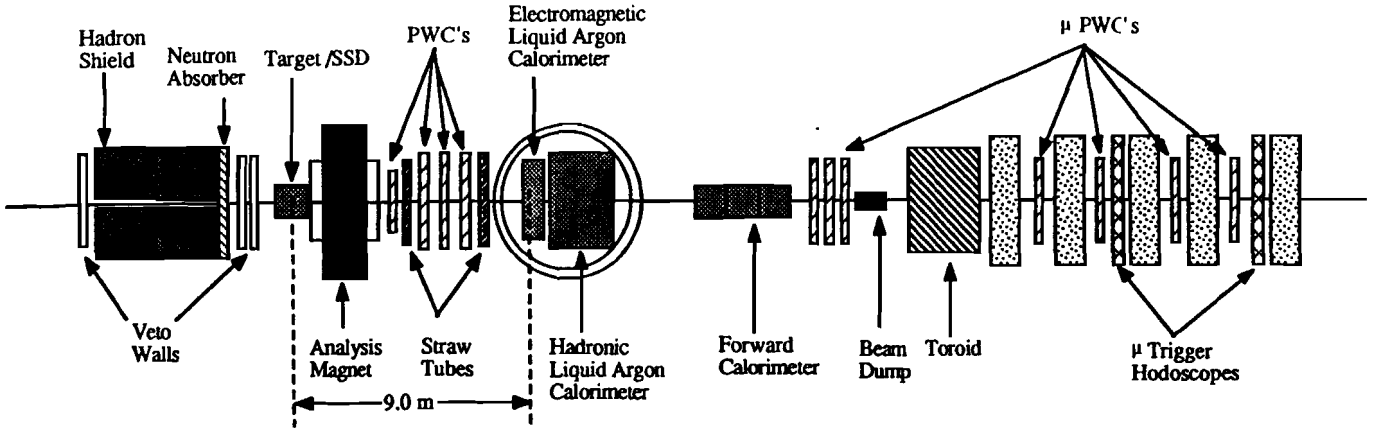
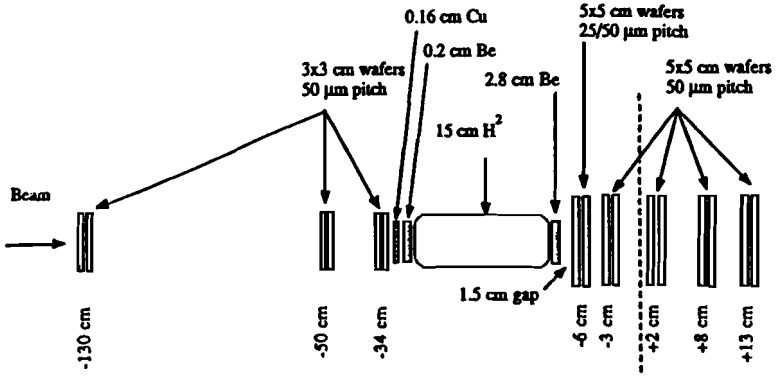


Figure 1. D_{NN} data as a function of p_T.



M WEST SPECTROMETER



Target Region

E-706 (Slattery) A Comprehensive Study of Direct Photon Production in Hadron Induced Collisions

UC/Davis, Delhi (India), Fermilab, Michigan State, Northeastern, Oklahoma, Pennsylvania State, Pittsburgh, Rochester

Status: *Data Analysis*

E-706 is a second generation fixed-target experiment to study events containing high transverse momentum direct photons produced in hadronic interactions. Only two leading order diagrams contribute to direct photon production: the QCD Compton diagram ($q + g \rightarrow q + \gamma$) and the quark-antiquark annihilation process ($\bar{q} + q \rightarrow g + \gamma$). Next-to-leading order QCD calculations are available for both inclusive direct photon cross sections and for direct photon plus jet production.

The physics goals of E-706 include measuring the gluon distribution function of the nucleon and the charged pions. The E-706 data for incident mesons is at a significantly higher CM energy (31 GeV) than previous experiments, which are clustered at CM energies between 19 and 24 GeV. The study of direct photon plus jet events (including $\gamma\gamma$ production) provides sensitive tests of next-to-leading order QCD calculations. Direct photon data also provide input to quark and gluon fragmentation studies.

Since electromagnetic decays of neutral pions are the primary source of background to direct photon data, precision measurements of neutral pion cross sections are an essential part of this experimental program. These measurements are of interest in their own right since they provide insight into hard scattering processes. Next-to-leading order calculations of large transverse momentum neutral pion (and eta) production are also available.

The MWest spectrometer, which was simultaneously employed to acquire data for E-706 and E-672, is a large acceptance multiparticle spectrometer. The MWest beamline included spoilers to reduce the muon flux incident upon the spectrometer, and a differential Cerenkov counter to identify incident particle types. Veto walls and hadron shielding upstream of the target minimized the impact of incident beam halo on the experiment. Six planes of 50 μm pitch silicon strip detectors were positioned upstream of the target. Different targets allow for investigation of the nuclear dependence of the various processes. A pair of silicon strip detectors, with 25 μm pitch in the central region and 50 μm pitch on their outer edges, was located immediately downstream of the target, and was followed by eight additional silicon strip planes of 50 μm pitch. The large aperture (122×91 cm^2) conventional analysis magnet provided a transverse momentum impulse of 450 MeV to charged particles. Four proportional wire chamber modules were located downstream of the magnet, each containing four planes with 2.54 mm pitch. Two straw tube drift chambers, each with four planes in each of two views, were also positioned downstream of the magnet. The drift chamber resolutions were

300 μm and 250 μm per plane, respectively. The finely segmented, focused electromagnetic lead and liquid argon calorimeter has a radius of 1.6 m and was located 9 m downstream of the target. The standard deviation of the reconstructed π^0 mass peak is ~6 MeV, while that of the η is ~20 MeV. A steel hadronic calorimeter was located behind the electromagnetic calorimetry within the liquid argon cryostat. An iron and scintillator calorimeter intercepted the particles passing through a central hole in the liquid argon calorimeters. A muon identification system provided by E-672 was located downstream of the forward calorimeter. For the purposes of E-706, the spectrometer triggered upon large transverse momentum electromagnetic showers detected in the liquid argon calorimeter.

The MWest spectrometer was commissioned during the 1987-1988 fixed-target run. Approximately 5 million physics-quality triggers were recorded during that run using positive and negative 0.5 TeV beam on copper and beryllium targets. This data sample corresponds to a sensitivity of about 0.5 events per picobarn for the negative beam and about 0.8 events per picobarn for the positive beam. Seventeen students completed their Ph.D. research using this data sample. These students investigated a wide variety of topics including neutral pion production at low transverse momentum, neutral pion and eta production at high transverse momentum, direct photon production at high transverse momentum, recoiling jet structure in high transverse momentum events, fragmentation properties of strange particles produced in high transverse momentum hadronic interactions, neutral pion pair production, characteristics of forward energy production, and leading particle production at 0.8 TeV.

During the 1990 fixed-target run, about 30 million triggers induced by a negative 0.5 TeV beam incident on beryllium and copper targets were recorded. These data provide more than a factor of fifteen increase in sensitivity relative to that acquired during our initial run. Prior to the 1991 fixed-target run, a 0.02 interaction length liquid hydrogen target was installed. During 1991, we accumulated 23 million triggers using an 0.8 TeV primary proton beam incident on hydrogen, beryllium, and copper targets. This data sample corresponds to a sensitivity of about ten events per picobarn. An additional 14 million triggers induced by a 0.5 TeV positive beam incident upon the same targets were also accumulated during this run. These data represent a sensitivity of about ten events per picobarn. A smaller sample (4 million triggers) of negative 0.5 TeV beam induced data was also recorded during the 1991 running, and provides the opportunity to investigate nuclear dependence effects in the negative data, and also verify the relative normalization of the 1990 and 1991 data samples.

Thirteen students have completed their Ph.D. research using the data accumulated during the 1990-91 fixed-target runs. Three additional students should complete their research within the coming year. We have measured the cross sections for neutral pion, eta, omega and direct photon production at high transverse momentum. Typical mass plots of the neutral pion, eta, and omega signals are shown in Figure 1. Examples of the resulting inclusive neutral pion and direct photon cross sections as functions of transverse momentum are shown in Figures 2, 3, and 4. The results of next-to-leading

order perturbative QCD calculations (with and without supplemental initial state parton transverse momentum correction factors) are also shown in these figures. Kinematic distributions from these hard scattering events provide evidence that the interacting partons carry significant initial state parton transverse momentum. The results of these studies are summarized in a recently released paper (FERMILAB-Pub-97/351-E). The nuclear dependence of neutral meson and direct photon production at high transverse momentum has been investigated. High statistics studies of photon-plus-jet and neutral-pion-plus-jet events have been carried out. Strange particle production in these high transverse momentum interactions has been investigated. The production of charm mesons at high transverse momentum has been investigated. A study of the inclusive production of low transverse momentum neutral pions has also been performed. Papers describing the details of this research are currently in preparation.

The large-acceptance MWest multiparticle spectrometer has demonstrated its power and versatility. The large-statistics, high-quality direct photon data samples acquired by E-706 are providing unique insights into hadronic structure and QCD dynamics.

Publications

Production of π^0 Mesons at High p_T in π^-Be and pBe Collisions at 500 GeV/c, G. Alverson et al., Phys. Rev. D45, R3899 (1992).

Direct Photon Production at High p_T in π^-Be and pBe Collisions at 500 GeV/c, G. Alverson et al., Phys. Rev. Lett. 68, 2584 (1992).

Production of Direct Photons and Neutral Mesons at Large Transverse Momenta by π^- and p Beams at 500 GeV/c, G. Alverson et al., Phys. Rev. D48, 5 (1993).

Structure of the Recoiling System in Direct-Photon and π^0 Production by π^- and p Beams at 500 GeV/c, G. Alverson et al., Phys. Rev. D49, 3106 (1994).

Production of Charm Mesons at High Transverse Momentum in 515 GeV/c π^--Nucleon Collisions, L. Apanasevich et al., Phys. Rev. D56, 1391 (1997).

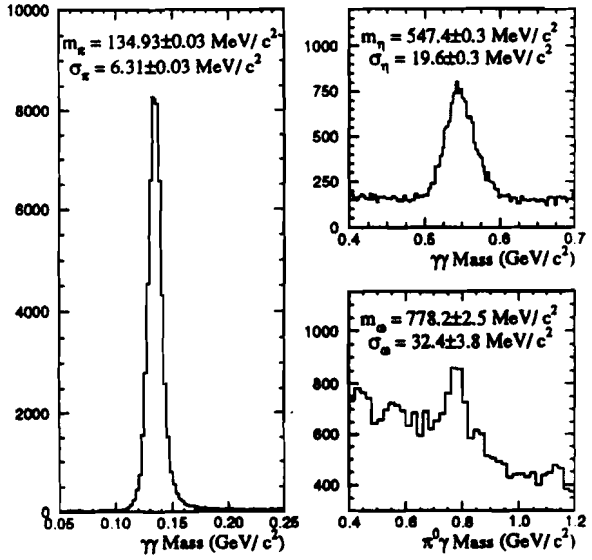


Figure 1. P_T > 5 GeV/c meson signals from the 1991 data sample.

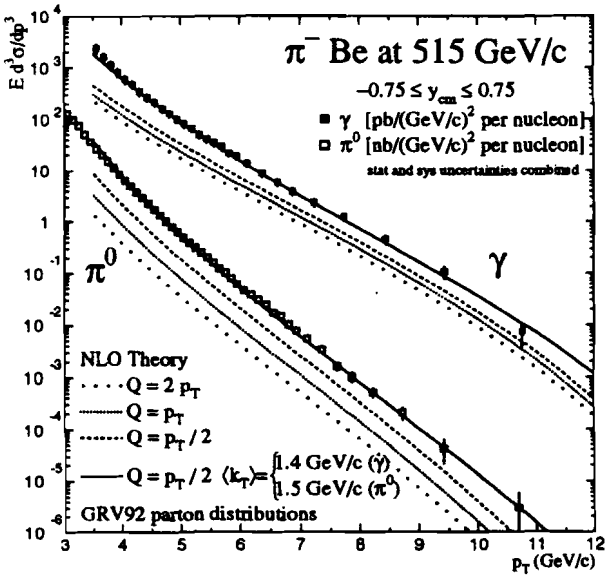


Figure 2. π^0 and direct-photon inclusive cross sections from 515 GeV/c π^- Be interactions.

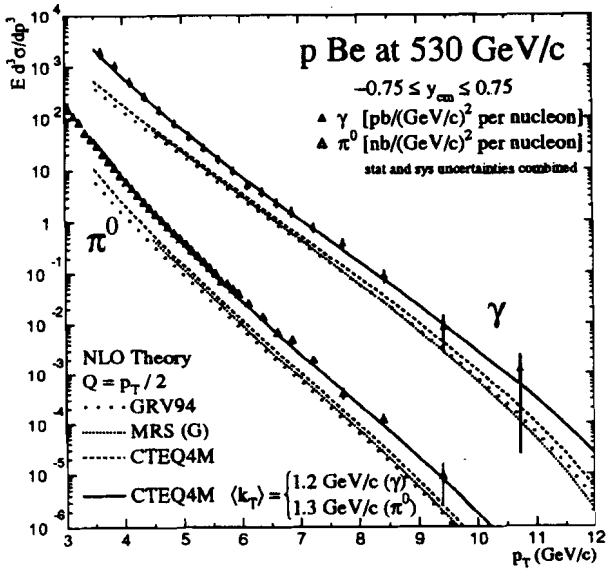


Figure 3. π^0 and direct-photon inclusive cross sections from 530 GeV/c p Be interactions.

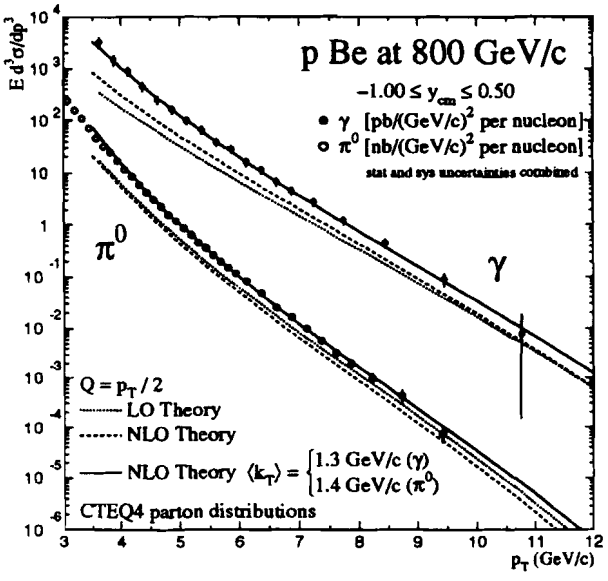
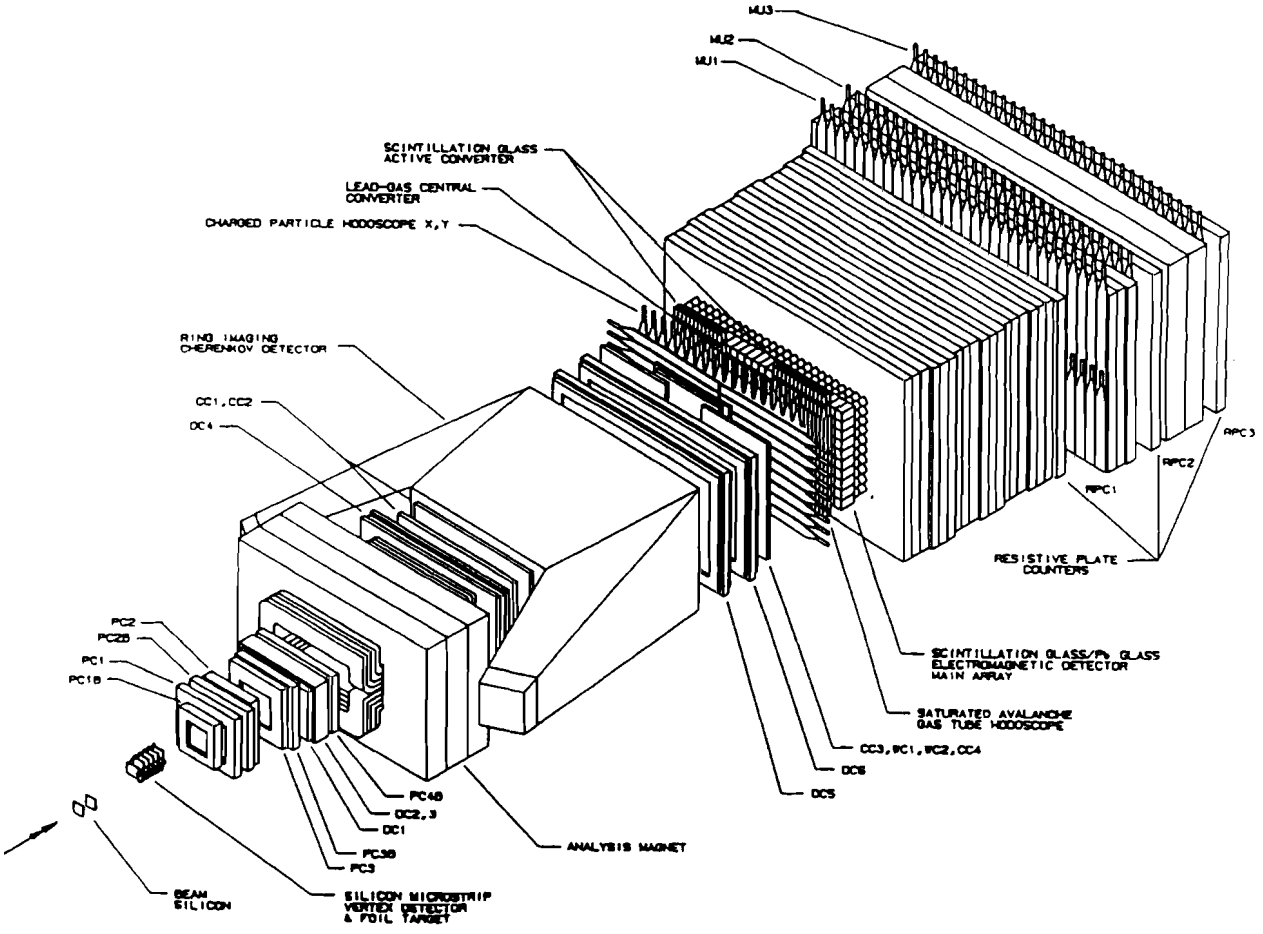


Figure 4. π^0 and direct-photon inclusive cross sections from 800 GeV/c p Be interactions.

High Intensity Lab Spectrometer
E771



E-771 (Cox) Beauty Production by Protons

Athens (Greece), Brown, UC/Berkeley, UCLA, Duke, Fermilab, Houston, JINR (Russia), Lecce (Italy), MIT, McGill (Canada), Nanjing (PRC), Northwestern, Pavia (Italy), Pennsylvania, Prairie View A&M, Shandong (PRC), South Alabama, SSCL, Vanier (Canada), Virginia, Wisconsin

Status: *Data Analysis*

In a brief data-taking period at the end of the 1991 run, 128 million dimuon triggers were acquired in 800 Gev/c p-Si interactions. This data has been analyzed to extract beauty and hidden charm physics via the signatures

$$pN \rightarrow B\bar{B} + x$$
$$B \text{ or } \bar{B} \rightarrow J/\psi + \text{anything}$$

$$pN \rightarrow B\bar{B} + x$$
$$B \rightarrow \mu^+ + \text{anything}$$
$$\bar{B} \rightarrow \mu^- + \text{anything}$$

$$pN \rightarrow \text{charmonium states} + \text{anything}$$
$$\rightarrow J/\psi + \text{anything}$$

All of the dimuon data has been processed and some 12K to 15K $J/\psi \rightarrow \mu\mu$ events have been reconstructed (the number depending on cuts necessary for the physics under study). Differential and total cross sections for inclusive J/ψ and ψ' states have been published, along with a measurement of the Υ total cross section at 800 GeV/c p-Si interactions.

E-771 has also published the most stringent limit to date on the flavor-changing neutral current decay, $D^0 \rightarrow \mu^+\mu^-$. Efforts are currently underway to achieve comparably significant limits for $D^\pm \rightarrow \mu^+\mu^-\pi^\pm$. Also, E-771 has presented in various conferences preliminary results on the ratio of χ_1 to χ_2 production in p-Si collisions.

The pN beauty cross section in 800 GeV/c interactions has been determined from double semimuonic decays to be $42\ ^{+20}_{-13} \pm 7$ nb. These results have been submitted to Phys. Rev. Letters for publication.

Publications

Search for the Flavor Changing Neutral Current Decay $D^0 \rightarrow \mu^+\mu^-$ in 800 GeV/c Proton-Silicon Interactions, T. Alexopoulos et al., Phys. Rev. Lett. 77, 2380 (1996).

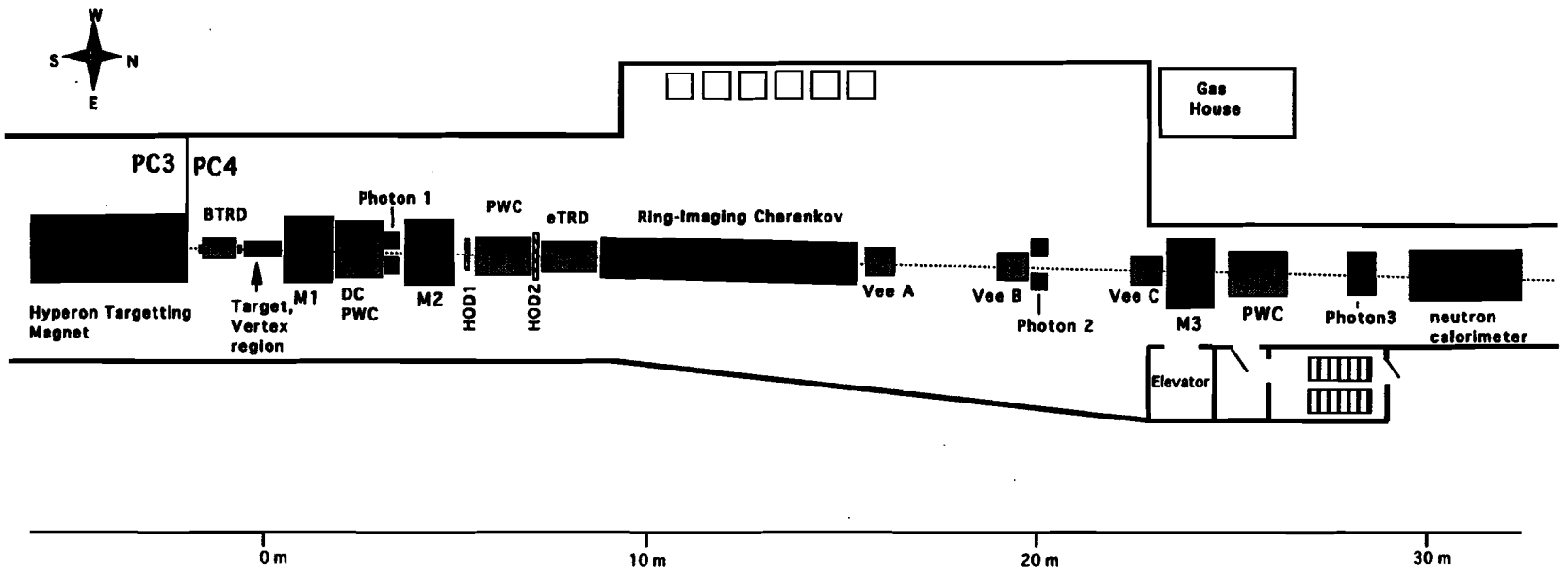
Production of J/ψ, ψ', and Υ in 800 GeV/c Proton-Silicon Interactions, T. Alexopoulos et al., Phys. Lett. B374, 271 (1996).

The Fermilab E-771 Spectrometer. A Large Aperture Spectrometer to Study Charm and Beauty States as Detected by Decays into Muons, T. Alexopoulos et al., Nucl. Instr. and Meth. A376, 375 (1996).

Differential Cross Sections of J/ψ and ψ' in 800 GeV p-Si Interactions, T. Alexopoulos et al., Phys. Rev. D55, 3927 (1997).

A Measurement of the $B\bar{B}$ Cross Section in 800 GeV/c Proton-Silicon Interactions, submitted to Phys. Rev. Lett. July 1997.

SELEX (E781)
Proton Center Layout



E-781 (Russ) Study of Charm Baryon Physics

Bogazici (Turkey), Bristol (Great Britain), Carnegie-Mellon, CBPF (Brazil), Fermilab, Hawaii, IHEP/Beijing (PRC), IHEP/Protvino (Russia), Iowa, ITEP (Russia), Moscow State (Russia), MPI/Heidelberg (Germany), Paraiba (Brazil), PNPI (Russia), Rochester, INFN/Rome (Italy), Rome (Italy), San Luis Potosi (Mexico), Sao Paulo (Brazil), Tel Aviv (Israel), INFN/Trieste (Italy), Trieste (Italy)

Status: *Data Analysis*

The study of charm baryons has lagged behind the recent progress in charm meson physics. The production of baryons by electron colliders or photon beams is small compared to meson production. Sample sizes of charm baryons comprise a few thousand events, compared to the hundred thousand event samples for charm mesons. In photoproduction Λ_c^+ decays comprise most of the data. Present hadron data indicate larger production of c-s baryons in hadronic interaction, especially with hyperons. E-781 runs in a mixed hyperon/pion beam. Because hadronic production of charm remains a difficult experimental challenge, current generation experiments have tended to run "open" triggers. The charm states produced are preponderantly charm mesons near x = 0, the dominant cross section in all hadronic processes. The design philosophy for E-781 is to use the fact that for all known baryons, the baryon/meson ratio increases dramatically at large x. The overall charm production cross section decreases, of course, but a good charm trigger can produce an enriched sample of charm baryons.

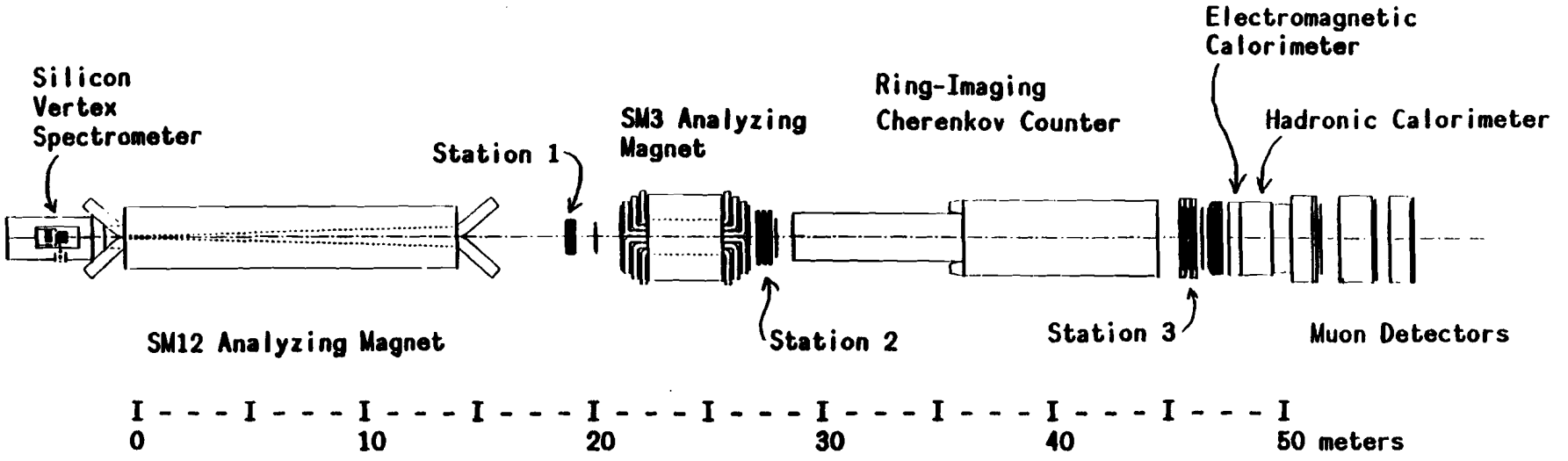
The charm trigger for E-781 is based on impact parameter, to provide a topology-independent trigger. All charm particles have a finite decay length, albeit short. A high resolution tracking device close to the target can select charm candidates on the basis of one or more tracks with a sufficiently large miss distance from the primary interaction point. Such a trigger is now conceivable because of recent advances in VLSI readout of silicon strip detectors and tremendous improvement in the online computer power available to an experiment. The spectrometer, shown in the accompanying figure, deploys a number of existing chambers and neutral particle detectors as well as the new silicon strip and pixel devices and the Ring-Imaging Cerenkov counter. By using VLSI amplifiers, E-781 can afford to make a vertex detector with 20 micron strips, totalling 50,000 channels of readout. They achieved 8-10 micron track spatial precision, and the large-x condition boosts all interesting tracks to high momentum (>15 GeV) to minimize multiple Coulomb scattering errors. The computational trigger for E-781 gives a charm reconstruction enrichment factor at large x of at least 10 compared to all interactions.

The physics questions for a charm baryon study have to do with both production and decay mechanisms. In charm baryon decays, the charm quark may decay or interact through exchange mechanisms with the light

quarks. The exchange mechanisms are not suppressed by helicity considerations as they are in meson decays. A rich spectrum of two-body resonances may dominate the final states. Do they? The discovery of resonance-dominance of charm meson final states was a surprise, and the study of decay modes in baryons is an important goal of E-781. Such a study requires good particle identification and also good photon detection. We have both. Comparison of non-leptonic and semi-leptonic modes is also important. The transition radiation detector in front of the Ring-Imaging Cerenkov is a clean tag on electrons. From a theoretical point of view, understanding the ordering of the decay rates of the four different stable charm baryons will give useful insight into which of the several competing decay mechanisms dominates these states. All these data will provide useful tests of the first-order corrections to Heavy Quark Effective Theory. For $c \rightarrow s$ transitions, details of the model can be probed.

Strong interaction physics can be studied in the production of charm baryons. The observation of a p_t-dependent polarization in the production of strange baryons has led to a resurgence of interest in spin-effects at high energies. What happens with charm baryons? E-781 will measure polarizations. There is evidence for leading production of charm baryons from some experiments, but this is not universally observed. E-781 will do a detailed x-dependence measurement of charm baryon production from several different incident beams.

The physics potential of the experiment touches many little-known areas of heavy quark physics. The focus on baryons is especially appropriate for a hadron machine. The experiment operated in the 1996-97 fixed-target period and recorded 24 billion inelastic interactions. Analysis is now underway.



E789 SCHEMATIC (PLAN VIEW)

E-789 (Kaplan / Peng) b-Quark Mesons and Baryons

Abilene Christian, Academia Sinica (Taiwan), Chicago, Fermilab, LANL, LBL, Northern Illinois, South Carolina

Status: *Data Analysis*

E-789 was designed to study charmless two-body two-prong decays of neutral b-quark hadrons. Sensitivity to inclusive beauty decays to J/ψ and to two-prong decays of charm was also achieved.

E-789 was an exploratory effort to address this physics using the existing MEast beamline and upgraded E-605/772 spectrometer. This spectrometer, shown in the accompanying figure, uses two large analysis magnets and twenty-three planes of scintillation-counter hodoscopes and wire chambers to measure charged-particle tracks passing above and below a central beam dump. Particles are identified by electromagnetic and hadronic calorimeters, muon detectors, and a ring-imaging Cherenkov counter. An array of silicon microstrip detectors pinpoints the vertices of two-prong beauty decays to < 1mm in z. Since the average decay distance for the decays accepted by the downstream spectrometer is 1.4 cm (for a 1.5×10^{-12} sec B lifetime), a vertex cut 0.7 cm downstream of the 3-mm-long target retains more than half of these decays while greatly suppressing the copious background of dihadrons produced in the target.

The E-605/772 spectrometer has demonstrated its suitability over several years for high-precision measurements at high luminosity and high counting rates. Such measurements require not only high-rate particle detectors but also high-rate data acquisition and sophisticated triggering capability. These are furnished by the Nevis Laboratories Data Transport and hardware trigger processor systems, which were suitably upgraded for the charm and beauty running. The upgraded data acquisition system is capable of recording ≈ 50 megabytes per beam spill on 8-mm tape cassettes. The upgraded trigger processor reconstructs the decay vertex using information from the silicon microstrip detectors, providing on-line suppression of non-heavy-quark triggers by up to an order of magnitude.[13]

The physics run for E-789 took place in July 1991 - January 1992. The beam time was divided roughly equally between charm and beauty running (two months each). A total of $\approx1.5\times10^{9}$ events, collected over a total of $\approx8.0\times10^{4}$ beam spills, were recorded on ≈1300 8-mm tapes. Table I lists the various data sets from this run.

Table I. Summary of E-789 Data Sets

Data set	Quark studied	Spectrometer setting	Target material	Target dimensions $x \times y \times z$ (mm^3)	Total live interactions
1	charm	1000A	Au	$50 \times 0.1 \times 0.8$	4×10^{11}
2	charm	1000A	Be	$50 \times 0.1 \times 0.8$	1×10^{11}
3	beauty	1500A	Au	$50 \times 0.2 \times 3$	3×10^{13}
4	charm	900A	Au	$50 \times 0.15 \times 1.5$	7×10^{10}
5	charm	900A	Be	$50 \times 0.15 \times 1.5$	1×10^{11}
6	charm→ dileptons	900A	Au	$50 \times 0.15 \times 1.5$	4×10^{11}
7	charmonium	2400A	Cu	Beam dump	2×10^{13}
8	charmonium	2400A	Be	$50 \times 100 \times 915$	5×10^{12}

The charm running was crucial for tuning our newly installed silicon-strip detectors. It also provided new information on the cross sections and nuclear effects of D^0 production. The observed D^0 cross section is $d\sigma/dx_F = 58 \pm 3 \pm 7$ pb/nucleon, which extrapolated over all x_F implies a total D^0 cross section $\sigma = 17.7 \pm 0.9 \pm 3.4$ μb/nucleon.[1] Averaging with previous measurements using 800-GeV proton beams gives $\sigma(pN \rightarrow D^0\ X) + \sigma(pN \rightarrow \bar{D}^0\ X) = (20.9 \pm 3.5)$ μb/nucleon, consistent with next-to-leading-order (NLO) QCD predictions within the broad range of theoretical uncertainty. The nuclear dependence of D^0 production was measured with gold and beryllium targets. Parametrizing the nuclear dependence as A^α, we find $\alpha = 1.02 \pm 0.03 \pm 0.02$ at $x_F = 0.03$.[1]

We have measured differential cross sections for charmonium production. We find $\sigma(pN \rightarrow J/\psi + X) = 442 \pm 2 \pm 88$ nb/nucleon and $\sigma(pN \rightarrow \psi' + X) = 75 \pm 5 \pm 22$ nb/nucleon, factors of 7 and 25 above QCD predictions.[2] Charmonium production is thus substantially underestimated in models which include only contributions from color-singlet charmonium states below DD threshold.

Our beauty data were collected at a spectrometer setting which simultaneously optimized sensitivity for $B \rightarrow J/\psi$ and for $B^0 \rightarrow$ dihadrons. We ran at a 50-MHz interaction rate, constrained by radiation limits at our trailer. The beauty data correspond to a total of 3.0×10^{13} interactions. Production of beauty hadrons is studied by searching for evidence of $J/\psi \rightarrow \mu^+\mu^-$ decay occurring in vacuum downstream of the 3-mm-long gold target. A significant excess is observed of events with vertex downstream of the target compared to those with vertex upstream, leading to the measured cross section for J/ψ from b decay $d^2\sigma/dx_F dp_T^2 = 107 \pm 28 \pm 19$ pb/(GeV/c)^2/nucleon at $x_F = 0.05$ and $p_T = 1$ GeV/c.[3] This can be corrected for the $b \rightarrow J/\psi + X$ branching ratio and extrapolated over all of phase space to yield $\sigma(pN \rightarrow bb + X) = 5.7 \pm 1.5 \pm 1.3$ nb/nucleon.[3] This value is consistent with NLO QCD predictions but a factor ≈2 below their central value.

In addition to the measurements discussed above, we have also measured the A-dependence of J/ψ production at very large x_F ($0.3 < x_F <$

0.95).[4] This was accomplished by detecting dimuons produced in the copper beam dump, as well as dimuons produced in a thick block of beryllium placed upstream of the beam dump. During the 1990 test run we also took data with three different targets to measure the A dependence of J/ψ production at x_F near 0.[5] These data supplement the results previously published by our collaboration in E-772.

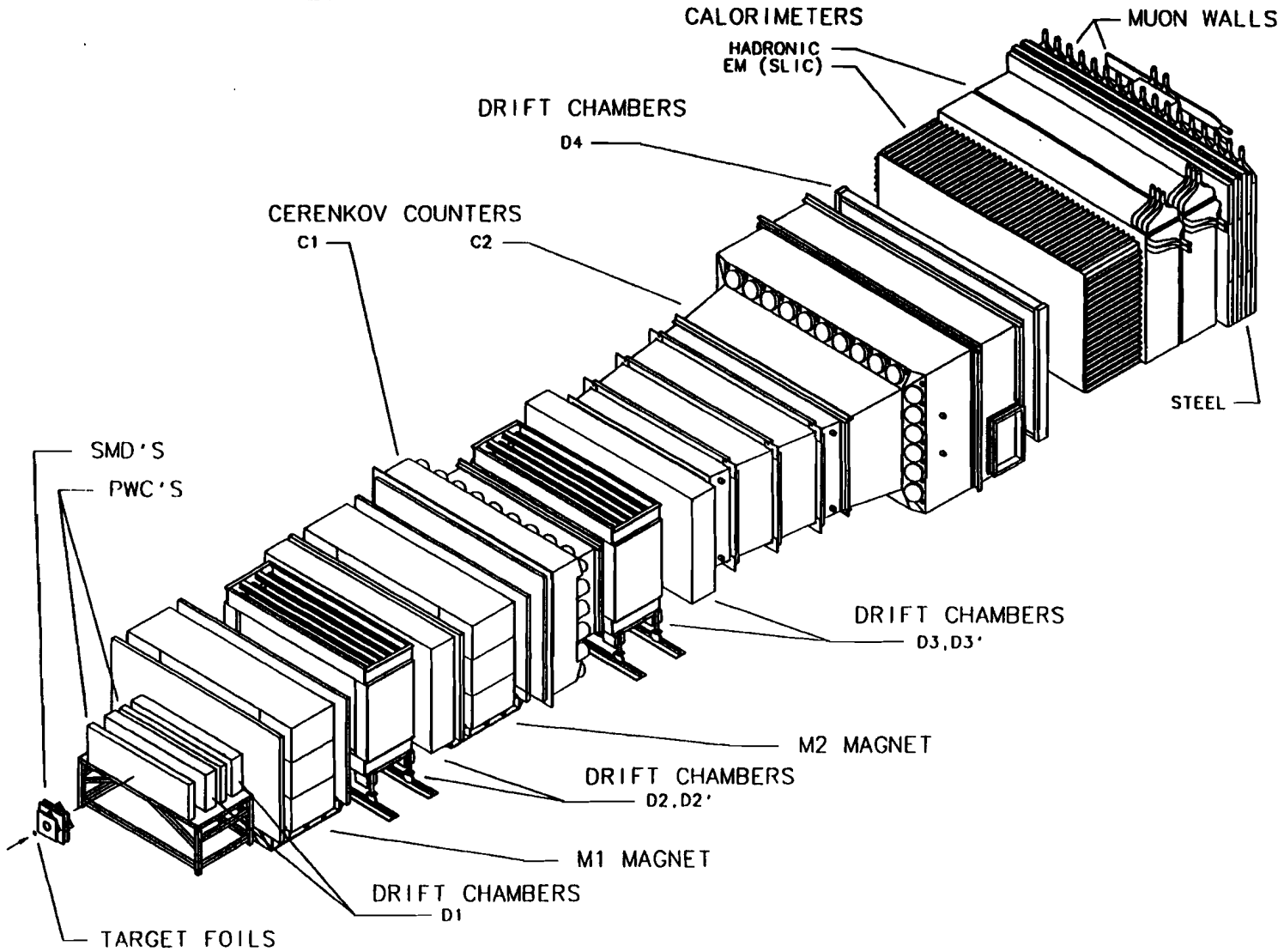
Analyses of the $B^0 \rightarrow h^+h^-$ and $D^0 \rightarrow l^+l^-$ decays are in progress. From the 1990 test run, a new upper limit for the $D^0 \rightarrow \mu^+\mu^-$ branching ratio was determined.[6]

E-789 has been the subject of several papers.[1-13] Four M.S. theses[14-17] and four Ph.D. dissertations[18-21] on E-789 have been completed.

References

1. M. J. Leitch et al., Phys. Rev. Lett. 72, 2542 (1994).
2. M. H. Schub et al., Phys. Rev. D52, 1307 (1995).
3. D. M. Jansen et al., Phys. Rev. Lett. 74, 3118 (1995).
4. M. S. Kowitt et al., Phys. Rev. Lett. 72, 1318 (1994).
5. M. J. Leitch et al., Phys. Rev. D52, 4251 (1995).
6. C. S. Mishra et al., Phys. Rev. D50, R9 (1994).
7. C. Lee et al., IEEE Trans. Nucl. Sci. 38, 461 (1991).
8. G. Charpak et al., Nucl. Instr. and Meth. A306, 439 (1991).
9. B. Turko et al., IEEE Trans. Nucl. Sci. 39, 758 (1992).
10. D. M. Kaplan et al., Nuct. Instr. and Meth. A330, 33 (1993).
11. D. M. Kaplan et al., Nucl. Instr. and Meth. A336, 116 (1993).
12. C. N. Brown et al., Phys. Rev. C54, 3195 (1996).
13. M. H. Schub et al., Nucl. Instr. and Meth. A376, 49 (1996).
14. C. Lee, M.S. thesis, Northern Illinois University (Electrical Engineering Department), December 1990.
15. J. Sa, M.S. thesis, Northern Illinois University, December 1991.
16. M. Apolinski, M.S. thesis, Northern Illinois University, August 1994.
17. V. Martin, M.S. thesis, Northern Illinois University, August 1995.
18. M. S. Kowitt, Ph.D. thesis, University of California/Berkeley, December 1992.
19. Y. C. Chen, Ph.D. thesis, National Cheng-Kun University, Taiwan, December 1993.
20. S. Misawa, Ph.D. thesis, University of California/Berkeley, March 1997.
21. D. A. Pripstein, Ph.D. thesis, University of California/Berkeley, June 1997.

TAGGED PHOTON SPECTROMETER
E791



E-791 (Appel / Purohit) / **E-769** (Appel) **Hadroproduction of Charm**

E-791: UC/Santa Cruz, CBPF (Brazil), Cincinnati, CINVESTAV (Mexico), Fermilab, IIT, Kansas State, Mississippi, Ohio State, Princeton, Puebla (Mexico), Rio de Janeiro (Brazil), Stanford, South Carolina, Tel Aviv (Israel), Tufts, Wisconsin, Yale

Status: *Data Analysis*

E-769 is an experiment to measure the properties of hadronic charm production using the Tagged Photon Spectrometer facility. It measures the flavor, x, p_t and A dependences of this process at the same time and in a single apparatus.

The experiment collected its data during the 1987-88 fixed-target running period, recording interactions of 250 GeV beams of identified pions, kaons and protons. The beam was incident on a foil target assembly with four materials: beryllium, aluminum, copper and tungsten, segmented in the beam direction. The total data set consists of about 400 million triggers with about 200 million each of negative beam events (85% pi, 15% kaon) and positive beam events (40% pi, 30% kaon and 30% proton). This data set, unprecedented in high energy physics at the time, required a highly parallel, multi-microprocessor system for data acquisition, designed and implemented specially for E-769. The off-line analysis also extended the use of microprocessor farms, being the first at Fermilab to use commercial processors with elements of the Computing Division CPS software for large-scale reconstruction of experiment data.

E-791 has broken new ground in charm physics. Located in the Tagged Photon Laboratory it has a 500 GeV/c π^- beam incident on a multi-foil target. As with E-769, charm events are selected by a high-E_T trigger made possible by the segmented nature of the electromagnetic and hadronic calorimeters. The detector has 23 planes of high-resolution silicon strip devices (six in the beam, 17 downstream of the target, giving a total of ten more than in E-769) followed by 37 planes of drift-chambers and PWC's. Two Cerenkov detectors and a muon wall are used with the calorimeters to identify particle types. The experiment took data in the 1991 fixed-target run and wrote to tape over 20 billion events. About 200,000 charm decays have been fully reconstructed (20 $\times$ E-691's sample of 10,000 fully reconstructed charm decays).

While several features of charm decays are now understood (the pattern of lifetimes, the small contributions from exchange, annihilation and color-suppressed diagrams) there remain several open questions. These include the resonant two- and three-body contributions to many-body decays and the branching ratios of doubly Cabibbo-suppressed decays which have a different interplay of diagrams.

Semileptonic and leptonic modes of charm particle decay are of particular interest because they probe the weak charm decay vertex without the complications of final-state interactions. E-691 had marginal sensitivity to $\pi e\nu$ and $\phi e\nu$ decays and E-791 will have important results there. Branching ratio measurements for even the copious modes are currently at the 10% level and will be improved. E-791 has good sensitivity to D_s^+ and Λ_c^+ semileptonic decays, and is measuring form-factors and polarization effects in these decays. Polarization and production dynamics of the large hyperon sample are also being measured.

D^0-$\bar{D}^0$ mixing is predicted to be unobservably small in the Standard Model. E-791's factor-of-twenty increase in statistics explores an interesting new region where physics beyond the Standard Model could be observed. The higher statistics also allows precision studies of charm hadroproduction. The data sample is being searched for evidence of pentaquarks, doubly charmed mesons and other new physics. Limits on flavor-changing neutral currents (FCNC), CP violation and particle-antiparticle mixing have been extracted.

E-791 has pioneered the use of high-speed data acquisition techniques. The vast number of reconstructed events was made possible by fast front-end electronics (<40 μs readout times), fast data acquisition and high-speed writing to 8 mm tape (10 Mbyte/sec).

Nine Ph.D. students gained hardware and running experience on E-791, but have completed physics analyses based on E-691 or E-769 data. A total of 15 Ph.D. theses based on E-769 have been accepted, with an additional one expected. All more recent Ph.D. students, 25 as of this writing, have both their hardware and analysis experience with E-791. The first 13 Ph.D. theses based on E-791 data have been accepted.

E-769 Publications

Using Multiple RISC CPUs in Parallel to Study Charm Quarks, C. Stoughton and D. J. Summers, Computers in Physics 6, 371 (1992).

Feynman-x and Transverse Momentum Dependence of $D^{\pm}$ and D^0, $\bar{D}^0$ Production in 250 GeV π^--Nucleon Interactions, G. A. Alves et al., Phys. Rev. Lett. 69, 3147 (1992).

Atomic Mass Dependence of $D^{\pm}$ and D^0, $\bar{D}^0$ Production in 250 GeV $\pi^{\pm}$-Nucleon Interactions, G. A. Alves et al., Phys. Rev. Lett. 70, 722 (1993).

Enhanced Leading Production of $D^{\pm}$ and $D^{*\pm}$ in 250 GeV $\pi^{\pm}$-Nucleon Interactions, G. A. Alves et al., Phys. Rev. Lett. 72, 812 (1994).

$D^{*\pm}$ Production in 250 GeV $\pi^{\pm}$N Interactions, G. A. Alves et al., Phys. Rev. D49, R4317 (1994).

Forward Cross Sections for Production of D^+, D^0, D_s, D^{*+} , and Λ_c in 250 GeV $\pi^\pm$, $K^\pm$, and p Interactions with Nuclei, G. A. Alves et al., Phys. Rev. Lett. 77, 2388 (1996).

Feynman-X and Transverse Momentum Dependence of D Meson Production in 250 GeV π, K, and p Interactions with Nuclei, G. A. Alves et al., Phys. Rev. Lett. 77, 2392 (1996).

Atomic Mass Dependence of Ξ^- and $\bar{\Xi}^+$ Production in Central 250 GeV π^--Nucleon Interactions, G. A. Alves et al., Phys. Rev. D56, 6003 (1997).

E-791 Publications

The E-791 Parallel Architecture Data Acquisition System, S. Amato et al., Nucl. Instr. and Meth. A324, 535 (1993).

Search for the Flavor-Changing Neutral-Current Decays $D^+\to\pi^+\mu^+\mu^-$, and $D^+\to\pi^+e^+e^-$, E. Aitala et al., Phys. Rev. Lett. 76, 364 (1996).

Asymmetries Between the Production of D^+ and D^- Mesons from 500 GeV/c π^--Nucleus Interactions as a Function of x_F and p_t^2, E. Aitala et al., Phys. Lett. B371, 157 (1996).

Mass Splitting and Production of Σ_c^0 and Σ_c^{++} Measured in 500 GeV π^--N Interactions, E. M. Aitala et al., Phys. Lett. B379, 292 (1996).

Search for $D^0\bar{D}^0$ Mixing in Semileptonic Decay Modes, E. M. Aitala et al., Phys. Rev. Lett. 77, 2384 (1996).

A Simple Multiprocessor Management System for Event-Parallel Computing, S. Bracker et al., IEEE Trans. Nucl. Sci. NS-43, 2457 (1996).

Observation of D-π Production Correlations in 500 GeV π^--N Interactions, E. M. Aitala et al., Phys. Lett. B403, 185 (1997).

Measurement of the Branching Ratio $B(D^+ \to \rho^0 l^+\nu_l) / B(D^+ \to \bar{K}^{*0} l^+\nu_l)$, E. M. Aitala et al., Phys. Lett. B397, 325 (1997).

Search for CP Violation in Charged D Meson Decays, E. M. Aitala et al., Phys. Lett. B403, 377 (1997).

The Doubly Cabibbo-Suppressed Decay $D^+ \to K^+\pi^-\pi^+$, E. M. Aitala et al., Phys. Lett. B404, 187 (1997).

Asymmetries Between the Production of D_s^- and D_s^+ Mesons from 500 GeV/c π^- Nucleon Interaction as Functions of x_F and p_t^2, E. M. Aitala et al., Phys. Lett. B411, 230 (1997).

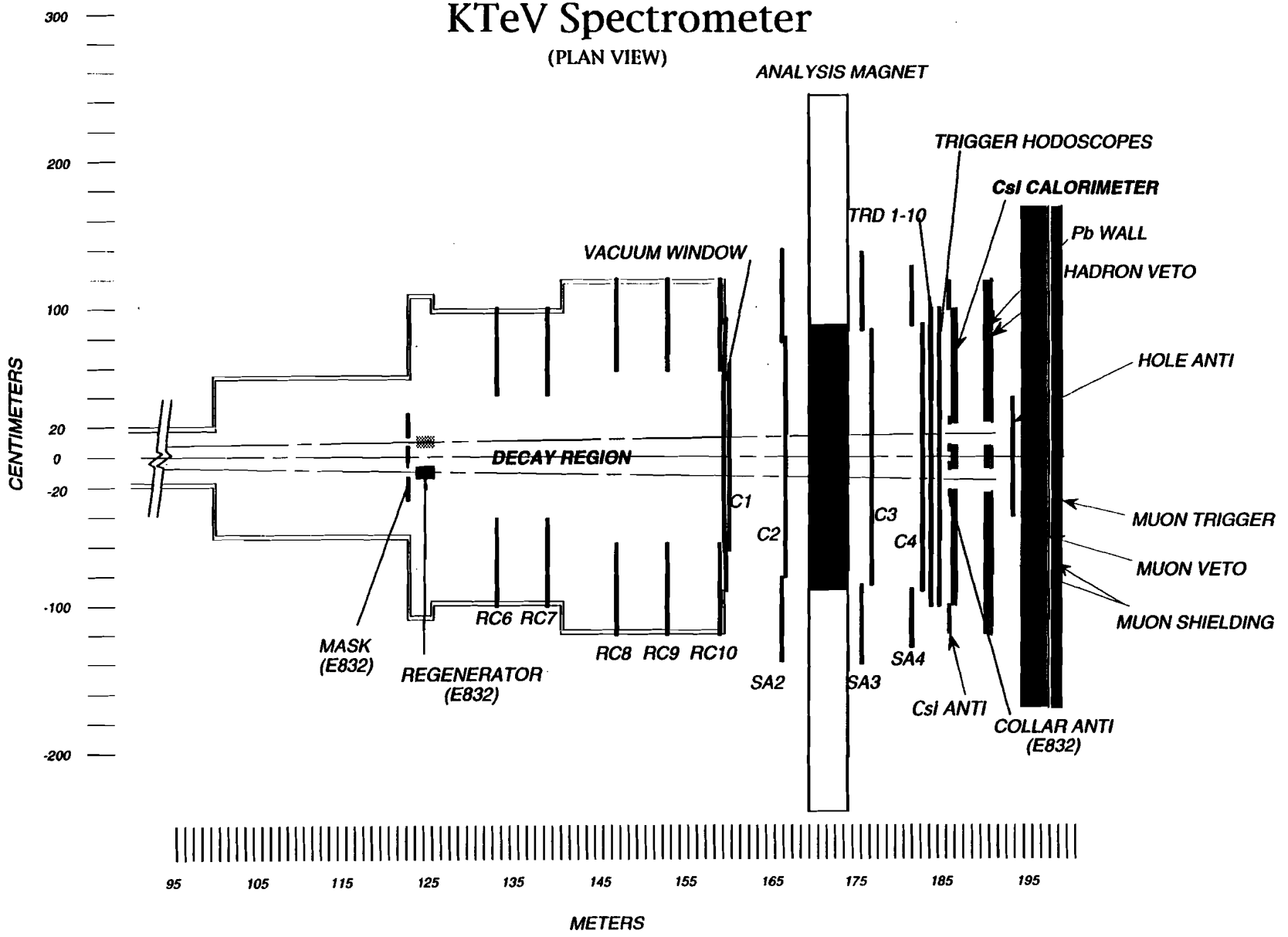
A Search for D^0-$\bar{D}^0$ Mixing and Doubly-Cabibbo-Suppressed Decays of the D^0 in Hadronic Final States, E. M. Aitala et al., Phys. Rev. D57, 13 (1998).

Branching Fractions for $D^0 \to K^+K^-$ and $D^0 \to \pi^+\pi^-$, and a Search for CP Violation in D^0 Decays, E. M. Aitala et al., FERMILAB-Pub-97/345-E, accepted for publication in Phys. Lett. B.

Measurement of the Form-Factor Ratios for $D^+ \to \bar{K}^{*0} e^+ \nu_e$, E. M. Aitala et al., FERMILAB-Pub-97/267-E, accepted for publication in Phys. Rev. Lett.

Study of the Decay $D^0 \to K^- K^+ \pi^- \pi^+$, E. M. Aitala et al., FERMILAB-Pub-97/373-E, accepted for publication in Phys. Lett. B.

Search for the Pentaquark Via the $P^0_{\bar{c}s} \to \phi \pi p$ Decay, E. M. Aitala et al., FERMILAB-Pub-97/118-E, submitted to Phys. Rev. Lett.


KTeV Spectrometer
(PLAN VIEW)
ANALYSIS MAGNET
TRIGGER HODOSCOPES
CsI CALORIMETER
TRD 1-10
Pb WALL
HADRON VETO
VACUUM WINDOW
HOLE ANTI
DECAY REGION
C1
C2
C3
C4
MUON TRIGGER
MUON VETO
MUON SHIELDING
RC6 RC7
RC8 RC9 RC10
MASK
(E832)
REGENERATOR
(E832)
SA2
SA3
SA4
CsI ANTI
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300
200
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115
125
135
145
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175
185
195
METERS

E-799 (Arisaka / Tschirhart) / E-832 (Blucher) Rare Decays of K_L^0 and a Search for Direct CP Violation in $K_L^0 \rightarrow 2\pi$

Arizona, UCLA, UC/San Diego, Chicago, Colorado, Elmhurst, Fermilab, Osaka (Japan), Rice, Rutgers, Virginia, Wisconsin

Status: *E-799 Phase I - Data Analysis*
E-799 Phase II - Data-Taking
E-832 - Data-Taking

KTeV (Kaons at the Tevatron) consists of two experiments: E-799 II (a rare K_L decay experiment) and E-832 (search for direct CP violation in $K_{L,S} \rightarrow 2\pi$).

E-799 is an experiment to search for rare K_L decays, such as $K_L \rightarrow \pi^0 l^+ l^-$ (l = e, μ, ν), and many other multibody rare decays, to a sensitivity of 10^{-11}.

E-799 Phase I ran from October 1991 until January 1992, with a lead-glass calorimeter and spectrometer in the Meson Center beamline. The table below summarizes the published results from E-799 Phase I.

Decay Mode	E-799I BR results	Paper
$\pi^0 \rightarrow ee$	$(7.6\ ^{+3.9}_{-2.8} \pm 0.5) \times 10^{-8}$	PRL 71, 34 (1993)
$K_L \rightarrow \pi^0 ee$	$< 4.3 \times 10^{-9}$	PRL 71, 3918 (1993)
$K_L \rightarrow \pi^0 \mu\mu$	$< 5.1 \times 10^{-9}$	PRL 71, 3914 (1993)
$\pi^0 \rightarrow \mu e$	$< 8.6 \times 10^{-9}$	PL B320, 407 (1994)
$K_L \rightarrow eeee$	$(3.96 \pm 0.78 \pm 0.32) \times 10^{-8}$	PRL 72, 3000 (1994)
$K_L \rightarrow \pi^0 \nu\bar{\nu}$	$< 5.8 \times 10^{-5}$	PRL 72, 3758 (1994)
$K_L \rightarrow \pi^0 \pi^0 \gamma$	$< 2.3 \times 10^{-4}$	PR D50, 1874 (1994)
$K_L \rightarrow ee\gamma\gamma$	$(6.5 \pm 1.2 \pm 0.6) \times 10^{-7}$	PRL 73, 2169 (1994)
Λ, $\bar{\Lambda}$ polarization		PL B338, 403 (1994)
$K_L \rightarrow \mu\mu\gamma$	$(3.23 \pm 0.23 \pm 0.19) \times 10^{-7}$	PRL 74, 3323 (1995)
$K_L \rightarrow ee\mu\mu$	$(2.9\ ^{+6.7}_{-2.4}) \times 10^{-9}$	PRL 76, 4312 (1996)
$K_L \rightarrow \pi^0 \mu e$	$< 3.2 \times 10^{-9}$	Submitted to PRL

The goal of E-832 is a measurement of the ratio of the CP violation parameters, ε'/ε, in the $K^0\bar{K}^0$ system to a precision of 1.0×10^{-4}, to search for direct CP violation phenomenon at the Fermilab Tevatron. This is a factor of seven improvement in precision over the previous Fermilab experiment E-731 and the CERN experiment NA31.

So far the only manifestations of CP violation are a result of a lack of symmetry in the rate of particle-antiparticle transitions in the $\Delta S = \pm 2$ processes $K^0 \leftrightarrow \bar{K}^0$. This experiment addresses the issue as to whether the CP violation is confined to a $\Delta S = 2$ interaction (the superweak model) or has a $\Delta S = 1$ component, as naturally arises in the standard six-quark model (Cabbibo-Kobayashi-Maskawa). Although there is considerable uncertainty in the predictions for the size of ε'/ε in the standard model, this measurement would severely constrain the models and, if non-zero but small ($<10^{-3}$), would give an important new "handle" on the phenomenon of CP violation, even with the discovery of "top" in the Tevatron Collider.

The E-832 experiment makes use of a double-beam technique, essentially the same as E-731, whereby both K_L and K_S decays are studied simultaneously: a totally active regenerator is placed in one of the beams to provide a K_S component with very small background and the regenerator is alternated from beam to beam to reduce the effects of any beam and detector asymmetries. The goal of the experiment is to collect 6×10^6 $K_L \rightarrow 2\pi^0$ events along with 1.0×10^7 $K_S \rightarrow 2\pi^0$ "normalizing" events, and at the same time to collect 3×10^7 $K_L \rightarrow \pi^+\pi^-$ events and 4.5×10^7 $K_S \rightarrow \pi^+\pi^-$ "normalizing" events for the ε'/ε measurement.

For the effort of E-832 and Phase II of E-799 (rare K decay experiment), a new KTeV facility was constructed which takes full advantage of the Tevatron primary protons up to 5×10^{12} per spill and its superior duty cycle to provide a factor of three increase in usable K_L flux in the 100 GeV/c region over E-731. Special attention has been paid to significantly improving the neutral beam stability, reducing the neutral beam halo, and reducing the background muon rate. The spectrometer consists of a 60 meter vacuum decay space, electromagnetic calorimetry, tracking and magnetic spectrometer, nearly hermetic photon vetoes, transition radiation detectors, and hadron and muon detectors.

The neutral final state ($2\pi^0$) is detected with a new 1.9m×1.9m high resolution (better than 1%) electromagnetic calorimeter made of an array of 3100 blocks of pure CsI crystals. A newly developed "digital" PMT base (digitizing the PMT signal with a charge integrator and encoder, a flash ADC and a data buffer right on the base and running at 53 MHz) is used to read out the CsI array for better performance of the calorimeter in the higher rate environment. Better than 1% energy resolution from the CsI calorimeter has been achieved. Triggering in the neutral mode is effected by counting clusters in the CsI array by a hardware cluster finder. The $\pi^+\pi^-$ are detected with a 2000 sense-wire high-rate drift chamber spectrometer. A new, large-aperture KTeV magnet, providing a p_T kick up to 450 MeV/c, is used for momentum measurement of charged particles. Scintillation hodoscope counters and an improved in-time track processor are used for the charged trigger. The most serious background, $K_L \rightarrow 3\pi^0$, is significantly reduced by means of a nearly hermetic system of 12 new photon-veto anti-counters, designed to detect extra photons outside the solid angle of the CsI calorimeter including the beam holes. Inelastic regeneration is greatly reduced by the detection of the production of secondaries in the totally active scintillation regenerator. The

$K_{\mu 3}$ background is rejected by the muon shielding and anti-counters behind the CsI calorimeter, and by crude hadron vetoes. A new buffer matrix data acquisition system with a level-3 parallel processing filter is used for the high data rate environment.

With the long decay space, the experiment can also measure the K_L-K_S interference in both the $2\pi^0$ and $\pi^+\pi^-$ data sample to obtain $\Delta\phi$, the phase difference between ϕ_{00} and ϕ_{+-}, to a precision of 0.2^o, a very stringent test of CPT invariance.

A KTeV Design Report (FN-580) was prepared for the project. A new KTeV experimental hall has been completed at the NM4 enclosure in the NM beamline and was operational in 1996. The experiment took data in the 1996-97 fixed-target run.

A 10-month run of data-taking ended in early September 1997. The E-832 data for ε'/ε were accumulated in the fall of 1996 and spring 1997 between April and July. Among a large sample of raw data collected (about 50 Terabytes) on tape, we estimated about 4M events are CP-violated $K_L \rightarrow \pi^0\pi^0$ after preliminary offline cuts, an order of magnitude improvement over the previous experiment E-731. This data sample should result in a statistical uncertainty of around 1.5×10^{-4} on ε'/ε; we hope to reduce the systematic error to about half of the statistical error, although achieving this goal may require several years' effort.

E-799 Phase II data were collected from mid-January to late March 1997 and again for about a month in August at the end of the 1997 run with the KTeV spectrometer and CsI calorimeter. The clean beam and new data acquisition system allow us to run at higher proton beam intensity and trigger acceptance. The CsI calorimeter offers a far better energy resolution to reduce major backgrounds in rare decays. New TRD modules give signficant e/π separation (~150:1) for background rejection. New photon veto counters have better coverage to reduce backgrounds caused by escaping photons. With all these combined, E-799 Phase II is planning to improve the sensitivity for many rare decays by two orders of magnitude compared to Phase I.

Several preliminary results from E-799 and E-832 data were analyzed before the run was over, such as a new limit on $K_L \rightarrow \pi^0\nu\nu$ from a one-day single beam special run; a light gluino search - the R^0 production limit (now published in PRL); the first discovery and branching ratio of $K_L \rightarrow \pi^+\pi^-e^+e^-$ decays; the first discovery of Ξ^0 β-decay and measurement of its branching ratio; a clean signal in Ξ radiative decay. The data sample for those analyses range from one day to several weeks of data. We have also studied many other modes, as in Phase I, with at least one day's data during the run.

KTeV is planning to take more data in 1999 for both ε'/ε and rare K decay search programs to reach or exceed the current physics goals in the proposal.

Publications

Design and Test Results of a Transition Radiation Detector for a Fermilab Fixed Target Rare Kaon Decay Experiment, G. E. Graham et al., Nucl. Instr. and Meth. A367, 224 (1995).

Development of a Parallel Plate Proportional Counter TRD with Suppressed Sensitivity to Ionization, N. Solomey et al., Nucl. Instr. and Meth. A367, 252 (1995).

Beam Test of Prototype CsI Calorimeter, R. S. Kessler et al., Nucl. Instr. and Meth. A368, 653 (1996).

Search for Light Gluinos Via the Spontaneous Appearance of $\pi^+\pi^-$ Pairs with an 800 GeV/c Proton Beam at Fermilab, J. Adams et al., Phys. Rev. Lett. 79, 4083 (1997).

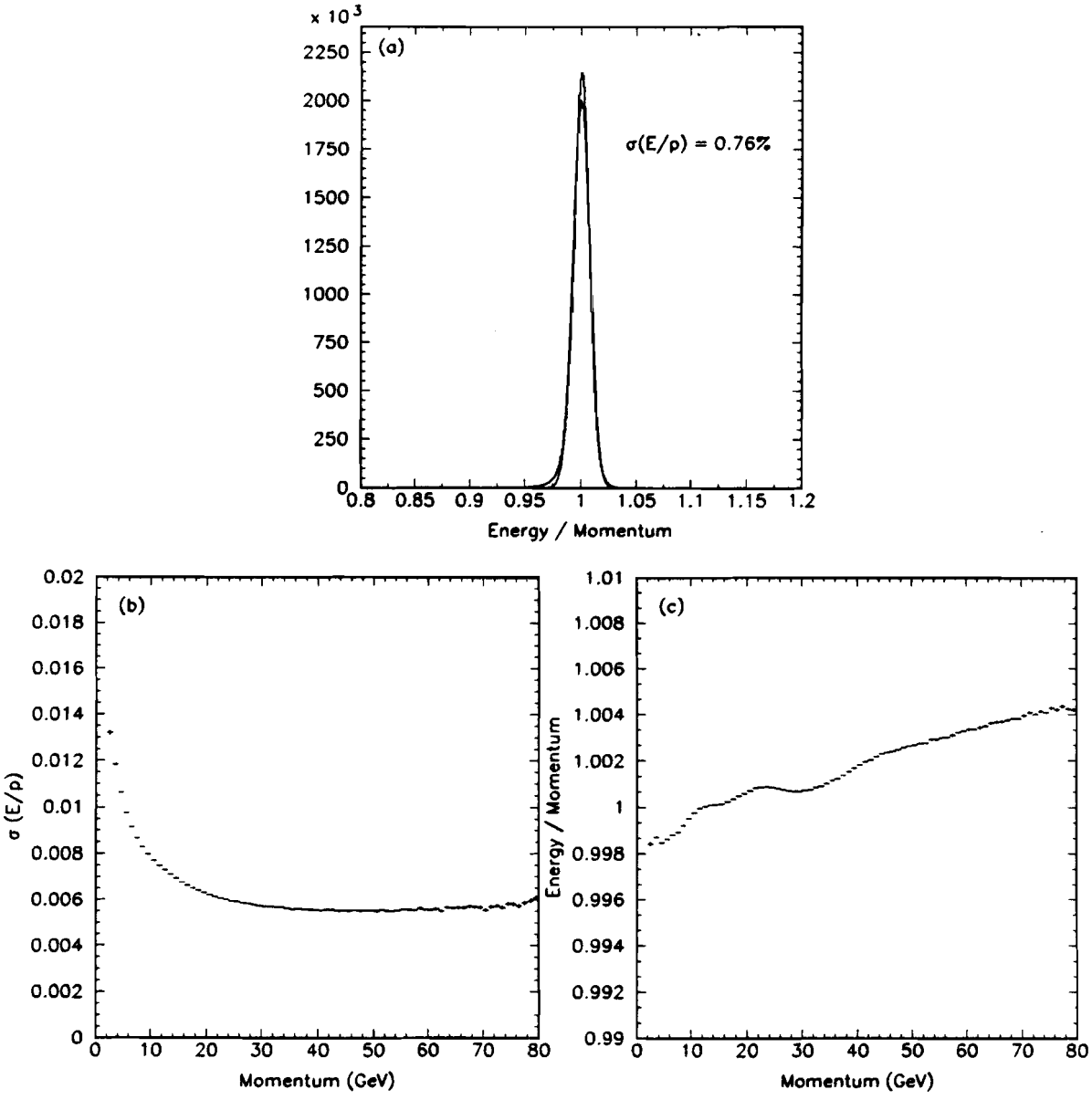


Figure 1. (a) Measured E/p (calorimeter energy / spectrometer momentum) for a sample of electrons from $K_L \rightarrow \pi^+ e^- \nu$ events; (b) σ(E/p) versus momentum for these electrons; (c) Measured E/p versus momentum for these electrons.

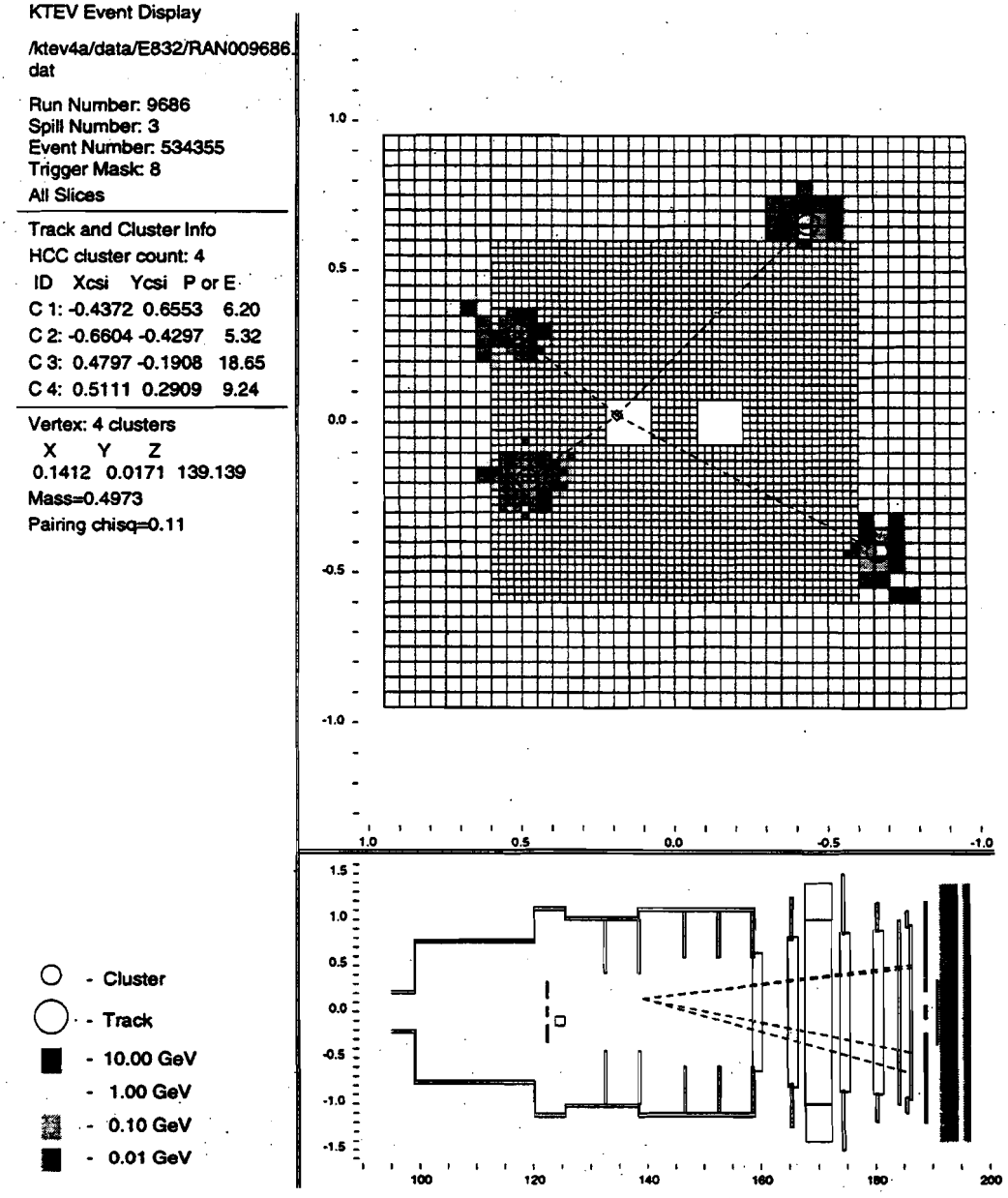


Figure 2. A typical online event display of a $K \rightarrow 2\pi^0$ decay.

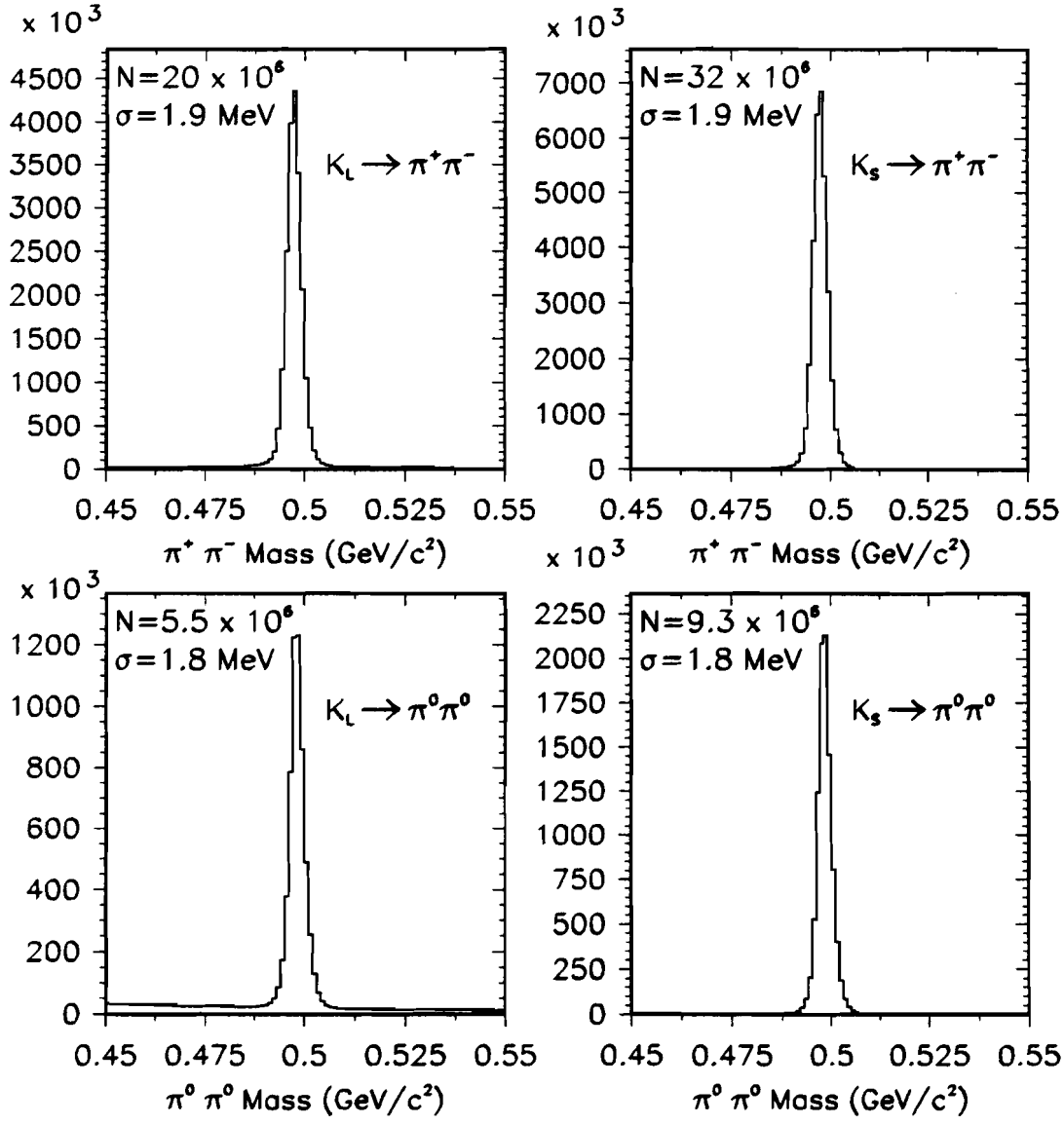


Figure 3. Online invariant-mass plots from the entire E-832 run for $K \to \pi^+\pi^-$ (top) and $K \to \pi^0\pi^0$ (bottom) for vacuum (left) and regenerator (right) beams.

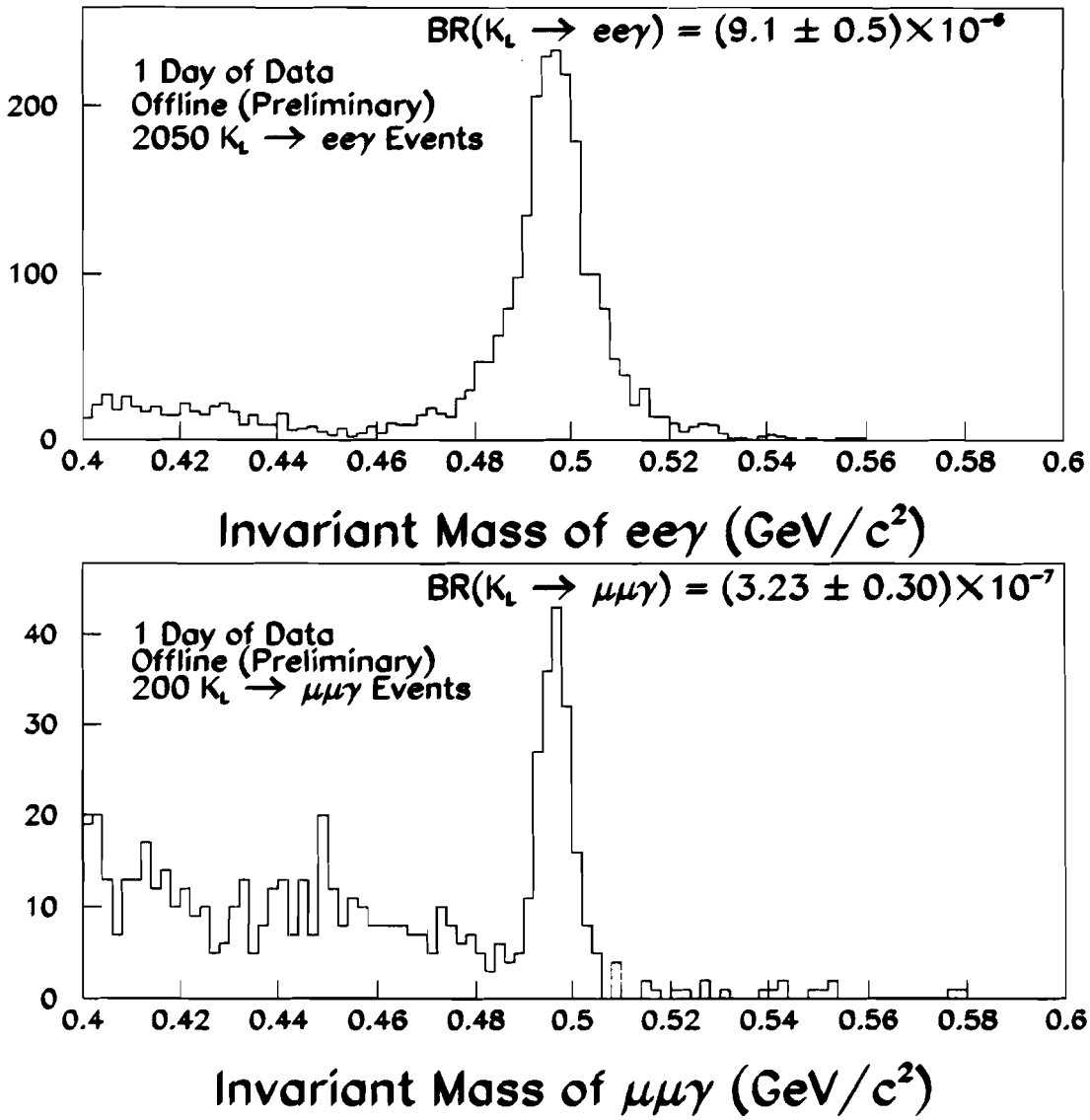


Figure 4. K_L Dalitz decay yields from the one-day analysis.

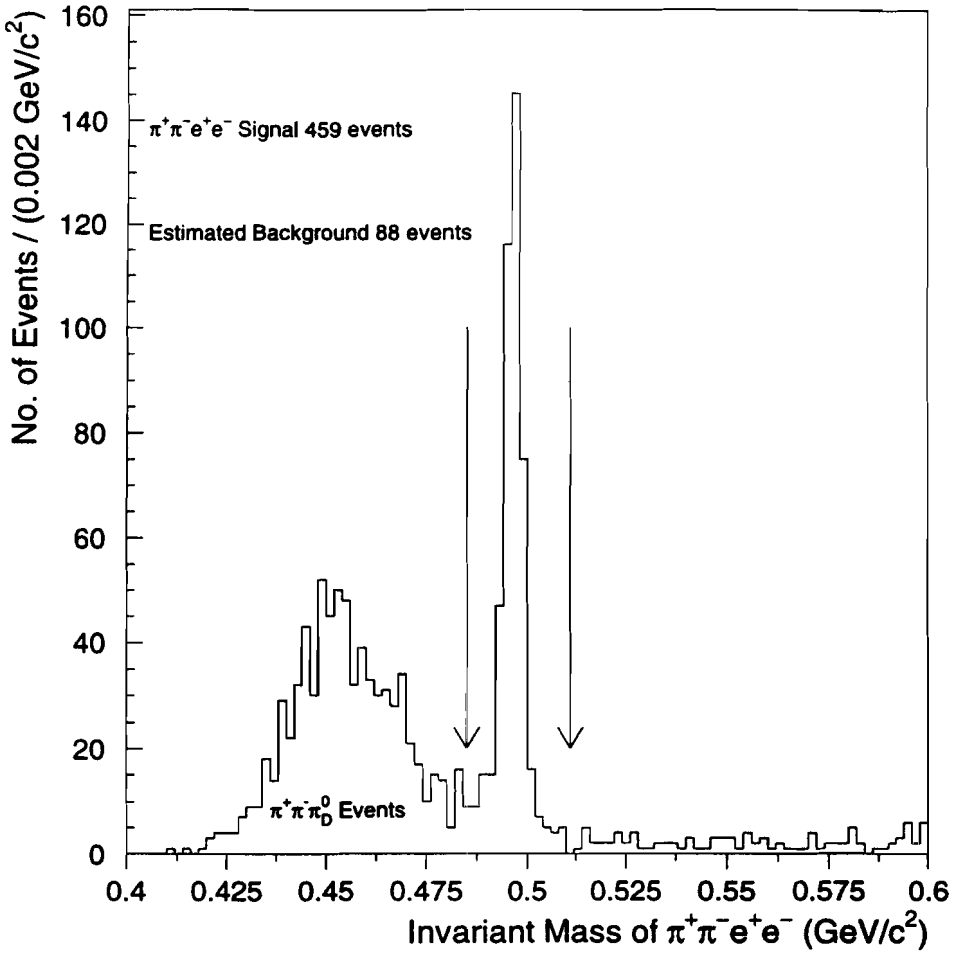


Figure 5. $K_L \rightarrow \pi^+\pi^-e^+e^-$ mass peak from the three-week data set.

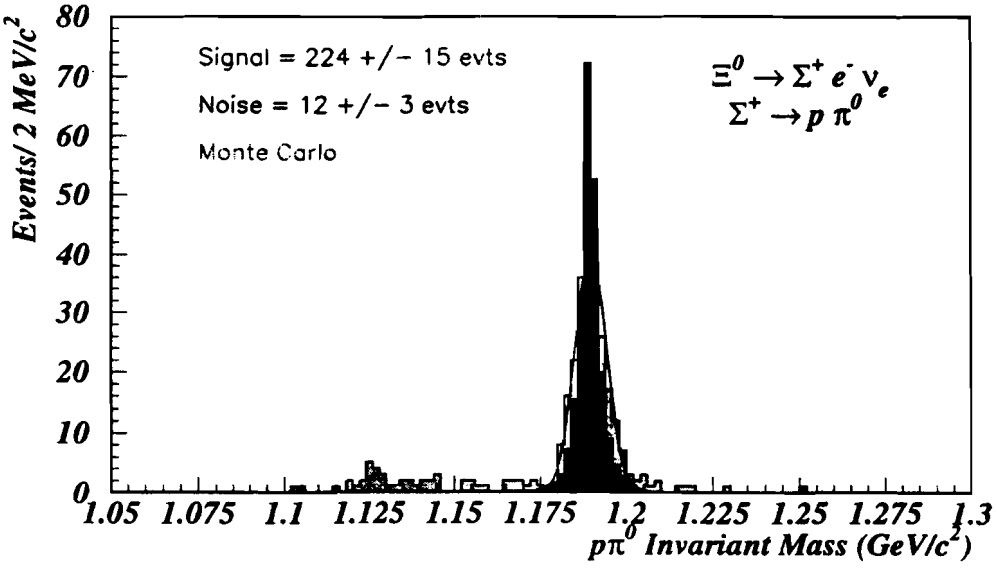
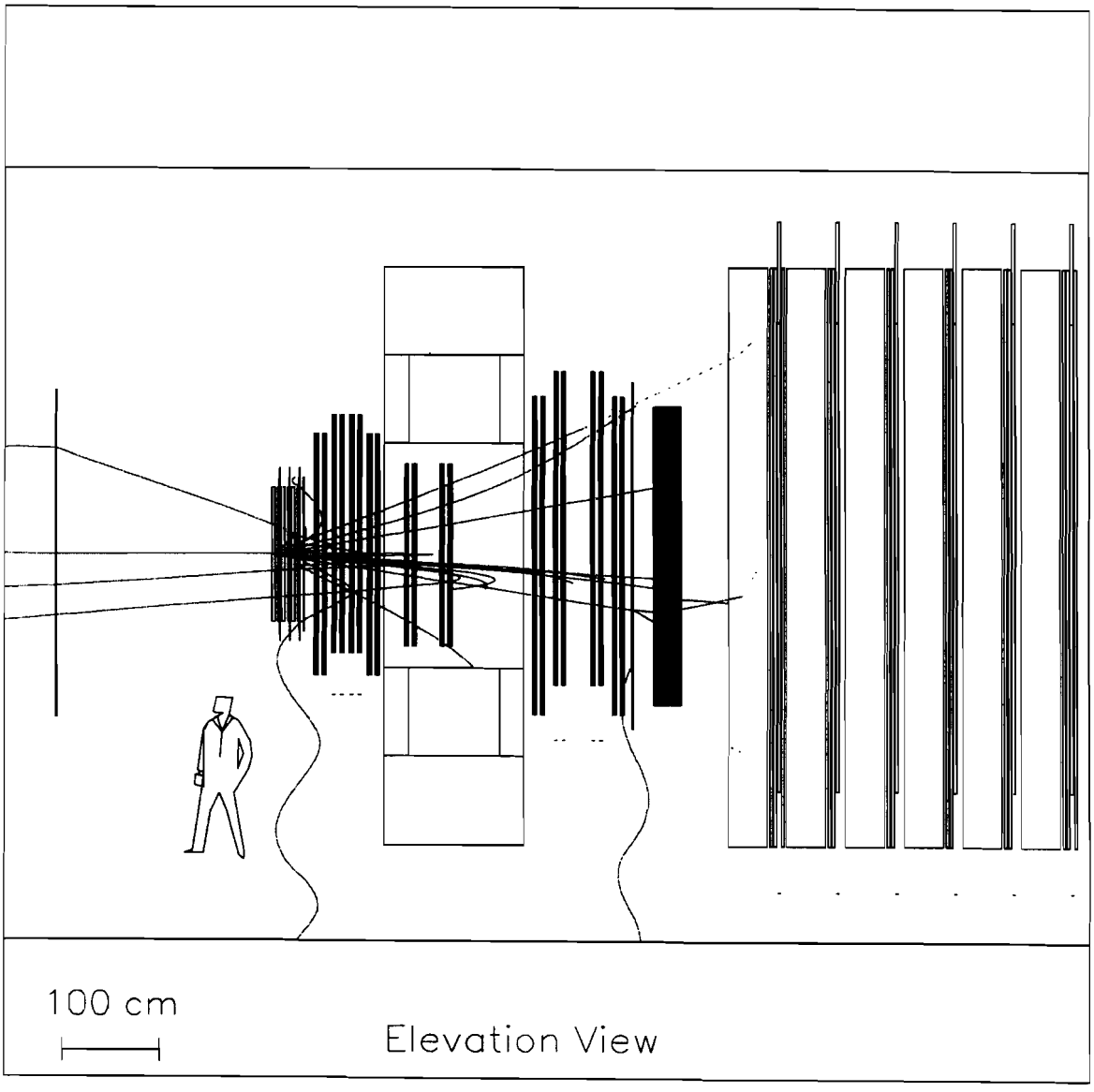


Figure 6. Evidence for the first observation of $\Xi^0 \rightarrow \Sigma^+e^-\bar{\nu}$, with $\Sigma^+ \rightarrow p\pi^0$. The reconstructed mass is plotted along with a Monte Carlo overlay (dark region).

E-803



E-803 (Reay) Muon Neutrino to Tau Neutrino Oscillations

Aichi (Japan), Athens (Greece), UC/Davis, UCLA, Chonnam (Korea), Fermilab, Gifu (Japan), Gyeongsang (Korea), Hirosaki (Japan), IIT, Indiana, ITEP (Russia), Kansas State, Kinki (Japan), Kobe (Japan), KAIST (Korea), Korea (Korea), Michigan, Nagoya Institute of Tech. (Japan), Okayama (Japan), Osaka City (Japan), Osaka Commerce (Japan), Osaka Sci. Ed. Inst. (Japan), Seoul (Korea), Soai (Japan), South Carolina, Technion (Israel), Toho (Japan), Tufts, Utsunomiya (Japan), Yokohama (Japan)

Status: *No Data Yet*

Fermilab E-803 (COSMOS) is a short-baseline neutrino oscillation $\nu_\mu, \nu_e \rightarrow \nu_\tau$ appearance experiment sensitive to ultra-small mixing angles, for neutrino mass differences in the cosmologically interesting range. Interest in oscillations has been stimulated by the apparent deficit of ν_e coming from the sun, and of ν_μ coming from atmospheric cosmic-ray interactions. Recent COBE measurements suggest that a third of the dark matter needed to close the universe could be hot. According to the see-saw mechanism, ν_τ potentially is the most massive neutrino, hence a leading candidate for the missing hot component.

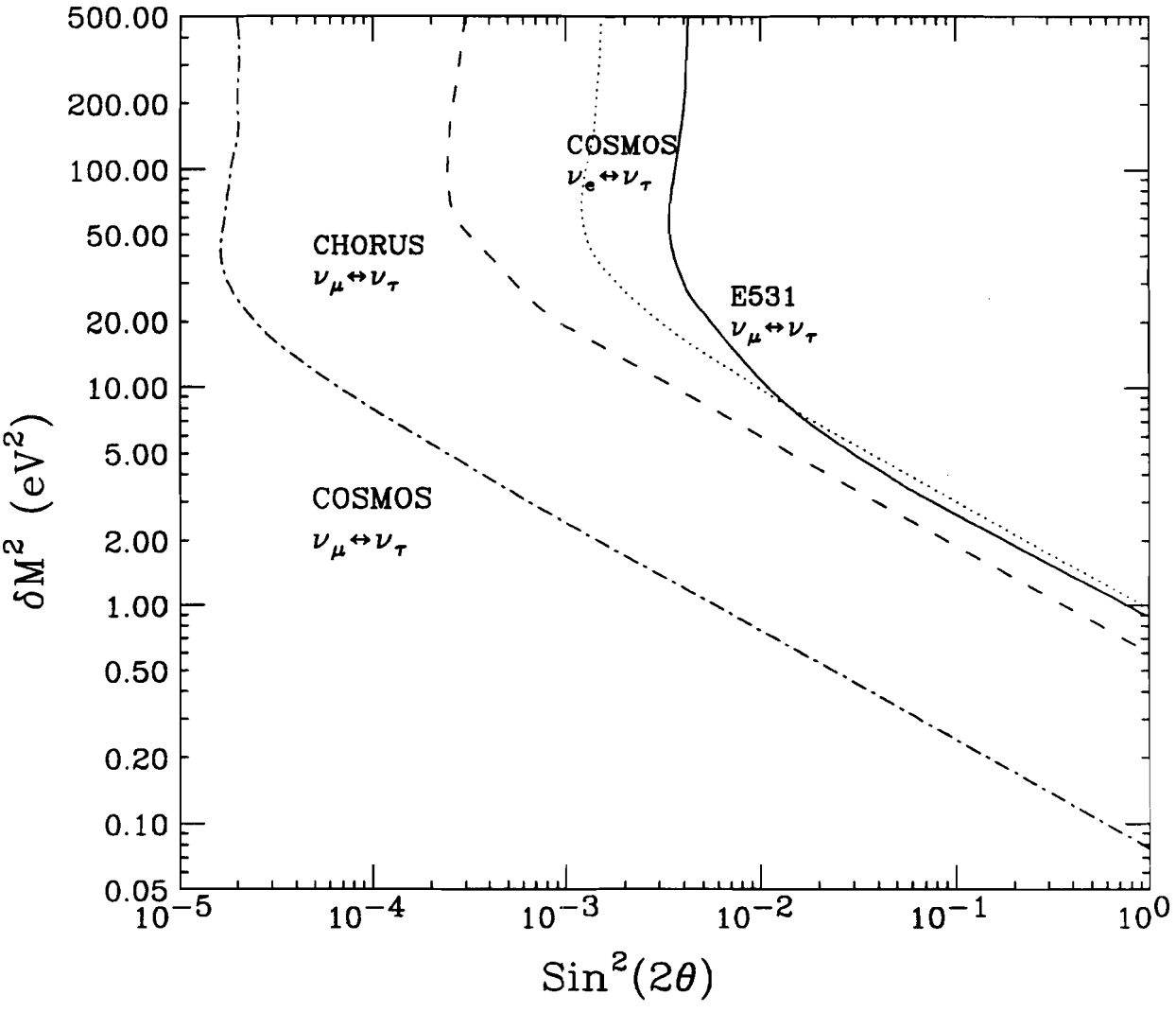
E-803 will achieve a sensitivity 200 times better than the seminal E-531 Fermilab experiment by using a wide-band Main Injector beam of unprecedented intensity. In the mass-squared range of cosmological interest, E-803's sensitivity is 60 times better than that of present CERN experiments. The E-803 apparatus is a third-generation hybrid emulsion-electronic spectrometer based on experience gained in previous Fermilab experiments E-531 and E-653. Muon or electron neutrinos oscillating to ν_τ will produce τ^- from charged-current interactions. The subsequent τ decays will leave a permanent record in an emulsion target with 1-micron spatial resolution. Information from the electronic spectrometer will be used both to locate events and together with emulsion measurements to provide p_T and other kinematic constraints on the short-lived τ decay. Proposed 90% confidence-level (CL) oscillation limits are given in the accompanying figure.

If τ candidates are observed, E-803 will be able to use its precise determination of p_T to fit τ mass and proper decay times for individual candidates in a variety of decay channels. The resulting discovery potential for observing oscillations is approximately five times the 90% CL limits shown in the figure.

The 10^7 neutrino interactions from COSMOS will be recorded in a detector which allows complete reconstruction of final states with high precision, and with micron vertex resolution in its emulsion target. These unique capabilities give COSMOS access to other high-quality physics such as QCD studies of F_2 (x, Q^2) and xF_3 (x, Q^2) (complementing studies with NuTeV),

determination of CKM matrix element V_{cd} to ±3%, a ±2% determination of the charm quark mass m_c, a detailed exploration of charm production dynamics in neutrino scattering, and clean measurements of inverse muon decay and quasi-elastic scattering. Much of this Standard Model physics depends on COSMOS' ability to measure high-statistics charm production by neutrinos and antineutrinos from threshold up to medium energies, and to scan large numbers of events automatically.

During the past year, E-803/COSMOS chose the ITEP lead-glass option for its electromagnetic calorimeter, which must be able to see shower energies as low as 100 MeV. Existing lead glass and Russian photomultipliers will allow a superb calorimeter to be built for less than $1 million. The performance of a portion of this calorimeter will be studied in the NuMI test beam during summer, 1997. Prototypes of COSMOS jet drift chambers are now under construction, and will be installed in ongoing experiments E-815 and E-872; they will contribute to the physics of these experiments as well as undergo extensive testing under real running conditions.


500.00
200.00
100.00
50.00
20.00
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2.00
1.00
0.50
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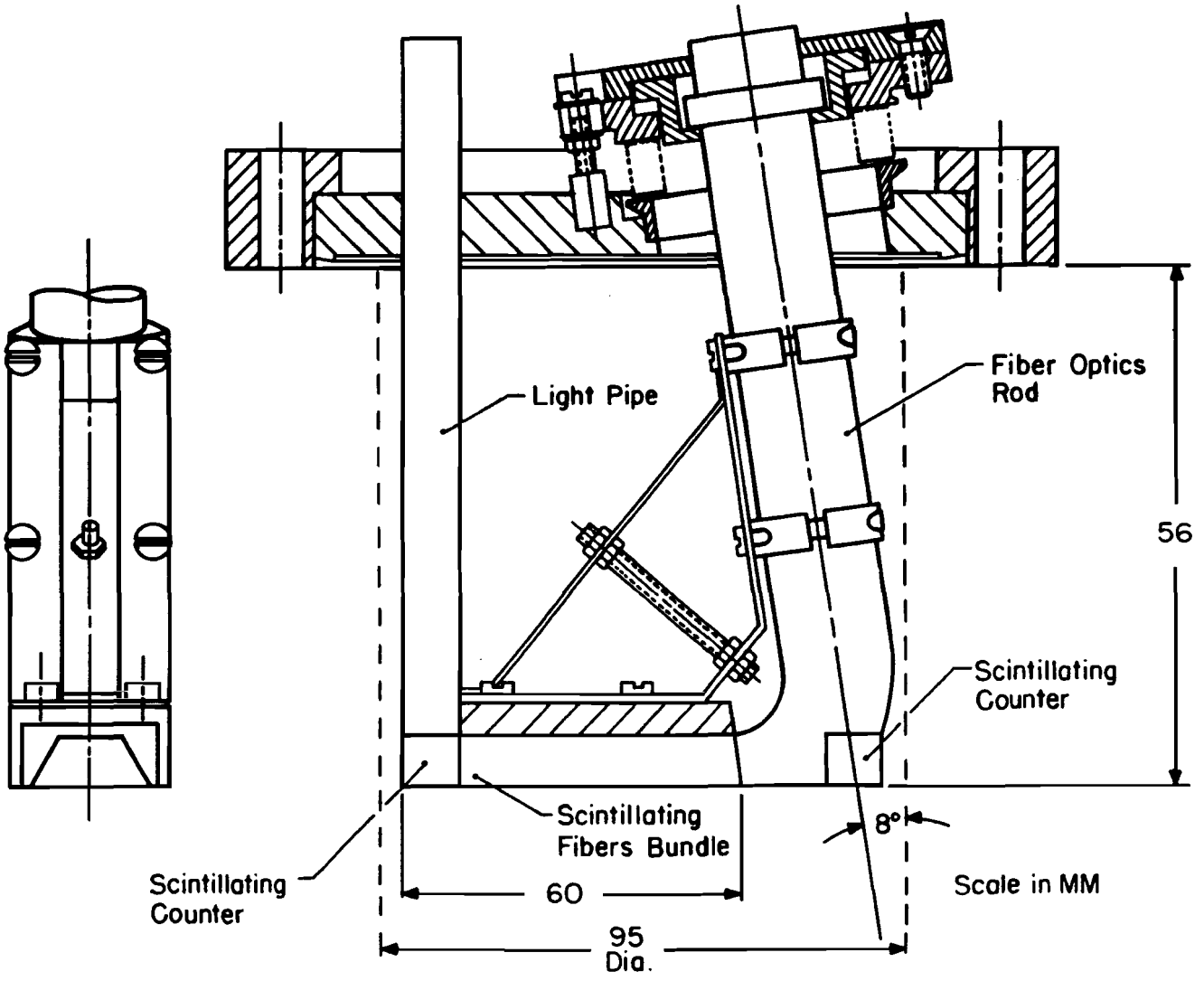
0.05
δM^2 (eV^2)
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
10^{0}
$\mathrm{Sin}^2(2\theta)$
CHORUS
$\nu_\mu \leftrightarrow \nu_\tau$
COSMOS
$\nu_e \leftrightarrow \nu_\tau$
E531
$\nu_\mu \leftrightarrow \nu_\tau$
COSMOS
$\nu_\mu \leftrightarrow \nu_\tau$


Light Pipe
Fiber Optics Rod
56
Scintillating Counter
Scintillating Fibers Bundle
8°
Scintillating Counter
60
95 Dia.
Scale in MM

E-811 (Orear) Physics at E0 for Collider Run Ib

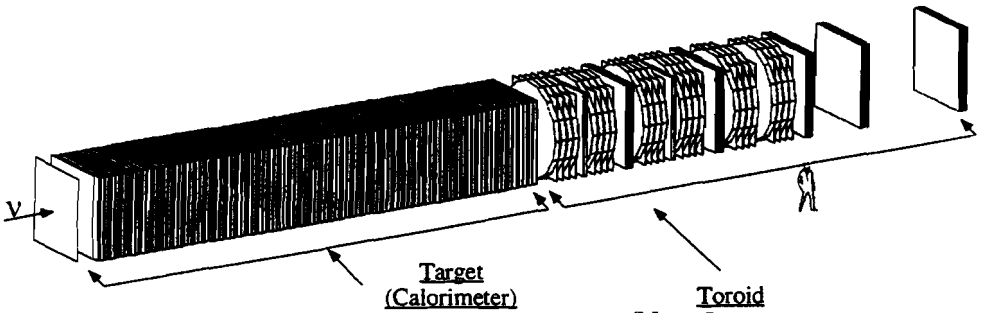
CERN, Cornell, Fermilab

Status: *Data Analysis*

The goals are two-fold: (1) to get new, accurate values of the rho value (ratio of real to imaginary part of the forward scattering amplitude) and total cross section at the full collider energy, and (2) to test out a new detector scheme designed to do the same thing at a higher energy collider. These new detectors are designed to measure very small angle elastic scatterings within a millimeter or two of the beam. They consist of bundles of 100 micron scintillating fibers lined up parallel to the beam and remotely adjustable in position. Light generated in a scintillating fiber is led outside the vacuum tank by glass fiber optics undergoing a 90 degree bend to a series of two image intensifiers. The image on the final phosphor is registered on a CCD, digitized, and dumped onto data tape after an appropriate trigger. The voltage signal on the final phosphor allows it to behave as the anode of a photomultiplier tube and can be used as part of the trigger. This new detector has been tested in a 10 GeV pion beam at CERN and found to be 100% efficient with zero background, both for the CCD image and the fast pulse obtained from the anode. Such a detector is equivalent to a bundle of 15,000 independently readable scintillation counters, each with 100% efficiency, with zero noise, no cracks, and position resolution in both dimensions of about 30 microns. In the actual data-taking run of January 1996, close to 100% efficiency was obtained for each detector, and position resolution of ~30 microns was also obtained.

Four such detectors were installed at the same far positions used by E-710. During the shutdown between Runs Ia and Ib one such detector had been installed and shown to work in the beam pipe vacuum. In E-710 the detectors were able to get within 2.2 mm of the beam without running into too much background. Analysis of simulated data has shown that if these new detectors can take data down to 2.9 mm of the beam then the rho value can be obtained to an accuracy of 0.03 and the total cross section to 1.5 mb. This is based on a sample of 80,000 elastics in the low-t geometry which is what was obtained in the January 1996 run. Data-taking was with separators off and highly scraped beam. Data analysis is now in progress. A preliminary value for the total cross section has been obtained and was reported in an invited paper at the VIIth International Conference on Elastic and Diffractive Scattering in Seoul, Korea, June 1997. This paper has also been released as a Fermilab preprint. We feel that this measurement is of significantly greater accuracy than E-710 or CDF and we hope to publish it soon. The one graduate student received his Ph.D. in April 1997 based on a Cornell University thesis entitled "Measurement of the Proton-Antiproton Total Cross Section at Center of Mass Energy of 1800 GeV."

E-815


ν
Target
(Calorimeter)
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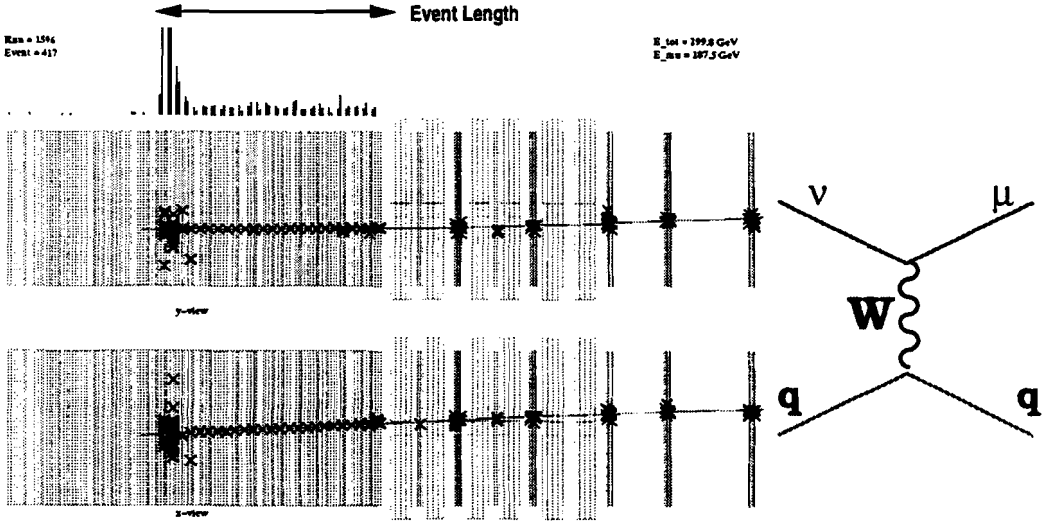
Drift Chambers
Fiducial Volume: 350 tons
Toroid
(Muon Spectometer)
420 tons


Event Length
ν
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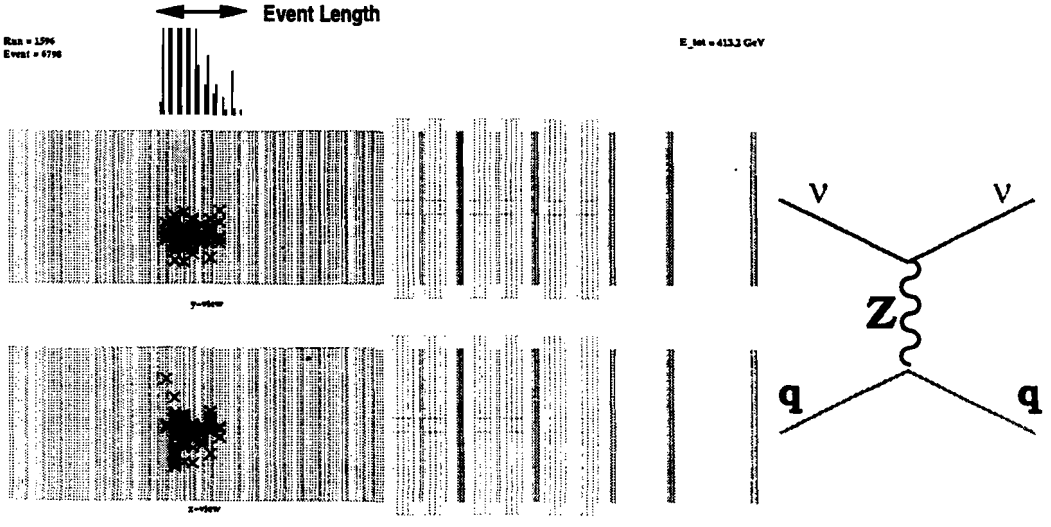
q


Event Length
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E-815 (Bernstein / Shaevitz) Precision Measurements of Neutrino Neutral- and Charged-Current Interactions Using a Sign-Selected Beam

Cincinnati, Columbia, Fermilab, Kansas State, Northwestern, Oregon, Rochester, Xavier

Status: *Data Analysis*

Before the discovery of the top quark, precision measurements of the weak mixing angle, θ_W, at lepton and hadron colliders and in neutrino-nucleon collisions, provided a prediction of its mass when interpreted in light of the top mass-dependent radiative corrections. With the discovery of the top quark, precision tests of Standard Model predictions have assumed an even greater role as sensitive probes for physics beyond it. The incomplete nature of the Standard Model inspires further theoretical and experimental effort to resolve the many unanswered questions, and the departure of a precisely measured Standard Model parameter from its predicted value would provide a clear indication of new physics.

E-815 (NuTeV) exploits the full power of the high-energy, high-intensity Tevatron neutrino beam to significantly improve upon the current precision of the electroweak parameters. The new Sign-Selected Quadrupole Train (SSQT) has enabled us to unambiguously distinguish neutrino and anti-neutrino interactions with at least two significant results:

(1) Previously limiting systematic errors on the determination of $\sin^2\theta_W$ have been eliminated or dramatically reduced.

(2) The ability to distinguish between neutrino and anti-neutrino interactions is allowing us to make the first precision measurement of ρ, the ratio of neutral- to charged-current coupling strengths.

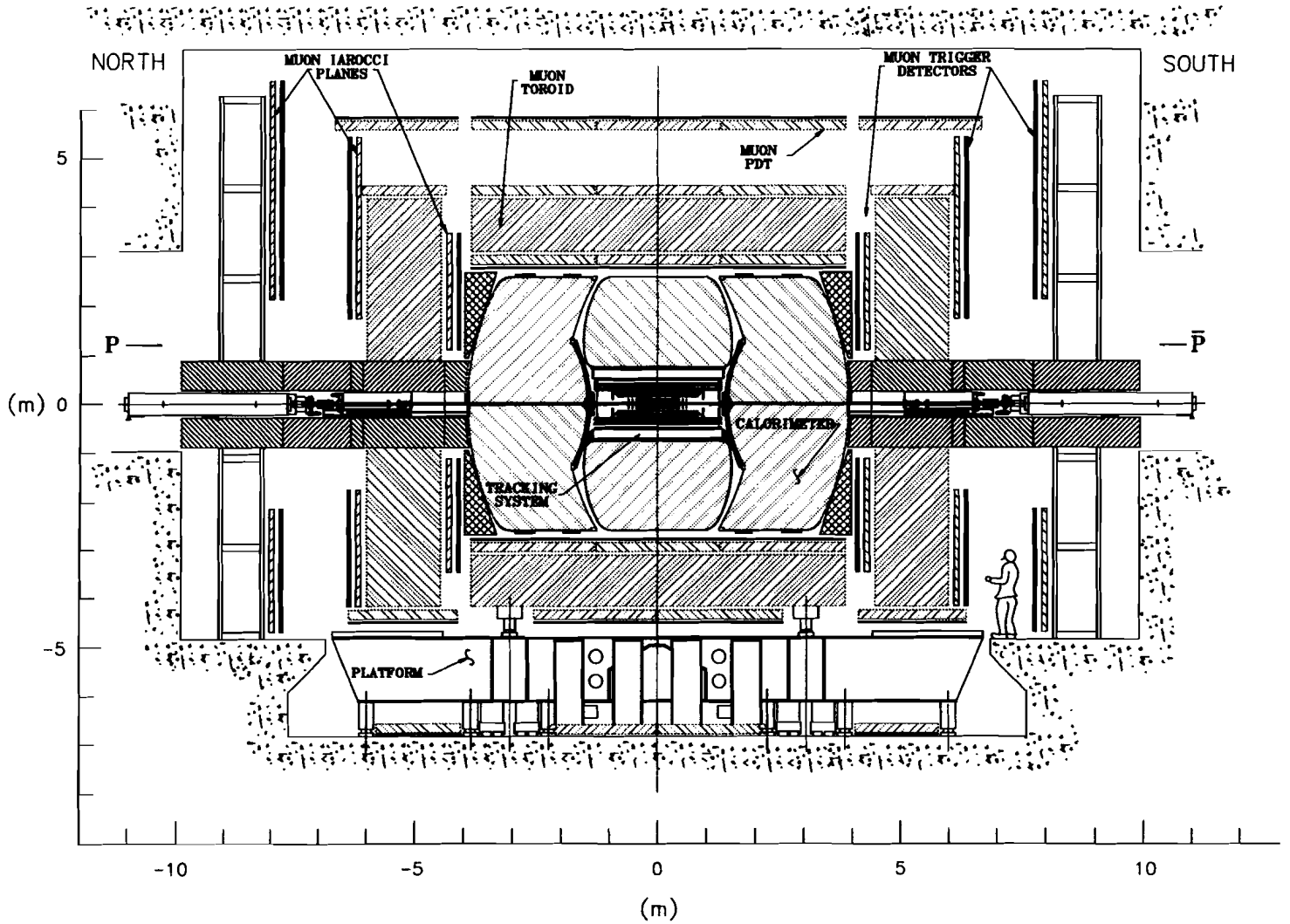
Historically, the comparison of different measurements of the weak mixing angle in collider and fixed-target experiments has proven fruitful since each type of experiment has different sensitivity to the Standard Model radiative corrections which depend on the top quark and Higgs boson masses. Precision electroweak measurements had already predicted the top mass before its recent discovery, and further increases in precision may uncover mass effects due to the existence of yet undiscovered particles such as the Higgs boson or supersymmetric particles. The value of ρ reflects the structure of the Higgs sector so a precise determination is a powerful probe of the nature of electroweak unification.

NuTeV is well into its analysis of the data and expects to meet its goals: a measurement of $\sin^2\theta_W$ with an expected total error of ± 0.0025, and ρ with an error of ± 0.010. These errors translate into an error on M_{top} of ± 20 GeV/c^2 ± 17

GeV/c^2 (M_{higgs}) and only ±120 MeV/c^2 on M_w, competitive with collider measurements. Neutrino-nucleon scattering measurements have a unique dependence on the radiative corrections and are the only measurements which directly determine both $\sin^2\theta_w$ and ρ.

Neutrino-nucleon scattering has always been a rich source of information on the structure of nucleons and tests of QCD, and NuTeV will build on that tradition. Experience gained in E-744/E-770 is being used to reduce the systematic errors on α_s and Λ_{QCD} through the use of an extensive calibration program with a new test-beam spectrometer. E-744/E-770 has already provided the best measurement $\alpha_s(M_z)$ with the limiting error being the comparison of the energy scales of the calorimeter and toroid. NuTeV has already reached the limit of E-744/E-770 and is busily pushing to a factor of three better. In addition, the SSQT will allow increased precision of measurements of the anti-quark distributions, charm and strange sea, and $R_l=\sigma_L/\sigma_T$. Our analysis of the dimuon sample which will provide much of this information is well underway. We are also engaged in a new search for neutral heavy leptons with a significantly improved sensitivity.

E-815 has completed data-taking and the analysis is proceeding well. The beam and detector so far show no significant problems and we expect a preliminary weak mixing angle this year.



Side view of the DØ detector for Run II

E-823 / 740 (Montgomery / Weerts) Study of Events in $\bar{p}p$ Collisions at 2 TeV in the D0 Detector

Acad. Sci. (Czech Rep.), los Andes (Colombia), Arizona, BNL, Boston, Brown, Buenos Aires (Argentina), UC/Berkeley, UC/Davis, UC/Irvine, UC/Riverside, CBPF (Brazil), Charles (Czech Rep.), Czech Tech (Czech Rep.), CINVESTAV (Mexico), Columbia, Delhi (India), Fermilab, Florida State, Hawaii, IHEP/Protvino (Russia), Illinois/Chicago, Indiana, INP/Krakow (Poland), Iowa State, ITEP (Russia), JINR (Russia), Kansas, Korea (Korea), Kyungsung (Korea), LBNL, Louisiana Tech, Maryland, Michigan, Michigan State, Moscow State (Russia), Nebraska, New York, Northeastern, Northern Illinois, Northwestern, Notre Dame, Oklahoma, Panjab (India), PNPI (Russia), Purdue, Rice, Rio de Janeiro (Brazil), Rochester, Saclay (France), Seoul National (Korea), SUNY/Stony Brook, Tata (India), Texas A&M, Texas/Arlington

Status: *E-740 - Data Analysis*
E-823 - No Data Yet

The D0 detector is a large, hermetic 4π detector for the study of proton-antiproton collisions with a center-of-mass energy of 1.8 TeV at the Fermilab Tevatron Collider. The detector stresses identification of leptons, photons, jets and missing transverse energy for high-p_T physics with high acceptance up to pseudorapidity of $|\eta| < 3$ for electrons and muons. After five years in the construction phase, the detector has been operated since 1992 by a collaboration now totaling 49 institutions within the U.S. and overseas, with over 450 Ph.D. physicists and graduate students, to study a variety of particle physics topics with the top search as perhaps the most visible example.

The detector used in Run I consisted of three major subsystems. Innermost is a central tracking system containing vertex, forward and central drift chambers. There was no central magnetic field. The drift chamber resolution is ~60 μm (vertex) and 180 μm (forward and central). The tracking system also included a transition radiation detector to aid in electron identification; it provided a rejection of about 50 against single pions. The tracking chambers were surrounded by a hermetic liquid argon sampling calorimeter with uranium and copper/steel absorber. The calorimeter is contained in three cryostat vessels (a central barrel and two end caps). The calorimeter is compensating (e/π ~1.05) and finely segmented to identify electrons, photons, muons and jets. The electromagnetic (EM) calorimeter covers $|\eta| < 3$ and hadronic calorimetry extends to $|\eta| < 4.4$; this large acceptance provides excellent measurement of missing transverse energy. The segmentation is $\Delta\eta \times \Delta\phi = 0.1 \times 0.1$ (0.05×0.05 at EM shower maximum); the energy resolution is $\sim 15\%/\sqrt{E}$ for electrons and photons (with a small constant term), $\sim 50\%/\sqrt{E} \oplus 5\%$ for single hadrons, and about $85\%/\sqrt{E}$ for jets. Outside the calorimeter cryostats was a muon system comprising three layers of proportional drift tubes (0.3 mm resolution) with magnetized iron toroids to provide muon momentum measurement. In the forward regions a small angle muon spectrometer (200 μm resolution) extends coverage up to $|\eta| < 3.3$.

The detector as a whole contained 116,000 channels. Data recording was initiated by a three-level trigger system: the first (Level 0) was a scintillator interaction trigger, the second (Level 1) a hardware analog trigger capable of making calorimeter energy sums, missing E_T, and coarse muon tracks, and the third (Level 2) was a software filter implemented on a farm of 48 VAX Station 4000 computers with full event information available. A supplementary Level 1.5 trigger refined the Level 1 muon and electron trigger.

Initial running concentrated on commissioning the apparatus and understanding the effects of the Main Ring beam which passes through the calorimeter 2m above the Tevatron beam. First collisions were observed on May 12, 1992 and the data run started after a brief shutdown in August. Over the whole of Run Ia, D0 accumulated $15pb^{-1}$ of collider data including special and calibration data runs. The overall ratio of beam data recorded to beam available was about 70%, with the main loss coming from the veto imposed to stop triggering during Main Ring injection and transition and while Main Ring protons pass through the detector. Data were taken at a rate of about 2 Hz and reconstructed at the same rate on a multi-processor UNIX farm.

D0 is now finished taking data in Run I. The detector was improved for the higher luminosities compared with Run Ia by the addition of a cosmic ray shield for the muon system and hardware Level 1.5 trigger for electrons capable of performing both threshold and simple isolation cuts. The total data to tape for Run I corresponded to ~120 pb^{-1}.

Current Ia and Ib physics analyses at D0 are organized into five groups. The Top Quark Group was able to set a mass limit of $m_t > 131$ GeV using Run Ia data. With the larger statistics available from Run Ib, we reported observation of the top quark in February 1995. This was a major accomplishment in understanding the Standard Model. During 1997, we presented a measurement of the top mass of $172.0 \pm 5.1 \pm 5.5$ GeV by combining the lepton + jet and dilepton final states.

The QCD Group has presented cross sections for inclusive jets in the central and forward regions and differential cross sections for dijet production. The dijet angular distributions have been measured, and photon cross sections and angular distributions presented. Many new analyses have extended the study of QCD at the Tevatron Collider into new regimes: the reported observation of rapidity gaps between forward and backward jets is a signal for colorless exchange, e.g. pomerons; the decorrelation in azimuthal angle between forward and backward jets allows tests of resummation in mixed-scale problems; measurement of energy flow around jets allows the color coherence of gluon emission to be probed.

The Electroweak Group focuses on the production and decay of W and Z bosons. The mass of the W-boson has been measured and published from Run I data: $m_W = 80.43 \pm 0.11$ GeV/c^2. Results published from Run Ia data include the W and Z production cross sections, and p_T distributions. The

production of dibosons (Wγ, Zγ, WW, WZ) through trilinear couplings, a test of the Standard Model, has been studied with Run I data. D0 is also using vector-boson-plus-jet events as a QCD laboratory: the strong coupling constant α_s has been measured from W+jet events and color coherence effects can be studied here too.

The B-Physics Group has obtained cross sections for low-p_T muons, inclusive b production and J/ψ's. The cross-sections for b and J/ψ production have been measured in previously unexplored large rapidity regions. Measurements of the inclusive b cross-section may also provide a new determination of the strong coupling constant. The b quark fragmentation function has been measured using muons within jets.

The New Phenomena Group is conducting searches for physics beyond the Standard Model. Limits on the production cross-sections for leptoquarks, W', Z' and right-handed W's have been presented. In addition, mass limits and cross-sections have been set for squarks, gluinos and gauginos as predicted by supersymmetric models.

The approved D0 upgrade for Run II, E-823, must operate at luminosities near $2\times10^{32}cm^{-2}s^{-1}$ with bunch spacings as short as 132 nanoseconds. To meet the challenges of such a high-rate environment the entire central tracking system will be replaced with a silicon microstrip detector, a scintillating-fiber tracker, a solenoid magnet, and central and forward preshower detectors. The new trackers will provide enhanced pattern recognition and triggering opportunities for both lepton and photon final states. Studies of top quark, electroweak, and b physics will be significantly enhanced by the new detectors.

The scintillating-fiber tracker, an innovative design based upon visible light photon counters, has passed a major developmental milestone with successful operation of a 3000-channel test stand at Fermilab. The single-channel noise rate, quantum efficiency, and photo-electron production all meet or exceed design specifications. The construction of the solenoid magnet is scheduled to be complete in 1997. Improvements in the calorimeter electronics required to meet the high-rate environment have been prototyped in a 3000-channel test. The design of similar improvements for the muon electronics is at an advanced stage. A preliminary design of the upgraded DAQ and triggering system specifies a Level 1 accept rate of 10 kHz, a Level 2 accept rate of 1 kHz and a Level 3 output of 5-10 Hz. The new triggering elements will include the fiber tracking and preshower detectors.

Publications

Hadron and Electron Response in a Uranium Liquid Argon Calorimeter from 10-150 GeV, Nucl. Instr. and Meth. A269, 492 (1988).

Hadron and Electron Response of Uranium/Liquid Argon Calorimeter Modules for the D0 Detector, Nucl. Instr. and Meth., A280, 36 (1989).

Beam Tests of the D0 Uranium Liquid Argon End Calorimeters, Nucl. Instr. and Meth. A324, 53 (1993).

The D0 Detector, Nucl. Instr. and Meth. A338, 185 (1994).

First Generation Leptoquark Search in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 72, 965 (1994).

Search for the Top Quark in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 72, 2138 (1994).

Rapidity Gaps Between Jets in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 72, 2332 (1994).

Search for High Mass Top Quark Production in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 74, 2422 (1995).

Observation of the Top Quark, Phys. Rev. Lett. 74, 2632 (1995).

Inclusive μ and b-Quark Production Cross Sections in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 74, 3548 (1995).

Search for Squarks and Gluinos in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 75, 618 (1995).

Search for W Boson Pair Production in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 75, 1023 (1995).

Limits on the Anomalous $ZZ\gamma$ and $Z\gamma\gamma$ Couplings in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 75, 1028 (1995).

Measurement of the $WW\gamma$ Gauge Boson Coupling in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 75, 1034 (1995).

W and Z Boson Production in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 75, 1456 (1995).

A Study of the Strong Coupling Constant Using W + Jets Processes, Phys. Rev. Lett. 75, 3226 (1995).

Top Quark Search with the D0 1992-93 Data Sample, Phys. Rev. D52, 4877 (1995).

Transverse Energy Distributions within Jets in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Lett. B357, 500 (1995).

Search for Heavy W Bosons in 1.8 TeV $\bar{p}p$ Collisions, Phys. Lett. B358, 405 (1995).

Second Generation Leptoquark Search in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 75, 3618 (1995).

Studies of Topological Distributions of Inclusive Three- and Four-Jet Events in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1800 GeV with the D0 Detector, Phys. Rev. D53, 6000 (1996).

Jet Production via Strongly-Interacting Color-Singlet Exchange in $\bar{p}p$ Collisions, Phys. Rev. Lett. 76, 734 (1996).

Search for Light Top Squarks in $\bar{p}p$ Collisions at 1.8 TeV, Phys. Rev. Lett. 76, 2222 (1996).

Search for $\tilde{W}_1\tilde{Z}_2$ Production Via Trilepton Final States in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 76, 2228 (1996).

Search for Right-Handed W Bosons and Heavy W' in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 76, 3271 (1996).

The Azimuthal Decorrelation of Jets Widely Separated in Rapidity, Phys. Rev. Lett. 77, 595 (1996).

Search for Anomalous WW and WZ Production in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 77, 3303 (1996).

J/Psi Production in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Lett. B370, 239 (1996).

Measurement of the W Boson Mass, Phys. Rev. Lett. 77, 3309 (1996).

Search for Additional Neutral Gauge Bosons, Phys. Lett. B385, 471 (1996).

The Isolated Photon Cross Section in the Central and Forward Rapidity Region in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 77, 5011 (1996).

Limits on Anomalous WWγ Couplings from $\bar{p} \rightarrow W\gamma+X$ Events at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 78, 3634 (1997).

Search for a Fourth Generaton Charge −1/3 Quark Via Flavor Changing Neutral Current Decay, Phys. Rev. Lett. 78, 3818 (1997).

Search for Diphoton Events with Large Missing Transverse Energy in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 78, 2070 (1997).

Search for Top Squark Pair Production in the Dielectron Channel, accepted by Phys. Rev. D as a Brief Report, FERMILAB-Pub-96/449-E.

Study of the ZZγ and Z$\gamma\gamma$ Couplings in $Z(\rightarrow \nu\nu)\gamma$ Production, Phys. Rev. Lett. 78, 3640 (1997).

Direct Measurement of the Top Quark Mass, Phys. Rev. Lett. 79, 1197 (1997).

Studies of Gauge Boson Pair Production and Trilinear Couplings, accepted by Phys. Rev. D, FERMILAB-Pub-97/088-E.

Measurement of the Top Quark Pair Production Cross Section in $\bar{p}p$ Collisions, Phys. Rev. Lett. 79, 1203 (1997).

Limits on WWZ and WWγ Couplings from $\bar{p}p \rightarrow e\nu jjX$ Events at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 79, 1441 (1997).

Search for Scalar Leptoquark Pairs Decaying to Electrons and Jets in $\bar{p}p$ Collisions, Phys. Rev. Lett. 79, 4321 (1997).

Search for the Trilepton Signature from the Associated Production of SUSY $\tilde{\chi}_1^{\pm}\tilde{\chi}_2^0$ Gauginos, FERMILAB-Pub-97/153-E, submitted to Phys. Rev. Lett.

Color Coherent Radiation in Multijet Events from $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, FERMILAB-Pub-97/201-E, accepted by Phys. Lett. B.

Measurement of the Top Quark Mass Using Dilepton Events, FERMILAB-Pub-97/172-E, submitted to Phys. Rev. Lett.

Measurement of Dijet Angular Distributions and Search for Quark Compositeness, FERMILAB-Pub-97/237-E, accepted by Phys. Rev. Lett.

Experimental Search for Chargino and Neutralino Production in Supersymmetry Models with a Light Gravitino, FERMILAB-Pub-97/273-E, accepted by Phys. Rev. Lett.

Scintillation Counters for the D0 Muon Upgrade, FERMILAB-Pub-97/226-E, submitted to Nucl. Instr. and Meth.

Determination of the Mass of the W Boson Using the D0 Detector at the Tevatron, FERMILAB-Pub-97/328-E, submitted to Phys. Rev. D.

$Z\gamma$ Production in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV and Limits on Anomalous $ZZ\gamma$ and $Z\gamma\gamma$ Couplings, FERMILAB-Pub-97/363-E, submitted to Phys. Rev. Lett.

Search for First Generation Scalar Leptoquark Pairs in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, FERMILAB-Pub-97/344-E, submitted to Phys. Rev. Lett.

Theses

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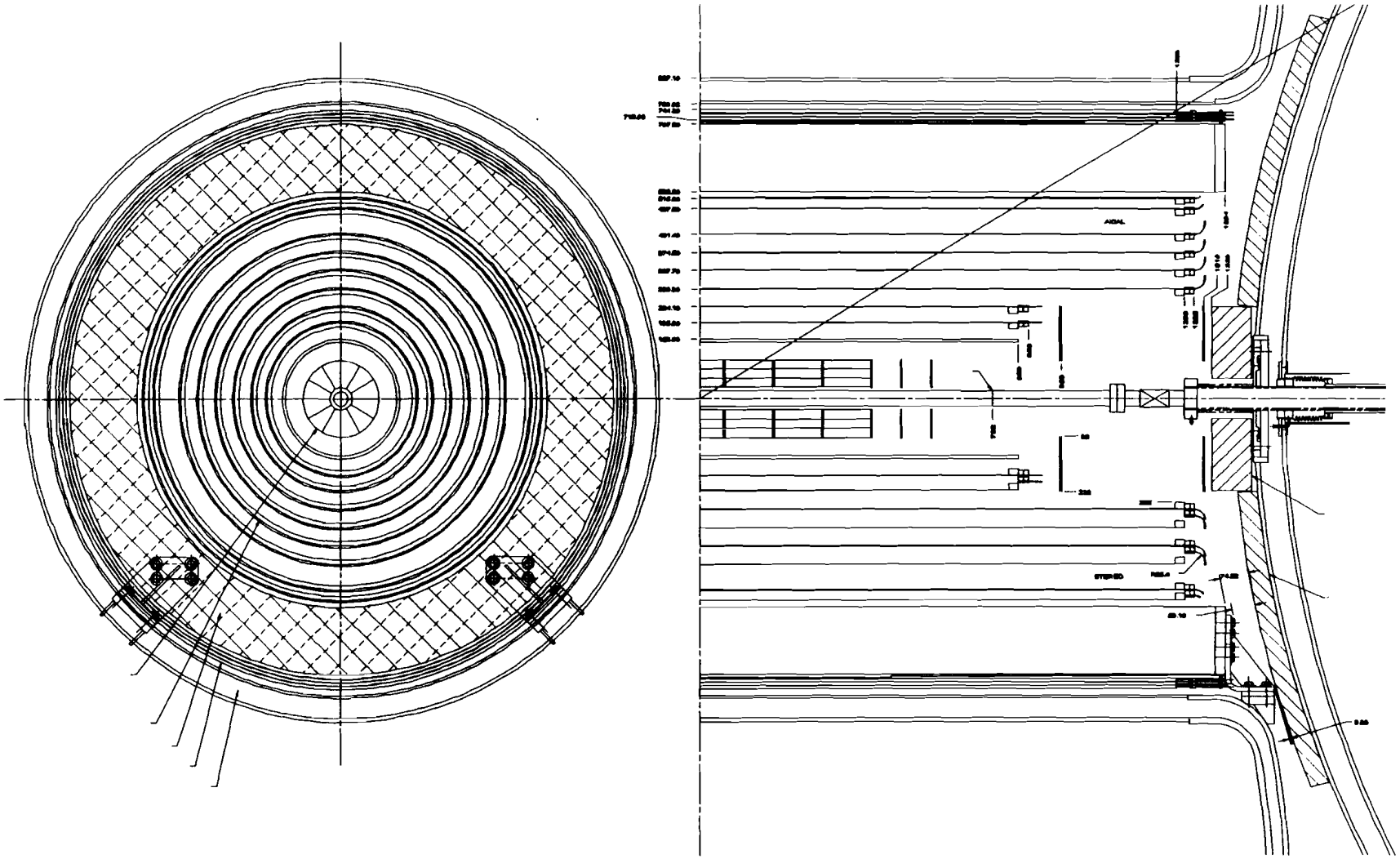
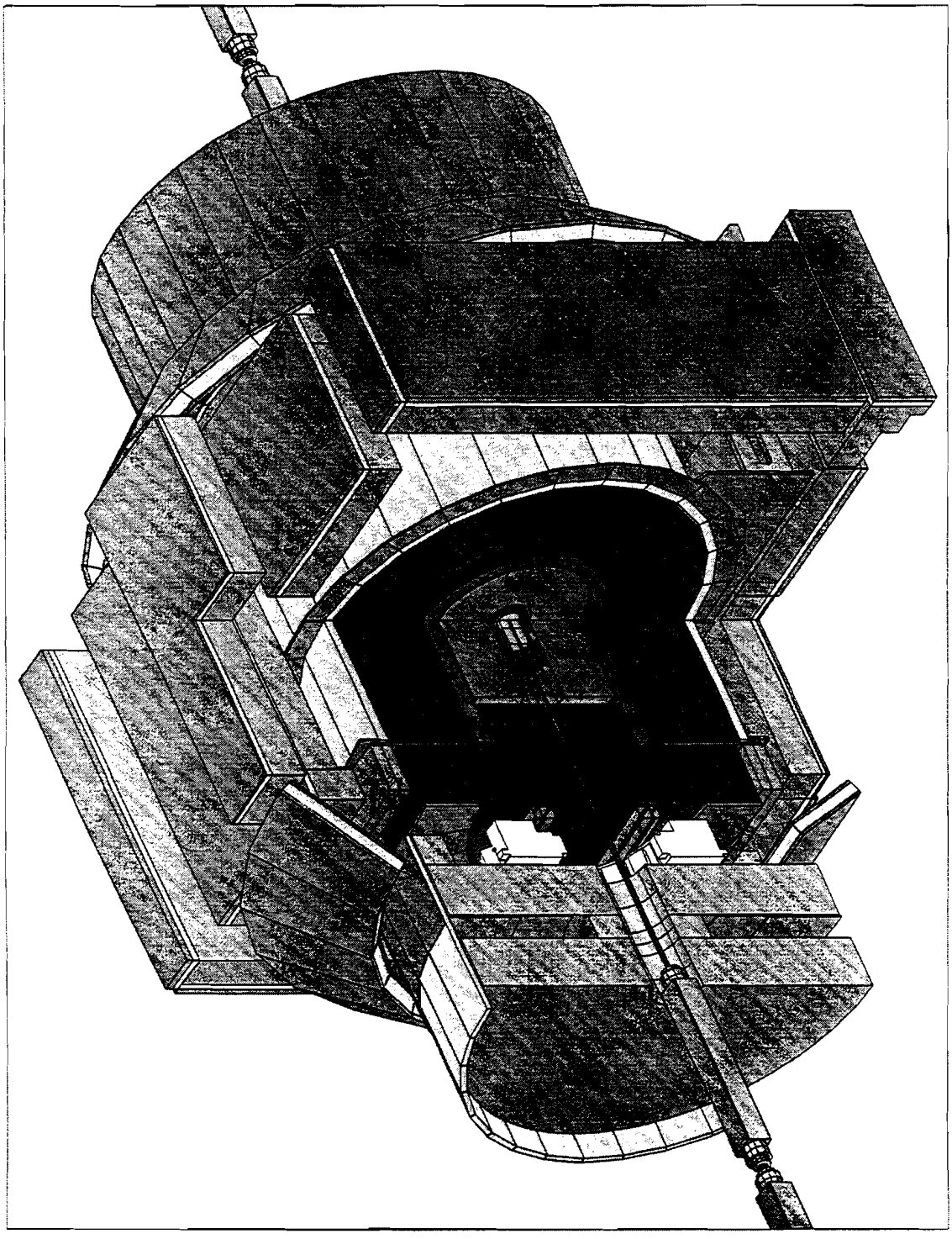


The Run II configuration of the tracking system. Shown are the central silicon vertex tracker, the central scintillating fiber tracker, and the central and forward preshower detectors.



E-830

E-830 / 775 (Carithers / Goshaw) Collider Detector at Fermilab

Academia Sinica (Taiwan), ANL, Bologna (Italy), Brandeis, UCLA, Chicago, Duke, Fermilab, Florida, Frascati (Italy), Geneva (Switzerland), Harvard, Hiroshima (Japan), Illinois, Inst. of Particle Phys. (Canada), Johns Hopkins, Karlsruhe (Germany), KEK (Japan), LBNL, MIT, Michigan, Michigan State, New Mexico, Ohio State, Osaka City (Japan), Padova (Italy), Pennsylvania, Pisa (Italy), Pittsburgh, Purdue, Rochester, Rockefeller, Rutgers, Texas A&M, Texas Tech, Trieste/Udine (Italy), Tsukuba (Japan), Tufts, Waseda (Japan), Wisconsin, Yale

Status:	*E-775 - Data Analysis* *E-830 - No Data Yet*

The Collider Detector at Fermilab (CDF) is a general purpose detector system designed to explore the physics of 2 TeV proton-antiproton collisions at the Fermilab Tevatron Collider.

The heart of the CDF central detector is a 5.0-meter-long, 1.5-meter-radius, 1.4 Tesla superconducting solenoid with tracking systems in the magnetic field for momentum analysis of charged particles. In the detector which operated until the spring of 1996, the solenoid was surrounded by scintillator-based calorimeters in the central region covering the angular range 30^{o} to 150^{o} with respect to the Tevatron beams, and two "plug" gas calorimeters in the ends of the solenoid extending the calorimeter coverage down to 10^{o}. In all regions the calorimeters are divided into electromagnetic and hadronic sections and have a projective tower geometry to measure energy flow in fine bins of pseudorapidity and azimuth. Muon chambers are located behind the calorimeters. In the forward directions for angles below 10^{o} and down to 2^{o} are additional electromagnetic and hadronic gas calorimeters. The muon detector system in the forward direction includes magnetized iron toroids for momentum measurement. The original detector has approximately 100,000 channels of electronics read out via a FASTBUS data acqusition system. A three-level trigger system selects events to be recorded on magnetic tape.

CDF as E-775

E-775 is the upgraded version of CDF for Collider Runs Ia and Ib. For Run Ia the highlights of the upgrade included:

1. The addition of a 4-layer, 46,000 channel silicon microstrip vertex detector, the SVX. This device was installed around a new 1.5 inch diameter beam pipe and enabled the reconstruction of secondary vertices, opening up a new field of precise b physics measurements and b-tags for top quark identification.

2. A new set of time-projection chambers with 4 cm drift spaces replacing the old 15 cm drift devices in order to cope with higher luminosity.

3. The muon coverage was considerably improved by:

   a) new chambers and scintillators (CMX) to extend the coverage from pseudorapidity of 0.6 to 1.0; and

   b) additional steel and new chambers to drastically improve the punchthrough background in the central region.

4. New front-end electronics were added to the gas calorimeters and tracking chambers to cope with higher luminosity. These allowed lower gas gain operation and improved noise performance. The outer regions of the CTC were also equipped with dE/dx readout.

5. The throughput of the data acquisition was considerably improved by adding new event builders and more computing power in Level 3. As a result the output to tape increased from 1.2 to 8 Hz.

6. The offline environment was improved by adding 1000 Mips to the farms and acquiring a 1.2 Tbyte robotic storage device.

For Run Ib, the upgrades included:

1. A new radiation-hard Silicon Vertex Detector.

2. The DAQ bandwidth was increased by adding VME-based scanners and an Ultranet hub to connect the readout scanners to the Level 3 processors.

3. New Level 2 processors were installed to increase the speed, flexibility, and power of the trigger.

4. A diffractive spectrometer featuring Roman pots was added.

In Collider Run Ia, CDF rolled into the B0 Collision Hall at the end of March 1992, and the first collisions were seen in May 1992. During Run Ia, the E-775 detector functioned well, taking data at luminosities up to $9\times10^{30}cm^{-2}sec^{-1}$ with 90 percent livetime and an overall data-taking efficiency of 71 percent. A total data sample of 21.4 pb^{-1} was collected by the end of the run in June 1993. The first-pass event reconstruction for all Run Ia data was completed by the end of 1993, and data analysis is continuing.

During Collider Run Ib, the detector has continued to function well, taking data at luminosities up to $\sim20\times10^{30}cm^{-2}sec^{-1}$ with 90 percent livetime and an overall data-taking efficiency of about 80 percent. Data-taking began on January 19, 1994, and by February 20, 1996, a total integrated luminosity of $\approx$90 pb^{-1} had been recorded. Data analysis for this Run Ib data is continuing.

The CDF Collaboration has increased dramatically in size since 1989. Twenty-four new institutions have joined, bringing the total to 41 representing seven countries. A total of more than 450 physicists are now members, up from 187 in 1989.

A total of 153 papers on CDF results have been published and submitted, and 155 students have written theses on CDF analyses. The highlights of the Run I physics program include:

1. First evidence of top quark production followed by discovery (simultaneously with D0) of the top quark. After the discovery, measurements of top quark mass, production and decay properties rapidly followed.

2. World-class measurements of the spectroscopy and lifetimes of b quark states.

3. Measurement of W mass and width, triboson couplings, and Drell-Yan cross section.

4. Observation of excess over QCD calculations for very high E_T jet production and other QCD measurements in jet physics, photon physics, and diffractive phenomena.

5. New limits on SUSY particles, Higgs, leptoquarks, new gauge bosons, and other exotic states.

CDF as E-830

E-830 (also known as CDFII) is the upgraded version of CDF for Collider Run II where the bunch spacing will be as small as 132 ns and the luminosity in excess of $2\times10^{32}cm^{-2}sec^{-1}$. The full scope of the upgrade is described in the Technical Design Report (TDR), available as a Fermilab publication. The highlights include:

1. Replacing the gas calorimeters with a scintillating tile-based plug calorimeter extending to $|\eta|$ of 3.

2. Replacing the SVX with a five-layer, double-sided SVXII that covers the entire luminous region.

3. Adding two additional layers of silicon detectors (ISL) at larger radii. The combination of the SVXII and ISL will allow precise 3D tracking out to $|\eta|$ of 2.

4. Replacing the CTC with a smaller drift cell version, the COT, which will reduce the drift time to less than the 132 ns bunch spacing.

5. Replacing all the front-end electronics to cope with the shorter bunch spacing. The principal elements include:

   a) pipelined front ends and buffering for L2 decisions resulting in virtually deadtimeless operation; and

   b) new ASICs for ADCs and TDCs.

6. New trigger system comprising:

   a) all digital trigger;

   b) new track processor allowing high resolution tracking decisions in L1; and

   c) Level 2 trigger based on SVXII to allow secondary vertex triggers at L2.

7. Extended muon coverage out to $|\eta|$ of 1.5 including:

   a) new counters and chambers on the muon toroids now moved closer to the interaction region;

   b) new counters covering the region just outside the CMX; and

   c) covering missing azimuthal regions in the CMX and central muon coverage.

8. New DAQ components with higher throughput at all levels.

9. Extended offline environment that includes:

   a) code migration toward object-oriented models;

   b) data handling to cope with petabyte-scale datasets; and

   c) enhanced computing power in farms.

With the 2 fb^{-1} expected for Run II, the anticipated physics program is truly exciting and features:

1. Top quark mass, production, and decay measurements at the few percent level.

2. Observation of CP violation in the b quark sector.

3. Precision mass, lifetime, and spectroscopy measurements of b quark states including B_s mixing and B_c properties.

4. W mass measurement to better than 40 MeV.

5. Jet and photon measurements out to very high E_T.

6. Searches for SUSY, Higgs, and other exotic states.

Run II is expected to begin in early 2000.

Publications

The CDF Detector: An Overview, Nucl. Instr. and Meth. A271, 387 (1988).

Transverse Momentum Distributions of Charged Particles Produced in $\bar{p}p$ Interactions at $\sqrt{s}$ = 630 and 1800 GeV, Phys. Rev. Lett. 61, 1819 (1988).

Measurement of the Inclusive Jet Cross Section in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 62, 613 (1989).

Measurement of W-Boson Production in 1.8-TeV $\bar{p}p$ Collisions, Phys. Rev. Lett. 62, 1005 (1989).

Limits on the Masses of Supersymmetric Particles from 1.8 TeV $\bar{p}p$ Collisions, Phys. Rev. Lett. 62, 1825 (1989).

Dijet Angular Distributions from $\bar{p}p$ Collisions at $\sqrt{s}$ =1.8 TeV, Phys. Rev. Lett. 62, 3020 (1989).

Measurement of the Mass and Width of the Z^0 Boson at the Fermilab Tevatron, Phys. Rev. Lett. 63, 720 (1989).

Search for Heavy Stable Particles in 1.8 TeV $\bar{p}p$ Collisions at the Fermilab Collider, Phys. Rev. Lett. 63, 1447 (1989).

K_S^0 Production in $\bar{p}p$ Interactions at $\sqrt{s}$ = 630 and 1800 GeV, Phys. Rev. D, Rapid Communication, 40, 3791 (1989).

A Search for the Top Quark in the Reaction $\bar{p}p \rightarrow e$ + Jets at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 64, 142 (1990).

A Search for New Heavy Quarks in Electron-Muon Events at the Fermilab Tevatron Collider, Phys. Rev. Lett. 64, 147 (1990).

Measurement of the Ratio $\sigma(W \rightarrow e\,\nu) / \sigma(Z \rightarrow ee)$ in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 64, 152 (1990).

Two Jet Differential Cross Section in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 Tev, Phys. Rev. Lett. 64, 157 (1990).

A Measurement of D* Production in Jets from $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 64, 348 (1990).

Jet Fragmentation Properties in $\bar{p}p$ Collisions at $\sqrt{s}$ =1.8 TeV, Phys. Rev. Lett. 65, 968 (1990).

A Measurement of the W Boson Mass, Phys. Rev. Lett. 65, 2243 (1990).

Search for a Light Higgs Boson at the Tevatron Proton-Antiproton Collider, Phys. Rev. D, Rapid Communication, 41, 1717 (1990).

The Two Jet Invariant Mass Distribution at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. D, Rapid Communication, 41, 1722 (1990).

Pseudorapidity Distributions of Charged Particles Produced in $\bar{p}p$ Interactions at $\sqrt{s}$ = 630 and 1800 GeV, Phys. Rev. D41, 2330 (1990).

Measurement of the W Boson P_T Distribution in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 66, 2951 (1991).

Measurement of the Z p_T Distribution in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 67, 2937 (1991).

A Determination of $\sin^2\theta_W$ from the Forward-Backward Asymmetry in $p\bar{p} \rightarrow Z^0 X \rightarrow e^+ e^- X$ Interactions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 67, 1502 (1991).

Measurement of the e^+e^- Invariant Mass Distribution in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 67, 2418 (1991).

Search for $W' \rightarrow e\nu$ and $W' \rightarrow \mu\nu$ in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 67, 2609 (1991).

Measurement of $B^0\bar{B}^0$ Mixing at the Fermilab Tevatron Collider, Phys. Rev. Lett. 67, 3351 (1991).

A Measurement of the W Boson Mass in 1.8 TeV $\bar{p}p$ Collisions, Phys. Rev. D43, 2070 (1991).

Top Quark Search in the Electron + Jets Channel in Proton-Antiproton Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. D43, 664 (1991).

A Measurement of $\sigma(W \rightarrow e\nu)$ and $\sigma(Z^0 \rightarrow e^+e^-)$ in $\bar{p}p$ Collisions at $\sqrt{s}$=1800 GeV, Phys. Rev. D44, 29 (1991).

Measurement of QCD Jet Broadening in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. D44, 601 (1991).

A Lower Limit on the Top Quark Mass from Events with Two Leptons in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 68, 447 (1992).

Inclusive Jet Cross Section in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 68, 1104 (1992).

Lepton Asymmetry in W Decays from $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 68, 1458 (1992).

A Search for New Gauge Bosons in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 68, 1463 (1992).

Measurement of the Isolated Prompt Photon Cross Section in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 68, 2734 (1992).

Measurement of the Ratio $\sigma B(W \rightarrow \tau\nu) / \sigma B(W \rightarrow e\nu)$ in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, as a Test of Lepton Universality, Phys. Rev. Lett. 68, 3398 (1992).

A Measurement of the B Meson and b Quark Cross Section at $\sqrt{s}$ = 1.8 TeV Using the Exclusive Decay $B^{+-} \rightarrow J/\psi\, K^{+-}$, Phys. Rev. Lett. 68, 3403 (1992).

A Measurement of the Production and Muonic Decay Rate of W and Z Bosons in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 69, 28 (1992).

Limit on the Rare Decay $W^{+-} \rightarrow \gamma + p^{+-}$ in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 69, 2160 (1992).

The Dijet Angular Distribution at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 69, 2897 (1992).

Search for Squarks and Gluinos from $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 69, 3439 (1992).

Inclusive J/ψ, ψ' and b-Quark Production in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 69, 3704 (1992).

Topology of Three Jet Events in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. D45, 1448 (1992).

Properties of Events with Large Total Transverse Energy Produced in Proton-Antiproton Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. D45, 2249 (1992).

A Limit on the Top Quark Mass from Proton-Antiproton Collisions at $\sqrt{s}$ = 1800 GeV, Phys. Rev. D45, 3921 (1992).

Limits on the Production of Massive Stable Charged Particles, Phys. Rev. D46, R1889 (1992).

A Measurement of Jet Shapes in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 70, 713 (1993).

Search for $\Lambda_b \rightarrow$ J/ψ Λ^0 in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. D47, R2639 (1993).

Comparison of Jet Production in $\bar{p}p$ Collisions at $\sqrt{s}$ = 546 and 1800 GeV, Phys. Rev. Lett. 70, 1376 (1993).

Measurement of the Cross Section for Production of Two Isolated Prompt Photons in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 70, 2232 (1993).

A Measurement of Jet Multiplicity in W Events Produced in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 70, 4042 (1993).

A Study of Four-Jet Events and Evidence for Double Parton Interactions in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. D47, 4857 (1993).

A Measurement of the Bottom Quark Production Cross Section Using Semileptonic Decay Electrons in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 71, 500 (1993).

Measurement of the Dijet Mass Distribution in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. D48, 998 (1993).

A Prompt Photon Cross Section Measurement in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. D48, 2998 (1993).

The Center-of-Mass Angular Distribution from Prompt Photons Produced in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 71, 679 (1993).

Observation of the Decay $B_s^0 \rightarrow$ J/$\psi\phi$ in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 71, 1685 (1993).

A Measurement of the Bottom Quark Production Cross Section in 1.8 Tev $p\bar{p}$ Collisions Using Muons from b-Quark Decays, Phys. Rev. Lett. 71, 2396 (1993).

Search for Quark Compositeness, Axigluons and Heavy Particles Using the Dijet Invariant Mass Spectrum Observed in $p\bar{p}$ Collisions, Phys. Rev. Lett. 71, 2542 (1993).

Inclusive χ_c and b-Quark Production in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 71, 2537 (1993).

A Search for First-Generation Leptoquarks in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV at CDF, Phys. Rev. D48, R3939 (1993).

Measurement of the Average Lifetime of B-hadrons Produced in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 71, 3421 (1993).

Measurement of Drell-Yan Electron and Muon Pair Differential Cross-Sections in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. D49, R1 (1994).

Evidence for Top Quark Production in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. D50, 2966 (1994).

A Measurement of the B Meson and b Quark Cross Sections at $\sqrt{s}$ = 1.8 TeV Using the Exclusive Decay $B^0 \rightarrow$ J/Psi $K^*(892)^0$, Phys. Rev. D50, 4252 (1994).

Measurement of Small Angle Antiproton-Proton Elastic Scattering at $\sqrt{s}$ = 546 and 1800 GeV, Phys. Rev. D50, 5518 (1994).

Measurement of the $\bar{p}p$ Single Diffraction Dissociation at $\sqrt{s}$ = 546 and 1800 GeV, Phys. Rev. D50, 5535 (1994).

Measurement of the Antiproton-Proton Total Cross Section at $\sqrt{s}$ = 546 and 1800 GeV, Phys. Rev. D50, (5550) 1994.

A Search for the Top Quark Decaying to a Charged Higgs in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 72, 1977 (1994).

Search for Excited Quarks in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 72, 3004 (1994).

Measurement of the B^+ and B^0 Meson Lifetimes, Phys. Rev. Lett. 72, 3456 (1994).

Measurement of the Ratio $\sigma B(W \rightarrow ev) / \sigma B(Z \rightarrow e^+e^-)$ in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 73, 220 (1994).

Evidence for Top Quark Production in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 73, 225 (1994).

Evidence for Color Coherence in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. D50, 5562 (1994).

W Boson + Jet Angular Distribution in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 73, 2296 (1994).

A Precision Measurement of the Prompt Photon Cross Section in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 73, 2662 (1994).

Search for the Top Quark Decaying to a Charged Higgs Boson in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 73, 2667 (1994).

A Direct Measurement of the W Boson Width, Phys. Rev. Lett. 74, 341 (1995).

The Charge Asymmetry in W-Boson Decays Produced in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 74, 850 (1995).

Observation of Rapidity Gaps in $\bar{p}p$ Collisions at 1.8 TeV, Phys. Rev. Lett. 74, 855 (1995).

Measurement of W-Photon Couplings with CDF in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 74, 1936 (1995).

Limits on Z-Photon Couplings from $p\bar{p}$ Interactions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 74, 1941 (1995).

Search for New Gauge Bosons Decaying into Dielectrons in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. D51, 949 (1995).

Observation of Top Quark Production in $\bar{p}p$ Collisions with CDF Detector at Fermilab, Phys. Rev. Lett. 74, 2626 (1995).

Search for Charged Bosons Heavier than the W in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1800 GeV, Phys. Rev. Lett. 74, 2900 (1995).

Kinematical Evidence for Top Pair Production in W + Multijet Events in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. D51, 4623 (1995).

Search for New Particles Decaying to Dijets in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 74, 3538 (1995).

Measurement of the B_S Meson Lifetime, Phys. Rev. Lett. 74, 4988 (1995).

A Measurement of the Ratio $\sigma \cdot B(p\bar{p} \rightarrow W \rightarrow e\nu) / \sigma \cdot B(p\bar{p} \rightarrow Z^0 \rightarrow ee)$ in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1800 GeV, Phys. Rev. D52, 2624 (1995).

Measurement of the W Boson Mass, Phys. Rev. Lett. 75, 11 (1995).

Properties of High-Mass Multijet Events at the Fermilab Proton-Antiproton Collider, Phys. Rev. Lett. 75, 608 (1995).

Search for Squarks and Gluinos Via Radiative Decays of Neutralinos in Proton-Antiproton Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 75, 613 (1995).

Identification of Top Quarks Using Kinematical Variables, Phys. Rev. D52, R2605 (1995).

Measurement of the W Boson Mass, Phys. Rev. D52, 4784 (1995).

A Search for Second Generation Leptoquarks in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 75, 1012 (1995).

Limits on WWZ and WWγ Couplings from WW and WZ Production in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 75, 1017 (1995).

Measurement of the B Meson Differential Cross-Section, $d\sigma/dp_T$, in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 75, 1451 (1995).

Measurement of the Polarization in the Decays $B_d \rightarrow J/\psi\ K^{*0}$ and $B_S \rightarrow J/\psi\phi$, Phys. Rev. Lett. 75, 3068 (1995).

Study of $t\bar{t}$ Production in $p\bar{p}$ Collisions Using Total Transverse Energy, Phys. Rev. Lett. 75, 3997 (1995).

Υ Production in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 75, 4358 (1995).

Measurement of Correlated μ-$\bar{b}$ Jet Cross Sections in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. D53, 1051 (1996).

Search for Gluino and Squark Cascade Decays at the Fermilab Tevatron Collider, Phys. Rev. Lett. 76, 2006 (1996).

Reconstruction of $B^0 \rightarrow J/\psi K_S^0$ and Measurement of Ratios of Branching Ratios Involving $B \rightarrow J/\psi K^{(*)}$, Phys. Rev. Lett. 76, 2015 (1996).

Search for the Rare Decay $W^{\pm} \rightarrow \pi^{\pm} + \gamma$, Phys. Rev. Lett. 76, 2852 (1996).

Measurement of $\sigma B(W \rightarrow e\nu)$ and $\sigma B(Z^0 \rightarrow e^+e^-)$ in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 76, 3070 (1996).

Measurement of the Mass of the B_S^0 Meson, Phys. Rev. D53, 3496 (1996).

Search for Chargino-Neutralino Production in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 76, 4307 (1996).

Search for Charged Higgs Decays of the Top Quark Using Hadronic Tau Decays, Phys Rev. D54, 735 (1996).

Measurement of the B^- and $\bar{B}^0$ Meson Lifetimes Using Semileptonic Decays, Phys. Rev. Lett. 76, 4462 (1996).

Search for Flavor-Changing Neutral Current B Meson Decays in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 76, 4675 (1996).

Inclusive Jet Cross Section in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 77, 438 (1996).

Properties of Jets in Z Boson Events from 1.8 TeV $\bar{p}p$ Collisions, Phys. Rev. Lett. 77, 448 (1996).

Measurement of Λ_b^0 Lifetime Using $\Lambda_b^0 \rightarrow \Lambda_c^+ l^- \bar{\nu}$, Phys. Rev. Lett. 77, 1439 (1996).

Forward-Backward Charge Asymmetry of Electron Pairs Above the Z^0 Pole, Phys. Rev. Lett. 77, 2616 (1996).

Measurement of the Lifetime of the B_S^0 Meson Using the Exclusive Decay Mode $B_S^0 \rightarrow J/\psi\phi$, Phys. Rev. Lett. 77, 1945 (1996).

Further Properties of High-Mass Multijet Events at the Fermilab Proton-Antiproton Collider, Phys. Rev. D54, 4221 (1996).

Ratios of Bottom Meson Branching Fractions Involving J/ψ Mesons and Determination of b Quark Fragmentation Fractions, Phys. Rev. D54, 6596 (1996).

Measurement of the $\gamma + D^{*\pm}$ Cross Section in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 77, 5005 (1996).

Measurement of Dijet Angular Distributions at CDF, Phys. Rev. Lett. 77, 5336 (1996).

Measurement of the Branching Fraction $B(B_u^+ \rightarrow J/\psi\pi^+)$ and Search for $B_c^+ \rightarrow J/\psi\pi^+$, Phys. Rev. Lett. 77, 5176 (1996).

Observation of $\Lambda_b^0 \rightarrow J/\psi\Lambda$ at the Fermilab Proton-Antiproton Collider, Phys. Rev. D55, 1142 (1997).

Measurement of $b\bar{b}$ Production Correlations, $B^0\bar{B}^0$ Mixing, and a Limit on ε_B in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. D55, 2546 (1997).

Observation of Diffractive W-Boson Production at the Tevatron, Phys. Rev. Lett. 78, 2698 (1997).

Search for Third Generation Leptoquarks in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 78, 2906 (1997).

Evidence for W^+W^- Production in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 78, 4536 (1997).

Search for Charged Higgs Decays of the Top Quark Using Hadronic Decays of the Tau Lepton, Phys. Rev. Lett. 79, 357 (1997).

Search for New Particles Decaying to Dijets at CDF, Phys. Rev. D55, Rapid Communications, R5263 (1997).

J/ψ and $\psi(2S)$ Production in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 79, 572 (1997).

Production of J/ψ Mesons from χ_c Meson Decays in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 79, 578 (1997).

Measurement of Double Parton Scattering in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 79, 584 (1997).

Search for Gluinos and Squarks at the Fermilab Tevatron Collider, Phys. Rev. D56, Rapid Communications, R1357 (1997).

First Observation of the All Hadronic Decay of $t\bar{t}$ Pairs, Phys. Rev. Lett. 79, 1992 (1997).

Search for New Gauge Bosons Decaying into Dileptons in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 79, 2192 (1997).

Limits on Quark-Lepton Compositeness Scales from Dileptons Produced in 1.8 TeV $p\bar{p}$ Collisions, Phys. Rev. Lett. 79, 2198 (1997).

Measurement of Diffractive Dijet Production at the Tevatron, Phys. Rev. Lett. 79, 2636 (1997).

Properties of Six-Jet Events with Large Six-Jet Mass at the Fermilab Proton-Antiproton Collider, Phys. Rev. D56, 2532 (1997).

Double Parton Scattering in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. D56, 3811 (1997).

The $\mu\tau$ and $e\tau$ Decays of Top Quark Pairs Produced in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 79, 3585 (1997).

Search for New Particles Decaying into $b\bar{b}$ and Produced in Association with W Bosons Decaying into $e\nu$ or $\mu\nu$ at the Tevatron, Phys. Rev. Lett. 79, 3819 (1997).

Search for First Generation Leptoquark Pair Production in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV Phys. Rev. Lett. 79, 4327 (1997).

Properties of Jets in W Boson Events from 1.8 TeV $\bar{p}p$ Collisions, Phys. Rev. Lett. 79, 4760 (1997).

Properties of Photon Plus Two-Jet Events in $\bar{p}p$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. D57, 67 (1998).

Search for Flavor-Changing Neutral Current Decays of the Top Quark in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, FERMILAB-Pub-97/270-E, submitted to Phys. Rev. Lett. July 1997.

Dijet Production by Color-Singlet Exchange at the Fermilab Tevatron, FERMILAB-Pub-97/283-E, submitted to Phys. Rev. Lett. August 1997.

Measurement of the Differential Cross Section for Events with Large Total Transverse Energy in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, FERMILAB-Pub-97/290-E, submitted to Phys. Rev. Lett. August 1997.

The Jet Pseudorapidity Distribution in Direct Photon Events in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, FERMILAB-Pub-98/009-E, submitted to Phys. Rev. D August 1997.

Measurement of the $B^0\bar{B}^0$ Oscillation Frequency in $p\bar{p}$ Collisions using π-B Meson Charge-Flavor Correlations at $\sqrt{s}$ = 1.8 TeV, FERMILAB-Pub-97/312-E, submitted to Phys. Rev. Lett. September 1997.

Measurement of the Top Quark Mass, FERMILAB-Pub-97/284-E, submitted to Phys. Rev. Lett. September 1997.

Measurement of the Top Quark Mass and $t\bar{t}$ Production Cross Section from Dilepton Events at the Collider Detector at Fermilab, FERMILAB-Pub-97/304-E, submitted to Phys. Rev. Lett. September 1997.

Measurement of the $t\bar{t}$ Production Cross Section in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, FERMILAB-Pub-97/286-E, submitted to Phys. Rev. Lett. October 1997.

Measurement of B Hadron Lifetimes Using J/ψ Final States at CDF, FERMILAB-Pub-97/352-E, submitted to Phys. Rev. Lett. October 1997.

Observation of Hadronic W Decays in $t\bar{t}$ Events with the Collider Detector at Fermilab, FERMILAB-Pub-97/285-E, submitted to Phys. Rev. Lett. November 1997.

Search for the Decays $B_d^0 \rightarrow \mu^+\mu^-$ and $B_s^0 \rightarrow \mu^+\mu^-$ in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, FERMILAB-Pub-97/397-E, submitted to Phys. Rev. Lett. November 1997.

Searches for New Physics in Diphoton Events in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, FERMILAB-Pub-98/024-E, submitted to Phys. Rev. Lett. January 1998.

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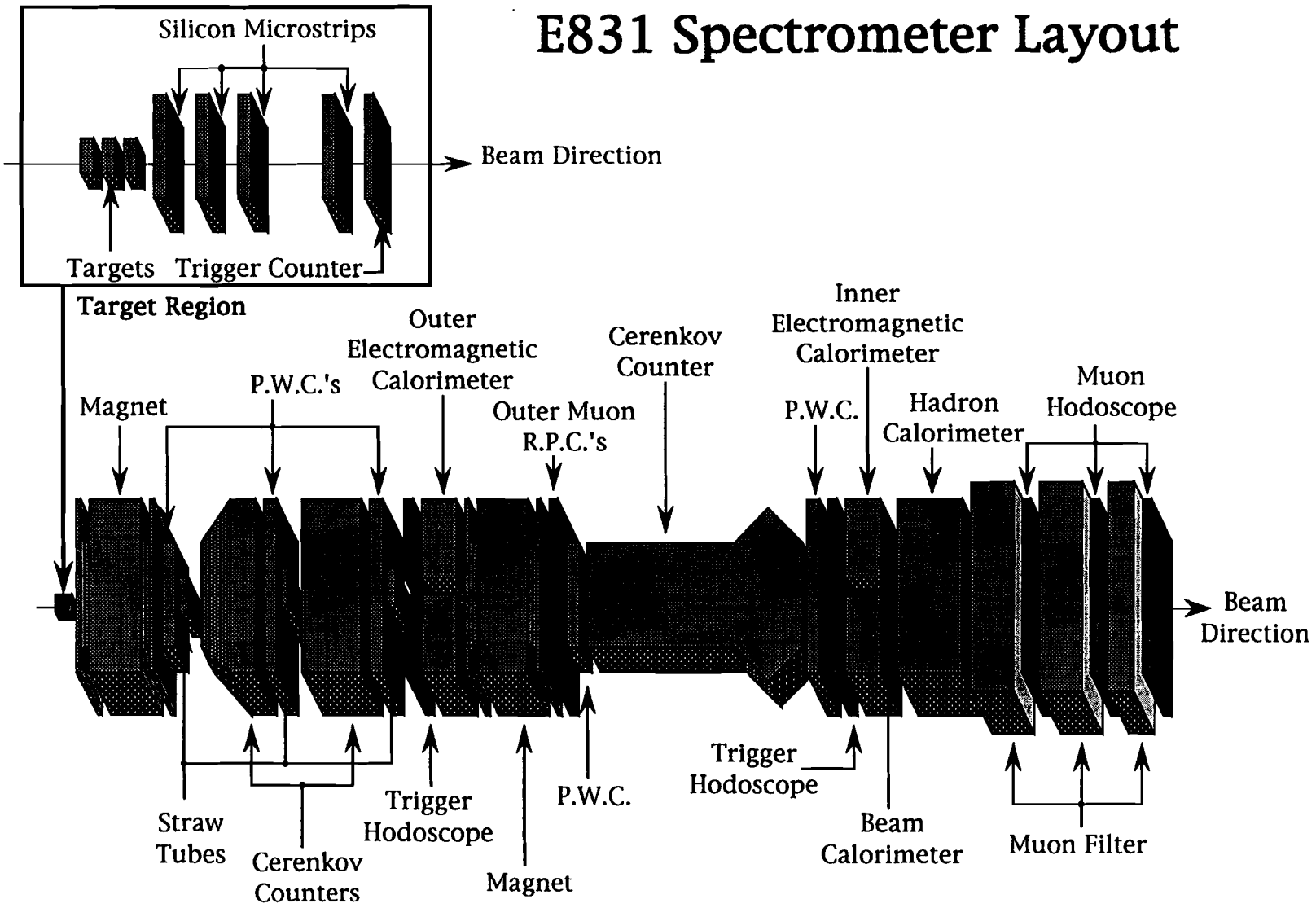
H. Mitsushio	University of Tsukuba	January 1996
R. Hans	Yale University	January 1996
G. Tartarelli	University of Milan	January 1996
P. Azzi	University of Padova	February 1996
M. Gallinaro	University of Rome	February 1996
M. Kruse	Purdue University	February 1996
I. Yu	Yale University	February 1996

T. Asakawa	University of Tsukuba	February 1996
F. Azfar	University of Pennsylvania	March 1996
A. Martin	University of Illinois	April 1996
G. Houk	University of Pennsylvania	April 1996
J. Tseng	Johns Hopkins University	May 1996
A. Maghakian	Rockefeller University	May 1996
D. Kestenbaum	Harvard University	May 1996
T. Baumann	Harvard University	May 1996
P. Yeh	National Taiwan University	June 1996
Y. Kato	Osaka University	June 1996
T. Ino	University of Tsukuba	June 1996
G. Sganos	University of Toronto	June 1996
J. Cammerata	John Hopkins University	August 1996
L. Zhang	University of Wisconsin	August 1996
E. Hayashi	University of Tsukuba	September 1996
M. Pillai	University of Rochester	September 1996
F. Keyvan	Univ. of California/Los Angeles	September 1996
S. Metzler	University of Pennsylvania	December 1996
P. Koehn	University of Rochester	December 1996
F. Qun	University of Rochester	December 1996
S. Aota	University of Tsukuba	January 1977
M. Shimojima	University of Tsukuba	January 1977
T. Daniels	Massachusetts Institute of Technology	April 1997
W. Bokhari	Massachusetts Institute of Technology	April 1977
C. C. Miao	University of Michigan	May 1997
M. Peters	University of California/Berkeley	May 1997
C. Couyoumtzelis	University of Geneva	June 1997
A. Titov	Rockefeller University	June 1997
T. Kuwabara	University of Tsukuba	June 1997
H. Sato	University of Tsukuba	June 1997
M. Hohlmann	University of Chicago	August 1997
D. Cronin-Hennessy	Duke University	August 1997
T. Takano	University of Tsukuba	September 1997
K. Tollefson	University of Rochester	October 1997
S. Bagdasarov	Rockefeller University	October 1997
O. Long	University of Pennsylvania	November 1997
P. Maksimovic	Massachusetts Institute of Technology	November 1997
K. Burkett	University of Michigan	December 1997
H. Kambara	University of Geneva	December 1997
S. Vanderbrink	University of Pittsburgh	December 1997
B. Tannenbaum	University of New Mexico	December 1997
D. Toback	University of Chicago	December 1997
E. Kuns	Rutgers University	December 1997
A. Warburton	University of Toronto	December 1997

E831 Spectrometer Layout



E-831 (Cumalat / Moroni) / E-687 (Butler) A High Statistics Study of States Containing Heavy Quarks Using the Wideband Photon Beam and the E-687 Multiparticle Spectrometer

UC/Davis, CBPF (Brazil), CINVESTAV (Mexico), Colorado, Fermilab, INFN/Frascati (Italy), Illinois/Champaign, Korea (Korea), INFN/Milano (Italy), Milano (Italy), North Carolina, INFN/Pavia (Italy), Pavia (Italy), Puebla (Mexico), Puerto Rico/Mayaguez, South Carolina, Tennessee, Vanderbilt, Wisconsin, Yeonsei (Korea)

Status: *E-687 - Data Analysis*
E-831 - Data Analysis

E-831 (FOCUS) is a high-intensity photoproduction experiment that is designed to study the production and decay of charmed particles. The experiment enjoyed a successful data-taking period during 1996-97. From the on-line rapid turn-around reconstruction in FOCUS, we estimate in excess of 10^6 fully reconstructed charm particles implying more than a factor of 10× the yield of E-687 with 20-30× the yield in semileptonic decays. Off-line event reconstruction is now underway using the Fermilab Computer Farm System and is expected to be completed in one year.

Several improvements were made in the spectrometer upgrade from E-687. A scintillating tile/fiber calorimeter was fabricated and implemented in the first level trigger to improve efficiency. Both the first and second level triggers were speeded up in order to increase the livetime, and silicon strip detectors were interleaved with the BeO segmented target. New detectors both reduced the electron and muon misidentification as well as improved the electron and muon efficiency.

The physics of the experiment involves high-precision studies of D semileptonic decays with an emphasis on the determination of form factors and CKM matrix elements $|V_{cd}|$ and $|V_{cs}|$, QCD studies of Double D events, a measurement of the absolute branching fraction for the D^0 meson, searches for D^0 mixing using hadronic and semileptonic final states, searches for CP violation, rare and forbidden decays, fully leptonic decays of the D^+, and a systematic investigation of charm baryons and their lifetimes.

The mass plots show the reconstructed charm signals obtained in about 17% of the FOCUS data set processed through the on-line expressline system. Each of the samples of $D^+ \to K^-\pi^+\pi^+$, $D^0 \to K^-\pi^+$, $K^-\pi^+\pi^-\pi^+$ and $\Lambda_c^+ \to pK^-\pi^+$ have the same significance of separation cut of $l/\sigma > 5$.

E-687 Publications

Measurement of the Λ_c^+ and D_s^+ Lifetimes, P. L. Frabetti et al., Phys. Lett. B251, 639 (1990).

Measurement of the D^0 and D^+ Lifetimes, P. L. Frabetti et al., Phys. Lett. B263, 584 (1991).

Measurement of the Decays $D^0 \to \pi^+\pi^+\pi^-\pi^-$, $D^0 \to K^+K^-$, and $D_s^+ \to \phi\pi^+\pi^+\pi^-$, P. L. Frabetti et al., Phys. Lett. B281, 167 (1992).

Study of $D^0 \to K_S^0\pi^+\pi^-$ and $D^0 \to K_S^0K^+K^-$ in High Energy Photoproduction, P. L. Frabetti et al., Phys. Lett. B286, 195 (1992).

Description and Performance of the Fermilab E-687 Spectrometer, P. L. Frabetti et al., Nucl. Instr. and Meth. A320, 519 (1992).

First Evidence of $\Omega_c^0 \to \Omega^-\pi^+$, P. L. Frabetti et al., Phys. Lett. B300, 190 (1993).

Measurement of the Mass and Lifetime of the Ξ_c^+, P. L. Frabetti et al., Phys. Rev. Lett. 70, 1381 (1993).

Measurement of the Λ_c^+ Lifetime, P. L. Frabetti et al., Phys. Rev. Lett. 70, 1755 (1993).

Measurement of the Lifetime of the Ξ_c^0, P. L. Frabetti et al., Phys. Rev. Lett. 70, 2058 (1993).

A Wide Band Photon Beam at the Fermilab Tevatron to Study Heavy Flavors, P. L. Frabetti et al., Nucl. Instr. and Meth. A329, 62 (1993).

Precise Measurement of the $D_s^\pm$ Lifetime, P. L. Frabetti et al., Phys. Rev. Lett. 71, 827 (1993).

Analysis of the Decay Mode $D^+ \to \bar{K}^{*0}\mu^+\nu$, P. L. Frabetti et al., Phys. Lett. B307, 262 (1993).

Studies of $D\bar{D}$ Correlations in High Energy Photoproduction, P. L. Frabetti et al., Phys. Lett. B308, 193 (1993).

A Measurement of $\Gamma(D_s^+ \to \phi\mu^+\nu)/\Gamma(D_s^+ \to \phi\pi^+)$, E-687 Collaboration, Phys. Lett. B313, 253 (1993).

Evidence for the Cabibbo-Suppressed Decay $\Lambda_c^+ \to pK^-K^+$, E-687 Collaboration, Phys. Lett. B314, 477 (1993).

Study of $D^0 \to K^-\mu^+\nu$ in High Energy Photoproduction, P. L. Frabetti et al., Phys. Lett. B315, 203 (1993).

A Measurement of Elastic J/ψ Photoproduction Cross Section at Fermilab E-687, P. L. Frabetti et al., Phys. Lett. B316, 197 (1993).

A Measurement of the Cabibbo-Suppressed Decays $D^0 \to \pi^-\pi^+$ and $D^0 \to K^-K^+$, P. L. Frabetti et al., Phys. Lett. B321, 295 (1994).

Precise Measurement of the D^0 and D^+ Meson Lifetimes, E-687 Collaboration, Phys. Lett. B323, 459 (1994).

Measurement of the Form Factors of the Decay $D_s^+ \to \phi\mu^+\nu$, P. L. Frabetti et al., Phys. Lett. B328, 187 (1994).

First Observation of the $\Sigma^-\pi^+\pi^+$ Decay Mode of the Λ_c Baryon and Its Branching Ratio Relative to the $\Sigma^+\pi^+\pi^-$ Mode, E-687 Collaboration, Phys. Lett. B328, 193 (1994).

Analysis of Three $D \to K\pi\pi$ Dalitz Plots, E-687 Collaboration, Phys. Lett. B331, 217 (1994).

Branching Ratios of the Decays $D^0 \to \bar{K}^0K^0$ and $D^0 \to K_S^0K_S^0K_S^0$, E-687 Collaboration, Phys. Lett. B340, 254 (1994).

Measurement of the Masses and Widths of L = 1 Charmed Mesons, P. L. Frabetti et al., Phys. Rev. Lett. 72, 324 (1994).

Observation of an Excited State of the Λ_c^+ Baryon, P. L. Frabetti et al., Phys. Rev. Lett. 72, 961 (1994).

Search for CP Violation in Charm Meson Decay, P. L. Frabetti et al., Phys. Rev. D50, R2953 (1994).

Observation and Mass Measurement of $\Omega_c^0 \to \Sigma^+K^-K^-\pi^+$, P. L. Frabetti et al., Phys. Lett. B338, 106 (1994).

Charm Meson Decay into the Final States $K_S^0K^+$ and $K_S^0K^{*+}$, P. L. Frabetti et al., Phys. Lett. B346, 199 (1995).

Analysis of the D^+, $D_s^+ \to K^+K^-\pi^+$ Dalitz Plots, P. L. Frabetti et al., Phys. Lett. B351, 591 (1995).

Study of Charged Hadronic Four-Body Decays of the D^0 Meson, P. L. Frabetti et al., Phys. Lett. B354, 486 (1995).

First Measurement of the Lifetime of the Ω_c^0, P. L. Frabetti et al., Phys. Lett. B357, 678 (1995).

Doubly and Singly Cabibbo-Suppressed Charm Decays into the $K^+\pi^-\pi^+$ Final State, P. L. Frabetti et al., Phys. Lett. B359, 403 (1995).

Search for the Decay of D^+ and D_s^+ Mesons to Three Charged Kaons, P. L. Frabetti et al., Phys. Lett. B363, 259 (1995).

Analysis of the Decay Mode $D^0 \to K^-\mu^+\nu_\mu$, P. L. Frabetti et al., Phys. Lett. B364, 127 (1995).

Study of Higher Mass Charm Baryons Decaying into Λ_c^+, E-687 Collaboration, P. L. Frabetti et al., Phys. Lett. B365, 461 (1996).

Charm-Anticharm Asymmetries in High Energy Photoproduction, E-687 Collaboration, P. L. Frabetti et al., Phys. Lett. B370, 222 (1996).

Analysis of the Caibbo-Suppressed Decay $D^0 \to \pi^- l^+ \nu$, E-687 Collaboration, P. L. Frabetti et al., Phys. Lett. B382, 312 (1996).

Observation of the Vector Meson Cabibbo-Suppressed Decay $D^+ \to \rho^0 \mu^+ \nu_\mu$, E-687 Collaboration, P. L. Frabetti et al., Phys. Lett. B391, 235 (1997).

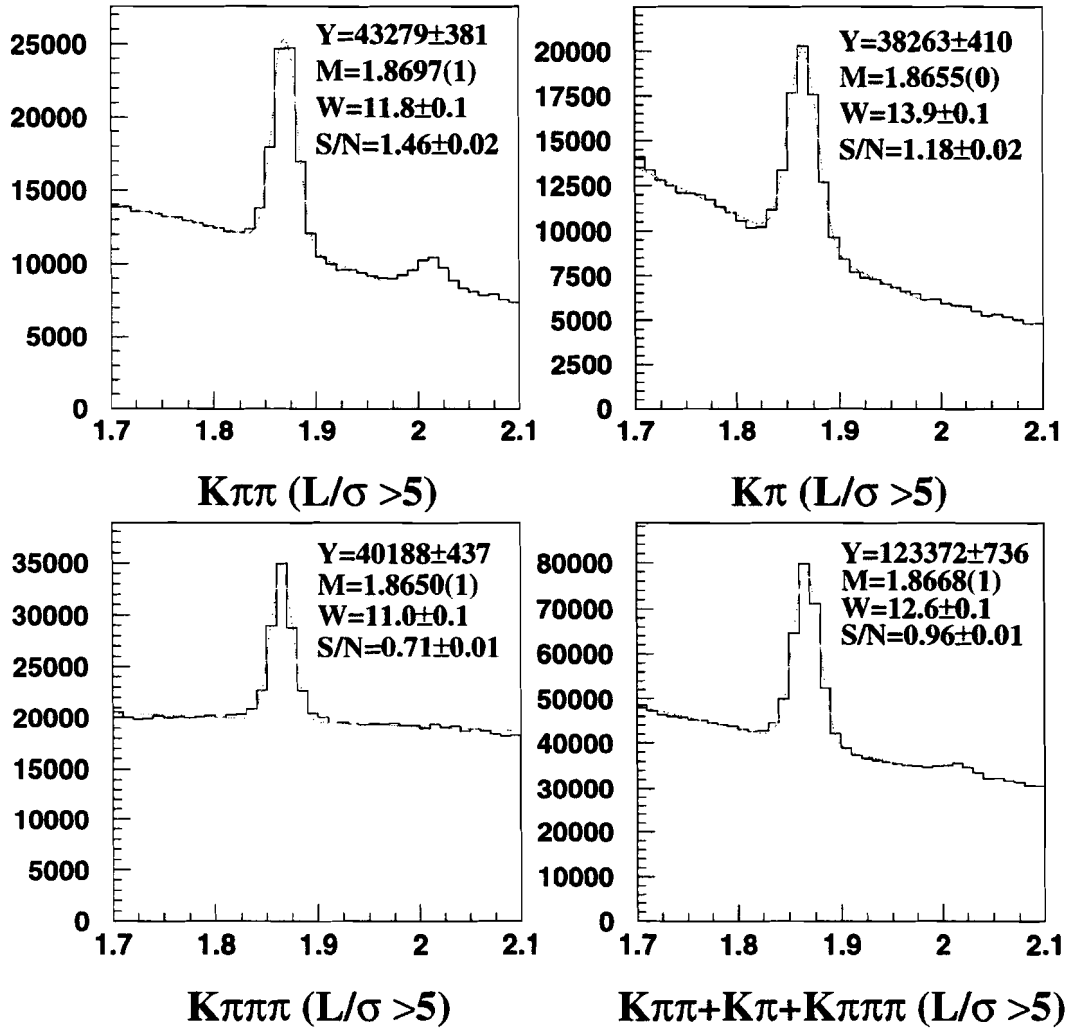


Figure 1. Expressline charm meson signals from about 17% of the FOCUS data set. This is consistent with a projected charm sample of over ten times that of E-687.

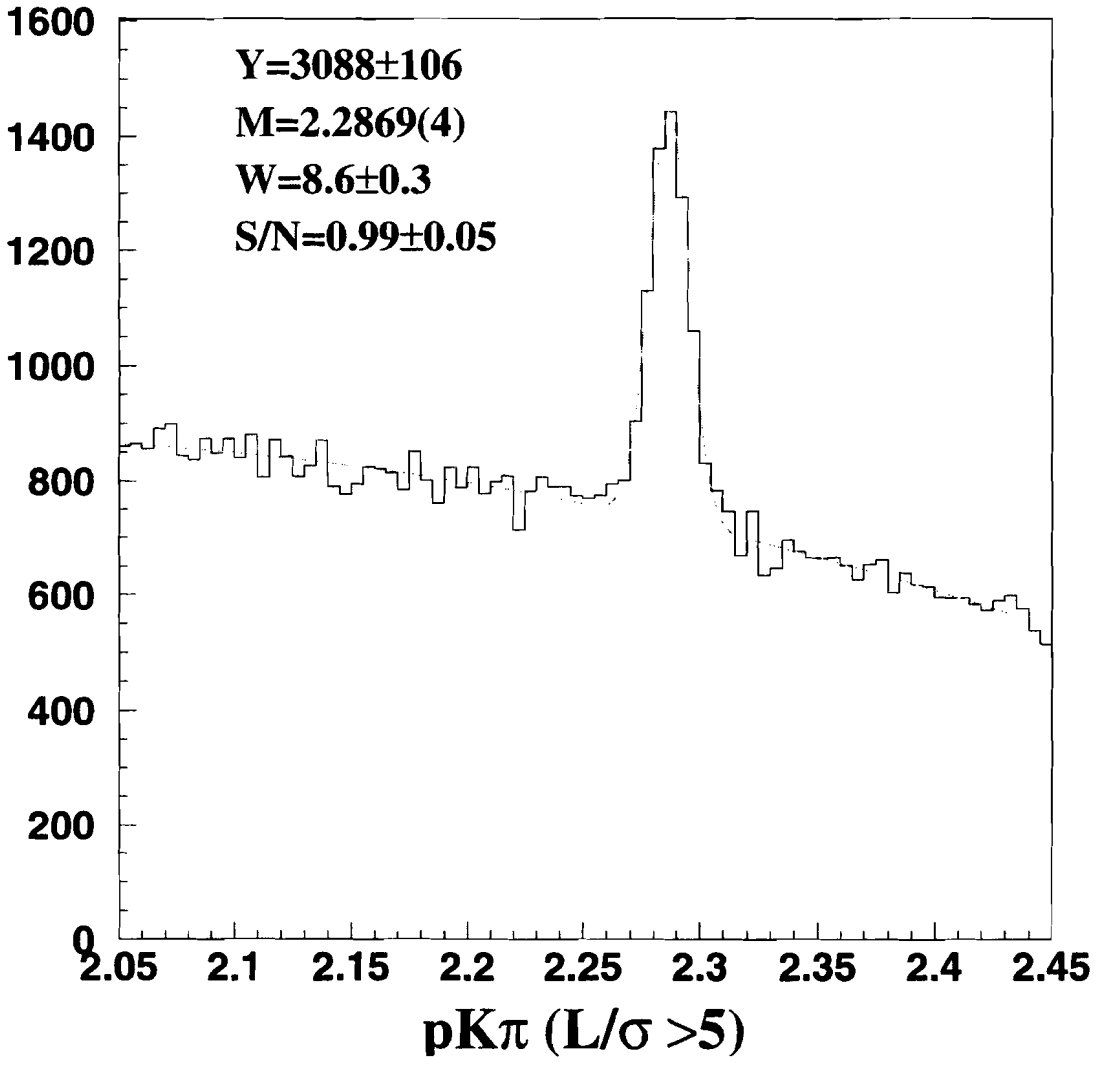
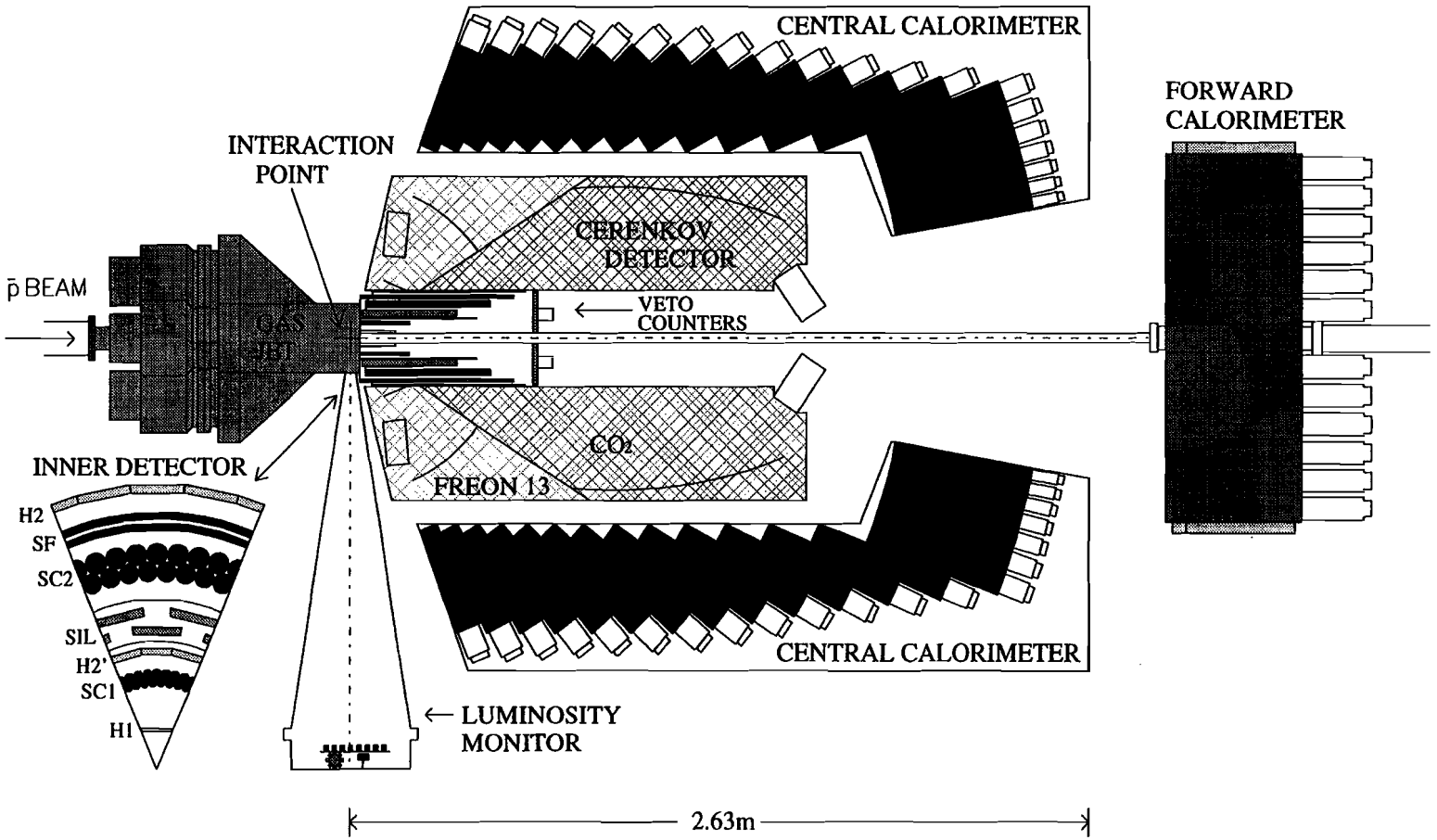


Figure 2. Expressline charm Λ_c^+ signal from about 17% of the FOCUS data set. This represents a projected charm baryon sample of over ten times that of E-687.

E835 EQUIPMENT LAYOUT



E-835 / E-760 (Cester / Pordes) Investigation of the Formation of Charmonium States Using the Antiproton Accumulator Ring

UC/Irvine, Fermilab, INFN/Ferrara (Italy), Ferrara (Italy), INFN/Genova (Italy), Genova (Italy), Northwestern, INFN/Torino (Italy), Torino (Italy)

Status: *E-760 - Data Analysis*
E-835 - Data-Taking

Experiment E-835 is a continuation of the studies of charmonium states formed in $\bar{p}p$ collisions performed in E-760. The experiment took ~150 pb^{-1} of data during the 1996-97 fixed-target run. The data-taking concentrated on

a) determination of the mass and total width of the η_c and of the product of the branching fractions $B(\eta_c \to \bar{p}p) \times B(\eta_c \to \gamma\gamma)$;

b) the confirmation of the $^1P_1$ signal; and

c) a search for the η_c' and determination of its mass and width.

A preliminary attempt to study the χ_0 was also made.

Angular distributions in radiative decays of the χ_1 and χ_2 were measured. The search for the $^3D_2$ and $^1D_2$ charmonium states was not conducted.

Data analysis is in progress.

E-760 Publications

Precision Measurements of Charmonium States Formed in $\bar{p}p$ Annihilation, T. A. Armstrong et al., Phys. Rev. Lett. 68, 1468 (1992).

Study of the χ_1 and χ_2 Charmonium States Formed in $\bar{p}p$ Annihilations, T. A. Armstrong et al., Nucl. Phys. B373, 35 (1992).

Observation of the $^1P_1$ State of Charmonium, T. A. Armstrong et al., Phys. Rev. Lett. 69, 2337 (1992).

Measurement of the J/ψ and ψ' Resonance Parameters in $\bar{p}p$ Annihilation, T. A. Armstrong et al., Phys. Rev. D47, 772 (1993).

The Proton Electromagnetic Form Factors in the Time-Like Region from 8.9 to 13.0 GeV^2, T. A. Armstrong et al., Phys. Rev. Lett. 70, 1212 (1993).

Measurement of the $\gamma\gamma$ Partial Width of the χ_2 Charmonium Resonance, T. A. Armstrong et al., Phys. Rev. Lett. 70, 2988 (1993).

Study of the Angular Distribution of the Reaction $\bar{p}p \to \chi_2 \to J/\psi\gamma \to e^+e^-\gamma$, T. A. Armstrong et al., Phys. Rev. D48, 3037 (1993).

Evidence for η-η Resonances in Antiproton-Proton Annihilations at 2950 < $\sqrt{s}$ < 3620 MeV, T. A. Armstrong et al., Phys. Lett. B307, 394 (1993).

Production of the f2 (1520) Resonance in Antiproton-Proton Annihilations at $\sqrt{s}$=2980 and 3526 MeV, T. A. Armstrong et al., Phys. Lett. B307, 399 (1993).

Study of the η_c (1^1S_0) State of Charmonium Formed in $\bar{p}p$ Annihilations and a Search for the η_c' (2^1S_0), T. A. Armstrong et al., Phys. Rev. D52, 4839 (1995).

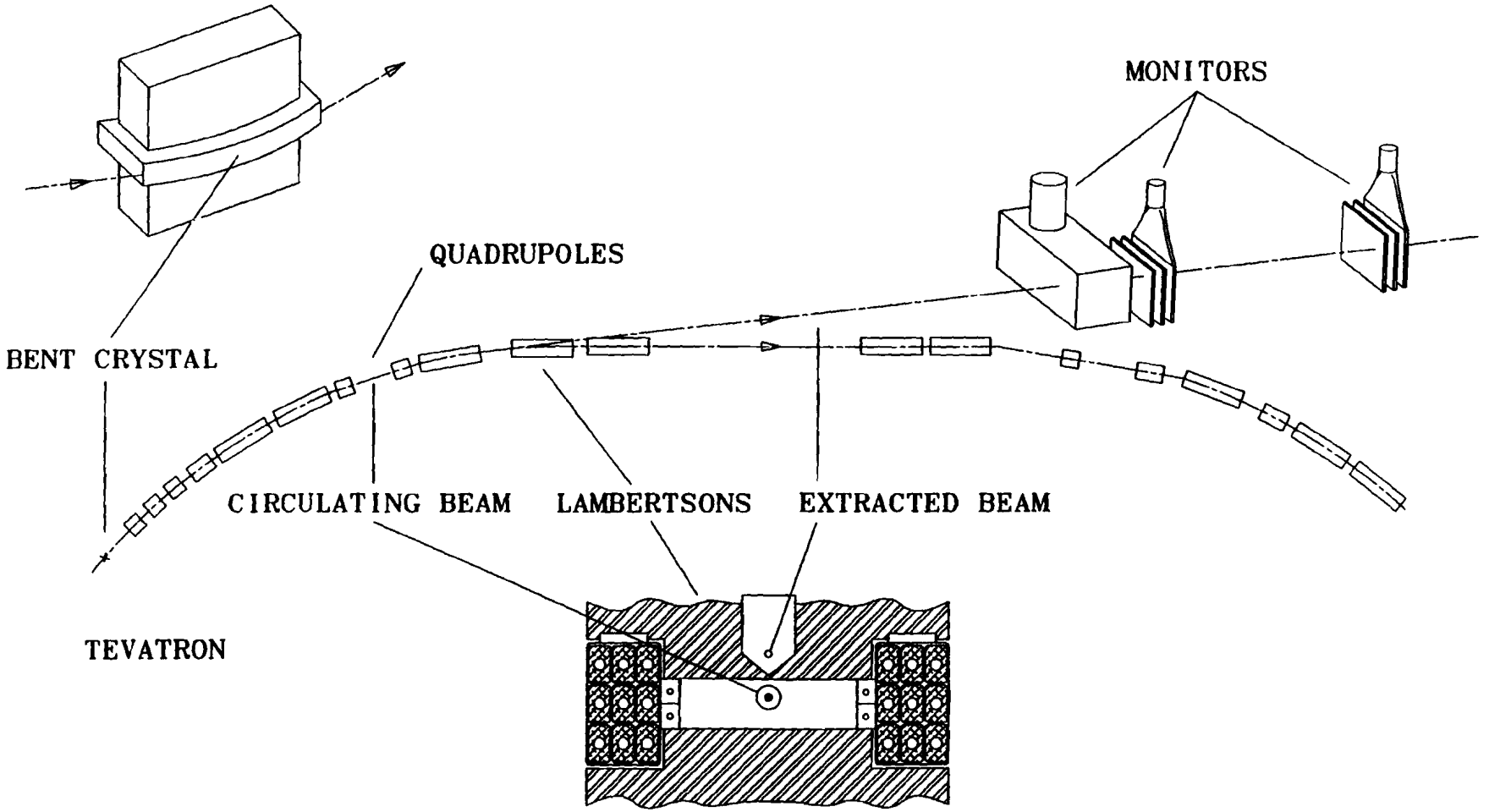
Precision Measurements of Antiproton-Proton Forward Elastic Scattering Parameters in the 3.7 to 6.2 GeV/c Region, T. A. Armstrong et el., Phys. Lett. B385, 479 (1996).

Observation of the Radiative Decay $J/\psi \rightarrow e^+e^-\gamma$, T. A. Armstrong et al., Phys. Rev. D54, 7067 (1996).

Measurement of Branching Ratios $\psi' \rightarrow e^+e^-$, $\psi' \rightarrow J/\psi\pi\pi$, and $\psi' \rightarrow J/\psi\eta$, T. A. Armstrong et al., Phys. Rev. D55, 1153 (1997).

Two-Body Neutral Final States Produced in Antiproton-Proton Annihilations at 2911 ≤ $\sqrt{s}$ < 3.686 GeV, T. A. Armstrong et al., Phys. Rev. D56, 2509 (1997).

FERMILAB E853
CRYSTAL EXTRACTION
C0 LONG STRAIGHT SECTION



several techniques. Beam was extracted in a few turns (kick mode) and with natural, noise-driven, and luminosity-driven diffusion (diffusion mode). Multiple crystal pass effects were observed and found to be significant. The technique has proved to be robust and crystal alignment was reproducible. It should be emphasized that significant beam intensities were extracted. On the order of 0.1 MHz can be extracted without violating CDF or D0 loss limits. Several interesting accelerator phenomena have been illuminated in the course of these studies. Two simulation models are in use to model channeling and accelerator effects.

We are now in the process of analyzing these studies to refine the efficiency measurements, investigate luminosity-driven diffusion, and follow some of the interesting accelerator phenomena. We believe the current system could be used as an active scraper in the Tevatron to diminish distributed radioactivity, and as a bunch eliminator when coupled with the E17 kicker. The technique could also be used to extract a parasitic 0.1 MHz beam to the 900 GeV areas during Collider operation.

Publications

G. Jackson, Proc. 1993 Part. Acc. Conf.

R. Carrigan et al., Proc. Workshop on B Physics at Hadron Colliders, Snowmass, p. 645 (1993).

R. Carrigan et al., Nucl. Instr. and Meth. B90, 128 (1994).

G. Jackson et al., Proc. 1995 Part. Acc. Conf.

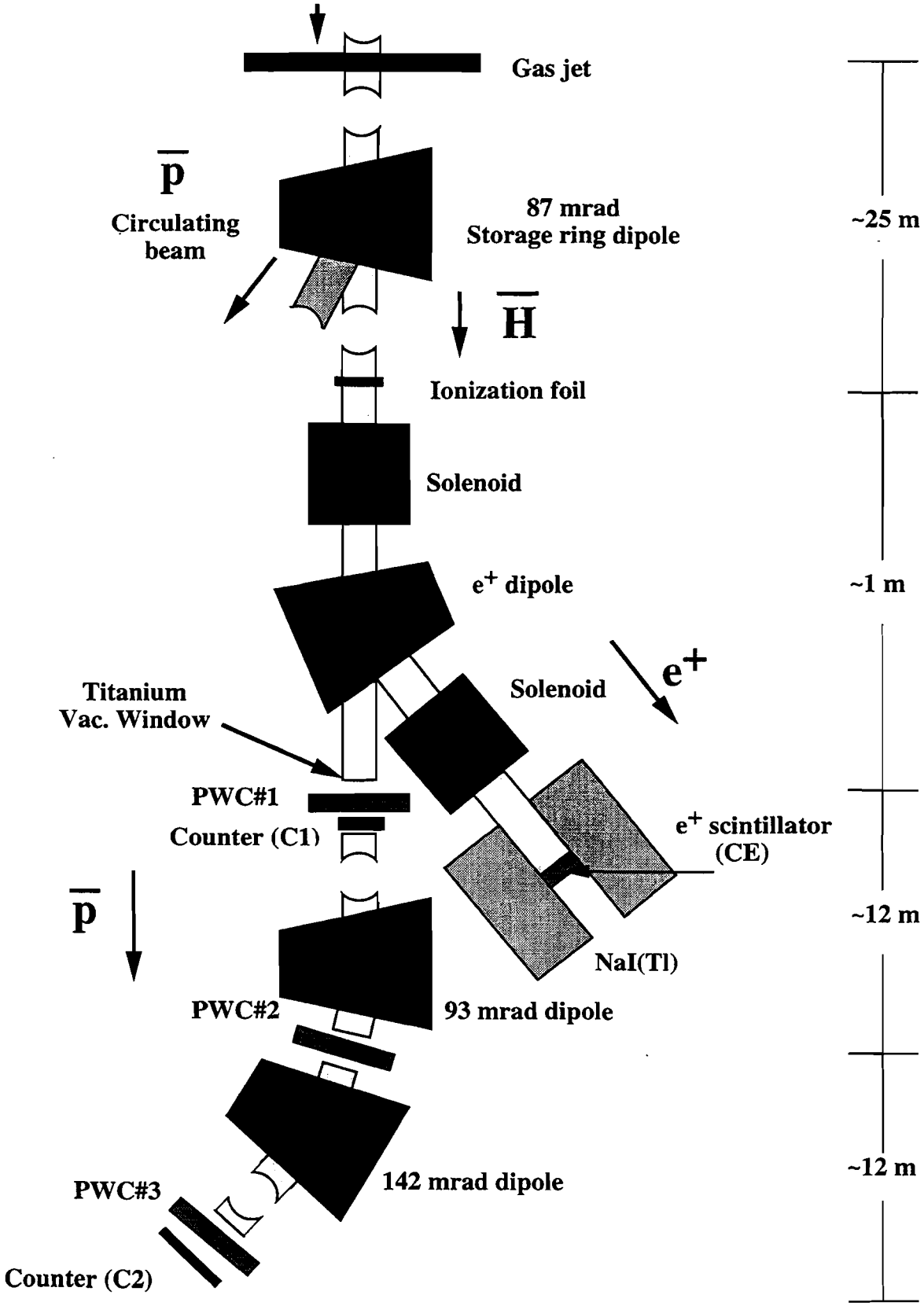
V. Biryukov, Simulation of an Experiment on Crystal Extraction of 900 GeV Protons, Phys. Rev. E52, 6818 (1995).

T. Murphy et al., First Results from Bent Crystal Extraction at the Fermilab Tevatron, Proc. Relativistic Channeling Workshop, Aarhus (1995), Nucl. Instr. and Meth. B119, 231 (1996).

S. A. Bogacz, et al., Simulation Results of Bent Crystal Extraction in the Tevatron, Nucl. Instr. and Meth. B119, 244 (1996).

See also CERN Courier, Jan/Feb 96; AIP Weekly Physics News, March 6, 1996.

E-862


Gas jet
$\overline{p}$
Circulating beam
87 mrad
Storage ring dipole
~25 m
$\overline{H}$
Ionization foil
Solenoid
e^+ dipole
~1 m
Titanium
Vac. Window
Solenoid
e^+
PWC#1
Counter (C1)
e^+ scintillator
(CE)
$\overline{p}$
~12 m
NaI(Tl)
PWC#2
93 mrad dipole
142 mrad dipole
~12 m
PWC#3
Counter (C2)

E-862 (Christian) Search for Antihydrogen in the Reaction $\bar{p}p \rightarrow \bar{H}pe^-$

UC/Irvine, Fermilab

Status: *Data Analysis*

The goal of this experiment was the detection of a sample of antihydrogen atoms – the bound state ($\bar{p}e^+$). This is the first element ever constructed entirely out of antimatter. A source of antihydrogen atoms is needed to compare antihydrogen with hydrogen spectroscopy, to search for interactions that violate CPT.

E-862 was run parasitically on experiment E-835 in the Antiproton Accumulator. Atoms of antihydrogen were formed in the reaction $\bar{p}p \rightarrow \bar{H}e^-p$ when a positron, created as a member of an e^+e^- pair by a beam $\bar{p}$ in the Coloumb field of a target p, was captured by the beam $\bar{p}$. This process involves momentum transfer of order m_ec, so the $\bar{H}$ atoms were produced with $\gtrsim 99.95\%$ of the beam momentum, and did not separate from the $\bar{p}$ beam until the beam was deflected 87 mrad by the storage ring dipole magnet 18 meters downstream of the gas jet target. The vacuum pipe through this magnet was modified to allow the neutral $\bar{H}$ to exit the storage ring. Six meters downstream, the atom was ionized in a thin carbon foil that was mounted on a wheel so that it could be removed from the beamline by remote control. The component e^+ and $\bar{p}$ each retained the velocity of the atom (although the e^+ direction was changed somewhat by multiple scattering in the foil); the momentum was shared in the ratio of the masses (0.511/938). The e^+ and $\bar{p}$ were detected in separate spectrometers. The positron was deflected through an angle of 40° by a small sector dipole, and stopped in a 2.54 cm thick scintillation counter (CE) that was exposed to the Accumulator machine vacuum. Two solenoid magnets provided a point-to-point focus between the ionization foil and counter CE. The counter was surrounded by a cylindrical NaI(Tl) counter composed of two half-cylindrical crystals, each of which was instrumented with three photomultiplier tubes. The purpose of the NaI(Tl) counter was to detect the 511 keV γ rays produced when the positron annihilated with an electron in the CE counter.

The $\bar{p}$ momentum was measured in a 24.4 m long spectrometer. The two dipole magnets in this spectrometer were energized in series with the Accumulator dipole magnets, so that a beam-momentum particle was deflected by 235 milliradians, independent of the value of the beam momentum. Position measurements were provided by three proportional wire chambers with 1 mm wire spacing. This spectrometer provided a measurement of track momentum relative to the nominal beam momentum, and covered the range $0.95<p/p_{beam}<1.05$. Two scintillation counters, a 1.6 mm thick counter (C1) located just downstream of PWC#1, and a 3.2 mm thick counter (C2) located two meters downstream of PWC#3, completed the $\bar{p}$ spectrometer. C1 and C2 were each instrumented with two photomultiplier tubes. Pulse height and leading edge timing information was recorded for

each tube, and a coincidence signal of the two tubes on each counter was formed for use in triggers.

During 1996, the E-862 apparatus was installed and the experiment started data-taking. The first antihydrogen event was recorded on November 10, and by the end of the year E-862 had collected more than a dozen clean antihydrogen events with no background. Antihydrogen could be separated from all backgrounds simply by requiring that events contain a three-way coincidence of CE, C1, and C2, and that either PWC#2 or PWC#3 register at least one wire hit. All events thus selected were found to contain a beam momentum antiproton track and data consistent with a positron of the expected momentum.

Data-taking continued until September 18, 1997. During 1997 the collaboration concentrated on

1. demonstrating that the signal could *only* be due to antihydrogen by showing that depended on the presence of the thin ionization foil; and

2. determining the geometrical acceptance of the apparatus, by increasing all limiting apertures.

In data collected with the ionization foil out of the beamline, no three-way coincidence of CE, C1, and C2 was recorded. However, in this configuration, a new antihydrogen signature was discovered. Since, in these events, the ionization occurred downstream of the small e^+ dipole magnet, the e^+ was not directed to the CE counter, but rather passed through PWC#1 along with the $\bar{p}$. Multiple scattering of the e^+ in the titanium window caused the e^+ to separate from the $\bar{p}$, resulting in two hits registered by the PWC. The upper histogram in Figure 1 shows the momentum spectrum of all tracks found in the foil-in data sample. Entries corresponding to events with a three-way coincidence of C1, C2, and CE are shaded. The lower histogram shows the corresponding momentum spectrum from data collected with the ionization foil out of the beamline. Entries from events containing a spectator hit in PWC#1 are shaded.

The analysis of E-862 was completed in November 1997, and a paper submitted to Physical Review Letters. The results are summarized in Table 1. The relatively small systematic error in these results was made possible by the high quality luminosity measurement provided by E-835 and by the fact that the acceptance and efficiency of the E-862 apparatus were both high.

The $\bar{H}$ production cross section measured by E-862 is close to a factor of four smaller than the cross section that had been computed before the experiment ran. However, a recent calculation by Bertulani and Baur gives a cross section of 0.91pb at p_{beam} = 5700 MeV/c, which is consistent with our measurement.

Table 1. $\bar{H}$ production cross section, for three data sets taken with 5203 MeV/c $\leq p_{beam} \leq$ 6232 MeV/c, and for the combined data set.

	437 μgm/c m^2 Foil	777 μgm/c m^2 Foil	Foil Out	Full Data Set
Luminosity (pb^{-1})	34.8	29.6	10.4	74.8
Acceptance × Efficiency	0.67	0.92	0.80	0.79
Sensitivity (pb^{-1})	23.3	27.2	8.3	58.8
Number of Events	24	33	9	66
Background	0	0	0.16	0.16
Cross Section (pb)	1.03	1.22	1.07	1.12
Statistical Error (pb)	0.21	0.21	0.36	0.14
Systematic Error (pb)	0.08	0.09	0.14	0.09

Publications

Observation of Atomic Antihydrogen, FERMILAB-Pub-97/398-E, submitted to Phys. Rev. Lett.

Measuring the Antihydrogen Lamb Shift with a Relativistic Antihydrogen Beam, FERMILAB-Pub-97/426-E, submitted to Phys. Rev. D.

Thesis

G. Blanford, University of California/Irvine, 1997.

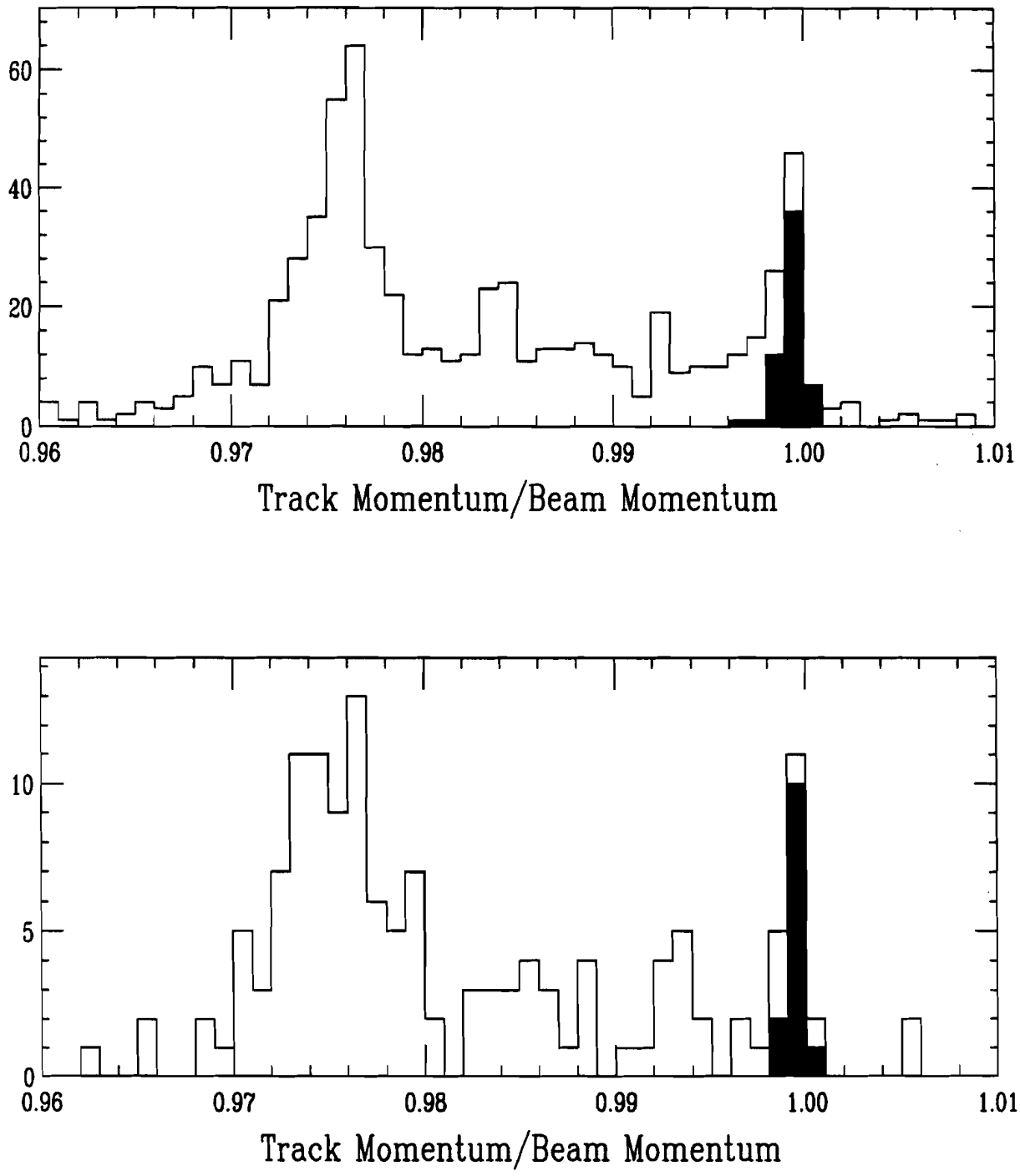
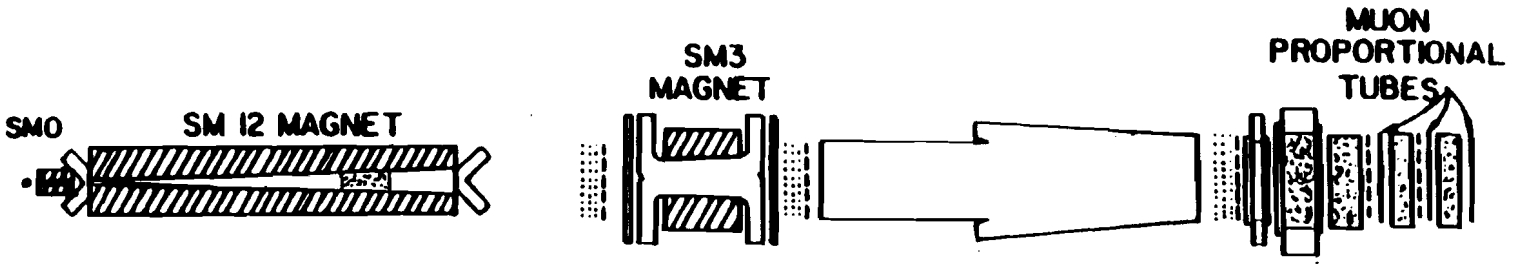
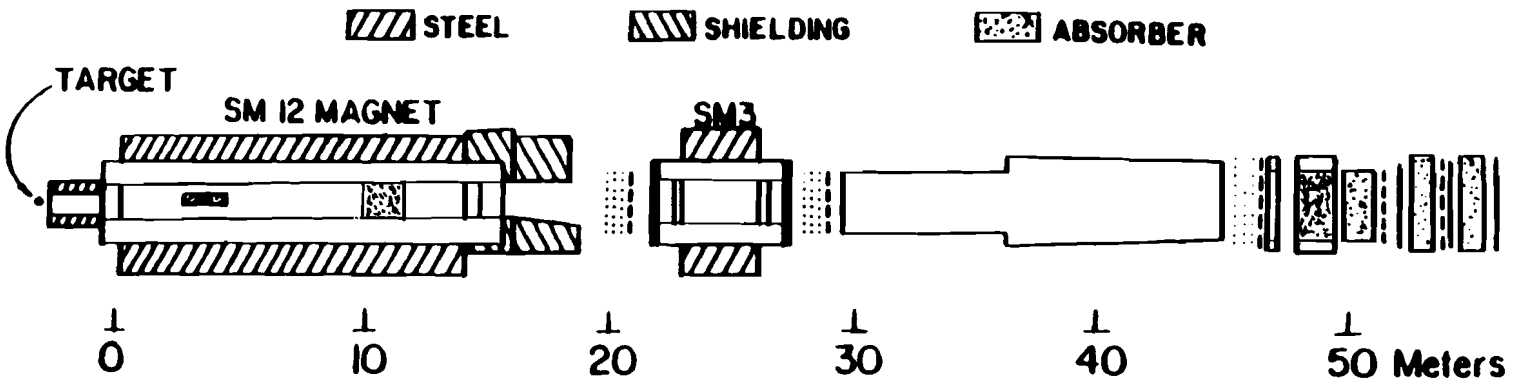


Figure 1. The upper histogram shows the momentum spectrum of all tracks found in the foil-in data sample. Entries corresponding to events with a three-way coincidence of C1, C2, and CE are shaded. The lower histogram shows the corresponding momentum spectrum from data collected with the ionization foil out of the beamline. Entries from events containing a spectator hit in PWC#1 are shaded.



PLAN VIEW



ELEVATION SECTION

DRIFT CHAMBER

COUNTER BANK

E-866 (Leitch) Measurement of $\bar{d}(x) / \bar{u}(x)$ in the Proton

Abilene Christian, ANL, Fermilab, Georgia State, IIT, LANL, Louisiana, New Mexico State, New Mexico, ORNL, Texas A&M, Valparaiso

Status: *Data Analysis*

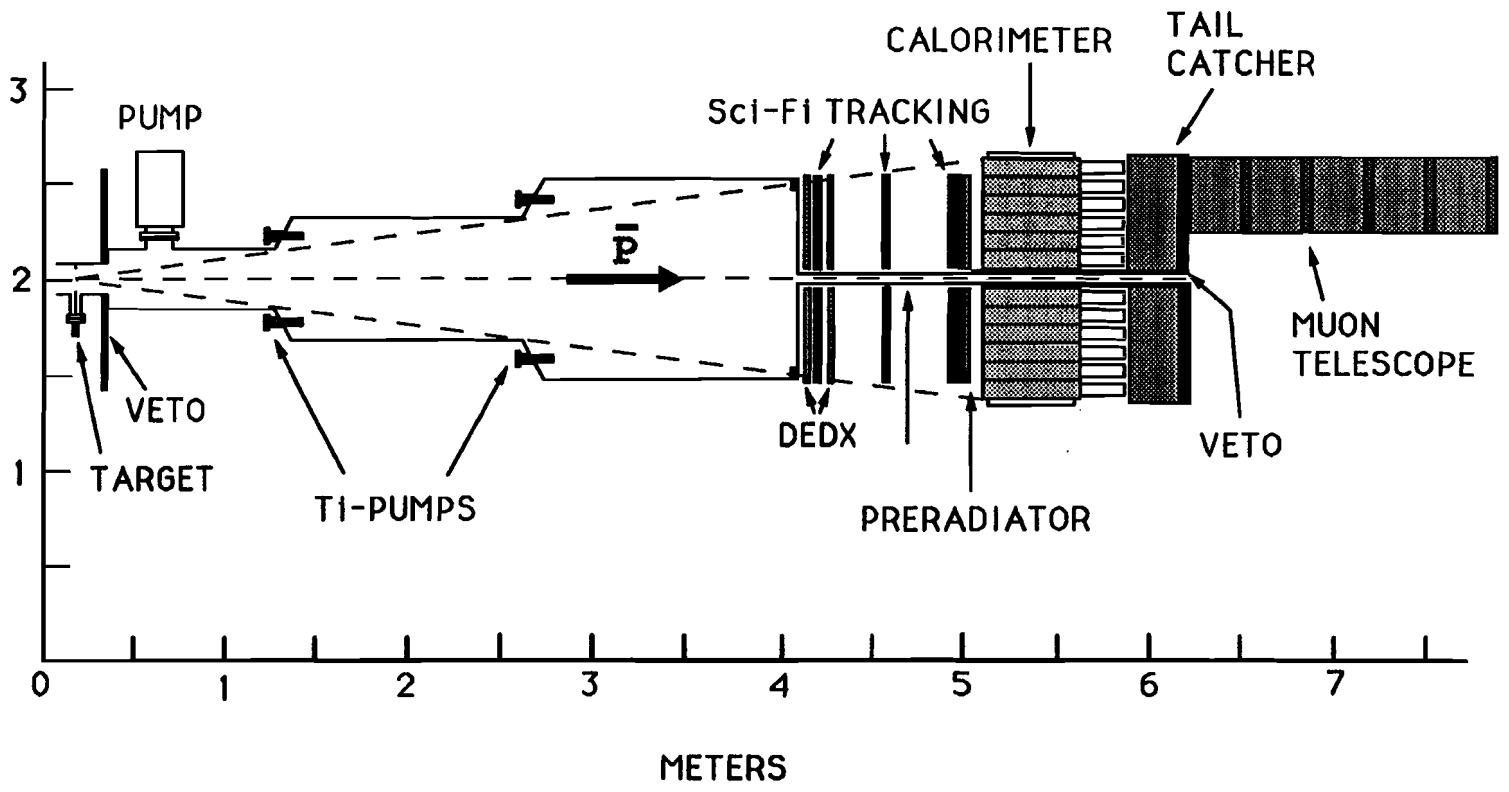
E-866 has greatly improved the experimental knowledge of $\bar{d}(x)/\bar{u}(x)$ via a precision measurement of the ratio of Drell-Yan yields from protons incident on hydrogen and deuterium targets. In addition, an extension to the original proposal includes measurements of the J/ψ nuclear dependence over a very broad range in x_F and p_T as well as angular distributions at extreme values of x_F.

The experiment completed data-taking in August 1997 with a large amount of data both on $\bar{d}(x)/\bar{u}(x)$ and on nuclear-dependence and angular distributions of vector-meson production. Analysis of this data is well underway, with preliminary results having been presented at a number of conferences, and the first Phys. Rev. Lett. covering the $\bar{d}(x)/\bar{u}(x)$ physics submitted.

Over 140,000 Drell-Yan muon pairs with dimuon mass $M_{\mu^+\mu^-} \geq 4.5$ GeV/c^2 were recorded. From these data, the ratio of anti-down ($\bar{d}$) to anti-up ($\bar{u}$) quark distributions in the proton sea is determined over a wide range in Bjorken-x. A strong x dependence is observed in the ratio $\bar{d}/\bar{u}$, showing substantial enhancement of $\bar{d}$ with respect to $\bar{u}$ for $x < 0.2$. This result is in fair agreement with recent parton distribution parameterizations of the sea. For $x > 0.2$, the observed $\bar{d}/\bar{u}$ ratio is much nearer unity than given by the parameterizations.

Preliminary results for the nuclear dependence of vector-meson production are also beginning to come out of our analysis, These show dramatic variations in the suppression of vector-mesons versus x_F and p_T. These are very interesting in terms of understanding the underlying mechanisms and also towards being able to interpret future data from heavy-ion collisions at RHIC.

Six graduate students are working towards Ph.D.'s on various physics topics using data from E-866. The first of these hopes to finish in early 1998.


CALORIMETER
TAIL CATCHER
PUMP
Sci-Fi TRACKING
$\bar{p}$
MUON TELESCOPE
VETO
TARGET
TI-PUMPS
DEDX
VETO
PRERADIATOR
3
2
1
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1
2
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7
METERS

E-868 (Geer) Search for Antiproton Decay at the Fermilab Antiproton Accumulator

UCLA, Fermilab, Michigan, Nebraska, Penn State

Status: *Data Analysis*

E-868 (APEX) is an experiment designed to search for antiproton decay at the Fermilab Antiproton Accumulator operating at 8.9 GeV. The CPT theorem requires that the antiproton lifetime $\tau_{\bar{p}}$ equals the proton lifetime which we know exceeds 10^{32} years. In practice we can only hope to observe antiproton decay if $\tau_{\bar{p}} << 10^{32}$ years. APEX is therefore a test of the CPT theorem and of the intrinsic stability of antimatter.

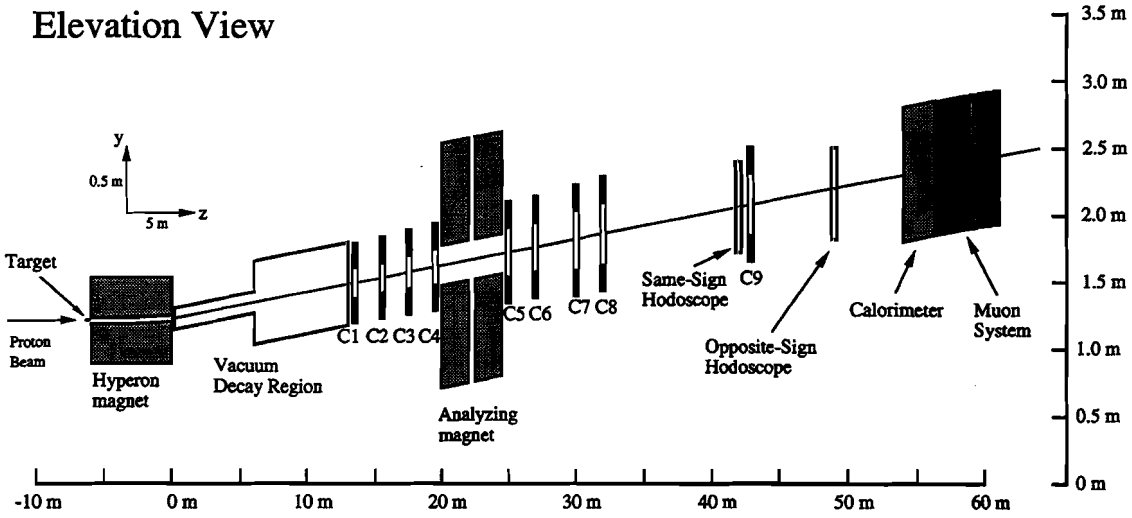
Our present experimental knowledge of the stability of the antiproton is modest. Prior to the recent T-861 test experiment, which was designed to prepare the way for APEX, the best limit on $\tau_{\bar{p}}$ came from observing ~1000 antiprotons in an ion trap for two months, which yielded $\tau_{\bar{p}} > 3$ months. The T-861 experiment at the Fermilab Antiproton Accumulator searched for explicit two-body decay modes of the antiproton containing an electron in the final state (angular momentum conservation requires that there is a final state fermion; electron, muon, or neutrino). T-861 obtained limits on several antiproton decay modes, the most stringent being $\tau_{\bar{p}}$/ BR($\bar{p} \rightarrow e^{-}\gamma$) > 1848 years at the 95% confidence level. [S. Geer et al., PRL 72, 1596 (1994)].

The APEX experiment was designed to achieve a sensitivity $\tau_{\bar{p}}$ / BR = O(10^5-10^6) years for several decay modes. The experiment was installed in the AP50 region of the Antiproton Accumulator, and took data in the period April-July 1995, during times when there were O(10^{12}) antiprotons stored and stacking was not taking place. The experiment consisted of a 3.5-meter-long decay tank, downstream of which were (i) three horizontal and three vertical scintillating-fiber tracking planes to allow reconstruction of charged tracks; (ii) dE/dx counters to distinguish between single electrons and conversion pairs, and to provide a trigger; (iii) a lead-scintillator preradiator to assist electron identification; (iv) a lead-scintillator electromagnetic calorimeter to locate electrons and photons and measure their energies; (v) a lead-scintillator tail catcher behind the calorimeter to aid electron and photon identification; and (vi) a limited-acceptance muon telescope to explore the possibility of searching for decay modes with a muon in the final state. The detector is described in T. Armstrong et al., FERMILAB-Pub-97/379-E (submitted to Nucl. Instr. Meth.).

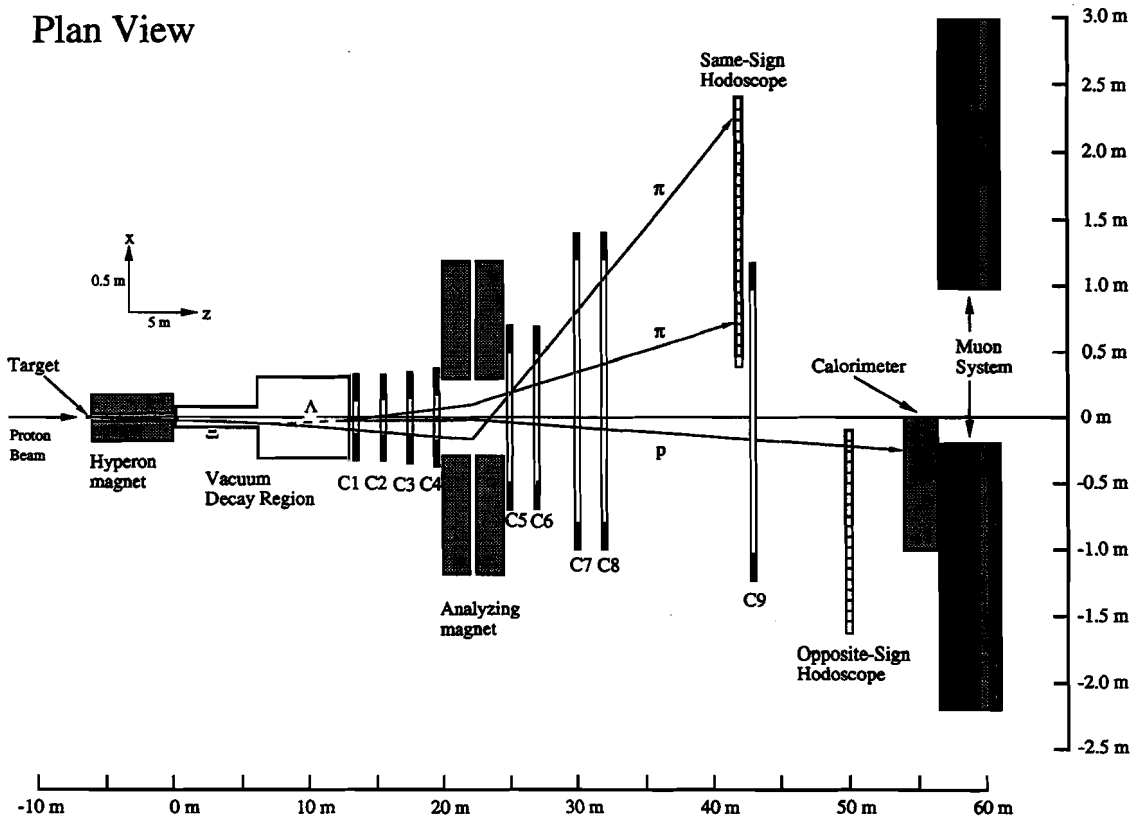
The experiment recorded a data sample which corresponds to a single-event sensitivity of $3 \times 10^9 \times \varepsilon$ years, where ε is the fraction of antiprotons decaying uniformly around the ring that would trigger the experiment. We expect ε to be O(10^{-3}-10^{-4}). Preliminary results from searches for $\bar{p} \rightarrow e^{-}\gamma$ and $\bar{p} \rightarrow e^{-}\pi^0$ have yielded lower limits for τ/B in the range 10^5-10^6 years, and results from searches for $\bar{p} \rightarrow e^{-}\eta$, $e^{-}K_S^0$, $e^{-}K_L^0$, $e^{-}\omega$, $\mu^{-}\gamma$, $\mu^{-}\pi^0$, $\mu^{-}\eta$, $\mu^{-}K_S^0$, $\mu^{-}K_L^0$ have yielded limits in the range 10^3-10^5 years.

E-871
The HYPERCP Spectrometer

Elevation View



Plan View



E-871 (Dukes / Luk) Search for CP Violation in the Decays of $\Xi^- / \bar{\Xi}^+$ and $\Lambda / \bar{\Lambda}$ Hyperons

Academia Sinica (Taiwan), UC/Berkeley, Fermilab, Guanajuato (Mexico), IIT, Lausanne (Switzerland), LBL, Michigan, New Mexico State, South Alabama, Virginia

Status: *Data-Taking*

In the thirty years since the discovery of CP violation our understanding of the phenomenon has improved little despite a long series of beautiful experiments. It still remains a small peculiarity found only in the decays of the K_L. Whether CP violation is a property unique to the kaon system and whether direct CP violation exists — as predicted by the Standard Model — remain outstanding experimental questions.

Both of these important issues are addressed by E-871 which seeks to perform a high-sensitivity search for CP violation in the decay of Ξ and Λ hyperons. The signature for a CP asymmetry is a difference between the angular distributions (α parameter) of the Ξ^- and $\bar{\Xi}^+$ decay daughters or in the decay daughters of the Λ and $\bar{\Lambda}$. The two measurements are done simultaneously through the decay sequence: $\Xi^- \rightarrow \Lambda\pi^-$, $\Lambda \rightarrow p\pi^-$ and its CP conjugate. The goal of the experiment is a sensitivity in the difference of the α parameters of less than 10^{-4}, three orders of magnitude better than the current experimental limit. Standard Model predictions range from about 5×10^{-4} to about an order of magnitude lower. The CP violation is manifestly direct, or $|\Delta S|=1$.

The design of the E-871 spectrometer is based on twenty years of experience in doing hyperon physics at Fermilab. The apparatus is simple and has a much higher rate capability than previous hyperon experiments. A target followed by a curved collimator embedded in a dipole (hyperon) magnet produces a momentum and charge-selected secondary beam. Following an evacuated decay region is a wire chamber spectrometer composed of high-rate narrow pitch (1.0 mm – 2.0 mm) wire chambers separated by a dipole spectrometer magnet. There is a total of 19,000 wires. The magnetic fields of the hyperon and spectrometer magnets are periodically reversed to switch between Ξ and $\bar{\Xi}^+$ data-taking modes. A simple first-level trigger requiring a left-right charged particle coincidence at the rear of the spectrometer selects events of interest. A hadronic calorimeter on the proton side makes that part of the trigger muon-blind and suppresses events due to secondary interactions. Fast front-end latches and a small event size allow an event rate of up to 100,000 per spill second with minimal dead time. A parallel data acquisition system based on the successful E-791 model builds the events and writes them to tape. We have logged approximately 75 billion triggers. A muon detector at the rear of the spectrometer allows the search for rare and forbidden decays of charged hyperons and kaons.

We had a successful first run in the 1996-97 fixed-target period. Construction of the new hyperon beam and the high-performance spectrometer was completed by the end of November 1996. After four months of beamline and spectrometer commissioning, the run officially began for E-871 on April 4, 1997. Data-taking ended on September 5. The spectrometer worked as proposed.

Approximately 75 billion events on 11,266 data tapes were collected during the run. About twice as much time was spent running on positives as on negatives because of the smaller $\bar{\Xi}^+$ yields. We expect to reconstruct 1.6 billion $\Xi \rightarrow \Lambda\pi$ decays and 280 million $K^{\pm} \rightarrow 3\pi$ decays, as well as a large number of $\Omega \rightarrow \Lambda K$ decays. This sample of 2.84×10^8 $\bar{\Xi}^+$ and 1.31×10^9 Ξ^- events would yield a statistical sensitivity of $\simeq 2\times10^{-4}$ in the search for CP violation in the Ξ-Λ decays.

Since the end of the run we have concentrated our efforts on: 1) careful studies of the track reconstruction codes; 2) improving the event yield; 3) bringing up the farm code; and 4) making preliminary physics studies.

A normalized comparison of the $\Lambda\pi^-$ and $\bar{\Lambda}\pi^+$ masses, based on some 2 million reconstructed Ξ^- and 0.5 million $\bar{\Xi}^+$ events, processed by the farms, is shown in Figure 1. The excellent mass resolution of σ = 1.5 MeV/c^2 is already at the level expected from the Monte Carlo. The level of the background is considerably less than 10^{-3}.

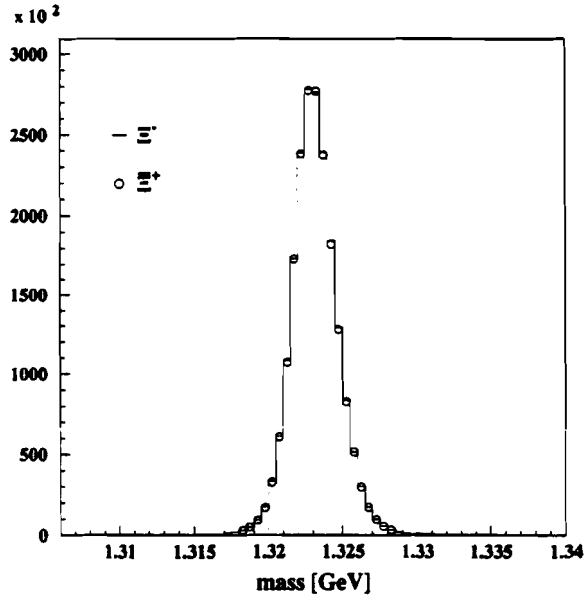
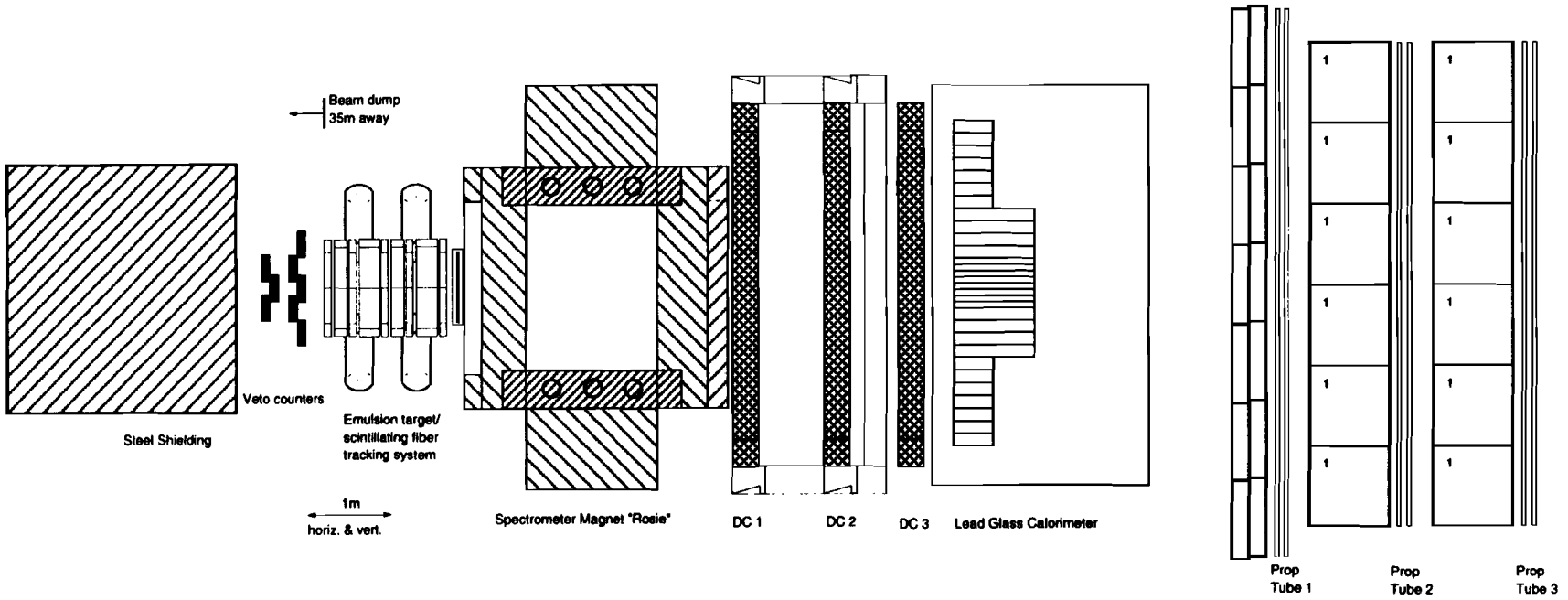


Figure 1. $\Lambda\pi$ invariant mass for negative and positive Ξ-trigger events. The mass resolution is 1.5 MeV/c^2.

E-872 Spectrometer Plan View



E-872 (Paolone) Measurement of τ Production from the Process $\nu_\tau + N \rightarrow \tau$

Aichi (Japan), Athens (Greece), UC/Davis, Changwon Nat'l (Korea), Coll. de France (France), Fermilab, Gyeongsang (Korea), Kansas State, Kobe (Japan), Kon-kuk (Korea), Korean Nat'l (Korea), Minnesota, Nagoya (Japan), Osaka Sci. Ed. Inst. (Japan), Pittsburgh, South Carolina, Toho (Japan), Tufts, Utsunomiya (Japan)

Status: *Data-Taking*

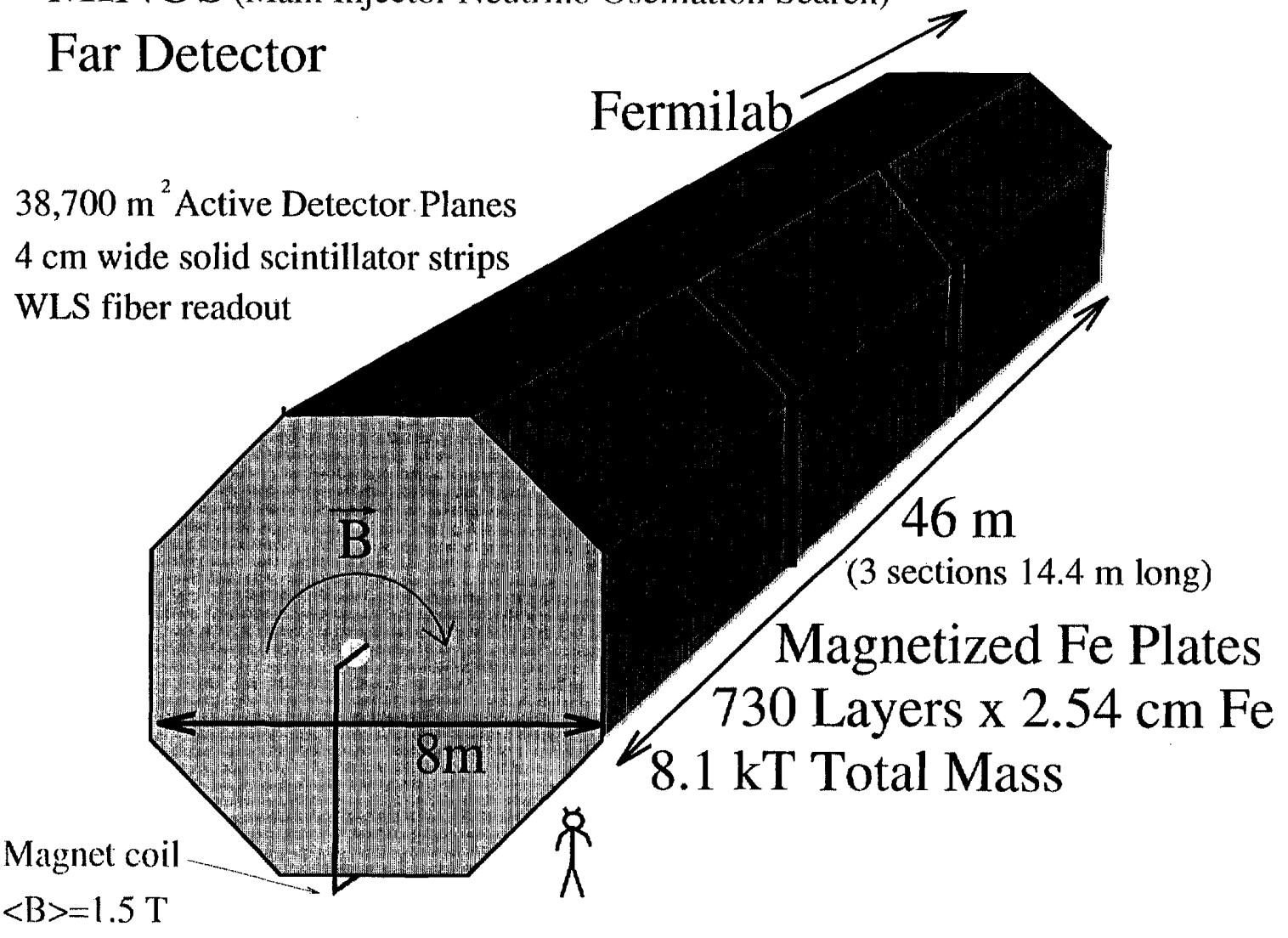
The direct observation of the tau neutrino through its charged-current interaction, in the manner of the ν_e and ν_μ discoveries, waits to be made. Since 1975 the desire to detect the ν_τ has been strong, but the proposed experiments were technically challenging, required large resources and relied on poorly known charm production cross-sections. In retrospect, using what we know now, it is clear that these efforts were not optimized to see ν_τ interactions. Today, the ν_τ production uncertainties are small, and using ultra-high resolution emulsions coupled with the technology of 1994 we can be confident in E-872 of measuring such an experimentally demanding process. There is compelling experimental evidence that a third neutrino exists, but since the ν_τ is the focus of many theoretical and experimental studies its direct confirmation is due.

Experimental observation of ν_τ charged-current interactions requires high proton intensities at high energy and extremely good detector resolution. An 800 GeV primary proton beam from the Fermilab Tevatron in conjunction with a high-resolution active target meets these requirements. In E-872 we will produce tau neutrinos in a beam dump and directly measure ν_τ charged-current interactions by observing τ production and subsequent decay in an emulsion target. This is the same technique currently being used to search for the $\nu_\mu \rightarrow \nu_\tau$ oscillations in the CERN CHORUS experiment and is also proposed for the Fermilab Main Injector experiment, COSMOS. Since E-872 will see the signal the oscillation experiments *hope* to observe, we view E-872 as an important step in addressing the exciting question of neutrino mass and mixing.

Tau neutrinos are produced predominantly from the leptonic decay of the D_s meson in the decay sequence $D_s \rightarrow \tau + \nu_\tau$, $\tau \rightarrow \nu_\tau$. In this experiment D_s mesons will be produced by 800 GeV protons interacting in a tungsten beam dump. Both the D_s and the daughter τ will decay in the dump, each decay producing one ν_τ. The number of ν_τ per incident proton which will be produced in the beam dump through this process is 1.7×10^{-4}. The number of ν_τ charged-current interactions that will occur per centimeter of target material is determined by the ν_τ energy and interaction cross section. Because of the energy dependence of the ν_τ cross section, the neutrinos from each of the decays ($D_s \rightarrow \tau + \nu_\tau$, and $\tau \rightarrow \nu_\tau$) have very different interaction probabilities. Their energy spectra are determined by the x_f dependence of the D_s production

cross section. An effective interaction cross section of 0.42×10^{-37} cm^2 can be used to estimate the interaction yield. Within a solid angle acceptance of ±7.1mr this gives 5.0×10^{-18} ν_τ charged-current interactions per centimeter of emulsion ($\rho = 3.72$ g/cm^3) per proton. Taking into account all other sources of ν_τ, such as secondary production from charm, $D^\pm$ decays, B-meson decays increases this number by 14% to 5.7×10^{-18} ν_τ charged-current interactions per centimeter of emulsion per proton. For the run which ended in September, we used seven emulsion modules that correspond to an average installed target mass of 260 kg. We accumulated about 5×10^{17} protons in the dump and expect about 100 ν_τ interactions in our targets. Details of the yields from the 1997 run are given in the proposal for continuing E-872 in the 1999 fixed-target run.

MINOS (Main Injector Neutrino Oscillation Search)
Far Detector



E-875 (Wojcicki) Main Injector Neutrino Oscillation Search

ANL, Caltech, Columbia, Fermilab, IHEP/Beijing (PRC), IHEP/Protvino (Russia), Indiana, ITEP (Russia), JINR (Russia), Lebedev (Russia), LLNL, Minnesota, ORNL, Oxford (Great Britain), PNPI (Russia), Rutherford (Great Britain), Stanford, Sussex (Great Britain), Texas A&M, Texas/Austin, Tufts, Univ. Coll. London (Great Britain), Western Washington

Status: *No Data Yet*

The goal of the Main Injector Neutrino Oscillation Search (MINOS) experiment is a comprehensive investigation of neutrino oscillations, down to a level of about 10^{-2} or lower in both Δm^2 (eV^2) and $\sin^2(2\theta)$, using neutrinos produced by the Fermilab Main Injector beam and a large new detector located at the Soudan Mine in Minnesota, some 730 km away. The existing Soudan 2 detector at the same site will also contribute to these studies. A "near detector" located at Fermilab will monitor the beam and enable a comparison to be made between neutrino interactions in detectors at two quite different distances from the neutrino source. The approach of our experimental program is to perform a variety of different measurements, all of which would be sensitive to neutrino oscillations. A self-consistent interpretation of all these measurements would be required for a claim of observation of neutrino oscillations.

Neutrino physics presents today one of the most promising avenues to probe for extensions of the Standard Model. A priori, no fundamental reason exists why neutrinos should have zero mass or why there should be no mixing between different neutrino species. Thus, the existence of neutrino oscillations is quite plausible, maybe even likely, on theoretical grounds. The possible existence of this phenomenon has recently received some experimental support, both from the observations of a deficit of solar neutrinos and from the apparent ν_μ/ν_e anomaly in the interactions of atmospheric neutrinos observed by large underground experiments. Furthermore, many of the attractive theoretical models predict a mass hierarchy i.e., $m_{\nu e} << m_{\nu\mu} << m_{\nu\tau}$. Thus a search for oscillations into the tau mode, especially from an initial ν_μ beam, may be one of the most promising experimental approaches.

This experiment emphasizes the investigation of neutrino interactions with energies sufficiently above the tau production threshold so that the presence of $\nu_\mu \rightarrow \nu_\tau$ oscillations, if they occur, can be convincingly demonstrated. One of the signals for $\nu_\mu \rightarrow \nu_\tau$ oscillations in our experiment relies on a measurement of ν_τ charged-current events and the subsequent tau decay. In addition, we shall perform several independent measurements which will be sensitive to both $\nu_\mu \rightarrow \nu_\tau$ and $\nu_\mu \rightarrow \nu_e$ oscillations. Most of our tests will rely on near-detector/far-detector comparisons in order to minimize

uncertainties due to imperfect knowledge of the neutrino beam energy spectrum and the detector responses.

One of the design goals of our experiment is to provide the maximum possible flexibility to respond to future improvements in our knowledge of neutrino oscillations. For example, in collaboration with Fermilab, we are designing a neutrino beamline that is capable of operating in several modes. The two extremes would be a wide-band beam which maximizes neutrino flux at the far detector and a narrow-band beam, which has lower flux, but is concentrated near one energy. In response to recent results from the SuperKamiokande experiment, the collaboration has recently begun a design study of a beam optimized for low-energy neutrinos, in order to extend MINOS sensitivity to lower Δm^2 values. Such flexibility would allow us to respond in an appropriate way to whatever may be the physics situation at the time of the startup of the experiment.

The MINOS experiment uses two very similar detectors, one at Fermilab and one in Minnesota's Soudan mine, 730 km away. Both detectors consist of assemblies of 1 inch-thick magnetized steel planes, interleaved with planes of 4 cm wide strips of plastic scintillator. The 1.8 kT near detector at Fermilab has 6 m wide octagonal planes; the 8 kT far detector at Soudan has 8 m wide planes arranged in three supermodules. The steel planes in both detectors are magnetized toroidally with an average field of 1.5 T. We estimate that, in the absence of oscillations, the far detector would record about 30,000 charged current ν_μ interactions annually using a wide-band beam. In addition, the existing 1 kT Soudan 2 detector will allow a complementary study of neutrino interactions, with much finer granularity but lower statistics.

The currently existing laboratory in the Soudan Mine will be expanded to house the new detector, as shown in Figure 1. Excavation of the new underground laboratory is scheduled to begin in October 1998. Civil construction for the NuMI facility at Fermilab, including the MINOS near detector hall, is also expected to begin around the same time. The current schedule calls for data-taking to begin with the near detector and the first third of the far detector when the NuMI neutrino beam turns on in the year 2002.

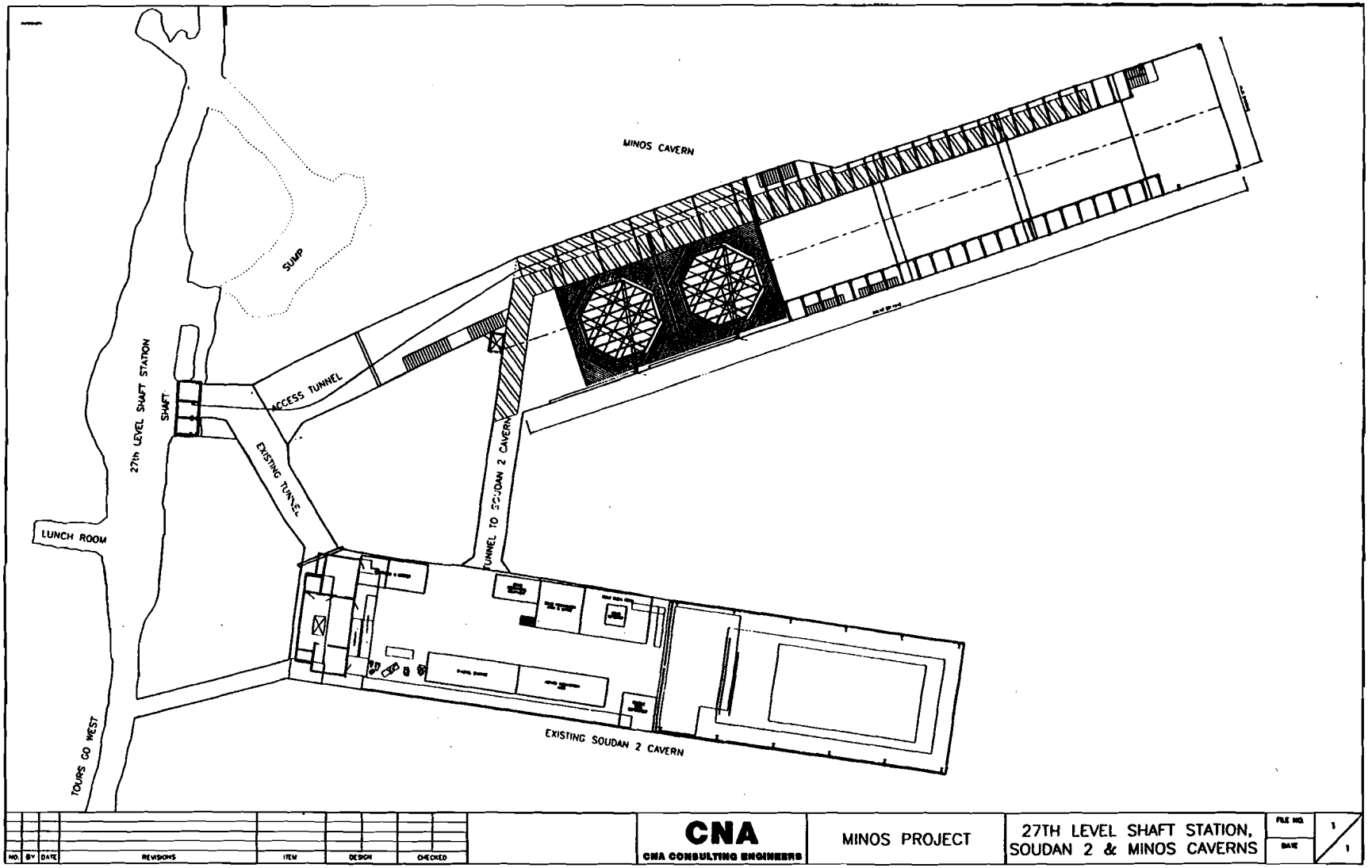
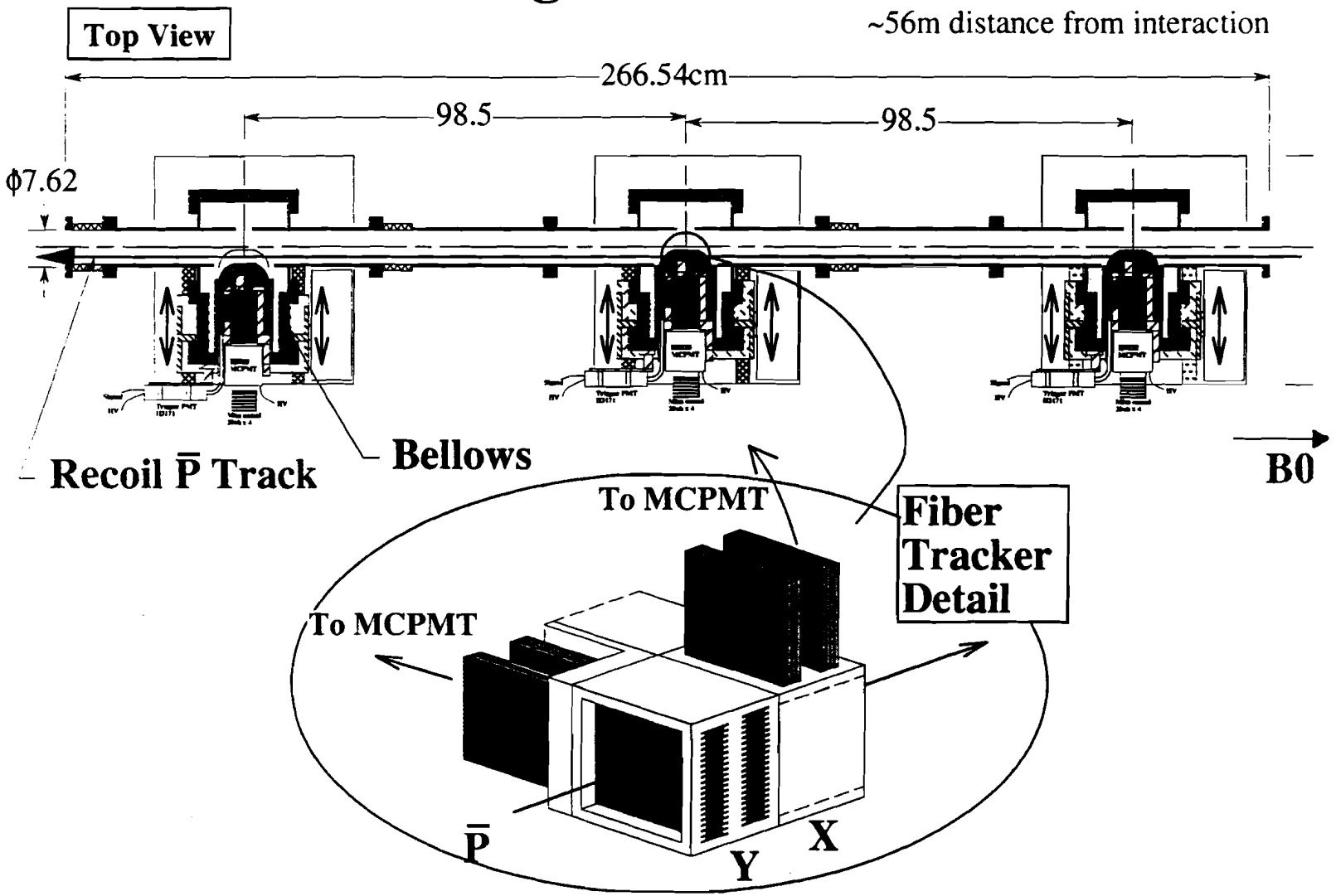


Figure 1. Plan view of MINOS detector in the Soudan Mine.

Roman Pot Arrangement



E-876 (Albrow) Hard Diffraction Studies in CDF

Academia Sinica (Taiwan), ANL, Bologna (Italy), Brandeis, UCLA, Chicago, Duke, Fermilab, Frascati (Italy), Harvard, Hiroshima (Japan), Illinois, Inst. of Particle Phys. (Canada), Johns Hopkins, KEK (Japan), LBL, MIT, Michigan, Michigan State, New Mexico, Osaka City (Japan), Padova (Italy), Pennsylvania, Pisa (Italy), Pittsburgh, Purdue, Rochester, Rockefeller, Rutgers, Texas A&M, Texas Tech, Tsukuba (Japan), Tufts, Waseda (Japan), Wisconsin, Yale

Status: *Data Analysis*

The purpose of this experiment is to search for and study events in which an antiproton is diffractively scattered, i.e. by pomeron exchange, and a hard interaction takes place at the pomeron-proton vertex. Such interactions would be characterized by the production of high E_T jets, W or Z, or heavy flavors (b or c). Measurements of these jets or heavy particles in the CDF detector, together with existing knowledge of the structure of the proton, give information about the parton structure of the pomeron, if that concept is meaningful. From an extensive set of measurements one can derive separately the gluon and quark distribution functions for different values of t, the (negative) squared mass of the pomeron. This is complementary to studies with photon-pomeron collisions at HERA (ep); inconsistencies are expected by some theorists who point out that the pomeron is not like a normal (time-like) hadron. Whatever it is, it plays a major role in hadronic interactions and these experiments should shed some light on its nature.

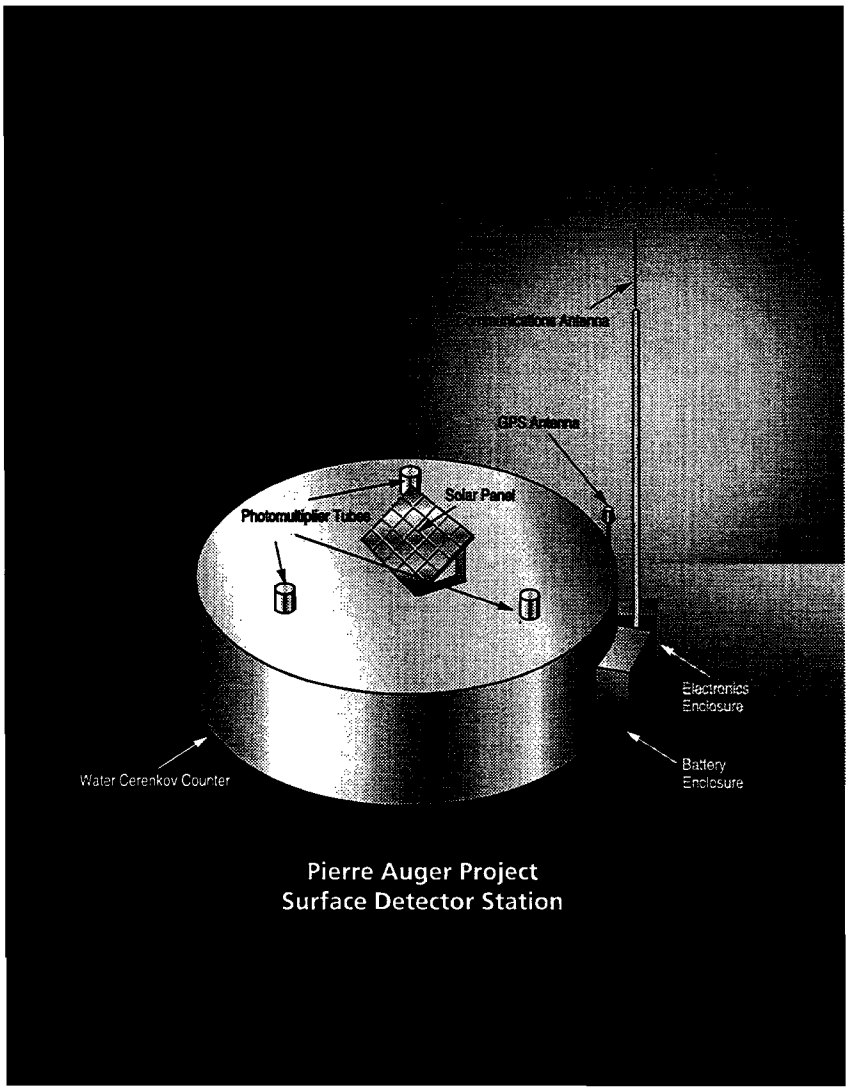
Diffractively scattered antiprotons have very small angles with respect to the outgoing beam and stay in the beam pipe. Those that have lost a small fraction (say 5%) of their energy in exciting the proton to a few hundred GeV (the pomeron-proton C.M. energy) are dispersed horizontally by the Tevatron dipoles. Small detectors are placed close to the beams, 57 m from the collision point, to measure these antiprotons. The detectors are hodoscopes of scintillating fibers, in x and y orientations, backed up by a square 2 cm x 2 cm trigger counter. There are three such detectors separated by 1 m mounted in vacuum pots ("Roman Pots") which enable the detectors to move in to within about 7 mm of the circulating beam while they remain at atmospheric pressure and accessible. The scintillating fibers are read by multichannel (80 channels) PMTs, and the hodoscopes have a resolution of about 100 microns. Together with the interaction point (vertex) from the CDF detector this gives a momentum resolution of approximately 0.2%. The t-coverage depends on the diffractive mass; it extends from t = 0 to t = -2 GeV^2 at M = 360 GeV when $\sqrt{s}$ = 1800 GeV.

The diffractive events should also have a rapidity gap close to the antiproton, i.e. an angular region devoid of particles. Many diffractive studies use this gap alone as a signature for diffraction. We added two small calorimeters, called "microplugs," around the beam pipe in CDF to be able to

correlate the gap information with the scattered antiproton. The microplugs are octagonal cylinders, with 8 lead/scintillator cells. The full CDF detector is used to measure central jets, heavy flavors, Drell Yan and W/Z produced diffractively and also to search for new phenomena.

Data were taken in December 1995 - February 1996, and high E_T jets and some W events have been observed. These are now being analyzed in detail.

E-881



Conceptual design for the Water Cerenkov detector for use in the surface array.

E-881 (Mantsch) The Pierre Auger Project - A Study of the Highest-Energy Cosmic Rays

Fermilab
(and institutions in 19 countries)

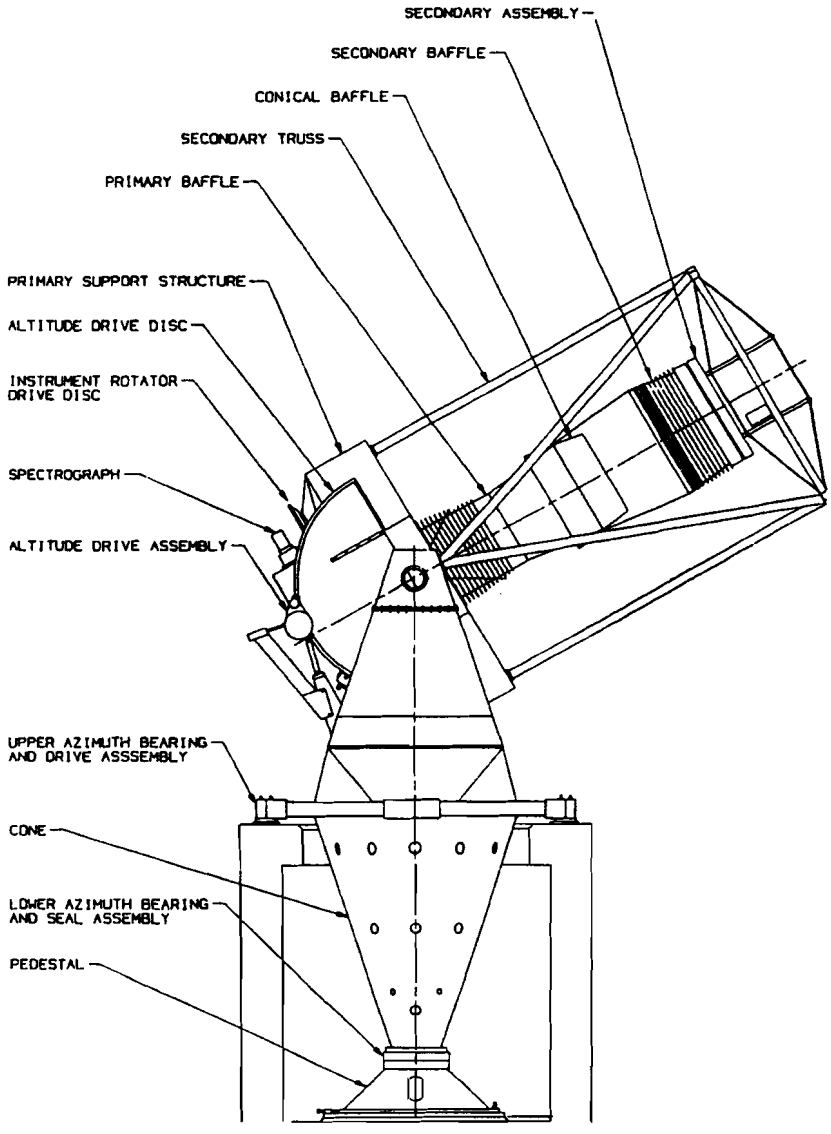
Status: *No Data Yet*

Over the past thirty years cosmic ray air shower detectors have recorded a number of events with energies greater than 10^{20} eV. In 1991, the collaboration operating the Fly's Eye atmospheric fluorescence detector in Utah recorded an event for which the primary energy was calculated to be $3.2\pm 0.9\times10^{20}$ eV (51 joules). Two years later, the AGASA air shower array at Akeno, Japan, observed an event with energy of $(1.7\text{-}2.6)\times10^{20}$ eV. These super-high-energy events are extraordinary for two reasons. First, there are no known acceleration mechanisms that can produce particles of these energies. Second, attenuation lengths for cosmic rays with energy greater than 1.5×10^{19} eV is less than about 30 Mpc. This attenuation (known as the Greisen-Zatsepin-Kuzmin cut off) results from the interaction of cosmic ray particles with the cosmic microwave background. Thus particles can have these energies only if they are produced relatively nearby. The high magnetic rigidity of these particles also means that they suffer little deflection from magnetic fields in the galaxy and in intergalactic space. Yet none of the particles observed points back to a possible astrophysical source within the distance limit imposed by the background radiation.

The Pierre Auger Project is a broadly-based international effort to make a detailed study of cosmic rays at the highest energies. Two air shower detectors are proposed, one to be placed in the Northern Hemisphere and one in the Southern Hemisphere. Each installation will consist of an array of about 1600 particle detectors spread over 3000 km^2. Each installation will also have three atmospheric fluorescence detectors viewing the volume above the surface array. These two air shower detector techniques working together form a powerful instrument for the proposed research. The objectives of the Pierre Auger Project are to measure the arrival direction, energy, and mass composition of 90 events per year above an energy of 10^{20} eV and 9000 events per year above 10^{19} eV. A collaboration has been formed and preferred sites chosen. The goal is to have the Pierre Auger Cosmic Ray Observatory in operation by 2002. At present, funds are being sought for the project.

Fermilab could play an important role in the Auger Project. In addition to scientific participation, Fermilab could bring to bear its substantial experience with projects of this scope. An R&D program is currently underway with other collaborators to develop the water Cerenkov surface detector station design including tank design, phototube specification and phototube base development. The project management for the Auger Project will be based at Fermilab.

E-885


SECONDARY ASSEMBLY
SECONDARY BAFFLE
CONICAL BAFFLE
SECONDARY TRUSS
PRIMARY BAFFLE
PRIMARY SUPPORT STRUCTURE
ALTITUDE DRIVE DISC
INSTRUMENT ROTATOR DRIVE DISC
SPECTROGRAPH
ALTITUDE DRIVE ASSEMBLY
UPPER AZIMUTH BEARING AND DRIVE ASSSEMBLY
CONE
LOWER AZIMUTH BEARING AND SEAL ASSEMBLY
PEDESTAL

E-885 (Kron) Sloan Digital Sky Survey

Fermilab
(and Chicago, Inst. for Adv. Study, Japan Promotion Group [Japan], Johns Hopkins, Princeton, US Naval Observatory, Washington)

Status: *No Data Yet*

The Sloan Digital Sky Survey (SDSS) intends to reveal large-scale structure in the distribution of galaxies with a spatial extent and precision in its determination that greatly exceed current capabilities. This map of the large-scale distribution of galaxies will serve to constrain models for the origin and evolution of that structure, and thereby to address fundamental questions in cosmology and astrophysics, including the amount and distribution of mass with respect to the luminous material in the Universe.

To achieve these goals, one million galaxy redshifts are to be measured to a uniform flux limit within a solid angle of pi steradians, away from the obscuring disk of the Milky Way. The need for a uniform and well-calibrated flux limit requires a new imaging survey to be conducted, from which the spectroscopic (redshift) target list will be derived. This imaging survey yields a two-dimensional map of the same region, which itself will provide new cosmological information since the detection threshold of the imaging survey is much fainter than that of the spectroscopic survey. A wide-field 2.5-m telescope (see adjacent figure) dedicated to this project will soon be undergoing commissioning tests at Apache Point Observatory, near Sunspot, New Mexico. The imaging system and the spectroscopic system share the same focal plane via an instrument exchange mechanism (see Figures 1 and 2). The unique data products include the multi-band imaging survey (there are five wave bands covering the visible spectral range, the data from which are collected nearly simultaneously), and the inclusion of quasar candidates along with the galaxies.

Fermilab role:

The project will produce at least 10 Terabytes of data in five years of operation (each long, clear night will yield 200 GBy of raw data). The implementation of the end-to-end data system to handle this volume of data has been assigned to Fermilab. This includes design and construction of the data acquisition system (on the mountaintop at Apache Point), and the specification and responsibility for running the production system (in the Feynman Computing Center at Fermilab). The scientific coding is being undertaken by scientists at the participating institutions (including Fermilab). The design and implementation of the code management system, the promulgation of standards, and the computing framework in which the scientific code runs, are also Fermilab's responsibility.

In addition to the computing infrastructure, Fermilab is an active contributor to a number of other aspects of the project. Fermilab is responsible for the design and implementation of the telescope motion control system; the design and implementation of the telescope equipment protection interlock system; and the development of several smaller sub-systems associated with telescope operation. Fermilab is also involved in developing systems and hardware associated with the telescope instruments, including the design and development of instrument handling equipment; design and implementation of an automated instrument change system; and the development of an automated system that identifies and maps the location of optical fibers randomly plugged into the fiber cartridge focal-plane plates.

Publications

The Spectroscopic Survey of the SDSS, R. G. Kron, in "Wide-Field Spectroscopy," eds. E. Kontizas et al., p. 41 (1997).

The Sloan Digital Sky Survey: Pi on the Sky, H. J. Newberg, Beamline 27, No. 3, p. 22 (1997).

Three-Dimensional Parameterization of the Stellar Locus with Application to QSO Color Selection, H. J. Newberg and B. Yanny, Astrophys. J. Suppl. 113, 89 (1997).

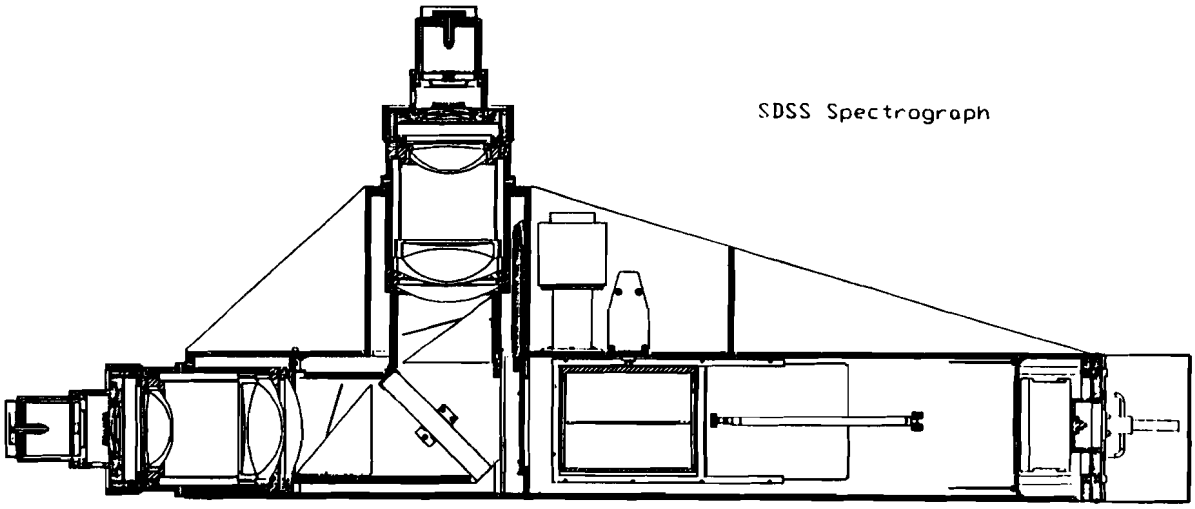


Figure 1

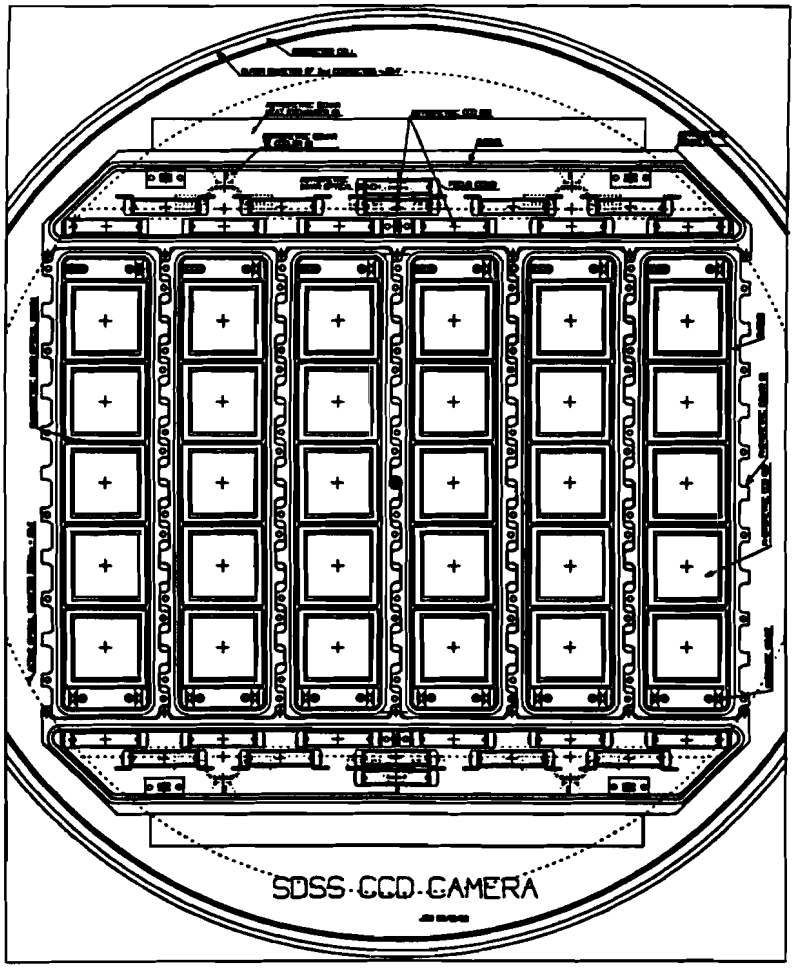
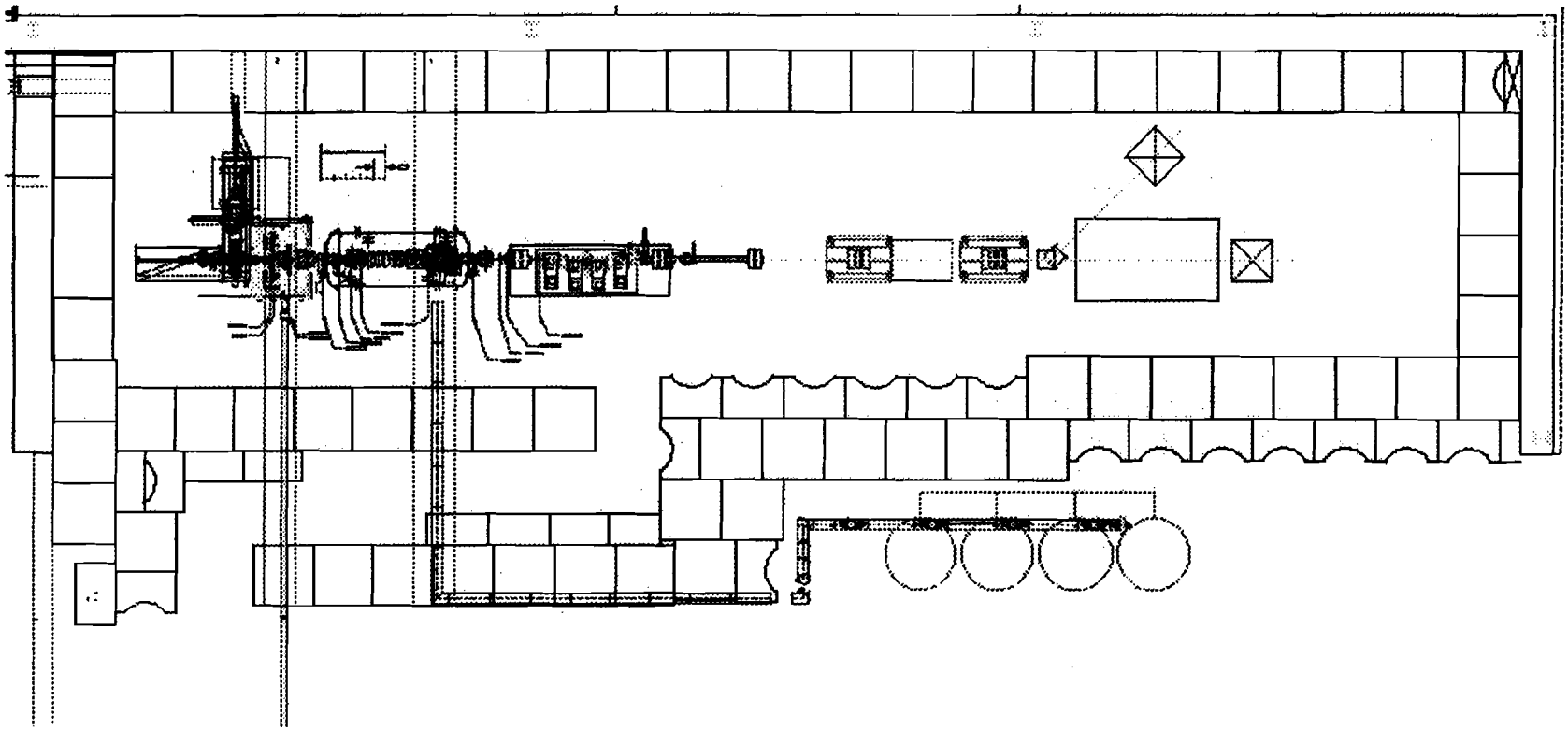


Figure 2



Schematic diagram of the electron source facility. A laser-driven photocathode produces short electron bunches which are accelerated by a superconducting cavity. A magnetic chicane is used to compress the bunches longitudinally, which are then focussed into the experimental chamber.

E-886 (Colestock / Melissinos) Experiments at the A0 Photoinjector

Fermilab, Rochester

Status: *No Data Yet*

The A0 photoinjector delivered electrons from the rf gun for the first time in June 1997. The beam is designed for a pulse train of up to 800 short (10 ps wide) electron bunches of 8 nC charge each. Presently the energy is 3.5 MeV and the pulse train has been limited to 200 pulses because the drive laser is not as yet completed; a typical pulse train is shown in Figure 1. Difficulties were encountered with the "SLAB" amplifier as used in this application (long flashlamp pumped mode). Experiments and thermal modeling are being pursued to understand the cause of the fracture of the Nd doped glass slab.

The quantum efficiency of the Cs_2Te cathode supplied by INFN/Milano has been characterized under varying conditions of laser illumination and rf acceleration. A typical measurement of the quantum efficiency is shown in Figure 2. Measurements of the energy spread and emittance of the beam are in progress. To complete the photoinjector, a 9-cell superconducting capture cavity will be installed in January 1998 to bring the beam energy to 15 MeV with the final beamline layout as shown in the schematic diagram of the electron source facility.

The first series of experiments planned with the photoinjector are as follows:

(a) Optoelectronic measurements of the electron beam bunch length with picosecond resolution (Ph.D thesis topic of M. Fitch).

(b) Study of the beam dynamics and long pulse operation of the injector with a superconducting cavity (Ph.D thesis topic of J-P. Carneiro).

(c) Investigation of the possibility of producing picosecond x-rays using a micro-undulator as a practical alternative to backward Thomson scattering. The micro-undulator involves interesting issues in nanofabrication which have to be resolved before a practical device is built.

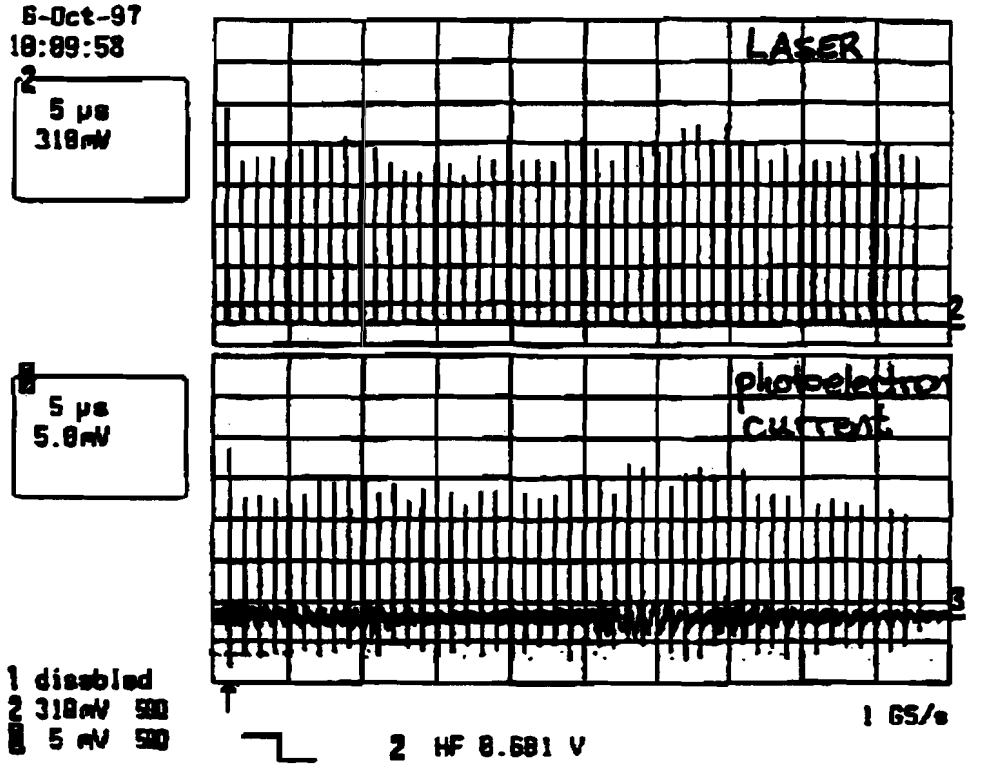


Figure 1. Typical pulse trains of the A0 photoinjector.

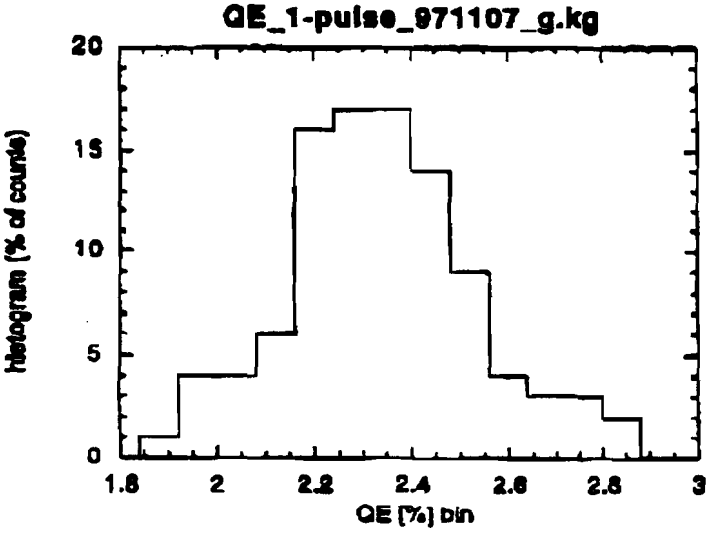
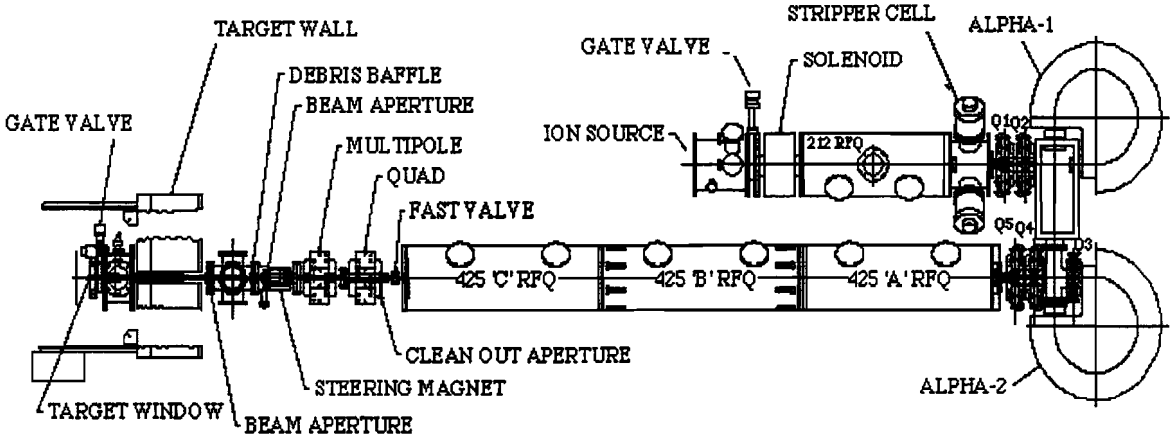


Figure 2. Typical measurement of the quantum efficiency of the Cs_2Te cathode.

Accelerator Layout



Schematic representation of the accelerator systems.

E-887 (Pasquinelli) A RFQ Linear Acclerator for PET Isotope Production

Fermilab
(and Biomedical Res. Found., Sci. Appl. Int'l. Corp., Washington)

Status: *Data-Taking*

The PET RFQ project is a collaboration between Fermilab, Science Applications International Corporation (SAIC, San Deigo, California), Biomedical Research Foundation (BRF, Shreveport, Louisiana), and the University of Washington (UW, Seattle, Washington) to create a linear accelerator for the production of Positron Emission Tomography (PET) isotopes utilizing Radio Frequency Quadrupoles (RFQs). The goal is to accelerate $^{3}He^{++}$ for the production of the four main radioisotopes used in PET, ^{18}F,^{11}C,^{13}N,^{15}O. Utilization of $^{3}He^{++}$ does not require enriched target material and was believed to reduce neutron radiation flux. The starting point was an existing Strategic Defense Initiative Organization (SDIO) funded 8 MeV RFQ accelerator that had reliability and performance problems. Almost all elements of that accelerator were redesigned and/or rebuilt, including raising the energy to 10.5 MeV. The project design goals are:

- Peak beam current = 12 milliamperes (mA electrical, 6 mA particle current)
- Average beam current = 300 microamperes (μA) (150 μA minimum)
- Duty cycle = 2.5%
- Beam uniformity on target = ± 25%
- Beam reliability/availability = 50% of scheduled time
- Minimal radiation shielding outside the target vault, i.e. not a radiation area
- Extensive radiochemistry targetry studies of ^{11}C,^{13}N,^{15}O,^{18}F
- Technology transfer for potential clinical use

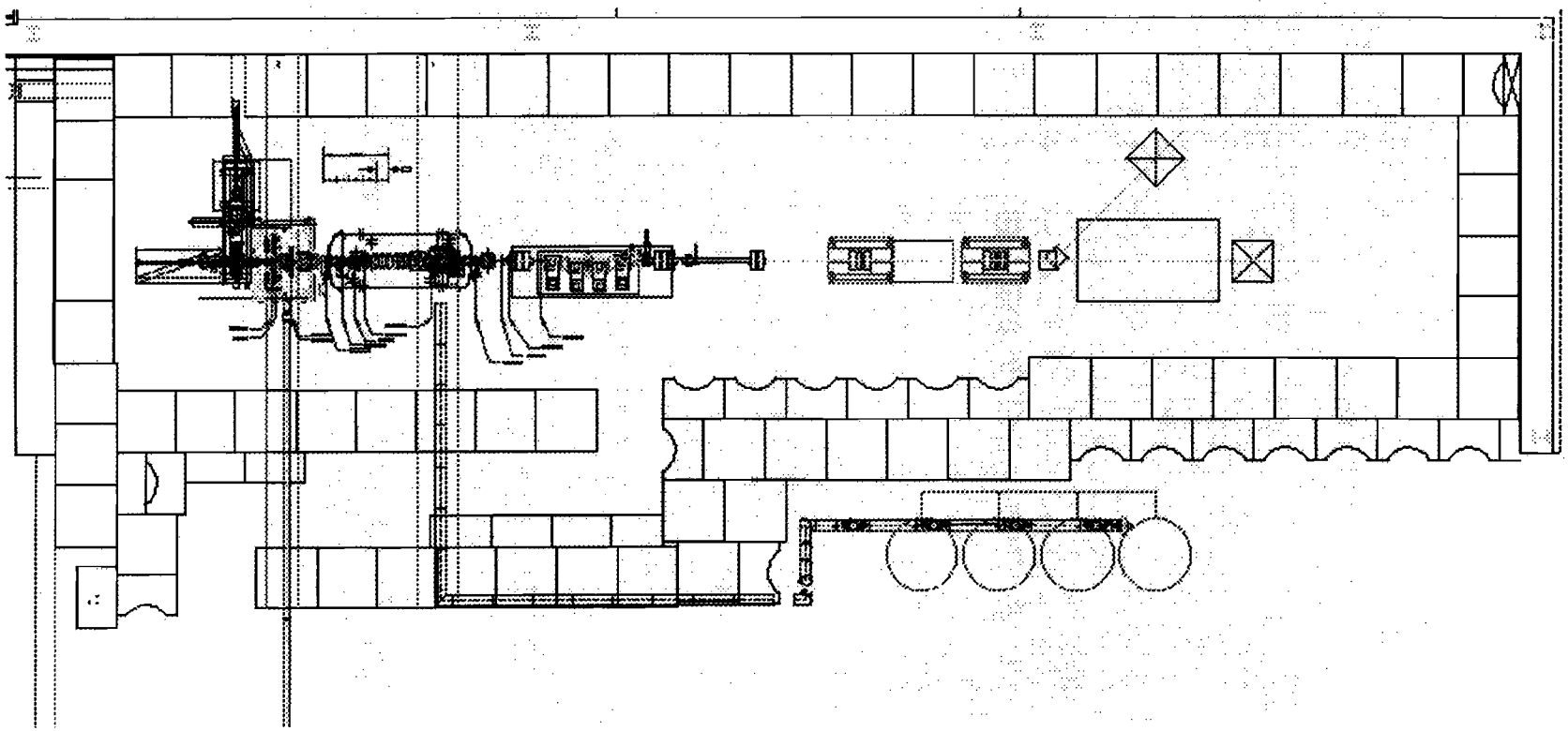
To date the accelerator has achieved 10.5 MeV $^{3}He^{++}$ beams with the following typical characteristics:

- Peak beam current = 5 mA (electrical, 2.5 mA particle current)
- Average beam current = 100 μA
- Duty cycle = 2.0%
- Beam uniformity on target = ± 50%
- Beam reliability/availability = 25-30%
- Entire accelerator footprint is a radiation area

The collaboration believes that the reliability of the accelerator will improve, but that the minimum design beam current will never be reached. The achieved performance is adequate to begin the radiochemistry program.

Most of the accelerator development has taken place at Fermilab's Lab G. Originally, the project had three phases, the first phase being design, construction and commissioning of the ^{3}He linear RFQ accelerator. The second phase is to carry out radiochemistry experiments. The final third phase was to investigate the possibility of technology transfer to commercialize the application of RFQ accelerators for PET isotope production. A number of difficulties and setbacks were uncovered during the design and commissioning of the accelerator complex that has made the possibility of phase three improbable with the current funding profile.

Although this project utilized some of the hardware from the SDIO program and surplus RF stations from the Fermilab Linac, the design of this accelerator has provided a number of novel hardware contributions and important changes to software programs utilized in designing accelerators. The MEBT design may be a useful mechanism for matching RFQs to subsequent accelerating stages. High quality 270 degree bending magnets were designed and implemented. The simple but effective use of a fuel injector for a gas stripper provides a robust and reliable gas jet target. The extensive modeling of the accelerator revealed a number of fundamental errors in codes that have been used for years in the field of accelerator design.



Schematic diagram of the electron source facility. A laser-driven photocathode produces short electron bunches which are accelerated by a superconducting cavity. A magnetic chicane is used to compress the bunches longitudinally, which are then focussed into the experimental chamber.

E-890 (Rosenzweig) Advanced Accelerator Test at the Fermilab Electron Source Facility

UCLA, Fermilab

Status: *No Data Yet*

A new set of experiments is proposed which uses accelerator facilities now under construction at Fermilab to accomplish several scientific objectives. The core of the facility is a short-bunch, long-pulse photoinjector, which can produce a train of intense electron bunches. Owing to the uniqueness and versatility of this facility, it can be used for multiple purposes in both accelerator and basic physics research.

There is widespread interest in developing high-gradient accelerating structures to pave the way toward more compact and affordable high energy accelerators. However, high-gradient acceleration is by nature faced with three problems to be solved: 1) to find a suitable structure or medium to support a high electric field for accelerating test particles using immediately available power sources; 2) to find methods to manipulate and synchronize intense beams for acceleration once the electric field is produced; and 3) to develop efficient compact power sources to couple energy from the external world to the accelerating structure, allowing staging of acceleration sections. In this proposal, we outline an experiment that can be performed at Fermilab, where staging of GeV/m accelerating sections can be demonstrated for the first time, using wakefields in plasmas driven by ultra-high brightness electron beams[1].

The plasma wakefield accelerator (PWFA) concept is based on the excitation of a steep field gradient in a plasma due to the injection of an intense drive electron beam, followed by a witness bunch which is to be accelerated. A promising regime which offers the most freedom from sources of instability and includes intrinsic linear focussing properties can be realized by the injection of an intense drive electron bunch into an underdense plasma, creating a symmetric focussing channel, the so-called electron blowout regime. Recent experimental work by the UCLA team at Argonne has shown effective generation of such channels, along with a significant acceleration gradient[2].

Perhaps the most important experiment to be undertaken in this area is that of synchronization of the witness bunch with the wakefields generated by the excitation bunch. Recently, it has been proposed that magnetic compression of an rf photoinjector beam can be applied to effectively reduce injection jitter from the witness beam that has plagued previous attempts at acceleration[3]. Such a scheme (shown schematically in the figure) would enable a first real attempt at synchronization and low-emittance, low-energy-

spread acceleration - with the possibility, currently unique to the Fermilab facility, of staging the accelerating sections.

The components of the experimental program envisioned are:

a) Demonstrate synchronization of a witness beam with the beam-generated wakefields in the blow-out regime of the PWFA, using an rf photoinjector with a bunch compression system;

b) Demonstration of GeV/m acceleration;

c) Understand the beam matching physics between successive modules of a multiple stage scheme. This includes the development of effective kickers or other schemes for merging drive and witness beams, and understanding of the beam dynamics; and

d) Demonstrate multiple stage acceleration using the PWFA; determine physics of intensity and gradient scaling, diagnose beam quality after each accelerating section.

The physical demands on the Fermilab facility for this project would be minimal. The basic experimental setup, as shown in the figure, consists of a plasma chamber at the end of the photoinjector/linac section. The primary diagnostics for the experiment are based on the Compton scattering apparatus described in E-886. It is envisioned that the work will proceed in two phases: the first phase will be the diagnosis of the accelerating channels produced by the drive beam, including demonstration of acceleration. A second phase would involve the demonstration of successful coupling of two stages.

References

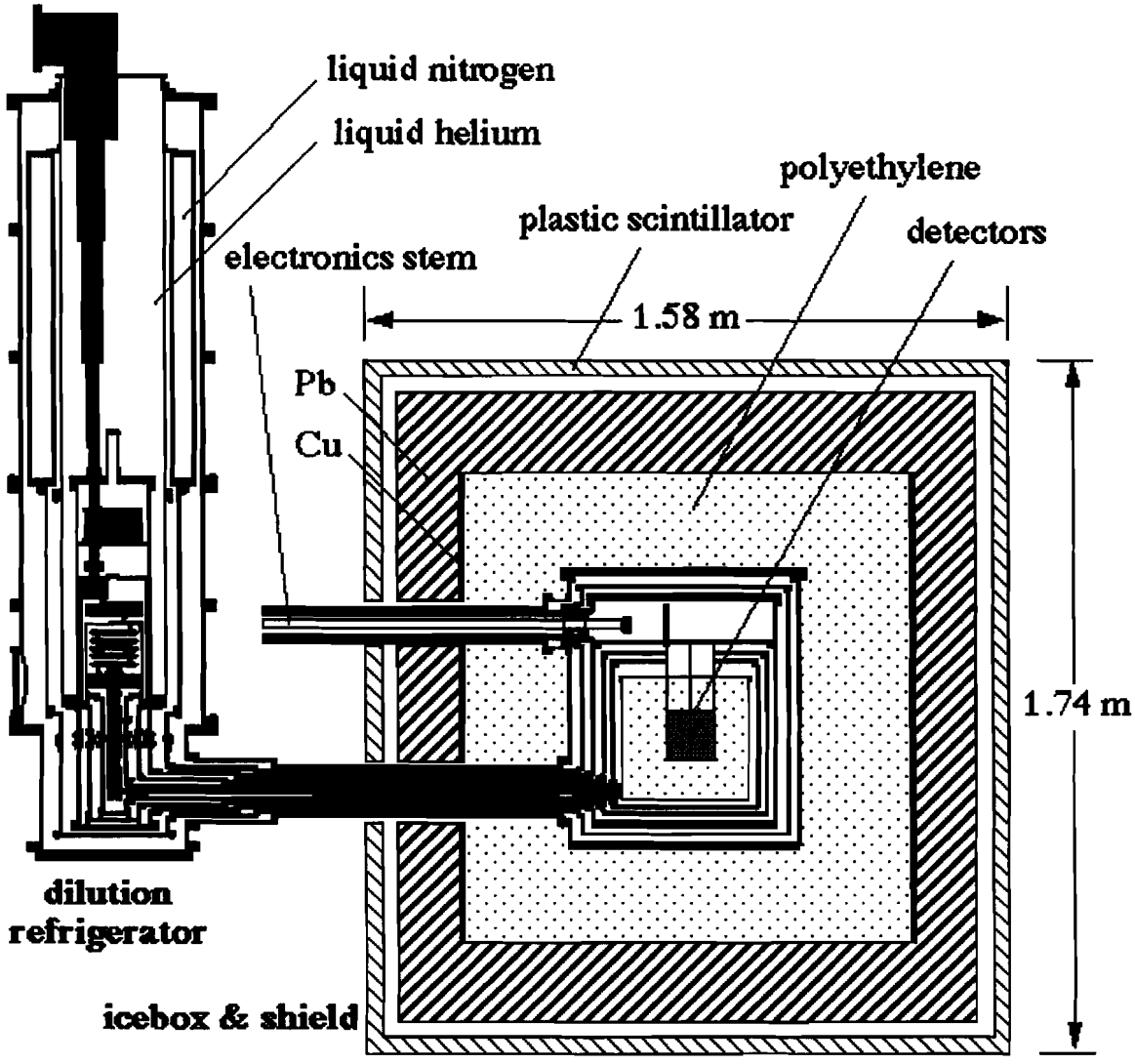
1. J. B. Rosenzweig, Proc. Linear Accelerator Conference, Chalk River, AECL-10728, (1993).

2. N. Barov, et al., Proc. Particle Accelerator Conference, Dallas (1995).

3. J. B. Rosenzweig, N. Barov, and E. Colby, IEEE Trans. Plasma Science 24, 2, (1996).

E-891

CDMS I


liquid nitrogen
liquid helium
polyethylene
plastic scintillator
detectors
electronics stem
1.58 m
Pb
Cu
1.74 m
dilution
refrigerator
icebox & shield

E-891 (Dixon) Cryogenic Dark Matter Search (CDMS)

Fermilab
(and UC/Berkeley, UC/Santa Barbara, Case Western Reserve, INR/Baksan (Russia), LBNL, San Francisco State, Santa Clara, Stanford)

Status: *Data-Taking*

The CDMS collaboration is building a detector to search for cold dark matter. There are good reasons to believe that most of the matter in the universe is "seen" only gravitationally, and does not emit or absorb substantial amounts of electromagnetic radiation at any known wavelength. The nature of this "dark matter" is unknown. However, there is some evidence that suggests that the dark matter consists of as yet undiscovered weakly interacting massive particles (WIMPs) that were produced in the early universe. If this is true, then we are immersed in a sea of relic WIMPs which occasionally interact with atomic nuclei as they traverse the Earth. The direct observation of the interaction of WIMPs in a terrestrial detector would solve the "dark matter problem," enable the properties of the dark matter to be measured, and advance our understanding of the physics of elementary particles and the evolution of the early universe.

This experiment will be an upgraded version of the Cryogenic Dark Matter Search experiment (CDMS) currently running at a shallow underground site on the Stanford campus. The CDMS experiment utilizes a new class of elementary particle detectors based on the propagation and detection of phonons in silicon or germanium crystals at temperatures below 0.1 K. CDMS is one of the first experiments capable of searching for WIMPs with properties and fluxes consistent with current expectations from particle physics and cosmology. However, although the CDMS experiment is expected to be a factor of 30 more sensitive than previous searches, this first-generation experiment has only sufficient sensitivity to explore a small region of the interesting parameter space. The second-generation experiment, CDMS II (see Figure 1), will be a larger version of CDMS, with a further factor of 30 improved sensitivity. This will enable us to explore for the first time a substantial region of the interesting parameter space. CDMS II will be installed in the low background environment of the Soudan mine in Minnesota. Currently, funding is being sought for CDMS II.

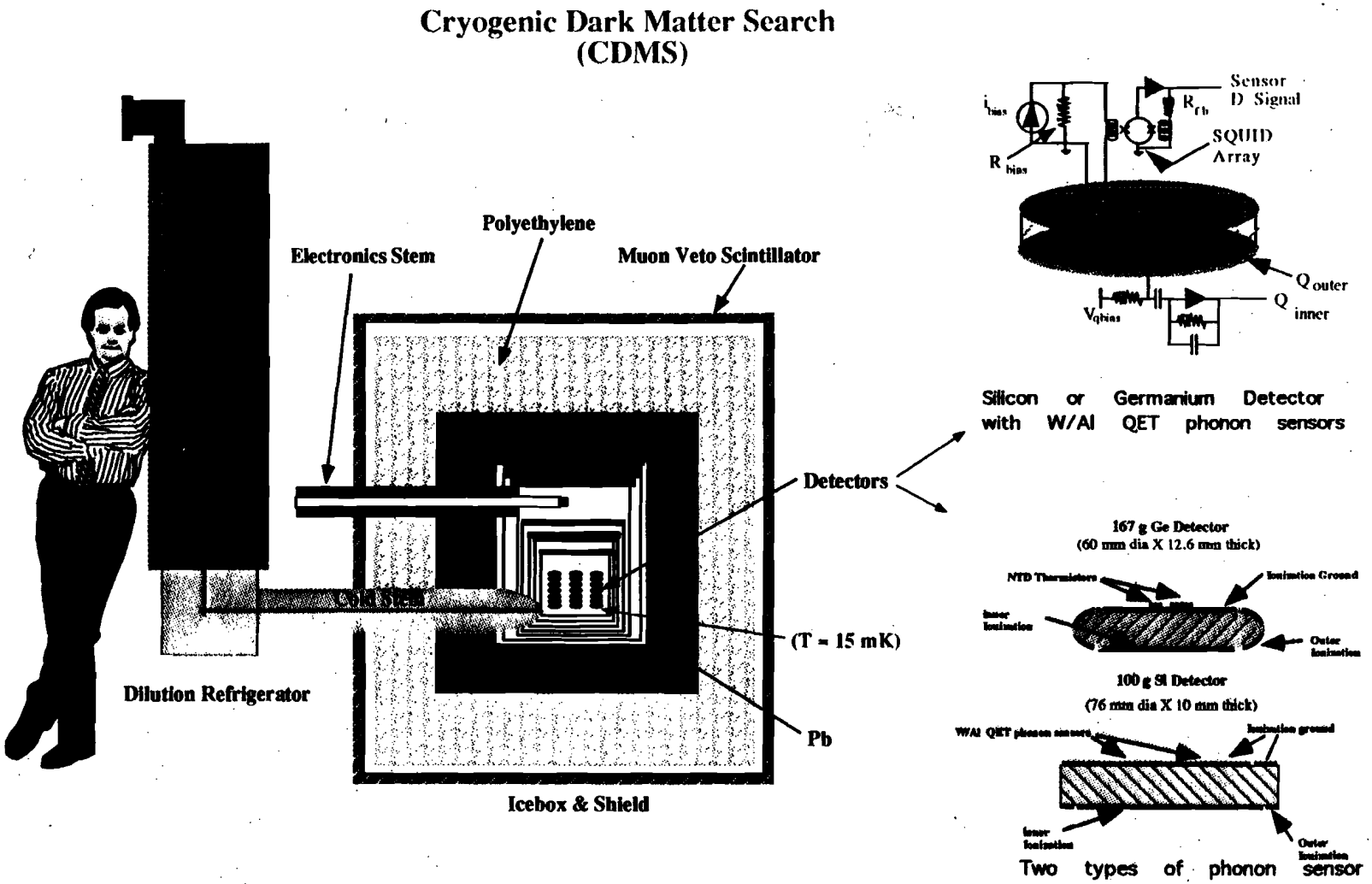
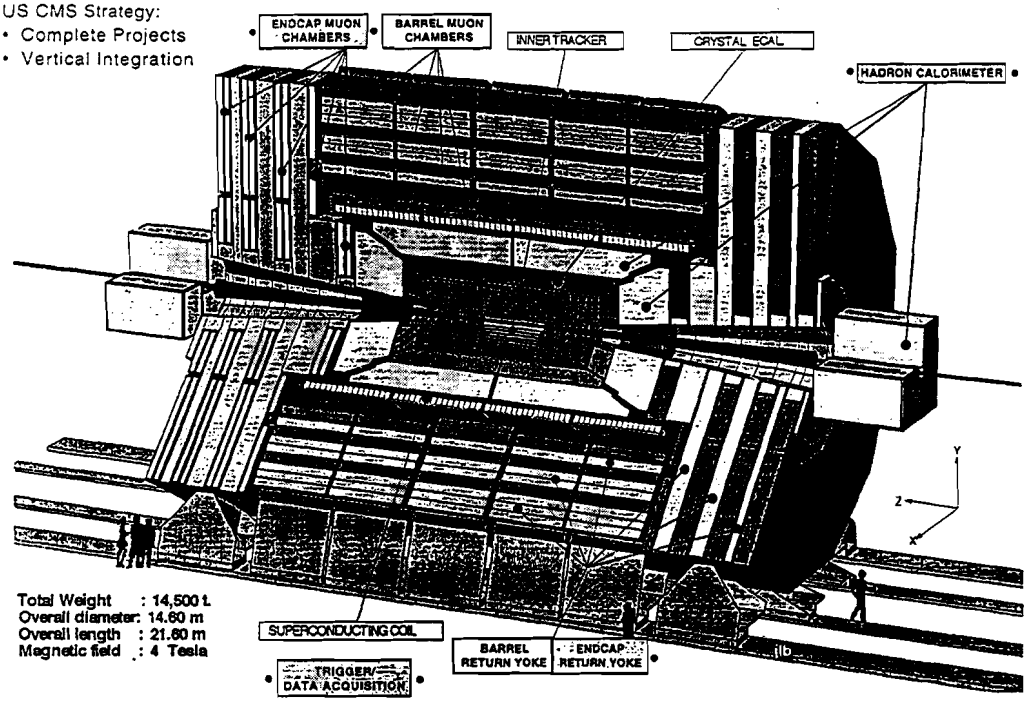


Figure 1. CDMS II will consist of 42 silicon and germanium crystals operating at .015 K to detect phonon and ionization signals which are generated as Weakly Interacting Massive Particles (WIMPS) scatter from the nuclei in the crystals. The detectors will be installed in the Soudan Mine in Tower, Minnesota.

E-892

US CMS Management Responsibilities

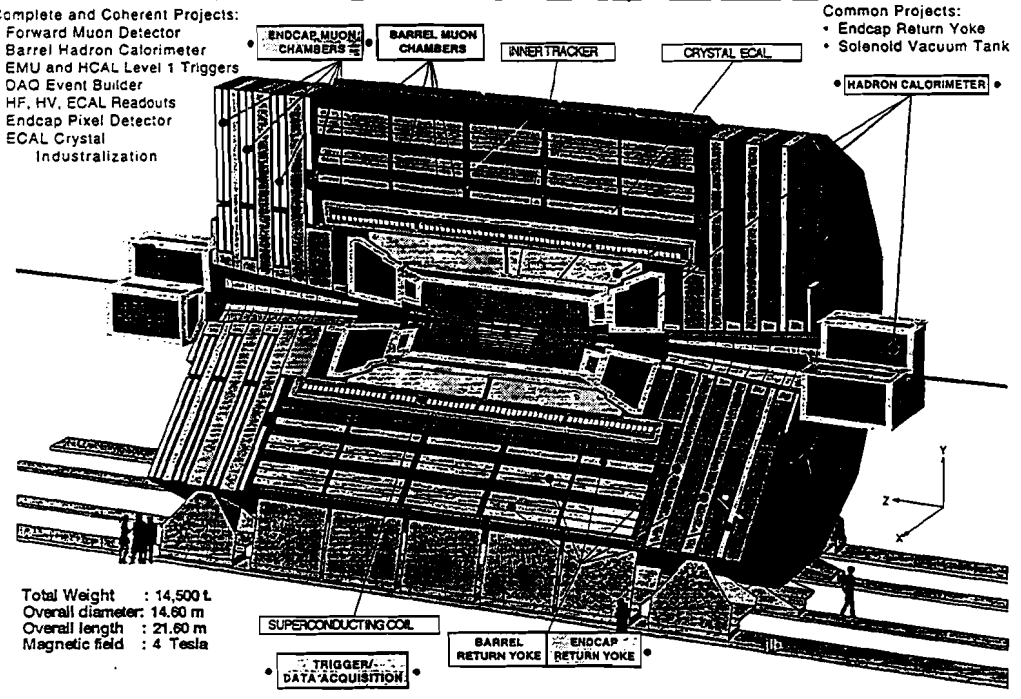
US CMS Strategy:
- Complete Projects
- Vertical Integration



US CMS Construction Responsibilities

Complete and Coherent Projects:
- Forward Muon Detector
- Barrel Hadron Calorimeter
- EMU and HCAL Level 1 Triggers
- DAQ Event Builder
- HF, HV, ECAL Readouts
- Endcap Pixel Detector
- ECAL Crystal Industrialization

Common Projects:
- Endcap Return Yoke
- Solenoid Vacuum Tank



E-892 (Green) The US CMS Collaboration at Fermilab

Fermilab
(and 38 other US institutions)

Status: *No Data Yet*

The Compact Muon Solenoid (CMS) is one of two high p_t experiments to be built at the CERN Large Hadron Collider (LHC). The primary physics goal of CMS is to explore electroweak symmetry breaking - the origin of mass. To that end, the basic philosophy of CMS is to enclose the tracking and calorimetry inside a strong **S**olenoidal magnet. This design allows for a **C**ompact design allowing optimal **M**uon detection without compromise to the electromagnetic calorimetry because of inert material. In general CMS is optimized for electrons, photons, muons, neutrinos and jets. The Higgs decay modes imply an emphasis on lepton detection. At the high luminosities to be used at the LHC, the charged lepton of choice is the muon due to its relatively clean signature. Neutrinos and jets may also be used in higher-rate but also higher-background signatures, $H \rightarrow ZZ \rightarrow llvv$, $H \rightarrow WW \rightarrow jjlv$.

There are about 1650 physicists in the CMS Collaboration who plan to build the detector for a cost of around 475 M Swiss Francs. The detector is to be built from 1997 until data-taking in 2005. The composition of CMS is roughly 50% physicists from member states, 30% from Russia and other non-member states, and 20% US groups. The US CMS Collaboration consists of about 360 physicists and engineers from 39 institutions (4 national labs). The collective goal of this group is to pursue high energy physics at the energy frontier which will be available at CMS. We find the physics opportunities compelling.

Test beam data was taken in 1995/96/97 by subgroups of US CMS involved in Hadron Calorimetry (HCAL), Endcap Muon Chambers (EMU), Electromagnetic Calorimetry (ECAL) and Tracking. The Fermilab group is particularly active in HCAL and EMU. The CMS Project Managers for both HCAL and EMU are members of the Fermilab group. During 1996 engineering studies were carried out with the aim of beginning the conceptual designs which will culminate in a full Technical Design Report in 1997, followed by the fabrication of preproduction prototypes. The CMS Fermilab group is heavily involved both in test beam R&D and in engineering design. The HCAL Technical Design Report was written at Fermilab and submitted to CERN in July 1997. The EMU Technical Design Report was partially written at Fermilab and submitted in December 1997.

Fermilab has also accepted to act as the "host laboratory" for the US CMS collaboration. Therefore, Fermilab will provide a focal point for US CMS. The Project Management of US CMS will be centralized and located at Fermilab. The intent is to utilize existing infrastructure at Fermilab for muon chamber construction, the production of calorimeter optical readout, the mechanical layout of tracking detectors, and the pipelined electronic readout of

all the HCAL devices. In addition, the fact that Fermilab is the location of the US HEP hadronic collider program, means that the synergy between CDF and D0 upgrades and CMS design and construction is available. For example, high-rate triggering and data acquisition is an area where Fermilab will contribute expertise to CMS.

In turn, working on CMS will enhance the art of detector building in the US, especially in the demanding environment found in high-luminosity hadron colliders. The operational experience obtained at CDF and D0 is crucial in ensuring a realistic detector design for CMS. In addition, the use of Fermilab facilities by university groups, such as the facilities for silicon detectors being developed for the Run II collider program, represents a low cost way for Fermilab to support university groups within the US CMS Collaboration.

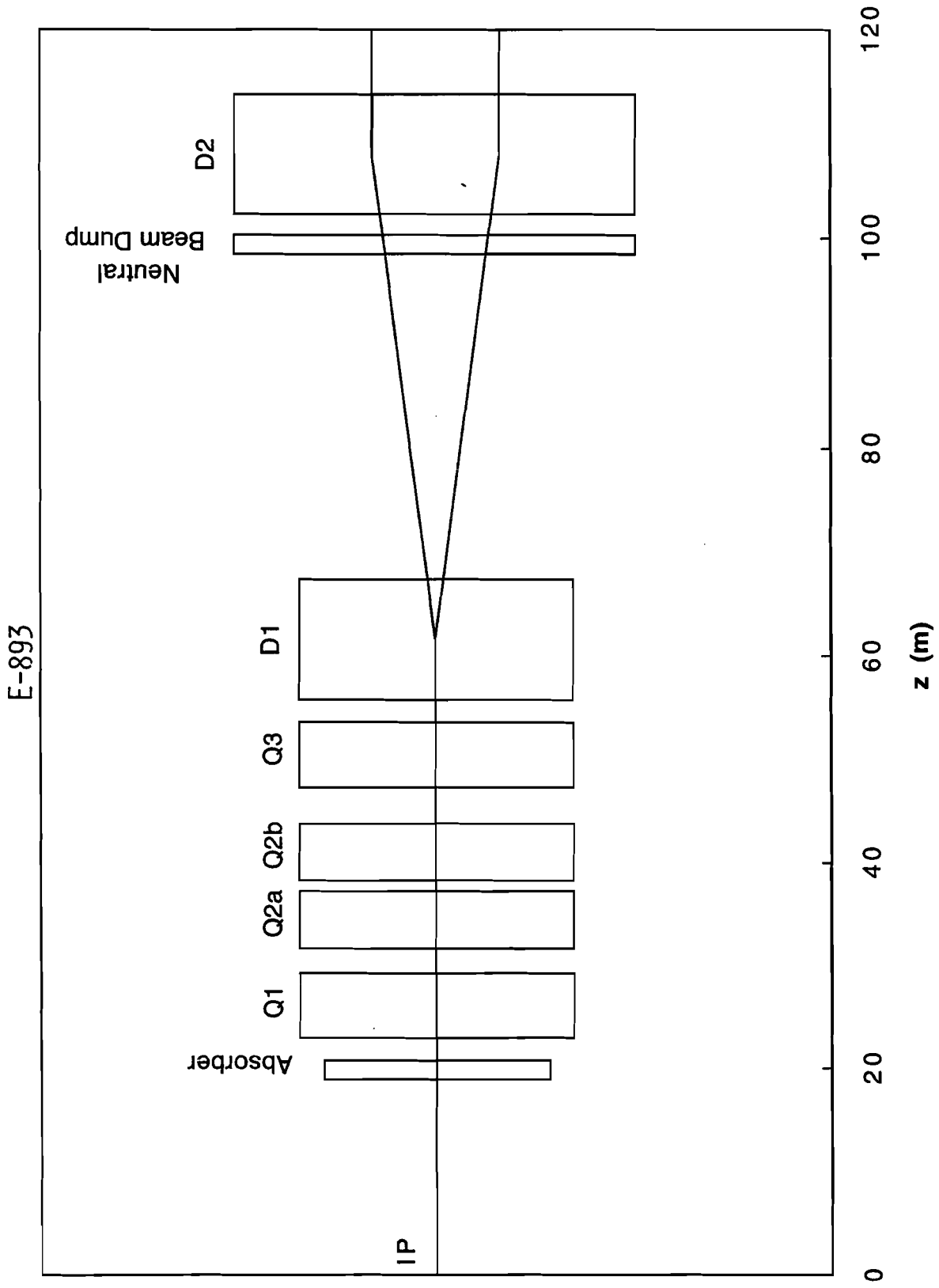
At present, KEK operates a remote control room to enable Japanese physicists to stand shift on CDF. Based on this positive experience, we imagine that a similiar remote control room could be set up at Fermilab in order to enable US physicists to stand shift on CMS. In general, the aim of Fermilab is to enable US CMS physicists to do physics at their home institution or within the U.S. if at all possible.

Fermilab has considerable experience operating computing farms of workstations as a cost effective method of providing analysis power to CDF and D0. It is thought that this expertise will translate well to support of US CMS. Fermilab plans to explore the operational meaning of "host laboratory to US CMS." Clearly, the decade-long experience of Fermilab in the running of the US hadron collider experimental program makes it a natural nucleation point.

Experience on existing hadron collider experiments at Fermilab and CERN and on the R&D associated with the SSC makes it possible for US physicists to have a major impact on the design of CMS. US physicists have been assigned distinct and coherent managerial and construction responsibilities as seen in the accompanying figures. We are the managers for HCAL, EMU, and the trigger system.

The US groups will also, as noted in the Letter of Intent (LoI) to DOE and NSF, take proportional responsibilities for the costs of common projects, such as the solenoid. Specifically, US physicists have positions of responsibility for the solenoid vacuum vessel and the endcap steel return yoke. Fermilab is very involved in the engineering analysis of the vacuum vessel, as that device supports the HCAL for which we are responsible. The aim is ultimately to provide in-kind contributions to CMS bid and bought in the US.

The experiment is presently scheduled to commence in 2005. It will subsequently have at least a decade lifetime, LHC being at present the sole facility in the world capable of addressing the physics of the TeV mass scale. Currently an interim MOU for CMS has been signed by US and CERN representatives.


E-893
IP
Absorber
Q1
Q2a
Q2b
Q3
D1
Neutral
Beam Dump
D2
0
20
40
60
80
100
120
z (m)

E-893 (Strait) Design and Construction of Interaction Regions at the CERN Large Hadron Collider (LHC)

Fermilab
(BNL, LBL)

Status: *No Data Yet*

Fermilab, Brookhaven National Laboratory and Lawrence Berkeley Laboratory have formed a collaboration to contribute to the design and construction of the Large Hadron Collider (LHC) which will be built at CERN. The US efforts will focus primarily on the interaction regions (IRs), with the US taking significant responsibility for the design and construction of at least two, and possibly all four IRs. (Other contributions will include special twin-aperture dipoles for the RF straight section and superconducting cable R&D and testing.) Fermilab will work exclusively on the IRs and is leading this effort. The current status is that an Interim Implementing Arrangement for this collaboration is almost ready for signature by CERN and US laboratories.

The layout shows one half of an IR. It consists of four strong (>200 T/m), large aperture (70 mm) superconducting quadrupoles (Q1-Q3), which focus to beam at the interaction point (IP), and two dipole magnets, one single-aperture (D1) and one twin-aperture (D2) which bring the beams from their separated orbits into collisions at the IP. The dipoles are superconducting at two of the four IRs and are conventional magnets at the other two. The US Laboratory Collaboration will supply all of the superconducting magnets shown in the layout.

Fermilab will design and build the high-gradient quadrupoles which are the centerpiece of the IR project and are among the most challenging magnets required for the LHC. Figure 1 is a cross-section of the magnet currently under design. These magnets are required to operate at an unprecedentedly high gradient, at least 50% higher than the Low Beta Quadrupoles in the Tevatron Collider. Their field quality must be excellent over a large fraction of the aperture, since under collision conditions these quadrupoles are expected to be the main determinant of the dynamic aperture of the LHC. In addition, these magnets will be subject to substantial heating due to the interaction of secondary particles from p-p collisions at the interaction point. The development, construction and testing of these very challenging quadrupoles will ensure that Fermilab and the US HEP program remain at the cutting edge of superconducting accelerator magnet technology. No matter what technology is used to build future higher energy colliders, it is certain that they will require quadrupoles of the highest possible gradient in their interaction regions. Thus this project looks forward to machines beyond the LHC as well as to the LHC itself. In addition, these quadrupoles, or ones very much like them, can be used to upgrade the Tevatron Collider. New quadrupoles will be required for the mini-collider region being considered for

C0, and stronger quadrupoles at the CDF and D0 interaction regions will be able to free valuable space for improved shielding, beam instrumentation and forward detectors that may be required as the Collider luminosity grows.

The R&D program for the high gradient quadrupole is well underway. As we design the new quadrupole, we are also using several models of the existing Tevatron Low Beta Quadrupoles as a test bed for new design ideas, and we have entered into collaborations with industry and other Labs to develop improved superconducting wire that will ensure that the quadrupoles can reach the highest possible gradient. We will begin winding the first coils for the new high gradient quadrupole in the spring of 1997 and the first model magnet will be completed later in the year. The quadrupole development program is the base around which we will build a broader superconducting magnet R&D program looking at high-field or low-cost magnets for use in proposed future hadron or muon colliders.

In addition to building the quadrupoles themselves, Fermilab, together with the other labs in the collaboration, intends to take major responsibility for all aspects of the interaction region construction, from the interaction point out through the beam separation-recombination dipoles. This includes the construction of cryostats, cryogenic feed boxes, power lead boxes, and the integration of these and other components into the CERN accelerator system. This level of responsibility requires that we be involved in the accelerator physics as well as the technology of the IRs. Preliminary discussions have taken place among the accelerator physics groups at Fermilab, CERN and the other US Labs, and several areas of potential collaboration have been identified. Since the middle of 1995 we have had a physicist stationed at CERN working with the group responsible for all of the LHC insertions, and smooth working relations are being established. We have already made significant contributions to the design of absorber systems (shown in the layout) which are necessary to limit the beam heating of the magnets. By taking this global approach to the design and construction of the LHC IRs, we have an excellent opportunity to be deeply involved in a forefront hadron collider project and to begin to build the sort of global collaboration that will be necessary to build future colliders beyond the LHC. Our work on the advanced accelerator physics and technology of the LHC, together with our continuing efforts to improve the Tevatron Collider, will maintain and improve our position as accelerator builders at the energy frontier, a position essential if we aspire to lead the construction of future colliders.

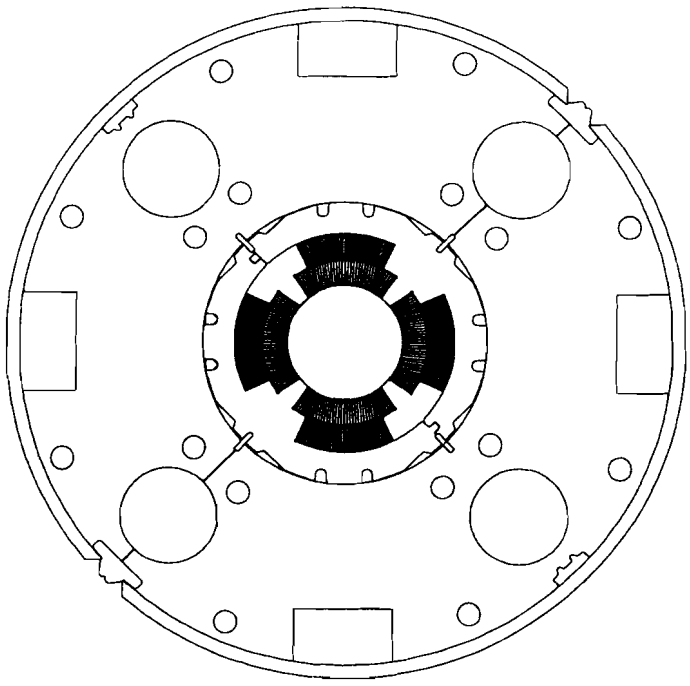
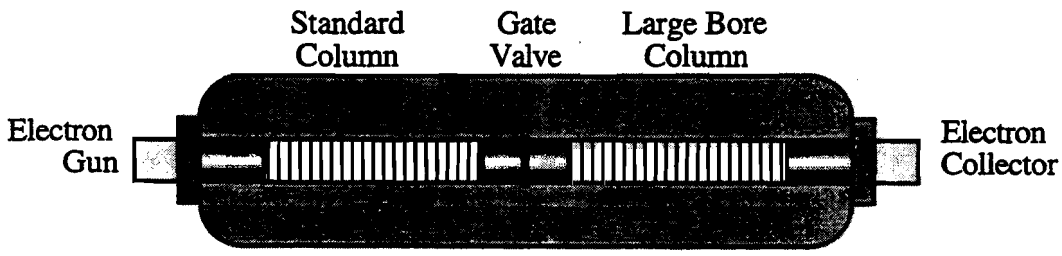


Figure 1. Cross-section of the LHC interaction region quadrupole currently under development at Fermilab.

E-901



Pelletron for the Electron Cooling Experiment

E-901 (Jackson) Recycler Medium Energy Electron Cooling Experiment

BINP (Russia), Fermilab, IHEP/Beijing (China), Indiana

Status: *No Data Yet*

The purpose of this experiment is to study the technical issues surrounding the implementation of electron cooling in the Recycler. There are two 5 MeV kinetic energy electron accelerators to be constructed and operated to perform this research.

The first is an electrostatic pelletron to study the effects of solenoidal magnetic field, enlarged aperture, and high beam currents on electrostatic voltage stability. A sketch of the pelletron is shown in the accompanying figure. It is approximately 30 ft long and 7 ft in diameter. Associated with the pelletron is an SF_6 gas handling system composed of vacuum pumps, dryers, compressors, and heat exchangers. The central electrode housing the gate valve is charged to 5 MV using a charging chain system.

The second is a modified betatron, a rapid cycling betatron in which a solenoidal field provides stability against space charge beam dynamics effects. The modified betatron is very important for two reasons. First, it is the only accelerator technology option under active consideration that can go to arbitrarily high currents. Second, it can go to much higher energies in a straightforward manner. The modified betatron is a planar racetrack machine which is approximately 5 ft across and 20 ft long.

The plan is to have both accelerators installed and operated in a common radiation enclosure. At the Wideband Photon Laboratory (WPL), the floor of the experimental pit is sufficiently shielded and interlocked. An additional safety concern is the oxygen deficiency hazard posed by the heavy and inert SF_6 gas used as a dielectric in the pelletron. If a leak occurred, approximately 8,300 cu ft of air would be displaced at the floor of the enclosure housing the pelletron.

It is expected that this experiment will run until electron cooling has been installed in the Recycler itself. At present, the beginning of calendar year 2001 is the anticipated date for this transition. If the E-831 collaboration at WPL is running during an upcoming fixed-target run, we are planning on deferring enclosure entries around their schedule.

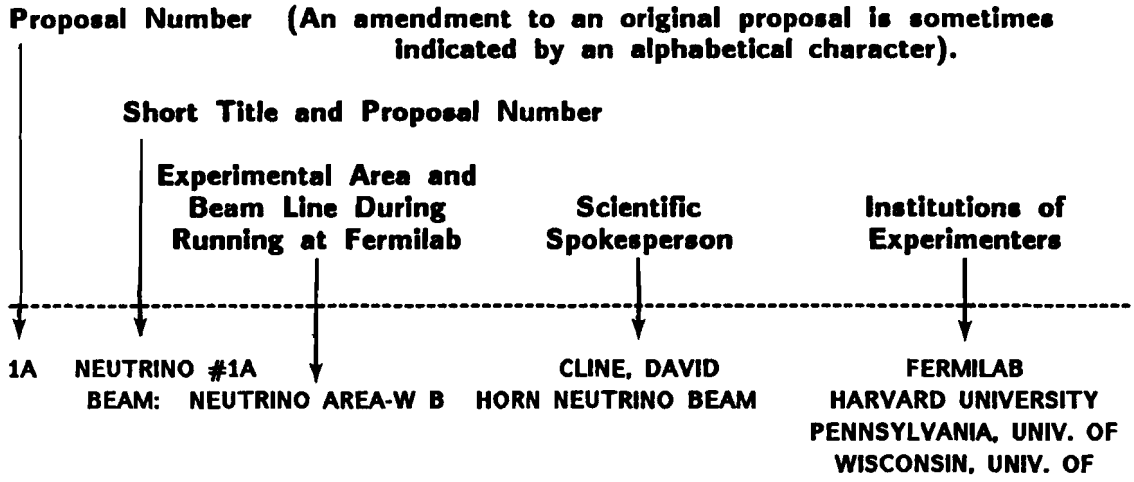
SECTION IX. MASTER LIST OF PROPOSALS

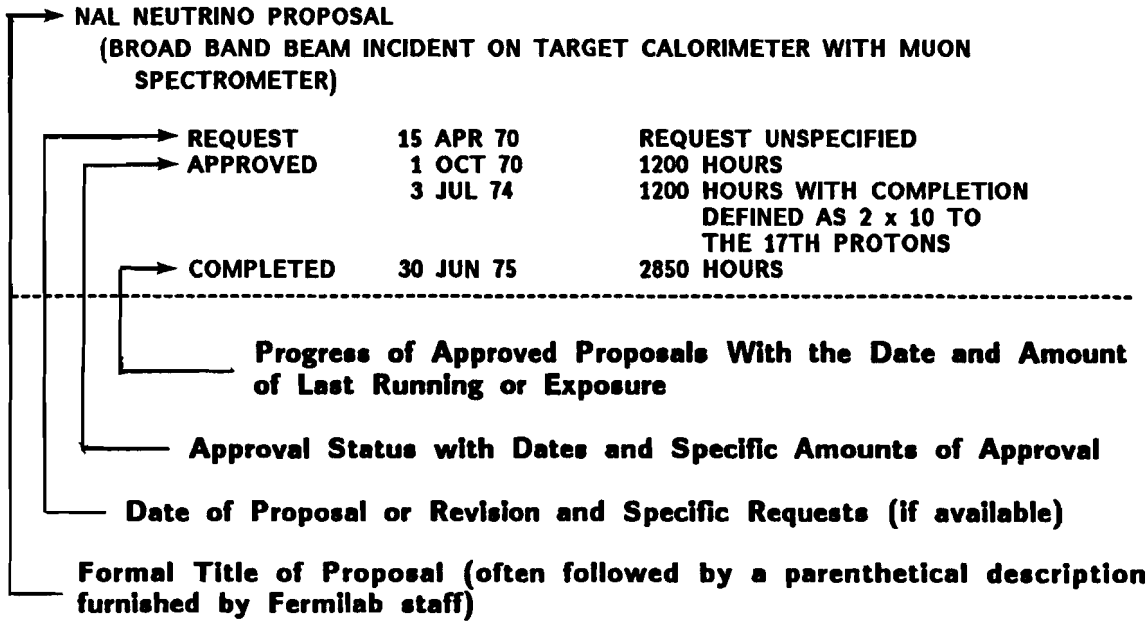
The Master List of proposals contains an entry for each proposal submitted to Fermilab; a typical entry is explained on the next page. In addition to the formal title of the proposal and a brief parenthetical explanation, the name of the spokesperson and a list of participating institutions are included. In the lower part of each entry the specific requests for running time to complete the experiment are listed together with approval action by the Laboratory. For approved proposals only, the amount of running time granted is given together with the current status and extent of beam time used so far.

Most of the information about each proposal stored in the Program Planning Office data file is given in the Master List; lists of proposals shown elsewhere in this Workbook are based on the information contained in the Master List.

For proposals with number below 700, only those which are approved or unconsidered or deferred are listed in the following pages; those with obsolete status (rejected or withdrawn/inactive) are omitted, which explains the gaps in the sequential listing. The complete listing is given starting with proposal 700.

EXPLANATION OF A TYPICAL ENTRY IN THE MASTER LIST





Note: For proposals having a number below 700 only the approved and pending ones are listed.
Total number of proposals - 902 ... Total number of approved & pending proposals - 444

1A NEUTRINO #1A — David B. Cline — FERMILAB, HARVARD UNIVERSITY, UNIVERSITY OF PENNSYLVANIA, UNIVERSITY OF WISCONSIN - MADISON

BEAM: Neutrino Area - Wide Band Horn
NAL NEUTRINO PROPOSAL.
(Broad band beam incident on target calorimeter with muon spectrometer.)

Request	15 Apr, 70	Unspecified	
Approval	1 Oct, 70	1,200 Hours	
	3 Jul, 74	1,200 Hours	with completion of the experiment defined as 20,000 events with 2 x 10 to the 17th protons on a horn-focused beam
Completed	30 Jun, 75	2,850 Hours	

2B 30-INCH HYBRID #2B — Gerald A. Smith — DUKE UNIVERSITY, FERMILAB, IOWA STATE UNIVERSITY, UNIVERSITY OF MARYLAND, MICHIGAN STATE UNIVERSITY, NOTRE DAME UNIVERSITY, PURDUE UNIVERSITY, UNIVERSITY OF TORONTO (CANADA), UNIVERSITY OF WISCONSIN - MADISON

BEAM: Neutrino Area - 30 in. Hadron Beam
STUDY OF MULTIPARTICLE P-P AND PI-P INTERACTIONS FROM 100 GEV/C TO 400 GEV/C WITH A 30-INCH BUBBLE CHAMBER-OPTICAL SPARK CHAMBER HYBRID SYSTEM.

Request	11 May, 70	Unspecified	but to include an exposure for study of p - p and pi- - p interactions from 75 to 300 GeV	
	29 Apr, 71	500 K Pix		
Approval	1 May, 71	450 K Pix	100K pix of p - p @ 200 GeV	ANL/Fermilab, MSU, ISU, MD
			100K pix of p - p @ 300 GeV)	
			120K pix of pi minus - p @ 200 GeV	Duke, Toronto, Notre Dame
			50K pix of pi minus - p @ 100 GeV)	
			80K pix of pi plus - p @ 100 GeV	Purdue, Wisconsin
Completed	22 Apr, 74	479 K Pix	114K pix of p - p @ 200	
			105K pix of p - p @ 300	
			123K pix of pi- - p @ 200	
			54K pix of pi- - p @ 100	
			83K pix of pi+ - p @ 100	
			bonus pix: 350K pix from #37A, #121A, #125, #137, #138, #141A, #143, #252	

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3 MONOPOLE #3 — Philippe Eberhard — LAWRENCE BERKELEY LABORATORY

BEAM: Neutrino Area - Miscellaneous
PROPOSAL FOR A SEARCH FOR MAGNETIC MONOPOLES AT NAL.
(Ferromagnetic target located in a beam dump.)

Request	20 May, 70	Target Exposure(s) to 1 x 10 to 18th protons
Approval	1 Aug, 70	Target Exposure(s)
Completed	4 Sep, 74	4 Targets Exposed

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4 NEUTRON CROSS SECTION #4 — Michael J. Longo — LAWRENCE BERKELEY LABORATORY, UNIVERSITY OF MICHIGAN - ANN ARBOR

BEAM: Meson Area - M3 Beam
NEUTRON TOTAL CROSS SECTIONS UP TO 300 GEV.
(Total cross sections on H2, D2, heavy nuclei to < 2%.)

Request	20 May, 70	300 Hours	with 100 hours for tune up and 200 hours for data to measure total cross sections
Approval	1 Aug, 70	400 Hours	
Completed	20 Mar, 74	1,450 Hours	

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7 ELASTIC SCATTERING #7 — Donald I. Meyer — ARGONNE NATIONAL LABORATORY, FERMILAB, INDIANA UNIVERSITY, UNIVERSITY OF MICHIGAN - ANN ARBOR

BEAM: Meson Area - M1 Beam
PROPOSAL TO MEASURE PI+(-) - P AND P-P DIFFERENTIAL ELASTIC SCATTERING CROSS SECTIONS FROM 50 TO 170 GEV/C.
(In addition, data will be taken on K+(-) - p and pbar - p simultaneously; t from 0.1 - 2.0 or 3.0.)

Request	10 Jun, 70	1,600 Hours
Approval	1 Aug, 70	800 Hours
Completed	28 Jan, 75	2,350 Hours

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8 NEUTRAL HYPERON #8 — Lee G. Pondrom — UNIVERSITY OF MICHIGAN - ANN ARBOR, RUTGERS UNIVERSITY, UNIVERSITY OF WISCONSIN - MADISON

BEAM: Meson Area - M2 Beam
EXPERIMENTS IN A NEUTRAL HYPERON BEAM.
(Beam survey, delta s = 2 decay search, and lambda - p scattering.)

Request	12 Jun, 70	260 Hours for data
Approval	1 Aug, 70	400 Hours
Completed	22 Mar, 76	2,450 Hours

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12 NEUTRON BACKWARD SCATTERING #12 — Neville W. Reay — CARELTON UNIVERSITY (CANADA), MICHIGAN STATE UNIVERSITY, OHIO STATE UNIVERSITY

BEAM: Meson Area - M3 Beam
A STUDY OF NEUTRON-PROTON CHARGE-EXCHANGE SCATTERING IN THE MOMENTUM RANGE 50-300 GEV/C.
(u from 0.002 - 1.0.)

Request	15 Jun, 70	760 Hours
Approval	1 Aug, 70	600 Hours with priority lower than exp #4
Completed	2 Dec, 74	1,300 Hours

14A PROTON-PROTON INELASTIC #14A — Paolo Franzini — COLUMBIA UNIVERSITY, SUNY AT STONY BROOK

BEAM: Neutrino Area - Miscellaneous
PROPOSAL TO STUDY INELASTIC HIGH-ENERGY PROTON-PROTON COLLISIONS IN THE DIFFRACTIVE REGION.
(t from 0.001 - 0.07 and missing mass to 10 GeV.)

Request	15 Jun, 70	200 Hours
Approval	1 Mar, 71	150 Hours with low priority
Completed	21 Jun, 73	140 Hours

21A NEUTRINO #21A — Barry C. Barish — CALIFORNIA INSTITUTE OF TECHNOLOGY, FERMILAB

BEAM: Neutrino Area - Dichromatic
NEUTRINO PHYSICS AT VERY HIGH ENERGIES.
(Dichromatic beam incident on target calorimeter with muon spectrometer.)

Request	15 Jun, 70	750 Hours	
Approval	1 Aug, 70	1,200 Hours	
	26 Jun, 74	1,200 Hours	with the inclination for the completion of exp# 21A (approximately 400 hours) to have a lower priority than running for exp# 320
	11 Nov, 74	1,200 Hours	with remaining running to be coordinated with exp# 254
Completed	2 Nov, 75	2,450 Hours	

22 MULTIGAMMA #22 — George B. Collins — BROOKHAVEN NATIONAL LABORATORY; VIRGINIA TECH
BEAM: Meson Area - M2 Beam
EXPERIMENTAL PROPOSAL TO THE NATIONAL ACCELERATOR LABORATORY FOR A SEARCH FOR MULTIGAMMA EVENTS FROM MAGNETIC MONOPOLE PAIRS.

Request	15 Jun, 70	100 Hours	for data
Approval	1 Aug, 70	200 Hours	for hadron beam use only
Completed	26 Jun, 74	350 Hours	

25A PHOTON TOTAL CROSS SECTION #25A — David O. Caldwell — UNIV. OF CALIFORNIA, SANTA BARBARA; FERMILAB; LEBEDEV PHYSICAL INST. (RUSSIA); UNIVERSITY OF TORONTO (CANADA)
BEAM: Proton Area - East
MEASUREMENT OF THE TOTAL PHOTOABSORPTION CROSS SECTION ON H, D, C, CU, AND PB FOR PHOTON ENERGIES FROM 14 TO 300 GEV, AND A SEARCH FOR THE PHOTOPRODUCED MONOPOLE.

Request	15 Jun, 70	400 Hours	for data
Approval	1 Aug, 71	600 Hours	with 200 hours for tuning, 400 hours for data
	26 Oct, 76	1,000 Hours	with additional 400 hours for the experiment to continue data taking until 30 Nov 1976
Completed	30 Nov, 76	1,850 Hours	

26 MUON #26 — Louis N. Hand — UNIV. OF CALIFORNIA, SAN DIEGO; CORNELL UNIVERSITY; LAWRENCE BERKELEY LABORATORY; MICHIGAN STATE UNIVERSITY
BEAM: Neutrino Area - Muon/Hadron Beam
HIGH MOMENTUM TRANSFER INELASTIC MUON SCATTERING AND TEST OF SCALE INVARIANCE AT NAL.

Request	15 Jun, 70	Unspecified	
Approval	1 Aug, 70	500 Hours	
	6 Aug, 73	500 Hours	defined as 3 x 10 to the 17th protons
Completed	16 Apr, 74	900 Hours	

27A NEUTRON DISSOCIATION #27A — Jerome L. Rosen — FERMILAB; UNIVERSITY OF MASSACHUSETTS; NORTHWESTERN UNIVERSITY; UNIVERSITY OF ROCHESTER
BEAM: Meson Area - M3 Beam
PROPOSAL TO STUDY THE COHERENT DISSOCIATION OF NEUTRONS.

Request	15 Jun, 70	Unspecified	
Approval	1 Mar, 71	200 Hours	for low priority Stage I running
Completed	24 Apr, 74	850 Hours	

28A 15-FOOT NEUTRINO/H2&NE #28A — William F. Fry — CERN (SWITZERLAND); UNIVERSITY OF HAWAII AT MANOA; LAWRENCE BERKELEY LABORATORY; UNIVERSITY OF WISCONSIN - MADISON
BEAM: Neutrino Area - Wide Band Horn
SEARCH FOR HEAVY LEPTONS AND HARD PENETRATING RADIATION IN THE NEUTRINO BEAM; STUDY DIFFRACTION SCATTERING OF NEUTRINOS AND DEEP INELASTIC MUON-NEUTRINO SCATTERING IN A NEON BUBBLE CHAMBER AT NAL; TEST OF DELTA S=DELTA Q RULE @ HIGH MOMENTUM

Request	15 Jun, 70	1,000 K Pix	to include 500K pix with the primary protons incident on the hadron shield and 500K pix with normal targetry
Approval	1 Dec, 71	100 K Pix	with 50K pix of neutrinos in neon (greater than or equal to 30%) with the constraint that running conditions yield at least 10,000 events; and 50K pix of neutrinos using special targeting
	9 May, 75	100 K Pix	total of neutrinos in the 22% neon mixture under horn focusing conditions
Completed	11 Jun, 75	97 K Pix	

31A 15-FOOT ANTI-NEUTRINO/H2 #31A — Malcolm Derrick — ARGONNE NATIONAL LABORATORY; CARNEGIE-MELLON UNIVERSITY; PURDUE UNIVERSITY
BEAM: Neutrino Area - Wide Band Horn
PROPOSAL TO INVESTIGATE MUON-ANTINEUTRINO INTERACTIONS IN HYDROGEN AT NAL.

Request	15 Jun, 70	1,000 K Pix	requiring a total exposure of 10 to the 19th protons with 10 to the 13th protons per pulse on target
Approval	1 Dec, 71	200 K Pix	maximum with the constraint that the running conditions yield at least 7,000 antineutrino interactions
Completed	13 Aug, 77	211 K Pix	

34 DETECTOR DEVELOPMENT #34 — Richard W. Huggett — LOUISIANA STATE UNIVERSITY; MAX-PLANCK INSTITUTE (GERMANY)
BEAM: Neutrino Area - Miscellaneous
NUCLEAR-ELECTROMAGNETIC CASCADE DEVELOPMENT STUDY.
(Ionization spectrometer development.)

Request	15 Jun, 70	400 Hours	in two calibration runs
Approval	1 Aug, 70	Parasitic Running	
Completed	26 Jun, 74	50 Hours	

36A PROTON-PROTON SCATTERING #36A — Rodney L. Cool — FERMILAB; JINR, DUBNA (RUSSIA); UNIVERSITY OF ROCHESTER; ROCKEFELLER UNIVERSITY
BEAM: Internal Target Area (C-0)
A PROPOSAL TO STUDY SMALL ANGLE P-P SCATTERING AT VERY HIGH ENERGIES.
(Using a gas jet target and the internal proton beam.)

Request	15 Jun, 70	550 Hours	
Approval	1 Feb, 71	500 Hours	
Completed	24 Jun, 73	700 Hours	

37A 30-INCH P-P @ 300 #37A — Ernest I. Malamud — CALIFORNIA INSTITUTE OF TECHNOLOGY; UNIV. OF CALIFORNIA, LOS ANGELES; FERMILAB; INDIANA UNIVERSITY
BEAM: Neutrino Area - 30 in. Hadron Beam
MULTIBODY FINAL STATES IN PP COLLISIONS UP TO 500 GEV.

Request	15 Jun, 70	250 K Pix	of p - p interactions at 100,200,300,400,500 GeV in 15-foot chamber
	3 May, 71	100 K Pix	of p - p interactions at one fixed high energy in 30-inch chamber
Approval	26 Aug, 71	50 K Pix	in bare chamber with events where there is downstream spark chamber data to be shared with exp #2B
Completed	1 Jun, 73	51 K Pix	

45A 15-FOOT NEUTRINO/H2 #45A — Frank A. Nezrick — FERMILAB; UNIVERSITY OF HAWAII AT MANOA; LAWRENCE BERKELEY LABORATORY; UNIVERSITY OF MICHIGAN - ANN ARBOR
BEAM: Neutrino Area - Wide Band Horn
PROPOSAL TO STUDY NEUTRINO INTERACTIONS WITH PROTONS USING THE 15-FOOT BUBBLE CHAMBER AT NAL.

Request	15 Jun, 70	200 K Pix	with 10 to the 13th protons/pulse of at least 200 GeV
	19 Jul, 71	500 K Pix	with 10 to the 13th protons/pulse at 350 GeV
Approval	17 Dec, 71	300 K Pix	maximum with the constraint that the running conditions yield on the order of 15,000 events of neutrinos in hydrogen
Completed	13 Jan, 76	162 K Pix	

48 MUON SEARCH #48 — Robert K. Adair — BROOKHAVEN NATIONAL LABORATORY; FERMILAB; YALE UNIVERSITY
BEAM: Proton Area - Center
A MEASUREMENT OF THE INTENSITY AND POLARIZATION OF MUONS PRODUCED DIRECTLY BY THE INTERACTIONS OF PROTONS WITH NUCLEI.

Request	15 Jun, 70	200 Hours	
Approval	1 Dec, 70	200 Hours	for an exploratory experiment
Completed	1 Dec, 75	500 Hours	

51A MISSING MASS #51A — Eberhard Von Goeler — NORTHEASTERN UNIVERSITY
BEAM: Meson Area - M2 Beam
MASS SPECTRA AND DECAY MODES FOR HADRONS WITH MASSES UP TO 15 GEV.

Request	15 Jun, 70	850 Hours	
Approval	14 Aug, 73	300 Hours	with low priority
Completed	23 Oct, 74	800 Hours	

53A 15-FOOT NEUTRINO/H2&NE #53A — Charles Baltay — BROOKHAVEN NATIONAL LABORATORY
BEAM: Neutrino Area - Wide Band Horn — COLUMBIA UNIVERSITY
SEARCH FOR THE INTERMEDIATE BOSON, LEPTON PAIR PRODUCTION, AND A STUDY OF DEEPLY INELASTIC REACTIONS UTILIZING HIGH ENERGY NEUTRINO INTERACTIONS IN LIQUID NEON.

Request	15 Jun, 70	1,000 K Pix	of neutrino interactions in 15-foot with 70% neon and 30% deuterium and with inserted plate
	6 Jul, 71	1,000 K Pix	with 900K pix of neutrino interactions in neon with single plate and 100K pix in hydrogen with two plates
	16 Jun, 76	200 K Pix	requested increase of the approved picture total from 100K to 200K
	25 Jan, 78	450 K Pix	to include an increase of 300K beyond the approximately 150K pix presently available for the experiment; at least 150K pix additional are requested during the summer or fall of 1978
	19 Jun, 78	450 K Pix	to include an increase of 300K pix; this follows rejection of the
Approval	17 Dec, 71	100 K Pix	in neon or plates to yield at least 20,000 events total including
	29 Jun, 76	150 K Pix	total including about 50K pix already taken
	28 Jun, 78	450 K Pix	total including an extension for 300K pix
Completed	9 Mar, 81	440 K Pix	

61 POLARIZED SCATTERING #61 — Owen Chamberlain — ARGONNE NATIONAL LABORATORY; FERMILAB; HARVARD UNIVERSITY; LAWRENCE BERKELEY LABORATORY; SUFFOLK UNIVERSITY; YALE UNIVERSITY
BEAM: Meson Area - M1 Beam
A PROPOSAL TO MEASURE POLARIZATION IN P P, PI- P, AND PI+ P ELASTIC SCATTERING AT 50, 100, AND 150 GEV/C.

Request	15 Jun, 70	1,100 Hours	for setup, tests, and data
	10 Mar, 77	1,600 Hours	to include additional time for 4 weeks of data at 300 GeV and 1 week at 100 GeV; running requires accelerator operation at those energies
Approval	1 Aug, 70	800 Hours	
	24 Jun, 77	1,200 Hours	with an attempt to provide 300 GeV data under the condition that the running not interfere with other major laboratory programs
Completed	26 Oct, 77	1,900 Hours	

63A PHOTON SEARCH #63A — James K. Walker — FERMILAB; UNIVERSITY OF HAWAII AT MANOA; NORTHERN ILLINOIS UNIVERSITY
BEAM: Internal Target Area (C-0)
SURVEY OF PARTICLE PRODUCTION IN PROTON COLLISIONS AT NAL.
(Photon production in proton collisions at the Internal Target Area; see also exp #284.)

Request	15 Jun, 70	Unspecified	
Approval	17 Dec, 70	400 Hours	
	19 Oct, 73	400 Hours	with understanding that additional photon production data would be taken at 60, 50, 40, 30, and 20 mrads
Completed	13 Mar, 75	2,600 Hours	

67A PROTON-PROTON MISSING MASS #67A — Felix Sannes — FLORIDA STATE UNIVERSITY; RUTGERS UNIVERSITY; UPSALA COLLEGE
BEAM: Internal Target Area (C-0)
SEARCH FOR BARYON RESONANCES UP TO 10 GEV MASS PRODUCED IN P + P TO P + MM WITH A RESOLUTION OF + OR - 25 MEV.
(Using a gas jet target and the internal proton beam.)

Request	15 Jun, 70	Unspecified	
Approval	1 Feb, 71	100 Hours	
Completed	8 Aug, 73	600 Hours	

69A ELASTIC SCATTERING #69A — Joseph Lach — FERMILAB; RUTHERFORD-APPLETON LABS.(ENGLAND); YALE UNIVERSITY
BEAM: Meson Area - M6 Beam
ELASTIC SCATTERING OF THE LONG-LIVED HADRONS.
(Small angle scattering to t of 0.2 and coulomb interference.)

Request	15 Jun, 70	380 Hours	of 'ideal time' to make coulomb interference measurements with stable particles and diffraction peak measurements with hyperons
	1 Dec, 70	180 Hours	of 'ideal time' to make coulomb interference measurements with stable particles; also see exp# 97 and 497
Approval	15 Sep, 70	600 Hours	
Completed	3 Mar, 76	2,800 Hours	

70 LEPTON #70 — Leon M. Lederman — COLUMBIA UNIVERSITY; FERMILAB
BEAM: Proton Area - Center
STUDY OF LEPTON PAIRS FROM PROTON-NUCLEAR INTERACTIONS; SEARCH FOR INTERMEDIATE BOSONS AND LEE-WICK STRUCTURE.

Request	23 Jun, 70	2,800 Hours	to include about 1,700 hours for study of single lepton production and 1,100 hours for study of lepton pairs
Approval	1 Dec, 70	600 Hours	
Completed	1 Dec, 74	2,800 Hours	

72 QUARK #72 — Lawrence B. Leipuner — BROOKHAVEN NATIONAL LABORATORY; YALE UNIVERSITY
BEAM: Meson Area - M4 Beam
EXPERIMENTAL PROPOSAL TO NAL -- QUARK SEARCH.
(By measuring ionization energy loss.)

Request	15 Jun, 70	100 Hours	for data taking
Approval	1 Aug, 70	200 Hours	
Completed	11 Jun, 73	500 Hours	

75 QUARK #75 — Taiji Yamanouchi — FERMILAB; NEW YORK UNIVERSITY
BEAM: Meson Area - M2 Beam
A PROPOSAL TO SEARCH FOR FRACTIONALLY CHARGED QUARKS.
(Measurement of ionization and total energy of fractionally charged particles using momentum selection.)

Request	29 Jun, 70	200 Hours	for tests and data taking
Approval	1 Sep, 70	200 Hours	
Completed	8 Sep, 73	1,050 Hours	

76 MONOPOLE #76 — Richard A. Carrigan — FERMILAB
BEAM: Neutrino Area - Miscellaneous
SEARCH FOR MAGNETIC MONOPOLES PRODUCED AT NAL.
(Employing a beam-dump target.)

Request	15 Jun, 70	Parasitic Running	
Approval	1 Sep, 70	Target Exposure(s) with parasitic running	
Completed	1 Dec, 74	5 Targets Exposed	

81A	NUCLEAR CHEMISTRY #81A	Sheldon Kaufman		ARGONNE NATIONAL LABORATORY BROOKHAVEN NATIONAL LABORATORY CARNEGIE-MELLON UNIVERSITY UNIVERSITY OF CHICAGO UNIV. OF ILLINOIS, CHICAGO CIRCLE PURDUE UNIVERSITY RBL, ORSAY (FRANCE)
	BEAM: Meson Area - Miscellaneous PRELIMINARY SURVEY OF 200 GEV PROTON INTERACTIONS WITH COMPLEX NUCLEI. (Nuclear chemistry analysis.)			
	Request	9 Jul, 70	Parasitic Running	
	Approval	1 Aug, 70	Target Exposure(s)	
	Completed	1 Oct, 78	197 Bombardment(s)	
82	K ZERO REGENERATION #82	Valentine L. Telegdi		UNIV. OF CALIFORNIA, SAN DIEGO UNIVERSITY OF CHICAGO SLAC UNIVERSITY OF WISCONSIN - MADISON
	BEAM: Meson Area - M4 Beam PROPOSAL TO INVESTIGATE REGENERATION OF NEUTRAL K-MESONS AT VERY HIGH ENERGIES. (See exp #425.)			
	Request	13 Jul, 70	1,000 Hours for preliminary run and data taking	
	Approval	15 Sep, 70	800 Hours	
		22 Nov, 74	1,100 Hours total including additional 300 hours with complex nuclear targets	
	Completed	5 Jul, 75	3,500 Hours	
86A	PION DISSOCIATION #86A	Henry J. Lubatti		LAL, ORSAY (FRANCE) UNIVERSITY OF WASHINGTON
	BEAM: Meson Area - M1 Beam A PROPOSAL TO STUDY INELASTIC DIFFRACTIVE PROCESSES BY OBSERVING COHERENT PRODUCTION OF MULTI-PION FINAL STATES FROM HE NUCLEI. (Using a streamer chamber.)			
	Request	24 Jul, 70	1,050 Hours for setup, tests and data taking	
	Approval	28 May, 71	800 Hours with low priority	
	Completed	22 Mar, 76	800 Hours	
87A	PHOTOPRODUCTION #87A	Thomas A. O'Halloran, Jr.		COLUMBIA UNIVERSITY FERMILAB UNIVERSITY OF HAWAII AT MANOA UNIVERSITY OF ILLINOIS, CHAMPAIGN
	BEAM: Proton Area - East PROPOSAL TO SEARCH FOR HEAVY LEPTONS AND INTERMEDIATE BOSONS FROM PHOTON-NUCLEON AND PHOTON-NUCLEI COLLISIONS.			
	Request	30 Jul, 70	Unspecified	
		25 Feb, 71	4,400 Hours for setup, tests, and data taking	
	Approval	1 Aug, 71	600 Hours	
		13 Nov, 75	1,100 Hours with an extension of 500 hours of data taking	
		28 Jul, 77	3,100 Hours with an additional 2,000 hours for study of charmed baryon production	
	Completed	7 May, 78	4,800 Hours	
90	EMULSION/PROTONS @ 200 #90	Wladyslaw Wolter		INP, KRAKOW (POLAND)
	BEAM: Meson Area - Miscellaneous CRACOW NUCLEAR EMULSION EXPOSURES.			
	Request	23 Jun, 70	Emulsion Exposure	
	Approval	1 Aug, 70	Emulsion Exposure	
	Completed	20 Sep, 72	4 Stack(s)	
95A	PHOTON SEARCH #95A	Bradley B. Cox		FERMILAB JOHNS HOPKINS UNIVERSITY
	BEAM: Proton Area - West PROPOSAL FOR EXAMINATION OF WIDE ANGLE GAMMA RAYS AT NAL. (Single and digamma production by proton-nucleon collisions.)			
	Request	26 Oct, 70	100 Hours of data taking with parasitic beam used for setup	
		12 Oct, 76	3,100 Hours for further study of diphoton spectra	
	Approval	1 Jun, 71	400 Hours	
		5 Jan, 77	1,650 Hours with an extension in an effort to approach the 12.5 weeks of running which was requested	
		12 Sep, 77	1,950 Hours with approval of an additional 3 weeks of running at 200/300 GeV	
	Completed	17 Oct, 77	3,400 Hours	
96	ELASTIC SCATTERING #96	David Ritson		ARGONNE NATIONAL LABORATORY UNIVERSITY OF BARI (ITALY) BROWN UNIVERSITY CERN (SWITZERLAND) CORNELL UNIVERSITY FERMILAB MASSACHUSETTS INST. OF TECHNOLOGY NORTHEASTERN UNIVERSITY STANFORD UNIVERSITY
	BEAM: Meson Area - M6 Beam FOCUSING SPECTROMETER FACILITY. (Measure elastic scattering and quasi elastic scattering of pi+(-), K+(-), p+(-) on H2 and D2 up to 200 GeV/c with t up to 1.5.)			
	Request	3 Dec, 70	1,000 Hours for check out and data taking	
	Approval	1 Dec, 70	800 Hours	
	Completed	17 Feb, 75	2,550 Hours	
98	MUON #98	Herbert L. Anderson		UNIVERSITY OF CHICAGO HARVARD UNIVERSITY UNIVERSITY OF ILLINOIS, CHAMPAIGN UNIVERSITY OF OXFORD (ENGLAND)
	BEAM: Neutrino Area - Muon/Hadron Beam MUON-PROTON INELASTIC SCATTERING EXPERIMENT AT THE NATIONAL ACCELERATOR LABORATORY. (Using a large aperture magnet to detect scattered muons and charged hadrons.)			
	Request	2 Dec, 70	1,600 Hours for tests and data taking	
	Approval	19 Jan, 71	400 Hours of initial running with H2 (100 hours of parasitic testing)	
		6 Aug, 73	400 Hours with approval for both D2 and H2	
		26 Jun, 74	800 Hours with additional 400 hours for data taking	
	Completed	17 Feb, 75	1,800 Hours	
99	ASSOCIATED PRODUCTION #99	Robert E. Diebold		ARGONNE NATIONAL LABORATORY FERMILAB SLAC STANFORD UNIVERSITY
	BEAM: Meson Area - M6 Beam A STUDY OF PI+ P TO K+ SIGMA+ AND PI+ P TO K+ Y-STAR+ USING THE FOCUSING SPECTROMETER FACILITY. (Incident momenta from 20 - 120 GeV/c, t from 0.04 - 0.6.)			
	Request	3 Dec, 70	500 Hours for tests and data taking	
	Approval	25 Nov, 74	500 Hours	
	Completed	24 Jan, 78	750 Hours	
100A	PARTICLE SEARCH #100A	Pierre A. Piroue		UNIVERSITY OF CHICAGO PRINCETON UNIVERSITY
	BEAM: Proton Area - East A PROPOSAL TO STUDY PARTICLE PRODUCTION AT HIGH TRANSVERSE MOMENTA. (Measurement of particle production at 90 degrees in c.m. from proton interactions with nuclei.)			
	Request	4 Dec, 70	500 Hours for data taking	
	Approval	1 Feb, 71	500 Hours	
	Completed	4 Apr, 74	1,150 Hours	

103 EMULSION/PROTONS @ 200 #103 — David T. King — UNIVERSITY OF TENNESSEE, KNOXVILLE
BEAM: Meson Area - Miscellaneous
INTRA-NUCLEAR CASCADE PRODUCED BY 200 GEV PROTONS.

Request	21 Dec, 70	Emulsion Exposure
Approval	1 Feb, 71	Emulsion Exposure
Completed	20 Sep, 72	1 Stack(s)

104 TOTAL CROSS SECTION #104 — Thaddeus F. Kycia — BROOKHAVEN NATIONAL LABORATORY
BEAM: Meson Area - M1 Beam — FERMILAB
MEASUREMENT OF TOTAL CROSS SECTIONS ON HYDROGEN AND DEUTERIUM. — MAX-PLANCK INSTITUTE (GERMANY)
(Of pi+-, K+-, p, pbar.) — ROCKEFELLER UNIVERSITY
UNIVERSITY OF WASHINGTON

Request	8 Jan, 71	700	Hours for tests and data taking
	16 Jun, 76	1,300	Hours total with additional 600 hours for completion of cross section data and particle search exp# 354
Approval	8 Mar, 71	700	Hours
	29 Jun, 76	1,300	Hours including an additional 600 hours for the remainder of exp# 104 and exp# 354
Completed	22 Dec, 77	2,650	Hours

105 EMULSION/PROTONS @ 200 #105 — Prince K. Malhotra — JAMMU UNIVERSITY (INDIA)
BEAM: Meson Area - Miscellaneous — PANJAB UNIVERSITY (INDIA)
A PROPOSAL TO STUDY SOME CHARACTERISTICS OF PROTON-NUCLEON AND PROTON-NUCLEUS COLLISIONS AT 400 GEV USING NUCLEAR EMULSIONS. — TATA INSTITUTE (INDIA)

Request	14 Jan, 71	Emulsion Exposure
Approval	1 Apr, 71	Emulsion Exposure
Completed	20 Sep, 72	1 Stack(s)

108 BEAM DUMP #108 — Miguel Awschalom — FERMILAB
BEAM: Meson Area - M2 Beam
A BEAM DUMP EXPERIMENT.
(Study of shielding including hadron cascade development, muon attenuation, radioactivity.)

Request	4 Feb, 71	40	Hours for irradiation
Approval	1 Mar, 71	40	Hours
Completed	2 Jun, 75	350	Hours

110A MULTIPARTICLE #110A — Alexander R. Dzierba — CALIFORNIA INSTITUTE OF TECHNOLOGY
BEAM: Meson Area - M6 Beam — UNIV. OF CALIFORNIA, LOS ANGELES
PROPOSAL TO STUDY MULTIPARTICLE PERIPHERAL PHYSICS AT NAL. — FERMILAB
(Using a large wire chamber magnetic spectrometer.) — UNIV. OF ILLINOIS, CHICAGO CIRCLE
INDIANA UNIVERSITY
MAX-PLANCK INSTITUTE (GERMANY)

Request	15 Feb, 71	400	Hours for test run and overview
	10 Aug, 72	900	Hours for tests and data taking
	21 Oct, 76	900	Hours for data taking
Approval	5 Apr, 72	800	Hours
	16 Nov, 73	600	Hours with understanding that approximately 200 hours of previously approved 800 hours of running will be used for exp# 260
	18 Nov, 76	1,000	Hours with expectation that 800 hours will be used for data taking and 2 weeks for tuneup of beam and equipment
Completed	9 Apr, 78	1,600	Hours

111 PION CHARGE EXCHANGE #111 — Alvin V. Tollestrup — CALIFORNIA INSTITUTE OF TECHNOLOGY
BEAM: Meson Area - M2 Beam — LAWRENCE BERKELEY LABORATORY
PROPOSAL TO STUDY PI- P TO PI0 N AND PI- P TO ETA N AT HIGH ENERGY.

Request	15 Feb, 71	450	Hours for tests and data taking
Approval	1 Feb, 71	400	Hours
Completed	19 Sep, 74	1,800	Hours

114 EMULSION/PROTONS @ 200 #114 — Piyare L. Jain — SUNY AT BUFFALO
BEAM: Meson Area - Miscellaneous
STUDY OF 200-500 GEV PROTON AND PION INTERACTION WITH NUCLEAR EMULSION.

Request	24 Feb, 71	Emulsion Exposure
Approval	1 Mar, 72	Emulsion Exposure
Completed	20 Sep, 72	1 Stack(s)

115 LONG-LIVED PARTICLES #115 — M. Lynn Stevenson — LAWRENCE BERKELEY LABORATORY
BEAM: Neutrino Area - Miscellaneous
SEARCH FOR LONG-LIVED PARTICLES
(Tau greater than or approximately equal 0.1 msec; analysis of particles from a beam dump.)

Request	1 Mar, 71	Parasitic Running
Approval	26 Aug, 71	Parasitic Running
Completed	23 Nov, 74	6 Hours

116 EMULSION/PROTONS @ 200 #116 — Jacques D. Hebert — UNIVERSITY OF BARCELONA (SPAIN)
BEAM: Meson Area - Miscellaneous — CRN, STRASBOURG (FRANCE)
INTERACTION OF HIGH ENERGY PROTONS IN NUCLEAR EMULSIONS LOADED WITH B 10 AND LIF. — FERMILAB
UNIVERSITY OF LYON (FRANCE)
MCGILL UNIVERSITY (CANADA)
UNIVERSITY OF MONTREAL (CANADA)
UNIVERSITY OF OTTAWA (CANADA)
UNIVERSITY OF VALENCIA (SPAIN)

Request	31 Mar, 71	Emulsion Exposure
Approval	1 Apr, 71	Emulsion Exposure
Completed	20 Sep, 72	5 Stack(s)

117A EMULSION/PROTONS @ 200 #117A — Osamu Kusumoto — KINKI UNIVERSITY (JAPAN)
BEAM: Meson Area - Miscellaneous — KOBE UNIVERSITY (JAPAN)
PHENOMOLOGICAL STUDY OF 200 AND 500 GEV/C PROTON-PROTON COLLISIONS IN EMULSION. — OSAKA CITY UNIVERSITY (JAPAN)
OSAKA SCIENCE EDUC. INST. (JAPAN)
WAKAYAMA MEDICAL COLLEGE (JAPAN)

Request	2 Mar, 71	Emulsion Exposure
Approval	1 Apr, 71	Emulsion Exposure
Completed	20 Sep, 72	11 Stack(s)

118A	INCLUSIVE SCATTERING #118A	George W. Brandenburg	UNIVERSITY OF BARI (ITALY)
	BEAM: Meson Area - M6 Beam		BROWN UNIVERSITY
	HADRON SPECTRA FROM HIGH ENERGY INTERACTIONS.		FERMILAB
	(Single particle inclusive spectra from pions, kaons, and protons using single arm spectrometer.)		MASSACHUSETTS INST. OF TECHNOLOGY

Request	3 Mar, 71	950 Hours	for tests and data taking
	20 Jun, 73	1,200 Hours	total with additional 250 hours of data taking
	22 Oct, 76	950 Hours	with an additional 350 hours to extend existing measurements; see proposal #513
Approval	25 Nov, 74	600 Hours	
	18 Nov, 76	950 Hours	with additional 350 hours for continued data taking
Completed	20 Jul, 77	2,550 Hours	

120	PHOTON SEARCH #120	David B. Cline	UNIVERSITY OF CHICAGO
	BEAM: Internal Target Area (C-0)		HARVARD UNIVERSITY
	EARLY PI ZERO PARTICLE PRODUCTION SURVEY WITH THE GAS JET TARGET.		UNIVERSITY OF WISCONSIN - MADISON
	(Also direct photon production using the internal proton beam.)		

Request	9 Mar, 71	Unspecified	
Approval	1 Jun, 71	200 Hours	
Completed	29 May, 73	1,200 Hours	

121A	30-INCH PI+ & P - P @ 100 #121A	Richard L. Lander	UNIV. OF CALIFORNIA, DAVIS
	BEAM: Neutrino Area - 30 in. Hadron Beam		LAWRENCE BERKELEY LABORATORY
	A PROPOSAL TO SEARCH FOR VERY HEAVY STRANGE PARTICLES USING A SMALL HYDROGEN BUBBLE CHAMBER.		

Request	11 Mar, 71	100 K Pix	
	17 May, 71	200 K Pix	total with 50K at each of four incident proton momenta, 100, 200, 300, and 400 GeV/c
Approval	26 Aug, 71	50 K Pix	in bare chamber with events where there is downstream spark chamber data to be shared with exp #2B
Completed	23 Jan, 74	104 K Pix	

125	30-INCH PI- - P @ 100 #125	Douglas R. O. Morrison	CERN (SWITZERLAND)
	BEAM: Neutrino Area - 30 in. Hadron Beam		
	PROPOSAL TO STUDY PI- P REACTIONS AT 60 AND 200 GEV/C IN THE 30-INCH.		

Request	7 May, 71	100 K Pix	
Approval	27 Aug, 71	50 K Pix	in bare chamber with events where there is downstream spark chamber data to be shared with exp #2B
Completed	28 Aug, 73	53 K Pix	

137	30-INCH PI- - P @ 200 #137	Fred Russell Huson	UNIV. OF CALIFORNIA, BERKELEY
	BEAM: Neutrino Area - 30 in. Hadron Beam		FERMILAB
	STUDY OF PI- + P INTERACTIONS AT HIGH ENERGY.		LAWRENCE BERKELEY LABORATORY

Request	4 May, 71	50 K Pix	
Approval	26 Aug, 71	50 K Pix	in bare chamber with events where there is downstream spark chamber data to be shared with exp #2B
Completed	10 Mar, 73	48 K Pix	

138	30-INCH P-P @ 400 #138	Jack C. Vander Velde	UNIVERSITY OF MICHIGAN - ANN ARBOR
	BEAM: Neutrino Area - 30 in. Hadron Beam		UNIVERSITY OF ROCHESTER
	STUDY OF MULTIPARTICLE PRODUCTION IN A 30-INCH BUBBLE CHAMBER.		

Request	10 May, 71	240 K Pix	total; combined experiment from proposals #62 and #80
Approval	26 Aug, 71	50 K Pix	in bare chamber with events where there is downstream spark chamber data to be shared with exp #2B
Completed	26 Aug, 75	52 K Pix	

141A	30-INCH P-P @ 200 #141A	Thomas H. Fields	ARGONNE NATIONAL LABORATORY
	BEAM: Neutrino Area - 30 in. Hadron Beam		FERMILAB
	STUDY OF PP INTERACTIONS IN THE ANL 30-INCH HYDROGEN BUBBLE CHAMBER AT NAL.		IOWA STATE UNIVERSITY
			UNIVERSITY OF MARYLAND
			MICHIGAN STATE UNIVERSITY

Request	25 Jun, 71	50 K Pix	
Approval	26 Aug, 71	50 K Pix	in bare chamber with events where there is downstream spark chamber data to be shared with exp #2B
Completed	27 Nov, 72	67 K Pix	

142	SUPER-HEAVY ELEMENTS #142	Raymond W. Stoughton	ARGONNE NATIONAL LABORATORY
	BEAM: Neutrino Area - Miscellaneous		OAK RIDGE NATIONAL LABORATORY
	PROPOSAL FOR A SEARCH FOR SUPERHEAVY ELEMENTS BY IRRADIATIONS AT NAL.		

Request	12 Jul, 71	Parasitic Running with a total of 10 to the 18th protons on target	
Approval	26 Aug, 71	Target Exposure(s)	
Completed	4 Jun, 75	1 Target(s)	

143A	30-INCH PI- - P @ 300 #143A	George R. Kalbfleisch	BROOKHAVEN NATIONAL LABORATORY
	BEAM: Neutrino Area - 30 in. Hadron Beam		CASE WESTERN RESERVE UNIVERSITY
	PROPOSAL FOR A RAPID SYSTEMATIC STUDY OF ALL INTERACTIONS IN A PI- - P EXPOSURE OF THE BARE 30-INCH CHAMBER AT 120 GEV/C.		

Request	12 Jul, 71	50 K Pix	
Approval	26 Aug, 71	50 K Pix	in bare chamber with events where there is downstream spark chamber data to be shared with exp #2B
Completed	10 Apr, 74	51 K Pix	

147	SUPER-HEAVY ELEMENTS #147	Monique DeBeauvais	CRN, STRASBOURG (FRANCE)
	BEAM: Meson Area - Miscellaneous		UNIVERSITY OF OTTAWA (CANADA)
	PROPOSAL OF AN EXPERIMENT ON THE FISSION OF VERY HEAVY NUCLEI INDUCED BY 200 GEV PROTONS.		

Request	9 Jul, 71	Target Exposure(s)	
Approval	6 Aug, 73	Target Exposure(s)	
Completed	11 Jun, 75	4 Exposure(s)	

152B PHOTOPRODUCTION #152B — Clemens A. Heusch — UNIV. OF CALIFORNIA, SANTA CRUZ
BEAM: Proton Area - East
PROPOSAL TO BUILD AN ELECTRON-PHOTON FACILITY AT NAL AND TO MEASURE PHOTON SCATTERING AT HIGH ENERGIES.
(Measurement of total cross sections, elastic and inelastic scattering meson production, and a search for new particles.)

Request	19 Jul, 71	300 Hours	with actual data taking of 160 hours
	23 Jun, 72	490 Hours	total with an additional 190 hours of data taking
Approval	4 Mar, 74	350 Hours	with understanding that there will be a collaborative effort in development and construction of equipment with exp# 263
	28 Jun, 78	1,800 Hours	approximately with the experiment to be considered complete by the time of the fall 1978 shutdown
Completed	13 Nov, 78	1,950 Hours	

154 30-INCH HYBRID #154 — Irwin A. Pless — BROWN UNIVERSITY, FERMILAB, ILLINOIS INSTITUTE OF TECHNOLOGY, UNIVERSITY OF ILLINOIS, CHAMPAIGN, INDIANA UNIVERSITY, JOHNS HOPKINS UNIVERSITY, MASSACHUSETTS INST. OF TECHNOLOGY, OAK RIDGE NATIONAL LABORATORY, RUTGERS UNIVERSITY, STEVENS INSTITUTE OF TECHNOLOGY, UNIVERSITY OF TENNESSEE, KNOXVILLE, YALE UNIVERSITY
BEAM: Neutrino Area - 30 in. Hadron Beam
TEST OF PROPORTIONAL WIRE CHAMBERS IN HYBRID SYSTEMS.

Request	23 Jun, 71	2,000 K Pix	
Approval	27 Aug, 71	20 K Pix	with understanding that work will be done in two phases. Phase I - design, construction, installation, and initial operation of upstream tagging system. Phase II - use of downstream PWC's for feasibility test run of 20K pix
	6 Aug, 73	120 K Pix	with additional 100K pix to be taken with single type incident particles at a given energy
Completed	13 Mar, 74	105 K Pix	of pi- - p @ 150 GeV

155 15-FOOT EMI TEST #155 — Vincent Z. Peterson — UNIVERSITY OF HAWAII AT MANOA, LAWRENCE BERKELEY LABORATORY
BEAM: Neutrino Area - Wide Band Horn
PROPOSAL TO DEVELOP A PHASE I EXTERNAL MUON IDENTIFIER (EMI) FOR USE WITH THE NAL 30 CUBIC METER BUBBLE CHAMBER.

Request	15 Jul, 71	Test Running	
Approval	27 Aug, 71	Parasitic Running	with understanding that completion of Phase I will include tests in neutrino beam with 15-ft bubble chamber in operation and number of pix to be determined at a later date
	17 Dec, 71	Parasitic Running	with 100K pix to be taken from exp# 45A exposures taken when EMI was operating; film containing about 200 events to be delivered as soon as feasible to aid in preliminary tuneup and checking
	26 Jun, 74	50 K Pix	with formal approval for dedicated pictures to follow successful analysis of 200 events from exp# 45A exposures
Completed	30 Nov, 74	14 K Pix	

156 EMULSION/PROTONS @ 200 #156 — Kiyoshi Niu — AICHI UNIV. OF EDUCATION (JAPAN), KWANSEI GAKUIN UNIVERSITY (JAPAN), NAGOYA UNIVERSITY (JAPAN), UNIVERSITY OF TOKYO (JAPAN), YOKOHAMA NATIONAL UNIV. (JAPAN)
BEAM: Meson Area - Miscellaneous
STUDY OF SECONDARY PARTICLES PRODUCED BY 200 AND 500 GEV PROTONS IN EMULSION CHAMBERS.

Request	15 Aug, 71	Emulsion Exposure
Approval	1 Sep, 71	Emulsion Exposure
Completed	20 Sep, 72	13 Stack(s)

161 30-INCH P - P&NE @ 300 #161 — James Mapp — UNIVERSITY OF WISCONSIN - MADISON
BEAM: Neutrino Area - 30 in. Hadron Beam
PROPOSAL TO SURVEY HIGH ENERGY PROTON COLLISIONS IN NEON AND TO SEARCH FOR ANOMALOUS PHOTON BUNDLES AT NAL.

Request	13 Oct, 71	50 K Pix
Approval	6 Aug, 73	50 K Pix
Completed	25 Jun, 74	51 K Pix

163A 30-INCH PI- - P&NE @ 200 #163A — William D. Walker — DUKE UNIVERSITY, UNIVERSITY OF NORTH CAROLINA
BEAM: Neutrino Area - 30 in. Hadron Beam
PROPOSAL FOR A STUDY OF THE INTERACTION OF HIGH ENERGY PI- WITH NEON.

Request	4 Dec, 71	50 K Pix
Approval	19 Jul, 72	50 K Pix
Completed	18 Jun, 74	52 K Pix

171 EMULSION/PROTONS @ 200 #171 — Jere J. Lord — UNIVERSITY OF WASHINGTON
BEAM: Meson Area - Miscellaneous
PROPOSED EMULSION EXPERIMENT SEARCH FOR SHORT LIVED PARTICLES AT HIGH ENERGIES.

Request	10 May, 72	Emulsion Exposure
Approval	1 Aug, 72	Emulsion Exposure
Completed	20 Sep, 72	6 Stack(s)

172 15-FOOT ANTI-NEUTRINO/H2&NE#172 — Henry J. Lubatti — UNIV. OF CALIFORNIA, BERKELEY, UNIVERSITY OF HAWAII AT MANOA, LAWRENCE BERKELEY LABORATORY, UNIVERSITY OF WASHINGTON
BEAM: Neutrino Area - Wide Band Horn
ANTINEUTRINO INTERACTIONS IN THE 15-FOOT H2-NEON BUBBLE CHAMBER.

Request	16 May, 72	50 K Pix
Approval	19 Jul, 72	50 K Pix
Completed	25 May, 76	49 K Pix

177A PROTON-PROTON ELASTIC #177A — Jay Orear — CORNELL UNIVERSITY, LEBEDEV PHYSICAL INST. (RUSSIA), MCGILL UNIVERSITY (CANADA), NORTHEASTERN UNIVERSITY
BEAM: Proton Area - West
EARLY MEASUREMENT OF HIGH ENERGY P P LARGE ANGLE ELASTIC SCATTERING.

Request	12 Jun, 72	100 Hours	for initial run
	27 Oct, 72	700 Hours	total with additional 600 hours for data
Approval	13 Aug, 73	100 Hours	for Phase I; counter tests to demonstrate success of proposed technique
	28 Jun, 76	700 Hours	with 600 hours additional for data
	19 Nov, 76	1,500 Hours	with additional 800 hours to collect data at 200 GeV and 400 GeV to t-values of 18 GeV squared; completion of run expected by 15 Feb 1977
	7 Mar, 77	2,200 Hours	with additional 700 hours to collect data in high t region with completion of experiment expected at end of April 1977
Completed	19 Apr, 77	2,400 Hours	

178 MULTIPLICITIES #178 — Wit Busza — CARELTON UNIVERSITY (CANADA); FERMILAB; MASSACHUSETTS INST. OF TECHNOLOGY
BEAM: Meson Area - M6 Beam
A STUDY OF THE AVERAGE MULTIPLICITY AND MULTICIPLICITY DISTRIBUTIONS IN HADRON-NUCLEUS COLLISIONS AT HIGH ENERGIES.
(Using Cerenkov counter pulse height analysis.)

Request	16 Jun, 72	60 Hours including 20 hours for tests
Approval	6 Aug, 73	100 Hours with understanding that running will be on a parasitic basis during tuning of M6 beam line by exp# 96
	25 Oct, 74	200 Hours with an additional 100 hours of running in the M6 beam line
Completed	14 Aug, 75	800 Hours

180 15-FOOT ANTI-NEUTRINO/H2&NE#180 — Pavel F. Ermolov — FERMILAB; UNIVERSITY OF MICHIGAN - ANN ARBOR; ITEP, MOSCOW (RUSSIA); IHEP, PROTVINO (SERPUKHOV)(RUSSIA)
BEAM: Neutrino Area - Wide Band Horn
A STUDY OF ANTINEUTRINO INTERACTIONS IN THE NAL 15-FOOT BUBBLE CHAMBER, FILLED WITH HYDROGEN AND NEON.

Request	23 Jun, 72	200 K Pix
Approval	11 Jul, 72	50 K Pix of antineutrinos to run before exp# 172 and to have first choice of the two H2/neon mixtures
	29 Jun, 76	200 K Pix including an additional 150K pix; with the expectation that the experiment will involve a total of 500K pix
Approved/Inactive	1 Jun, 77	273 K Pix as of 01 Jun 1977

181 EMULSION/PROTONS @ 300 #181 — Arthur S. Cary — HARVEY MUDD COLLEGE
BEAM: Neutrino Area - Miscellaneous
THE DIRECT PRODUCTION OF ELECTRON PAIRS IN NUCLEAR EMULSION BY 100 AND 200 GEV PROTONS.

Request	27 Jul, 72	Emulsion Exposure
Approval	15 Nov, 72	Emulsion Exposure
Completed	20 Oct, 73	3 Stack(s)

183 EMULSION/PROTONS @ 200 #183 — M. I. Tretjakova — LEBEDEV PHYSICAL INST. (RUSSIA)
BEAM: Meson Area - Miscellaneous
A PROPOSAL OF THE PHOTOEMULSION EXPERIMENT AT THE NATIONAL ACCELERATOR LABORATORY (BATAVIA).

Request	7 Jul, 72	Emulsion Exposure
Approval	1 Aug, 72	Emulsion Exposure
Completed	20 Sep, 72	3 Stack(s)

184 PARTICLE SEARCH #184 — Peter J. Wanderer — UNIVERSITY OF CHICAGO; HARVARD UNIVERSITY; UNIVERSITY OF PENNSYLVANIA; UNIVERSITY OF WISCONSIN - MADISON
BEAM: Internal Target Area (C-0)
SEARCH FOR A NEW CLASS OF PENETRATING MASSIVE PARTICLES AT C-0.

Request	14 Sep, 72	Unspecified
Approval	5 Oct, 72	400 Hours with installation to begin at time of removal of exp# 120 and extending for a period of one month
	6 Aug, 73	600 Hours with approval for occupancy at C-0 for 6 weeks
	22 Feb, 74	760 Hours with an authorized extension of 160 hours
Completed	29 May, 74	800 Hours

186 PROTON-DEUTERON SCATTERING #186 — Adrian Melissinos — FERMILAB; JINR, DUBNA (RUSSIA); UNIVERSITY OF ROCHESTER; ROCKEFELLER UNIVERSITY
BEAM: Internal Target Area (C-0)
A PROPOSAL TO STUDY SMALL ANGLE PROTON-DEUTERON SCATTERING.
(Using a gas jet target with deuterium and the internal proton beam; t from 0.001 - 0.020.)

Request	19 Oct, 72	400 Hours
Approval	1 Nov, 72	400 Hours
Completed	19 Aug, 74	450 Hours

187 PARTICLE SEARCH #187 — Leon M. Lederman — COLUMBIA UNIVERSITY; FERMILAB
BEAM: Proton Area - Center
PHASE 0.8 - SEARCH FOR LONG-LIVED MASSIVE OBJECTS (HIGH ENERGY CALIBRATION RUN).
(Relying on r.f. bunching and time of flight measurement.)

Request	5 Sep, 72	Unspecified
Approval	30 Oct, 72	100 Hours
Completed	6 Nov, 73	200 Hours

188 PROTON-NUCLEON INCLUSIVE #188 — Felix Sannes — UNIV. OF ILLINOIS, CHICAGO CIRCLE; IMPERIAL COLLEGE (ENGLAND); RUTGERS UNIVERSITY; UPSALA COLLEGE
BEAM: Internal Target Area (C-0)
A PROPOSAL TO MEASURE CROSS SECTIONS FOR P-P TO P-X, N-X AS A FUNCTION OF S AND MX SQUARED USING THE INTERNAL TARGET FACILITY AT NAL.

Request	25 Oct, 72	200 Hours
Approval	1 Nov, 72	200 Hours
Completed	9 May, 73	1,050 Hours

189 EMULSION/PROTONS @ 200 #189 — David Ritson — STANFORD UNIVERSITY
BEAM: Meson Area - Miscellaneous
NUCLEAR EMULSION EXPOSURES TO 400 GEV.
(For student laboratory use.)

Request	16 Oct, 72	Emulsion Exposure
Approval	2 Nov, 72	Emulsion Exposure
Completed	20 Sep, 72	2 Plate(s)

194 30-INCH P - D @ 100 #194 — C. Thornton Murphy — CARNEGIE-MELLON UNIVERSITY; FERMILAB; UNIVERSITY OF MICHIGAN - ANN ARBOR; SUNY AT STONY BROOK
BEAM: Neutrino Area - 30 in. Hadron Beam
PROPOSAL TO STUDY PROTON-DEUTERON INTERACTIONS IN THE 30-INCH BUBBLE CHAMBER.

Request	13 Nov, 72	200 K Pix
Approval	1 Mar, 74	100 K Pix in bare chamber with downstream chamber data if it can be arranged
Completed	20 Aug, 76	92 K Pix

195 EMULSION/PROTONS @ 300 #195 — Yu K. Lim — CRFC, CAMBRIDGE; EMMANUEL COLLEGE; MISSISSIPPI STATE UNIVERSITY; UNIVERSITY OF SINGAPORE(SINGAPORE)
BEAM: Neutrino Area - Miscellaneous
PROPOSAL TO MEASURE THE LIFETIME OF THE NEUTRAL PION.

Request	13 Nov, 72	Emulsion Exposure
Approval	15 Nov, 72	Emulsion Exposure
Completed	10 Jun, 75	3 Stack(s)

196 30-INCH P - D @ 400 #196 — Roderich J. Engelmann — CARNEGIE-MELLON UNIVERSITY
BEAM: Neutrino Area - 30 in. Hadron Beam — FERMILAB
PROTON-DEUTERON INTERACTIONS IN THE BARE 30-INCH BUBBLE CHAMBER. — UNIVERSITY OF MICHIGAN - ANN ARBOR
SUNY AT STONY BROOK

Request	13 Nov, 72	100 K Pix
Approval	21 Mar, 74	100 K Pix in bare chamber with downstream chamber data if it can be arranged
Completed	20 Oct, 75	109 K Pix

198A PROTON-NUCLEON SCATTERING #198A — Stephen L. Olsen — IMPERIAL COLLEGE (ENGLAND)
BEAM: Internal Target Area (C-0) — UNIVERSITY OF ROCHESTER
A PROPOSAL FOR A MAGNETIC RECOIL SPECTROMETER FOR THE GAS JET TARGET. — RUTGERS UNIVERSITY
(Use of the gas jet target with H2 and D2 to study p - p and p - d scattering with the internal proton beam; t from 0.15 - 3.0.)

Request	22 Dec, 72	800 Hours
Approval	22 Mar, 74	800 Hours contingent on construction of C-0 extension
	26 Jun, 74	800 Hours with the understanding that concurrent running with exp# 313 be arranged whenever possible
Completed	19 Apr, 77	900 Hours

199 MASSIVE PARTICLE SEARCH #199 — Sherman Frankel — FERMILAB
BEAM: Neutrino Area - Miscellaneous — UNIVERSITY OF PENNSYLVANIA
SEARCH FOR WEAKLY PRODUCED MASSIVE LONG LIVED PARTICLES AT NAL.
(Using a threshold Cerenkov counter.)

Request	21 Dec, 72	Target Exposure(s)
Approval	15 Jan, 73	Target Exposure(s)
Completed	22 Aug, 73	2 Targets Exposed

202 TACHYON MONOPOLE #202 — David F. Bartlett — UNIVERSITY OF COLORADO AT BOULDER
BEAM: Neutrino Area - Miscellaneous — PRINCETON UNIVERSITY
SEARCH FOR TACHYON MONOPOLES IN COSMIC RAYS ABOVE 15-FOOT BUBBLE CHAMBER.
(Using magnet fringe field.)

Request	1 Feb, 73	800 Hours of which half would be at zero field
Approval	22 Aug, 73	Parasitic Running
Completed	19 May, 76	Cosmic Ray Running

203A MUON #203A — Leroy T. Kerth — UNIV. OF CALIFORNIA, BERKELEY
BEAM: Neutrino Area - Muon/Hadron Beam — FERMILAB
FEASIBLE SEARCH FOR HEAVY NEUTRAL MUONS PREDICTED BY GAUGE THEORIES AND CONCURRENT MEASUREMENT OF DEEP-INELASTIC VIRTUAL COMPTON SCATTERING. — LAWRENCE BERKELEY LABORATORY
PRINCETON UNIVERSITY

Request	9 Mar, 73	600 Hours with muon beam intensity of 5 x 10 to the 6th per pulse
Approval	26 Mar, 75	500 Hours with formal approval of 1 x 10 to the 18th protons
	23 Mar, 78	1,200 Hours with the expectation to run the experiment until about April 27, 1978
Completed	18 May, 78	1,200 Hours

205A EMULSION/MUONS @ 150 #205A — Osamu Kusumoto — KINKI UNIVERSITY (JAPAN)
BEAM: Neutrino Area - Miscellaneous — KOBE UNIVERSITY (JAPAN)
PHENOMENOLOGICAL STUDY OF MUON-NUCLEON COLLISION AT ENERGY MORE THAN 100 GEV IN EMULSION. — OKAYAMA UNIVERSITY (JAPAN)
OSAKA CITY UNIVERSITY (JAPAN)
OSAKA SCIENCE EDUC. INST. (JAPAN)
UNIVERSITY OF TOKYO (JAPAN)

Request	4 Apr, 73	Emulsion Exposure
Approval	15 Jun, 73	Emulsion Exposure
Completed	16 Oct, 73	2 Stack(s)

209 30-INCH P - D @ 300 #209 — Fu Tak Dao — CALIFORNIA INSTITUTE OF TECHNOLOGY
BEAM: Neutrino Area - 30 in. Hadron Beam — IOWA STATE UNIVERSITY
A STUDY OF 300 GEV/C P D INTERACTIONS IN THE THIRTY-INCH BUBBLE CHAMBER. — TUFTS UNIVERSITY
VANDERBILT UNIVERSITY

Request	1 May, 73	50 K Pix
Approval	21 Mar, 74	100 K Pix in bare chamber with downstream chamber data if it can be arranged
Completed	7 Oct, 76	106 K Pix

211 BEAM DUMP #211 — Klaus Goebel — CERN (SWITZERLAND)
BEAM: Neutrino Area - Miscellaneous — FERMILAB
PROPOSAL FOR RADIATION MEASUREMENTS AROUND A PROTON BEAM DUMP AT 300 GEV.
(Early measurements to confirm calculations for CERN; very reduced version of exp #108.)

Request	18 Apr, 73	10 Hours with a total of 10 to the 15th protons
Approval	20 Apr, 73	10 Hours
Completed	14 Nov, 73	2 Hours

216 FORM FACTOR #216 — Donald H. Stork — UNIV. OF CALIFORNIA, LOS ANGELES
BEAM: Meson Area - M1 Beam — FERMILAB
A MEASUREMENT OF THE PION FORM FACTOR BY DIRECT PION-ELECTRON SCATTERING. — JINR, DUBNA (RUSSIA)
NOTRE DAME UNIVERSITY
UNIVERSITY OF PITTSBURGH

Request	25 May, 73	630 Hours
Approval	6 Aug, 73	100 Hours for testing and running at 100 GeV to assess background effects
	7 Jul, 75	600 Hours with additional 500 hours of running in M-1 beam line and encouragement to select a single high energy for measurement
Completed	1 Oct, 75	900 Hours

217 30-INCH PI+ & P - P @ 200 #217 — Richard L. Lander — UNIV. OF CALIFORNIA, DAVIS
BEAM: Neutrino Area - 30 in. Hadron Beam — LAWRENCE BERKELEY LABORATORY
A COMPARISON OF 100 GEV AND 200 GEV PI+ - P INTERACTIONS. — SLAC

Request	29 May, 73	50 K Pix
Approval	6 Aug, 73	50 K Pix
Completed	15 May, 74	85 K Pix

218 30-INCH PI- - D @ 200 #218 — Philip Marvin Yager — UNIV. OF CALIFORNIA, DAVIS
BEAM: Neutrino Area - 30 in. Hadron Beam — INP, KRAKOW (POLAND)
PION-DEUTERON INTERACTIONS AT 200 GEV/C. — WARSAW UNIVERSITY, INP, (POLAND)
UNIVERSITY OF WASHINGTON

Request	29 May, 73	50 K Pix
Approval	21 Mar, 74	50 K Pix in bare chamber with downstream chamber data if it can be arranged
Completed	18 Sep, 74	72 K Pix

221 PROTON-PROTON INELASTIC #221 — Paolo Franzini — COLUMBIA UNIVERSITY; SUNY AT STONY BROOK
BEAM: Internal Target Area (C-0)
P - P INELASTIC SCATTERING IN THE DIFFRACTIVE REGION.
(Continuation of experiment #14A.)

Request	8 Jun, 73	400 Hours including 200 hours of setup and tuning
Approval	6 Aug, 73	400 Hours
Completed	5 Sep, 74	950 Hours

226 K ZERO CHARGE RADIUS #226 — Valentine L. Telegdi — UNIVERSITY OF CHICAGO; LHE, ETH HONGGERBERG (SWITZERLAND); UNIVERSITY OF WISCONSIN - MADISON
BEAM: Meson Area - M4 Beam
COHERENT K-SHORT REGENERATION BY ELECTRONS.

Request	12 Jun, 73	720 Hours
	15 Nov, 74	2,100 Hours total for Phase 1, 500 hours in M4 line; and Phase 2, 1600 hours in M3 line
Approval	22 Nov, 74	500 Hours
	30 Jun, 76	600 Hours with a total of 800 hours approved for the combination of E-486 and E-226
Completed	17 Mar, 77	1,200 Hours

228 30-INCH PI+ & P - P @ 60 #228 — Thomas Ferbel — UNIVERSITY OF MICHIGAN - ANN ARBOR; UNIVERSITY OF ROCHESTER
BEAM: Neutrino Area - 30 in. Hadron Beam
PROPOSAL TO EXTEND THE ENERGY RANGE OF A STUDY OF MULTIPARTICLE PRODUCTION IN P - P COLLISIONS.
(Request for the remaining pictures for exp #252 to be with a momentum of 60 GeV/c.)

Request	16 Jun, 73	25 K Pix
	20 Feb, 74	35 K Pix total with a pi/p ratio of 5/3
Approval	6 Aug, 73	25 K Pix in bare chamber with tagged beam
	14 Mar, 74	35 K Pix including additional 10K pix and a pi/p ratio of about 5/3
Completed	15 Apr, 74	37 K Pix

229 DETECTOR DEVELOPMENT #229 — Luke C. L. Yuan — BROOKHAVEN NATIONAL LABORATORY
BEAM: Meson Area - M1 Beam
A PROPOSAL FOR TESTING A TRANSITION RADIATION DETECTOR AT NAL.

Request	19 Jun, 73	100 Hours
Approval	23 Aug, 73	Parasitic Running for about 200 hours
Completed	16 Nov, 74	300 Hours

230 MULTIGAMMA #230 — Michael J. Longo — UNIVERSITY OF MICHIGAN - ANN ARBOR
BEAM: Meson Area - M3 Beam
A SEARCH FOR "SCHEIN EVENTS" AND EVENTS WITH A HIGH MULTIPLICITY OF GAMMAS.

Request	25 Jun, 73	40 Hours
Approval	6 Aug, 73	40 Hours with restriction that wide gap chambers will not cause any interference with other experiments in the area
Completed	24 Apr, 74	50 Hours

232 EMULSION/PROTONS @ 300 #232 — David T. King — UNIVERSITY OF TENNESSEE, KNOXVILLE
BEAM: Neutrino Area - Miscellaneous
400-GEV PROTONS ON COMPLEX NUCLEI.

Request	6 Jul, 73	Emulsion Exposure
Approval	16 Aug, 73	Emulsion Exposure
Completed	20 Oct, 73	2 Stack(s)

233 EMULSION/PROTONS @ 300 #233 — Jacques D. Hebert — UNIVERSITY OF BARCELONA (SPAIN); UNIVERSITY OF BELGRADE(YUGOSLAVIA); IAP, BUCHAREST (ROMANIA); CRN, STRASBOURG (FRANCE); FERMILAB; UNIVERSITY OF LUND (SWEDEN); MCGILL UNIVERSITY (CANADA); UNIVERSITY OF NANCY (FRANCE); UNIVERSITY OF OTTAWA (CANADA); UNIV. OF PARIS VI, LPG (FRANCE); UNIVERSITY OF QUEBEC (CANADA); LRC, LYON (FRANCE); INFN, ROME (ITALY); IFC, VALENCIA (SPAIN)
BEAM: Neutrino Area - Miscellaneous
300 GEV (AND 400 GEV) PROTON INTERACTIONS IN NUCLEAR EMULSION.

Request	16 Jul, 73	Emulsion Exposure
Approval	16 Aug, 73	Emulsion Exposure
Completed	20 Oct, 73	8 Stack(s)

234 15-FOOT ENGINEERING RUN #234 — Fred Russell Huson — FERMILAB; FLORIDA STATE UNIVERSITY
BEAM: Neutrino Area - 15 ft. Hadron Beam
AN ENGINEERING RUN FOR THE NAL 15-FOOT CRYOGENIC BUBBLE CHAMBER.

Request	1 Aug, 73	50 K Pix
Approval	6 Aug, 73	50 K Pix
Completed	5 Nov, 74	57 K Pix of pi- - p interactions at 250 GeV/c

236A HADRON JETS #236A — Paul M. Mockett — FERMILAB; TUFTS UNIVERSITY; UNIVERSITY OF WASHINGTON
BEAM: Meson Area - M1 Beam
A PROPOSAL TO EXPLORE THE LARGE-PT DOMAIN: INCLUSIVE CROSS SECTIONS AND POSSIBLE JET STRUCTURE.

Request	13 Aug, 73	550 Hours for tests and data
	16 Dec, 76	1,150 Hours including an additional 400 hours for data and 200 hours for tests
Approval	22 Jan, 74	550 Hours
	1 Apr, 77	1,150 Hours including additional 600 hours to complete experiment during a six week running period
Completed	20 Jul, 77	1,700 Hours

237 EMULSION/PROTONS @ 300 #237 — Jere J. Lord — UNIVERSITY OF WASHINGTON
BEAM: Neutrino Area - Miscellaneous
EMULSION EXPOSURE TO 300 GEV PROTONS.

Request	14 Aug, 73	Emulsion Exposure
Approval	11 Sep, 73	Emulsion Exposure
Completed	10 Jun, 75	5 Stack(s)

238 EMULSION/PROTONS @ 400 #238 — Jere J. Lord — UNIVERSITY OF WASHINGTON
BEAM: Neutrino Area - Miscellaneous
EMULSION EXPOSURE TO 400 GEV PROTONS.

Request	14 Aug, 73	Emulsion Exposure
Approval	12 Mar, 74	Emulsion Exposure
Completed	9 Dec, 75	9 Stack(s)

239 LONG-LIVED PARTICLES #239 — William Frati — FERMILAB; UNIVERSITY OF PENNSYLVANIA
BEAM: Neutrino Area - Miscellaneous
PROPOSAL FOR A FURTHER SEARCH FOR LONG LIVED PARTICLES AT NAL.
(With a Cerenkov counter looking at the neutrino target from the 90 degree monitor pipe.)

Request	15 Jul, 73	Parasitic Running
Approval	6 Dec, 73	Parasitic Running
Completed	3 Feb, 74	350 Hours

242 EMULSION/PROTONS @ 300 #242 — Kiyoshi Niu — AICHI UNIV. OF EDUCATION (JAPAN); NAGOYA UNIVERSITY (JAPAN); YOKOHAMA NATIONAL UNIV. (JAPAN)
BEAM: Neutrino Area - Miscellaneous
STUDY OF SECONDARY PARTICLES PRODUCED BY 300 GEV PROTONS IN EMULSION CHAMBERS.

Request	28 Sep, 73	Emulsion Exposure
Approval	22 Nov, 73	Emulsion Exposure
Completed	20 Oct, 73	2 Stack(s)

243 EMULSION/PROTONS @ 400 #243 — Kiyoshi Niu — AICHI UNIV. OF EDUCATION (JAPAN); KONAN UNIVERSITY (JAPAN); NAGOYA UNIVERSITY (JAPAN); YOKOHAMA NATIONAL UNIV. (JAPAN)
BEAM: Neutrino Area - Miscellaneous
STUDY OF SECONDARY PARTICLES PRODUCED BY 400 GEV PROTONS IN EMULSION CHAMBERS.

Request	28 Sep, 73	Emulsion Exposure
Approval	12 Mar, 74	Emulsion Exposure
Completed	9 Dec, 75	7 Stack(s)

244 EMULSION/PROTONS @ 300 #244 — Piyare L. Jain — SUNY AT BUFFALO
BEAM: Neutrino Area - Miscellaneous
INTERACTION OF 300 GEV PROTONS IN NUCLEAR EMULSION.

Request	1 Oct, 73	Emulsion Exposure
Approval	22 Nov, 73	Emulsion Exposure
Completed	20 Oct, 73	1 Stack(s)

245 EMULSION/PROTONS @ 400 #245 — Piyare L. Jain — SUNY AT BUFFALO
BEAM: Neutrino Area - Miscellaneous
INTERACTION OF 400 GEV PROTONS IN NUCLEAR EMULSION.

Request	1 Oct, 73	Emulsion Exposure
Approval	3 Mar, 74	Emulsion Exposure
Completed	9 Dec, 75	1 Stack(s)

247 PARTICLE SEARCH #247 — Eric H. S. Burhop — UNIV. COLLEGE DUBLIN (IRELAND); FERMILAB; UNIVERSITY OF LIBRE (BELGIUM); LONDON UNIVERSITY COLLEGE(ENGLAND); INFN, ROME (ITALY); UNIVERSITY OF STRASBOURG (FRANCE)
BEAM: Neutrino Area - Wide Band Horn
A PROPOSED EXPERIMENT TO SEARCH FOR HEAVY LEPTONS.
(Using a hybrid emulsion-spark chamber arrangement.)

Request	21 Sep, 73	1,000 Hours with request for a bombardment of 2 x 10 to the 18th protons
Approval	2 Oct, 73	Unspecified but with expectation of test running for feasibility studies
	26 Mar, 75	1,000 Hours with formal approval for 2 x 10 to the 18th protons subject to the condition that running is compatible with exp# 310 and the 15-ft bubble chamber program
	11 Mar, 76	1,000 Hours with formal approval for 2 x 10 to the 18th protons and high priority
Completed	18 May, 76	350 Hours

248 NEUTRON ELASTIC SCATTERING #248 — Michael J. Longo — UNIVERSITY OF MICHIGAN - ANN ARBOR
BEAM: Meson Area - M3 Beam
NEUTRON-PROTON DIFFRACTION SCATTERING UP TO 300 GEV.
(Differential cross sections with t from 0.1 to 3.5; formerly referred to as exp #4II.)

Request	15 May, 70	700 Hours as an estimate
Approval	1 Aug, 70	400 Hours
Completed	10 Dec, 76	2,400 Hours

249 EMULSION/PROTONS @ 400 #249 — Wladyslaw Wolter — INP, KRAKOW (POLAND)
BEAM: Neutrino Area - Miscellaneous
CRACOW EMULSION EXPOSURE TO 400 GEV PROTONS.

Request	8 Oct, 73	Emulsion Exposure
Approval	12 Mar, 74	Emulsion Exposure
Completed	9 Dec, 75	3 Stack(s)

250 EMULSION/PROTONS @ 300 #250 — Osamu Kusumoto — KINKI UNIVERSITY (JAPAN); KOBE UNIVERSITY (JAPAN); OSAKA CITY UNIVERSITY (JAPAN); OSAKA SCIENCE EDUC. INST. (JAPAN); WAKAYAMA MEDICAL COLLEGE (JAPAN)
BEAM: Neutrino Area - Miscellaneous
PHENOMENOLOGICAL STUDY OF PROTON-NUCLEUS COLLISION AT NAL ENERGIES IN EMULSION (300 GEV).

Request	10 Oct, 73	Emulsion Exposure
Approval	22 Nov, 73	Emulsion Exposure
Completed	20 Oct, 73	1 Stack(s)

251 EMULSION/PROTONS @ 400 #251 — Osamu Kusumoto — KINKI UNIVERSITY (JAPAN); KOBE UNIVERSITY (JAPAN); OSAKA CITY UNIVERSITY (JAPAN); OSAKA SCIENCE EDUC. INST. (JAPAN); WAKAYAMA MEDICAL COLLEGE (JAPAN)
BEAM: Neutrino Area - Miscellaneous
PHENOMENOLOGICAL STUDY OF PROTON-NUCLEUS COLLISION AT NAL ENERGIES IN EMULSION (400 GEV).

Request	10 Oct, 73	Emulsion Exposure
Approval	22 Oct, 73	Emulsion Exposure
Completed	9 Dec, 75	3 Stack(s)

252 30-INCH P-P @ 100 #252 — Thomas Ferbel — UNIVERSITY OF MICHIGAN - ANN ARBOR; UNIVERSITY OF ROCHESTER
BEAM: Neutrino Area - 30 in. Hadron Beam
STUDY OF MULTIPARTICLE PRODUCTION IN A 30-INCH BUBBLE CHAMBER.
(Formerly known as experiment #138I.)

Request	10 May, 71	240 K Pix
Approval	26 Aug, 71	50 K Pix in bare chamber with events where there is downstream spark chamber data to be shared with exp #2B
Completed	6 Dec, 72	33 K Pix

253 NEUTRINO #253 — Luke W. Mo — IHEP, BEIJING (PRC); UNIVERSITY OF MARYLAND; NATIONAL SCIENCE FOUNDATION; UNIVERSITY OF OXFORD (ENGLAND); VIRGINIA TECH

BEAM: Neutrino Area - Wide Band Horn
NEUTRINO-ELECTRON SCATTERING AT NAL.

Request	15 Oct, 73	Parasitic Running expected to total 1,000 hours
Approval	7 Jul, 75	Parasitic Running
Completed	7 Mar, 79	2,050 Hours

254 NEUTRINO #254 — George R. Kalbfleisch — BROOKHAVEN NATIONAL LABORATORY; CALIFORNIA INSTITUTE OF TECHNOLOGY; FERMILAB; PURDUE UNIVERSITY

BEAM: Neutrino Area - Dichromatic
PROPOSAL TO SEARCH FOR A SECOND MUON NEUTRINO.
(Dichromatic beam incident on target calorimeter with muon spectrometer of exp #21A; muon monitoring instrumentation will be added.)

Request	17 Oct, 73	300 Hours with total flux of 3 x 10 to the 17th protons
Approval	22 Nov, 74	300 Hours with a formal approval for 3 x 10 to the 17th protons and the hope that running can be coordinated with exp# 21
Completed	15 Oct, 75	550 Hours

255 EMULSION/MUONS @ 150 #255 — Piyare L. Jain — SUNY AT BUFFALO

BEAM: Neutrino Area - Miscellaneous
EXPOSURE OF NUCLEAR EMULSIONS TO A BEAM OF 150 GEV MUONS AT THE NATIONAL ACCELERATOR LABORATORY.

Request	15 Oct, 73	Emulsion Exposure
Approval	22 Oct, 73	Emulsion Exposure
Completed	16 Oct, 73	1 Stack(s)

258 PION INCLUSIVE #258 — Melvyn Jay Shochet — UNIVERSITY OF CHICAGO; PRINCETON UNIVERSITY

BEAM: Proton Area - West
A PROPOSAL TO MEASURE PARTICLES PRODUCED AT HIGH TRANSVERSE MOMENTUM BY PIONS.

Request	22 Oct, 73	Unspecified
Approval	26 Jun, 74	800 Hours contingent upon development of a suitable beam
Completed	9 Jul, 79	1,500 Hours

260 HADRON JETS #260 — Donald W. McLeod — CALIFORNIA INSTITUTE OF TECHNOLOGY; UNIV. OF CALIFORNIA, LOS ANGELES; FERMILAB; UNIV. OF ILLINOIS, CHICAGO CIRCLE; INDIANA UNIVERSITY; MAX-PLANCK INSTITUTE (GERMANY)

BEAM: Meson Area - M6 Beam
A PROPOSAL TO STUDY HIGH PT PHYSICS WITH A MULTIPARTICLE SPECTROMETER.

Request	26 Oct, 73	650 Hours
	9 Aug, 76	1,150 Hours including an extension of 500 hours to complete the experiment
Approval	16 Nov, 73	200 Hours to come out of the 800 hours previously approved for exp# 110A
	13 Aug, 76	950 Hours for data including an additional 750 hours with the understanding that the commitment to the experiment is to be complete before a shutdown in September 1976
Completed	20 Sep, 76	2,300 Hours

261 DETECTOR DEVELOPMENT #261 — Ching Lin Wang — BROOKHAVEN NATIONAL LABORATORY; FERMILAB

BEAM: Meson Area - M1 Beam
PROPOSAL TO TEST TRANSITION COUNTERS AT NAL.

Request	26 Oct, 73	Parasitic Running expected to total 200 hours
Approval	17 Jan, 74	Parasitic Running for about 200 hours
Completed	20 Nov, 74	600 Hours

262 NEUTRINO #262 — Barry C. Barish — CALIFORNIA INSTITUTE OF TECHNOLOGY; FERMILAB

BEAM: Neutrino Area - Dichromatic
NEUTRAL CURRENT INVESTIGATION AT NAL.
(Using the Dichromatic beam, target calorimeter, and spectrometer of exp. #21A.)

Request	28 Oct, 73	300 Hours to include 3 x 10 to the 17th protons
Approval	16 Nov, 73	300 Hours with understanding that this will include 3 x 10 to the 17th protons
Completed	20 Mar, 74	400 Hours

264 EMULSION/PI- @ 200 #264 — Poh Shien Young — MISSISSIPPI STATE UNIVERSITY; UNIVERSITY OF TENNESSEE, KNOXVILLE

BEAM: Neutrino Area - Miscellaneous
EXPOSURE OF EMULSIONS TO 200-300 GEV PI- FOR NEW DETERMINATION OF MEAN LIFE OF PI ZERO.

Request	31 Oct, 73	Emulsion Exposure
Approval	12 Mar, 74	Emulsion Exposure
Completed	7 Oct, 74	2 Stack(s)

265 EMULSION/PROTONS @ 400 #265 — Poh Shien Young — CRFC, CAMBRIDGE; MISSISSIPPI STATE UNIVERSITY

BEAM: Neutrino Area - Miscellaneous
EXPOSURE OF EMULSIONS TO 400 GEV PROTONS FOR NEW DETERMINATION OF MEAN LIFE OF PI ZERO.

Request	31 Oct, 73	Emulsion Exposure
Approval	12 Mar, 74	Emulsion Exposure
Completed	9 Dec, 75	3 Stack(s)

268 INCLUSIVE PHOTON #268 — Joel Mellema — BROOKHAVEN NATIONAL LABORATORY; CALIFORNIA INSTITUTE OF TECHNOLOGY; LAWRENCE BERKELEY LABORATORY

BEAM: Meson Area - M2 Beam
A PROPOSAL TO STUDY MESON PRODUCTION AT LARGE P- TRANSVERSE WITH A GAMMA RAY DETECTOR.
(Induced by protons @ 300 GeV and by pi+- @ 100 and 200 GeV; using photon detector of exp #111.)

Request	5 Nov, 73	900 Hours total with an initial run of 500 hours
	3 Nov, 75	1,200 Hours including a three-week extension
Approval	21 Mar, 74	100 Hours of running in diffracted proton beam to demonstrate feasibility
	26 Jun, 74	100 Hours with formal approval for parasitic running using a pion beam in front of exp# 51
	22 Nov, 74	600 Hours including an additional 500 hours of running in a pion beam
	10 Nov, 75	900 Hours including an additional three week run to obtain data at a forward angle with a 200 GeV beam
Completed	11 Feb, 76	1,850 Hours

271 EMULSION/PROTONS @ 200 #271 — Kurt Gottfried — IAP, BUCHAREST (ROMANIA); CERN (SWITZERLAND); CORNELL UNIVERSITY; UNIVERSITY OF LUND (SWEDEN)
BEAM: Neutrino Area - Miscellaneous
MULTIPARTICLE PRODUCTION IN NUCLEI BY PROTONS OF SEVERAL HUNDRED GEV.
(Using target materials consisting of fine wires imbedded in emulsion or foils covering the emulsion; 200 GeV exposure.)

Request	30 Nov, 73	Emulsion Exposure
Approval	16 Jan, 74	Emulsion Exposure
Completed	10 Jun, 75	10 Stack(s)

272 HADRON DISSOCIATION #272 — Thomas Ferbel — BROOKHAVEN NATIONAL LABORATORY; FERMILAB; UNIVERSITY OF MINNESOTA; UNIVERSITY OF ROCHESTER
BEAM: Meson Area - M1 Beam
PROPOSAL TO MEASURE COHERENT DISSOCIATION OF PI-, K-, AND PBAR INTO TWO-BODY SYSTEMS AT FERMILAB ENERGIES.

Request	3 Dec, 73	600 Hours
	9 Jun, 75	900 Hours total with the additional 300 hours of data taking at 150 and 300 GeV/c incident momentum
Approval	7 Jul, 75	600 Hours
Completed	3 Dec, 79	1,950 Hours

275 PLASTIC DETECTORS #275 — Wolfgang Enge — CHRISTIAN-ALBRECHTS UNIV.(GERMANY)
BEAM: Neutrino Area - Miscellaneous
EXPOSURE OF PLASTIC-DETECTOR STACKS TO A 300 GEV PROTON BEAM AT NAL.

Request	17 Dec, 73	Detector Exposure
Approval	20 Oct, 73	Detector Exposure
Completed	20 Oct, 73	4 Stack(s)

276 QUARK #276 — Andreas Van Ginneken — ARGONNE NATIONAL LABORATORY; UNIVERSITY OF CHICAGO; FERMILAB
BEAM: Neutrino Area - Miscellaneous
A SEARCH FOR STABLE INTEGRALLY CHARGED MASSIVE PARTICLES (HAN-NAMBU QUARKS).
(Mass spectroscopic analysis of irradiated target.)

Request	25 Jan, 74	Target Exposure(s)
Approval	8 Jul, 74	Target Exposure(s)
	30 Aug, 76	Target Exposure(s) with different chemicals and re-exposure of two previous samples
Completed	2 Nov, 75	3 Targets Exposed

279 EMULSION/PROTONS @ 400 #279 — David T. King — UNIVERSITY OF TENNESSEE, KNOXVILLE
BEAM: Neutrino Area - Miscellaneous
THE INTERACTION OF PA=PAE+E- AT 400 GEV.

Request	28 Jan, 74	Emulsion Exposure
Approval	12 Mar, 74	Emulsion Exposure
Completed	9 Dec, 75	3 Stack(s)

280 30-INCH P - D @ 200 #280 — Thomas H. Fields — ARGONNE NATIONAL LABORATORY; CIPP (CANADA); JINR, DUBNA (RUSSIA); MOSCOW STATE UNIVERSITY (RUSSIA)
BEAM: Neutrino Area - 30 in. Hadron Beam
PROPOSAL TO STUDY P - D INTERACTIONS AT 205 GEV/C IN THE 30-INCH BUBBLE CHAMBER.

Request	1 Feb, 74	100 K Pix
Approval	21 Mar, 74	100 K Pix in bare chamber with downstream chamber data if it can be arranged
Completed	11 Oct, 75	103 K Pix

281 30-INCH HYBRID #281 — Gerald A. Smith — IOWA STATE UNIVERSITY; UNIVERSITY OF MARYLAND; MICHIGAN STATE UNIVERSITY; NOTRE DAME UNIVERSITY
BEAM: Neutrino Area - 30 in. Hadron Beam
PROPOSAL TO STUDY HIGH ENERGY PROTON-PROTON AND PI-MINUS PROTON INTERACTIONS WITH THE NAL 30-INCH BUBBLE CHAMBER-WIDE GAP SPARK CHAMBER HYBRID SYSTEM.

Request	1 Feb, 74	400 K Pix including 200K pix of p - p 300 GeV and 200K pix of pi- - p at highest momentum
	25 Sep, 74	700 K Pix total including 300K pix of p - p @ 300 GeV, 100K pix of pi- - p @ 100 GeV, and 300K pix of pi- - p @ 375 GeV
Approval	22 Nov, 74	300 K Pix in a combination of pi- and p bombardments at an energy greater than or equal to 300 GeV and with the understanding that following this run work with the wide gap chamber system will be terminated
Completed	28 Sep, 75	301 K Pix of pi- - p interactions at 360 GeV/c

284 PARTICLE PRODUCTION #284 — James K. Walker — FERMILAB; NORTHEASTERN UNIVERSITY; NORTHERN ILLINOIS UNIVERSITY
BEAM: Proton Area - West
SURVEY OF PARTICLE PRODUCTION IN PROTON COLLISIONS AT NAL.
(Continuation of work begun in exp #63A.)

Request	19 Feb, 74	Unspecified
Approval	26 Jun, 74	750 Hours divided roughly as 150 hours for setup and testing and 150 hours each at the four energies of 100, 200, 300, and 400 GeV
Completed	3 Oct, 76	1,150 Hours

285 SUPER-HEAVY ELEMENTS #285 — Leon M. Lederman — COLUMBIA UNIVERSITY; FERMILAB
BEAM: Neutrino Area - Miscellaneous
A SEARCH FOR A NEW STATE OF MATTER IN THE ANALYSIS OF AN NAL BEAM DUMP.

Request	21 Feb, 74	Target Exposure(s)
Approval	27 Feb, 74	Target Exposure(s)
Completed	2 Aug, 76	3 Targets Exposed

288 DI-LEPTON #288 — Leon M. Lederman — COLUMBIA UNIVERSITY; FERMILAB; SUNY AT STONY BROOK
BEAM: Proton Area - Center
A STUDY OF DI-LEPTON PRODUCTION IN PROTON COLLISIONS AT NAL.
(Formerly known as exp #70 III.)

Request	21 Feb, 74	Unspecified
	10 May, 76	1,500 Hours additional for mu-mu II
	10 Nov, 77	4,500 Hours with a request for an additional 3,000 hours for high intensity and high resolution studies
Approval	18 Jan, 74	1,000 Hours
	17 Nov, 76	2,500 Hours with additional 1,500 hours not to extend beyond 1 Sep 1977
	16 Nov, 77	5,500 Hours with an extension of about 3,000 hours until August 1978, and with a request for a progress report in May 1978
Completed	23 Jul, 78	6,850 Hours

289 PROTON-HELIUM SCATTERING #289 — Ernest I. Malamud — UNIVERSITY OF ARIZONA; FERMILAB; JINR, DUBNA (RUSSIA)
BEAM: Internal Target Area (C-0)
SMALL ANGLE PROTON-HELIUM ELASTIC AND INELASTIC SCATTERING FROM 8 TO 500 GEV.
(Using an internal proton beam with a gas jet target.)

Request	1 Mar, 74	700 Hours
Approval	22 Mar, 74	700 Hours conditional upon successful development of the helium jet technique
Completed	8 Nov, 77	1,050 Hours

290 BACKWARD SCATTERING #290 — Winslow F. Baker — UNIVERSITY OF ARIZONA
BEAM: Meson Area - M6 Beam — FERMILAB
BACKWARD PION-PROTON ELASTIC SCATTERING.
(For u from 0 - 0.8.)

Request	6 Mar, 74	1,100 Hours including 200 hours for testing
Approval	22 Nov, 74	900 Hours
Completed	31 Jul, 78	1,500 Hours

292 EMULSION/PROTONS @ 400 #292 — Kurt Gottfried — IAP, BUCHAREST (ROMANIA)
BEAM: Neutrino Area - Miscellaneous — CERN (SWITZERLAND)
MULTIPARTICLE PRODUCTION IN NUCLEI BY PROTONS OF SEVERAL HUNDRED GEV. — CORNELL UNIVERSITY
(Using target materials consisting of fine wires imbedded in emulsion or foils covering the emulsion; 400 GeV exposure.) — UNIVERSITY OF LUND (SWEDEN)

Request	30 Nov, 73	Emulsion Exposure
Approval	16 Jan, 74	Emulsion Exposure
Completed	9 Dec, 75	12 Stack(s)

295 30-INCH PI+ & P - D @ 200 #295 — Gideon Yekutieli — CRN, STRASBOURG (FRANCE)
BEAM: Neutrino Area - 30 in. Hadron Beam — FERMILAB
A STUDY OF PI+ - D INTERACTIONS AT 200 GEV/C IN THE 30-INCH BUBBLE CHAMBER AT NAL. — WEIZMANN INSTITUTE (ISRAEL)

Request	15 Mar, 74	50 K Pix of p - d @ 205 GeV
	14 Aug, 74	150 K Pix total including an additional 50K pix due to decreased yield of pi+ - d events
Approval	21 Mar, 74	100 K Pix in bare chamber with downstream chamber data if it can be arranged; and with request that interest be switched from p - d to pi+ - d bombardment
	27 Aug, 74	150 K Pix with additional 50K pix to yield the requested number of pi+ - d
Completed	2 Nov, 75	156 K Pix

297 QUARK #297 — Lawrence B. Leipuner — BROOKHAVEN NATIONAL LABORATORY
BEAM: Neutrino Area - 30 in. Hadron Beam
QUARK SEARCH USING 400-500 GEV PROTONS.
(By measuring ionization energy loss.)

Request	15 Apr, 74	24 Hours with beam of 5 x 10 to the 4th particles/pulse and a 200 msec spill
Approval	15 May, 74	24 Hours
Completed	10 Jul, 74	50 Hours

299 30-INCH HYBRID #299 — Irwin A. Pless — BROWN UNIVERSITY
BEAM: Neutrino Area - 30 in. Hadron Beam — UNIVERSITY OF CAMBRIDGE (ENGLAND)
PRECISION STUDY OF HIGH ENERGY COLLISIONS INDUCED BY INCIDENT 150 GEV/C PIONS AND PROTONS. — FERMILAB
(Using the downstream PWC hybrid system.) — ILLINOIS INSTITUTE OF TECHNOLOGY
UNIVERSITY OF ILLINOIS, CHAMPAIGN
INDIANA UNIVERSITY
JOHNS HOPKINS UNIVERSITY
UNIVERSITY OF L'ETAT (BELGIUM)
MASSACHUSETTS INST. OF TECHNOLOGY
SUNY AT ALBANY
NIJMEGEN UNIVERSITY (NETHERLANDS)
OAK RIDGE NATIONAL LABORATORY
RUTGERS UNIVERSITY
STEVENS INSTITUTE OF TECHNOLOGY
UNIVERSITY OF TENNESSEE, KNOXVILLE
YALE UNIVERSITY

Request	16 May, 74	1,200 K Pix at 150 GeV equally split between study of p - p, pi- - p, and pi+ - p interactions
Approval	22 Nov, 74	600 K Pix of pi- - p, p - p, and pi+ - p interactions at 150 GeV/c
	6 Aug, 76	500 K Pix to be pi+ - p @ 150 GeV/c in 30-inch bubble chamber with PWC hybrid system and with 100K pix of pi- - p now included in approval for exp# 393
	28 Oct, 76	660 K Pix with additional 160K pix from a collaboration with proposal #375 to provide an overall package of 500K pix to be taken in an enriched K+ mode; 160K pix already taken at this time
Completed	22 Nov, 76	431 K Pix with 229K pix remaining to be taken under earlier approval when declared complete on 29 Jun 1977

300 PARTICLE SEARCH #300 — Pierre A. Piroue — UNIVERSITY OF CHICAGO
BEAM: Proton Area - East — PRINCETON UNIVERSITY
STUDY OF PARTICLE PRODUCTION AT HIGH TRANSVERSE MOMENTA USING HYDROGEN AND DEUTERIUM TARGETS.

Request	16 May, 74	1,200 Hours with a liquid hydrogen/deuterium target and at beam energies of 200, 300, 400, and 500 GeV
Approval	26 Jun, 74	600 Hours with hydrogen target
Completed	24 Apr, 76	750 Hours

305 NEUTRON DISSOCIATION #305 — Bruno Gobbi — FERMILAB
BEAM: Meson Area - M3 Beam — NORTHWESTERN UNIVERSITY
PROPOSAL TO STUDY THE COHERENT DISSOCIATION OF NEUTRONS. — UNIVERSITY OF ROCHESTER
(A continuation of work begun in exp #27A.) — SLAC

Request	22 May, 74	1,200 Hours total to include one month of running every four months through calendar 1975
Approval	26 Jun, 74	900 Hours without approval for the installation of the transmission target for H2 and D2 cross section measurements
	16 Dec, 74	1,200 Hours with additional 300 hours for particle search
Completed	14 Apr, 75	1,400 Hours

310 NEUTRINO #310 — David B. Cline — FERMILAB; HARVARD UNIVERSITY; UNIVERSITY OF PENNSYLVANIA; RUTGERS UNIVERSITY; UNIVERSITY OF WISCONSIN - MADISON
BEAM: Neutrino Area - Wide Band Horn
FURTHER STUDY OF HIGH ENERGY NEUTRINO INTERACTIONS AT FERMILAB.

Request	4 Jun, 74	Unspecified	
	1 Feb, 78	1,200 Hours	to include 2 x 10 to the 18th protons on target with the Wide Band Horn system focused for negatives without a plug and 2 x 10 to the 18th for positives
Approval	22 Nov, 74	1,000 Hours	with a formal approval for 2 x 10 to the 18th protons and the understanding that use will be made of a horn focusing system
	17 Nov, 76	1,000 Hours	to also include running with the Quadrupole Triplet train for an exposure of 1 x 10 to the 18th protons during December 1976
	15 Mar, 77	2,500 Hours	with formal additional approval as follows--1 - 2 x 10 to the 18th protons using the sign-selected-bare-target train understood to focus antineutrinos, and 2 x 10 to the 18th protons using the Quadrupole Triplet train load
	21 Mar, 78	3,500 Hours	with additional approval for a final run to complete the experiment during wide-band horn running for the 15-ft bubble chamber
Completed	31 Aug, 78	3,800 Hours	at the request of the experimenters, because it was felt that the conditions required to properly continue the experiment could not be met.

311 30-INCH PBAR - P @ 100 #311 — William W. Neale — UNIVERSITY OF CAMBRIDGE (ENGLAND); FERMILAB; MICHIGAN STATE UNIVERSITY
BEAM: Neutrino Area - 30 in. Hadron Beam
PROPOSAL TO STUDY MULTIPARTICLE PRODUCTION IN HIGH ENERGY ANTIPROTON-PROTON INTERACTIONS WITH THE FERMILAB 30-INCH BUBBLE CHAMBER.

Request	6 Jun, 74	100 K Pix	with equal numbers of pbar and pi-
Approval	26 Jun, 74	100 K Pix	to be obtained with not more than 200K pulses of the chamber
Completed	27 Jan, 75	98 K Pix	

313 PROTON-PROTON POLARIZATION #313 — Homer A. Neal — INDIANA UNIVERSITY
BEAM: Internal Target Area (C-0)
POLARIZATION IN P - P ELASTIC, INELASTIC AND INCLUSIVE REACTIONS AT FERMILAB ENERGIES.
(Using a gas jet target with hydrogen, the internal proton beam, the spectrometer of exp #198A, and a new carbon polarimeter.)

Request	5 Jun, 74	1,500 Hours	total with two jet pulses per cycle
Approval	26 Jun, 74	1,000 Hours	with about 800 hours of running on polarization in elastic scattering and about 200 hours of running to observe polarization in inelastic channels
	15 Mar, 77	1,000 Hours	with encouragement to use some of the remaining running to accumulate further data on polarization in inelastic processes; see proposal #522
Completed	30 Mar, 77	850 Hours	with some approved running remaining; see exp #522

317 PROTON-NUCLEON INELASTIC #317 — Rodney L. Cool — UNIVERSITY OF ARIZONA; FERMILAB; JINR, DUBNA (RUSSIA); UNIVERSITY OF ROCHESTER; ROCKEFELLER UNIVERSITY
BEAM: Internal Target Area (C-0)
PROTON DIFFRACTION DISSOCIATION ON HYDROGEN AND DEUTERIUM.
(Using the gas jet target and internal proton beam.)

Request	7 Jun, 74	800 Hours	for tests and data taking
Approval	3 Jul, 74	800 Hours	using gas jet with running to be interleaved with exp# 321
Completed	1 Nov, 75	1,400 Hours	

319 MUON #319 — K. Wendell Chen — FERMILAB; MICHIGAN STATE UNIVERSITY
BEAM: Neutrino Area - Muon/Hadron Beam
FURTHER TEST OF SCALING AT HIGH MOMENTUM TRANSFERS IN DEEP INELASTIC MUON SCATTERING.
(A continued exploration of the studies begun in exp #26.)

Request	10 Jun, 74	1,100 Hours	
Approval	26 Mar, 75	500 Hours	for a scaling test at high energies
Completed	20 Sep, 76	900 Hours	

320 NEUTRINO #320 — Frank J. Sciulli — CALIFORNIA INSTITUTE OF TECHNOLOGY; FERMILAB
BEAM: Neutrino Area - Dichromatic
PROPOSAL TO MEASURE NEUTRAL CURRENT CROSS-SECTIONS AND ASSOCIATED INELASTIC DISTRIBUTIONS IN THE NARROW-BAND BEAM.

Request	10 Jun, 74	1,200 Hours	with request of 3 x 10 to the 18th protons total and initial run of 1 x 10 to the 18th protons for investigation
Approval	26 Jun, 74	500 Hours	with a formal approval for 1 x 10 to the 18th protons pending a positive finding of neutral currents and with the inclination to assign higher priority for running to exp# 320 than to completion of exp# 21
Completed	1 Oct, 74	500 Hours	

321 PROTON-PROTON INELASTIC #321 — Juliet Lee-Franzini — COLUMBIA UNIVERSITY; SUNY AT STONY BROOK
BEAM: Internal Target Area (C-0)
A HIGH PRECISION EXPERIMENT TO MEASURE THE INELASTIC P - P CROSS SECTION AND ITS ASSOCIATED FORWARD MULTIPLICITIES AT SMALL MOMENTUM TRANSFER.
(Using a new hydrogen gas jet target and the internal proton beam.)

Request	11 Jun, 74	2,000 Hours	total including 800 hours for testing
Approval	3 Jul, 74	800 Hours	with running to be interleaved with exp# 317 and using the existing cryogenic hydrogen jet
	26 Mar, 75	800 Hours	with approval to use a room temperature gas jet of their own design
Completed	20 Sep, 76	1,900 Hours	

324 INCLUSIVE SCATTERING #324 — Howard L. Weisberg — UNIVERSITY OF PENNSYLVANIA
BEAM: Meson Area - M1 Beam
A PROPOSAL TO STUDY SINGLE PARTICLE INCLUSIVE SPECTRA IN HIGH ENERGY HADRON-HADRON COLLISIONS

Request	11 Apr, 74	1,000 Hours	
Approval	24 Jun, 74	500 Hours	
Completed	13 Aug, 77	1,200 Hours	

325 PARTICLE SEARCH #325 — Pierre A. Piroue — UNIVERSITY OF CHICAGO; PRINCETON UNIVERSITY
BEAM: Proton Area - East
STUDY OF DI-MUON PRODUCTION AT HIGH TRANSVERSE MOMENTA.

Request	12 Jun, 74	Parasitic Running	
Approval	25 Nov, 74	Parasitic Running	with the stipulation that this running time will be concurrent with the previously approved 600 hours for exp# 300
	6 May, 76	600 Hours	for a portion of the program estimated to require 13 weeks and with the expectation to continue the experiment during another running period
	26 Oct, 76	1,200 Hours	during a six-week running period to begin in January 1977
Completed	28 Feb, 77	1,500 Hours	

326 DI-MUON #326 — Melvyn Jay Shochet — UNIVERSITY OF CHICAGO; PRINCETON UNIVERSITY
BEAM: Proton Area - West
PROPOSAL TO MEASURE MUON PAIRS PRODUCED AT HIGH TRANSVERSE MOMENTUM BY PIONS.

Request	29 May, 74	Unspecified
	7 Jul, 75	400 Hours
	2 Feb, 77	800 Hours to be run in conjunction with exp #258 in the P-West pion beam by adding a second arm to the exp #258 spectrometer
Approval	15 Mar, 77	800 Hours
Completed	26 Apr, 82	2,000 Hours

327 DETECTOR DEVELOPMENT #327 — Wade W. M. Allison — MASSACHUSETTS INST. OF TECHNOLOGY; UNIVERSITY OF OXFORD (ENGLAND)
BEAM: Neutrino Area - Miscellaneous
PROPOSAL TO TEST PARTICLE IDENTIFICATION BY IONIZATION LOSS (ISIS).

Request	15 Jul, 74	400 Hours
Approval	31 Jul, 74	50 Hours
Completed	7 Feb, 75	50 Hours

328 EMULSION/PI- @ 200 #328 — M. I. Tretjakova — LEBEDEV PHYSICAL INST. (RUSSIA)
BEAM: Neutrino Area - Miscellaneous
PROPOSAL TO STUDY THE INTERACTIONS OF PI- MESONS IN NUCLEAR EMULSION AT THE FERMILAB ACCELERATOR.

Request	5 Aug, 74	Emulsion Exposure
Approval	5 Aug, 74	Emulsion Exposure
Completed	7 Oct, 74	5 Stack(s)

329 EMULSION/PROTONS @ 300 #329 — M. I. Tretjakova — LEBEDEV PHYSICAL INST. (RUSSIA)
BEAM: Neutrino Area - Miscellaneous
PROPOSAL TO STUDY THE INTERACTIONS OF PROTONS IN NUCLEAR EMULSION AT THE FERMILAB ACCELERATOR.

Request	5 Aug, 74	Emulsion Exposure
Approval	3 Jun, 75	Emulsion Exposure
Completed	10 Jun, 75	2 Stack(s)

330 PARTICLE SEARCH #330 — H. Richard Gustafson — UNIVERSITY OF MICHIGAN - ANN ARBOR
BEAM: Meson Area - M4 Beam
SEARCH FOR MASSIVE NEUTRAL PARTICLES.
(Using time-of-flight and a total absorption calorimeter.)

Request	6 Aug, 74	1,300 Hours to include 800 hours for tuneup parasitic to exp #305 and 500 hours for data
Approval	22 Jan, 75	100 Hours
Completed	7 Jul, 75	150 Hours

331 DI-MUON #331 — James E. Pilcher — UNIVERSITY OF CHICAGO; PRINCETON UNIVERSITY
BEAM: Neutrino Area - Muon/Hadron Beam
PROPOSAL FOR A DETAILED STUDY OF DI-MUON PRODUCTION.
(Alternative version of exps #308 & #323 designed for muon laboratory cyclotron spectrometer.)

Request	10 Aug, 74	Unspecified
Approval	25 Nov, 74	400 Hours for an initial run at an incident beam intensity of about 10 to the 6th particles/pulse
Completed	22 Mar, 76	1,400 Hours

335 MUON SEARCH #335 — Orrin D. Fackler — CALIFORNIA INSTITUTE OF TECHNOLOGY; UNIVERSITY OF CHICAGO; FERMILAB; PRINCETON UNIVERSITY; ROCKEFELLER UNIVERSITY
BEAM: Meson Area - M1 Beam
A SEARCH FOR DIRECT MUON PRODUCTION IN THE FORWARD DIRECTION.

Request	18 Aug, 74	200 Hours total including time for tests and data
Approval	22 Nov, 74	200 Hours provided that this running time can be arranged in such a way as not to interfere substantially with the ongoing physics program in the M1 beam line
Completed	6 Jun, 75	300 Hours

336 EMULSION/PROTONS @ 400 #336 — Takeshi Ogata — KWANSEI GAKUIN UNIVERSITY (JAPAN)
BEAM: Neutrino Area - Miscellaneous
MULTIPARTICLE PRODUCTION IN NUCLEON-NUCLEUS COLLISIONS AT 400 GEV.

Request	9 Sep, 74	Emulsion Exposure
Approval	19 Oct, 74	Emulsion Exposure
Completed	9 Dec, 75	2 Stack(s)

337 DI-MUON #337 — David P. Eartly — FERMILAB; MAX-PLANCK INSTITUTE (GERMANY)
BEAM: Meson Area - Miscellaneous
MEASUREMENT OF DI-MUON EVENTS IN THE MESON AREA.

Request	20 Sep, 74	3 Hours
Approval	27 Sep, 74	3 Hours
Completed	7 Feb, 75	5 Hours

338 30-INCH PI- - D @ 360 #338 — Keihachiro Moriyasu — UNIV. OF CALIFORNIA, DAVIS; INP, KRAKOW (POLAND); WARSAW UNIVERSITY, INP, (POLAND); UNIVERSITY OF WASHINGTON
BEAM: Neutrino Area - 30 in. Hadron Beam
PION-DEUTERON INTERACTIONS AT 400 GEV/C.

Request	21 Sep, 74	100 K Pix
Approval	24 Sep, 74	50 K Pix in bare chamber with downstream chamber data if it can be arranged
Completed	28 Aug, 76	53 K Pix

339 EMULSION/PI- @ 200 #339 — Wladyslaw Wolter — INP, KRAKOW (POLAND)
BEAM: Neutrino Area - Miscellaneous
CRACOW EMULSION EXPOSURE TO 200 GEV PIONS.

Request	12 Sep, 74	Emulsion Exposure
Approval	1 Oct, 74	Emulsion Exposure
Completed	9 Jun, 75	4 Stack(s)

340 EMULSION/ELECTRONS @ HI E #340 — Shoji Dake — KOBE UNIVERSITY (JAPAN); KONAN UNIVERSITY (JAPAN); SAITAMA UNIVERSITY (JAPAN); UNIVERSITY OF TOKYO (JAPAN); UTSUNOMIYA UNIVERSITY (JAPAN); WASEDA UNIVERSITY (JAPAN)
BEAM: Proton Area - Miscellaneous
STUDY OF THE ELECTRON-PHOTON CASCADE SHOWER IN LEAD ABSORBER.

Request	25 Sep, 74	Emulsion Exposure
Approval	10 Oct, 74	Emulsion Exposure
Completed	5 Oct, 76	10 Stack(s)

341 15-FOOT P - P @ 400 #341 — Winston Ko — UNIV. OF CALIFORNIA, DAVIS; LAWRENCE BERKELEY LABORATORY
BEAM: Neutrino Area - 15 ft. Hadron Beam
INTERACTIONS OF PI+ MESONS AND PROTONS IN A HYDROGEN-NEON MIXTURE.

Request	1 Oct, 74	100 K Pix	
Approval	4 Dec, 74	25 K Pix	of tagged pi+ and p at 150 GeV in H2 to develop analysis techniques for 15-foot bubble chamber film
	8 Dec, 75	25 K Pix	of p - p interactions at 400 GeV
Completed	21 Dec, 75	34 K Pix	

343 15-FOOT P - P @ 300 #343 — Roderich J. Engelmann — ARGONNE NATIONAL LABORATORY; UNIVERSITY OF KANSAS; SUNY AT STONY BROOK; TUFTS UNIVERSITY
BEAM: Neutrino Area - 15 ft. Hadron Beam
PROPOSAL TO STUDY NEUTRAL PARTICLE PRODUCTION IN 250 GEV P - P INTERACTIONS IN THE FERMILAB 15-FOOT BUBBLE CHAMBER.

Request	3 Oct, 74	25 K Pix	
Approval	4 Dec, 74	25 K Pix	
Completed	13 Jan, 76	27 K Pix	

344 30-INCH PBAR - P @ 50 #344 — Laszlo J. Gutay — CNTRL RES INST, BUDAPEST (HUNGARY); FERMILAB; PURDUE UNIVERSITY
BEAM: Neutrino Area - 30 in. Hadron Beam
PROPOSAL TO SURVEY CENTRAL COLLISIONS IN PBAR - P TO MESONS BETWEEN 30 AND 60 GEV/C IN THE 30-INCH BUBBLE CHAMBER AT FERMILAB.

Request	4 Oct, 74	100 K Pix	to be taken in < 200K chamber expansions
Approval	27 Nov, 74	100 K Pix	with the qualification that it must be possible to obtain these pictures in no more than one calender month of running time
Completed	1 Nov, 76	145 K Pix	

345 30-INCH PBAR - D @ 100 #345 — Gosta Ekspong — UNIVERSITY OF LIVERPOOL (ENGLAND); UNIVERSITY OF STOCKHOLM (SWEDEN); VANDERBILT UNIVERSITY
BEAM: Neutrino Area - 30 in. Hadron Beam
PROPOSAL TO STUDY MULTIPARTICLE PRODUCTION IN 100 GEV/C ANTI-PROTON-DEUTERIUM INTERACTIONS WITH THE FERMILAB 30-INCH BUBBLE CHAMBER.

Request	5 Oct, 74	100 K Pix	with a Cerenkov tagged incoming beam
Approval	4 Dec, 74	100 K Pix	with the qualification that serious consideration be given to the use* of the PWC downstream system
Completed	7 Sep, 76	61 K Pix	with 39K pix remaing to be taken under earlier approval when declared complete on 29 Jun 1977

346 EMULSION/PROTONS @ 400 #346 — Gosta Ekspong — UNIVERSITY OF STOCKHOLM (SWEDEN)
BEAM: Neutrino Area - Miscellaneous
SEARCH FOR HEAVY, SHORTLIVED PARTICLES.

Request	6 Oct, 74	Emulsion Exposure
Approval	21 Oct, 74	Emulsion Exposure
Completed	9 Dec, 75	1 Stack(s)

350 INCLUSIVE NEUTRAL MESON #350 — Robert W. Kenney — BROOKHAVEN NATIONAL LABORATORY; CALIFORNIA INSTITUTE OF TECHNOLOGY; LAWRENCE BERKELEY LABORATORY
BEAM: Meson Area - M2 Beam
A PROPOSAL TO STUDY NEUTRAL PIONS AND MESON INCLUSIVE PRODUCTION WITH INCIDENT NEGATIVE PIONS IN THE TRIPLE REGGE REGION.
(Using the photon detector of exp #111.)

Request	11 Oct, 74	500 Hours	
Approval	21 Nov, 74	400 Hours	
	16 Dec, 74	400 Hours	with up to 150 hours approved for a particle search with the condition that this time be included within the 900 hours already approved for for exps# 268 and 350
Completed	24 Feb, 77	900 Hours	

356 NEUTRINO #356 — Frank J. Sciulli — CALIFORNIA INSTITUTE OF TECHNOLOGY; FERMILAB; UNIVERSITY OF ROCHESTER; ROCKEFELLER UNIVERSITY
BEAM: Neutrino Area - Dichromatic
STUDIES OF DEEP INELASTIC DIFFERENTIAL DISTRIBUTIONS AT HIGH ENERGIES FOR NEUTRINO AND ANTI-NEUTRINO BEAMS.
(A continuation of the work begun in exp #21A with a new narrow band beam and changed apparatus.)

Request	18 Oct, 74	1,000 Hours	
Approval	22 Nov, 74	1,000 Hours	with a formal commitment of 2 x 10 to the 18th protons contingent on the feasibility of developing the improved Dichromatic beam
Completed	17 Jan, 79	1,350 Hours	

357 PARTICLE SEARCH #357 — Donald I. Meyer — FERMILAB; UNIVERSITY OF MICHIGAN - ANN ARBOR; PURDUE UNIVERSITY
BEAM: Meson Area - M2 Beam
A PROPOSAL TO SEARCH FOR CHARMED PARTICLES AND MEASUREMENTS OF TWO-PARTICLE INCLUSIVE CROSS SECTIONS AT LARGE P-TRANSVERSE.
(Employing a two-arm magnetic spectrometer.)

Request	19 Oct, 74	2,400 Hours
Approval	16 Dec, 74	600 Hours
Completed	7 Jun, 76	1,700 Hours

358 DI-MUON #358 — Wonyong Lee — COLUMBIA UNIVERSITY; CORNELL UNIVERSITY; FERMILAB; UNIVERSITY OF HAWAII AT MANOA; UNIVERSITY OF ILLINOIS, CHAMPAIGN
BEAM: Proton Area - East
DI-MUON PRODUCTION BY NEUTRONS.

Request	20 Oct, 74	Unspecified	
Approval	27 Nov, 74	300 Hours	of neutron running to be interleaved within the 600 hours already approved for exp# 87A
Completed	1 Oct, 75	400 Hours	

361 LAMBDA BETA-DECAY #361 — Lee G. Pondrom — UNIVERSITY OF MICHIGAN - ANN ARBOR; UNIVERSITY OF MINNESOTA; RUTGERS UNIVERSITY; UNIVERSITY OF WISCONSIN - MADISON
BEAM: Meson Area - M2 Beam
PRECISION MEASUREMENT OF LAMBDA BETA DECAY PARAMETERS.
(Will run with experimental set-up for neutral hyperon #8.)

Request	14 Nov, 74	300 Hours	
	23 Jan, 76	350 Hours	total including 150 hours in unpolarized lambda-zero beam and 200 hours in polarized lambda-zero beam
Approval	15 Nov, 77	300 Hours	
Completed	29 Oct, 79	1,250 Hours	

362 EMULSION/PI- @ 200 #362 — Piyare L. Jain — SUNY AT BUFFALO
BEAM: Neutrino Area - Miscellaneous
INTERACTION OF 200 - 400 GEV PIONS WITH EMULSION NUCLEI.

Request	15 Nov, 74	Emulsion Exposure
Approval	25 Nov, 74	Emulsion Exposure
Completed	9 Jun, 75	1 Stack(s)

363 PARTICLE SEARCH #363 — Stephen L. Olsen — FLORIDA STATE UNIVERSITY; IMPERIAL COLLEGE (ENGLAND); UNIVERSITY OF ROCHESTER; RUTGERS UNIVERSITY
BEAM: Internal Target Area (C-0)
A PROPOSAL TO SEARCH FOR CHARMED PARTICLE PRODUCTION NEAR THRESHOLD.

Request	24 Nov, 74	Unspecified
Approval	16 Dec, 74	500 Hours of running with the rotating carbon filament target
Completed	9 Apr, 75	650 Hours

365 PARTICLE SEARCH #365 — David A. Garelick — NORTHEASTERN UNIVERSITY
BEAM: Meson Area - M2 Beam
A PROPOSAL TO SEARCH FOR THE PRODUCTION OF CHARMED MESONS IN PI - P INTERACTIONS.

Request	27 Nov, 74	200 Hours including 40 hours for testing
Approval	31 Dec, 74	200 Hours during a two week run with a passive, nonmagnetized steel absorber to be used in conjunction with a muon trigger
Completed	5 Feb, 75	200 Hours

366 PARTICLE SEARCH #366 — Maris A. Abolins — CARELTON UNIVERSITY (CANADA); FERMILAB; MICHIGAN STATE UNIVERSITY; OHIO STATE UNIVERSITY
BEAM: Meson Area - M3 Beam
STUDY OF HEAVY, NARROW MESONS USING A MASS-FOCUSING SPECTROMETER.
(Experiment consists mainly of rearranged components from exp #12.)

Request	27 Nov, 74	Unspecified
Approval	16 Dec, 74	600 Hours for a particle search to be slanted particularly toward an identification of charmed mesons
	24 Nov, 75	1,200 Hours with an additional 600 hours to explore the possibility of a mass peak in the K- pi+ mass spectrum
Completed	2 Jul, 76	2,500 Hours

369 PARTICLE SEARCH #369 — Thomas B. W. Kirk — FERMILAB; HARVARD UNIVERSITY; UNIVERSITY OF ILLINOIS, CHAMPAIGN; MAX-PLANCK INSTITUTE (GERMANY); TUFTS UNIVERSITY
BEAM: Neutrino Area - Muon/Hadron Beam
A SEARCH FOR CHARMED PARTICLES.
(Using the spectrometer originally developed for exp #98.)

Request	9 Dec, 74	700 Hours for data with 300 pulses/hour and 1 x 10 to the 6th pi-/pulse
Approval	17 Mar, 76	600 Hours
Completed	13 Aug, 77	1,000 Hours

370 NEUTRINO #370 — David B. Cline — FERMILAB; HARVARD UNIVERSITY; UNIVERSITY OF PENNSYLVANIA; UNIVERSITY OF WISCONSIN - MADISON
BEAM: Neutrino Area - Quadrupole Triplet
CONTINUED SEARCH FOR NEW PARTICLE PRODUCTION USING THE EXP #1A DETECTOR.

Request	9 Dec, 74	500 Hours with a total of 1 x 10 to the 18th protons and a 1 msec spill
Approval	7 Jul, 75	500 Hours with the hope of providing 1 x 10 to the 18th protons
Completed	19 Mar, 75	400 Hours

371 SUPER-HEAVY ELEMENTS #371 — Mira Juric — UNIVERSITY OF BELGRADE(YUGOSLAVIA)
BEAM: Meson Area - Miscellaneous
INVESTIGATION OF THE PRODUCTION OF HEAVY FRAGMENTS INDUCED BY PARTICLES OF HIGH ENERGIES.

Request	2 Dec, 74	Target Exposure(s)
Approval	12 Mar, 75	Target Exposure(s)
Completed	20 Dec, 75	2 Stack(s)

373 EMULSION/MUONS @ 200 #373 — Piyare L. Jain — SUNY AT BUFFALO
BEAM: Neutrino Area - Miscellaneous
INTERACTION OF 50 - 100 GEV MUONS WITH EMULSION NUCLEI.

Request	8 Jul, 75	Emulsion Exposure
Approval	24 Sep, 76	Emulsion Exposure to muons @ 225 GeV/c and with an intensity not to exceed 50K particles/sq cm
Completed	22 Nov, 76	2 Stack(s)

374 EMULSION/PROTONS @ 300 #374 — D. H. Davis — UNIVERSITY OF BELGRADE(YUGOSLAVIA); UNIV. COLLEGE DUBLIN (IRELAND); INP, KRAKOW (POLAND); UNIVERSITY OF LIBRE (BELGIUM); LONDON UNIVERSITY COLLEGE(ENGLAND); THE OPEN UNIVERSITY (ENGLAND); INFN, ROME (ITALY); UNIVERSITY OF STRASBOURG (FRANCE); WARSAW UNIVERSITY, INP, (POLAND)
BEAM: Neutrino Area - Miscellaneous
A PROPOSAL TO SEARCH FOR CHARMED PARTICLES ORIGINATING FROM INTERACTIONS OF 300 GEV/C PROTONS IN EMULSION NUCLEI.

Request	25 Jan, 74	Emulsion Exposure
Approval	12 Mar, 75	Emulsion Exposure with the understanding that exp# 374 will replace exp# 364
Completed	10 Jun, 75	1 Stack(s)

379 PARTICLE SEARCH #379 — Stanley G. Wojcicki — CALIFORNIA INSTITUTE OF TECHNOLOGY; UNIVERSITY OF ROCHESTER; STANFORD UNIVERSITY
BEAM: Neutrino Area - 15 ft. Hadron Beam
SEARCH FOR SHORT LIVED STATES DECAYING WEAKLY VIA LEPTONIC MODES.

Request	5 Feb, 75	1,000 Hours
Approval	26 Mar, 75	200 Hours for testing and initial data taking
	17 Nov, 76	600 Hours with 400 hours for high priority running and with the expectation that a second 400 hour run will be approved if preliminary analysis of initial results are satisfactory
	15 Mar, 77	600 Hours with a hope of combining the two requested running periods into a single block of running but with the understanding that the total number of hours would be somewhat less than requested
Completed	8 Jun, 77	1,250 Hours

380 15-FOOT NEUTRINO/H2&NE #380 — Charles Baltay — BROOKHAVEN NATIONAL LABORATORY; COLUMBIA UNIVERSITY
BEAM: Neutrino Area - Dichromatic
STUDY OF THE PROPERTIES OF WEAK NEUTRAL CURRENTS IN THE INTERACTIONS OF A NARROW BAND NEUTRINO BEAM IN LIQUID NEON.

Request	6 Feb, 75	200 K Pix
Approval	7 Jul, 75	200 K Pix in a heavy neon-hydrogen mixture contingent upon the construction and adequate performance of an improved narrow-band beam
	24 Jun, 77	200 K Pix at higher energies using the D C Dichromatic train; new requests for use of the Dichromatic horn to be considered later
Completed	31 Oct, 79	196 K Pix

381 PROTON-NUCLEON SCATTERING #381 — Ernest I. Malamud — UNIVERSITY OF ARIZONA
BEAM: Internal Target Area (C-0) — FERMILAB
MEASUREMENT OF THE REAL PART OF THE P - N AND P - P FORWARD SCATTERING AMPLITUDES; PRODUCTION OF LOW MASS ISOBARS IN THE VERY SMALL MOMENTUM TRANSFER REGION. (Uses gas jet target.) — JINR, DUBNA (RUSSIA); UNIVERSITY OF ROCHESTER

Request	20 Feb, 75	300 Hours
Approval	26 Mar, 75	300 Hours
Completed	30 Mar, 77	600 Hours

382 PARTICLE SEARCH #382 — Louis N. Hand — CORNELL UNIVERSITY
BEAM: Neutrino Area - Muon/Hadron Beam — FERMILAB
A SEARCH FOR CHARMED HADRONS PRODUCED BY MUON DEEP INELASTIC SCATTERING IN TAGGED NUCLEAR EMULSIONS. (Using drift chambers to locate events and reduce scanning time.) — INP, KRAKOW (POLAND); MICHIGAN STATE UNIVERSITY; UNIVERSITY OF WASHINGTON

Request	21 Feb, 75	Emulsion Exposure
Approval	26 Mar, 75	Emulsion Exposure with a provision that it does not seriously interfere with the rest of the muon and neutrino program
	24 Nov, 75	Emulsion Exposure with a bombardment of five days duration during December 1975
Completed	19 Dec, 75	200 Hours

383 INCLUSIVE K-SHORT #383 — Hans G. E. Kobrak — UNIV. OF CALIFORNIA, DAVIS
BEAM: Meson Area - M4 Beam — UNIV. OF CALIFORNIA, SAN DIEGO
A PROPOSAL TO STUDY THE INCLUSIVE PRODUCTION OF K ZERO SHORT BY K MINUS ON HYDROGEN. (To use the M4 line as a charged beam at momenta of 20 - 150 GeV/c.) — CARELTON UNIVERSITY (CANADA); MICHIGAN STATE UNIVERSITY

Request	24 Feb, 75	500 Hours
Approval	29 Jun, 76	500 Hours with 200 hours for setup and original run and 300 hours for final run
Completed	7 May, 78	2,200 Hours

385 EMULSION/PROTONS @ 400 #385 — Yog Prakash — DELHI UNIVERSITY (INDIA)
BEAM: Neutrino Area - Miscellaneous — JAMMU UNIVERSITY (INDIA)
PROPOSAL FOR EXPOSURE OF A STACK OF NUCLEAR EMULSIONS TO PROTONS OF 400 GEV/C. — PANJAB UNIVERSITY (INDIA); RAJASTHAN UNIVERSITY (INDIA)

Request	5 Mar, 75	Emulsion Exposure
Approval	11 Mar, 75	Emulsion Exposure
Completed	9 Dec, 75	1 Stack(s)

386 EMULSION/NEW PARTICLES #386 — Jere J. Lord — UNIVERSITY OF WASHINGTON
BEAM: Neutrino Area - Miscellaneous
A SEARCH FOR LOW ENERGY NEUTRAL PARTICLES AND PARTICLE INTERACTIONS INVOLVING SMALL ENERGY EXCHANGES IN THE NEUTRINO BEAM.

Request	7 Mar, 75	Emulsion Exposure
Approval	27 Mar, 75	Emulsion Exposure
Completed	29 Dec, 76	1 Stack(s)

387 EMULSION/PI- @ 200 #387 — Richard J. Wilkes — UNIVERSITY OF WASHINGTON
BEAM: Neutrino Area - Miscellaneous
100 TO 300 GEV PION INTERACTIONS IN EMULSION AND HEAVY ELEMENT TARGETS.

Request	7 Mar, 75	Emulsion Exposure
Approval	13 May, 75	Emulsion Exposure
Completed	9 Jun, 75	4 Stack(s)

388 15-FOOT ANTI-NEUTRINO/H2&NE#388 — Vincent Z. Peterson — FERMILAB
BEAM: Neutrino Area - Dichromatic — UNIVERSITY OF HAWAII AT MANOA
PROPOSAL TO STUDY NEUTRAL CURRENT NEUTRINO AND ANTI-NEUTRINO INTERACTIONS IN THE 15-FOOT BUBBLE CHAMBER USING THE EXTERNAL MUON IDENTIFIER AND A DICHROMATIC BEAM. — LAWRENCE BERKELEY LABORATORY

Request	24 Apr, 75	200 K Pix
	7 Jun, 78	500 K Pix or 5 x 10 to the 18th protons
Approval	7 Jul, 75	200 K Pix of antineutrino bombardment with a heavy neon-hydrogen mixture contingent upon the construction and adequate performance of an improved narrow-band beam; see proposal #455
	24 Jun, 77	200 K Pix at higher energies using the D C Dichromatic train; new requests for use of the Dichromatic horn to be considered later
	28 Jun, 78	200 K Pix with a decision to maintain the approval as it stands
Completed	12 Sep, 79	181 K Pix

390 15-FOOT ANTI-NEUTRINO/D2 #390 — Arthur F. Garfinkel — ARGONNE NATIONAL LABORATORY
BEAM: Neutrino Area - Wide Band Horn — CARNEGIE-MELLON UNIVERSITY
ANTI-NEUTRINO INTERACTIONS IN THE DEUTERIUM-FILLED 15-FOOT BUBBLE CHAMBER. — PURDUE UNIVERSITY

Request	29 Apr, 75	300 K Pix
Approval	7 Jul, 75	300 K Pix
	28 Jun, 78	300 K Pix with a total of 150K pix presently scheduled for the experiment during the fall 1978 run
	19 Mar, 79	250 K Pix
Approved/Inactive	1 Apr, 79	10 K Pix as of 1 Apr 1979

391 MUON #391 — Leroy T. Kerth — UNIV. OF CALIFORNIA, BERKELEY
BEAM: Neutrino Area - Muon/Hadron Beam — FERMILAB
EXPLORATION OF RARE MUON-INDUCED PROCESSES. — LAWRENCE BERKELEY LABORATORY; PRINCETON UNIVERSITY

Request	15 Feb, 75	Unspecified
Approval	7 Jul, 75	Parasitic Running concurrent with exp# 203
Completed	18 May, 78	Unspecified but for information on the total extent of run, see exp #203A

395 HADRON JETS #395 — Walter Selove — LEHIGH UNIVERSITY
BEAM: Meson Area - M2 Beam — UNIVERSITY OF PENNSYLVANIA
CALORIMETER-ARRAY STUDY OF HIGH P-TRANSVERSE EVENTS. — UNIVERSITY OF WISCONSIN - MADISON

Request	21 May, 75	450 Hours total including 150 hours of tests
Approval	7 Jul, 75	450 Hours contingent upon the successful completion of the calorimeter tests planned for the M5 beam line
Completed	16 Nov, 77	1,150 Hours

396 HADRON DISSOCIATION #396 — Konstantin Goulianos — ROCKEFELLER UNIVERSITY
BEAM: Meson Area - M6 Beam
ELASTIC SCATTERING AND DIFFRACTION DISSOCIATION AT SMALL MOMENTUM TRANSFER FOR PI+-, K+-, P, PBAR AND N.

Request	21 May, 75	1,000 Hours
Approval	7 Jul, 75	600 Hours for Phase I
Completed	23 Nov, 77	1,200 Hours

397	PARTICLE SEARCH #397	Jerome L. Rosen		FERMILAB
	BEAM: Meson Area - M3 Beam			NORTHWESTERN UNIVERSITY
	PROPOSAL TO SEARCH FOR HIGH MASS PARTICLES PRODUCED IN ASSOCIATION WITH PROMPT MUONS.			UNIVERSITY OF ROCHESTER
	(Using the spectrometer from exps #27A and #305 with additions.)			SLAC
	Request	21 May, 75	1,000 Hours	
	Approval	9 Jul, 75	500 Hours	
		18 May, 76	1,000 Hours including an additional running period of approximately 5 weeks duration during the summer of 1976	
	Completed	18 Aug, 76	1,150 Hours	
398	MUON #398	Richard Wilson		UNIVERSITY OF CHICAGO
	BEAM: Neutrino Area - Muon/Hadron Beam			HARVARD UNIVERSITY
	A PROPOSAL FOR A FURTHER STUDY OF MUON NUCLEON INELASTIC SCATTERING AT FERMILAB.			UNIVERSITY OF ILLINOIS, CHAMPAIGN
	(Using the spectrometer of exp #98.)			UNIVERSITY OF OXFORD (ENGLAND)
				VIRGINIA TECH
	Request	21 May, 75	800 Hours	
	Approval	7 Jul, 75	800 Hours of H2 and D2 running with the expectation that some of this running can occur concurrently with exp #319, at which time priority will be given to exp# 319	
	Completed	1 Dec, 76	1,100 Hours	
399	EMULSION/ELECTRONS @ >100 #399	Robert L. Golden		JOHNSON SPACE CENTER (NASA)
	BEAM: Proton Area - Miscellaneous			KANAGAWA UNIVERSITY (JAPAN)
	PRODUCTION OF ELECTROMAGNETIC CASCADE SHOWERS BY SEVERAL HUNDRED GEV ELECTRONS IN EMULSION CHAMBERS.			ISAS, TOKYO UNIVERSITY (JAPAN)
				UNIVERSITY OF WASHINGTON
	Request	5 May, 75	1,000 Emulsion Exposure	
	Approval	19 Jun, 75	Emulsion Exposure to electrons with fluxes of 10, 1,000, and 200K/sq cm	
	Completed	5 Oct, 76	6 Stack(s)	
400	PARTICLE SEARCH #400	James E. Wiss		UNIVERSITY OF BOLOGNA (ITALY)
	BEAM: Proton Area - East			UNIVERSITY OF COLORADO AT BOULDER
	A SEARCH FOR NEW PARTICLES PRODUCED IN ASSOCIATION WITH THE HADRONIC PRODUCTION OF PSI (3.1) MESONS.			FERMILAB
				UNIVERSITY OF ILLINOIS, CHAMPAIGN
	(Using a proton beam of about 10 to the 7th into the zero degree neutral beam line and the spectrometer of exp #401/458 with additions.)			INFN, MILANO (ITALY)
				UNIVERSITY OF MILANO (ITALY)
				UNIVERSITY OF PAVIA (ITALY)
				YALE UNIVERSITY
	Request	22 May, 75	870 Hours	
	Approval	7 Jul, 75	400 Hours	
		2 Jul, 76	400 Hours with a total of 1,000 hours approved for the combination of exps #400, #401, and #458	
		14 Mar, 77	400 Hours with a total of 2,000 hours for the combination of exps #400,401 & 458	
		1 Apr, 78	Unspecified since approved running time has been used by exp #87A	
		7 Jul, 80	500 Hours	
	Completed	14 Jul, 84	2,210 Hours	
401	PHOTOPRODUCTION #401	Michael F. Gormley		FERMILAB
	BEAM: Proton Area - East			UNIVERSITY OF ILLINOIS, CHAMPAIGN
	PHOTOPRODUCTION OF HIGH MASS TWO-BODY FINAL STATES.			
	(Using an improved exp #87A apparatus and an additional sweeping magnet in the photon beam.)			
	Request	22 May, 75	300 Hours	
		1 Jun, 78	1,100 Hours	
	Approval	7 Jul, 75	300 Hours	
		2 Jul, 76	300 Hours with a total of 1,000 hours approved for the combination of exps #400, #401, and #458	
		14 Mar, 77	600 Hours with a total of 2,000 hours for the combination exps #400,401,&458	
		1 Apr, 78	Unspecified since approved running time has been used by exp #87A	
		29 Jun, 78	600 Hours	
	Completed	26 Nov, 79	2,100 Hours	
404	INCLUSIVE NEUTRON #404	H. Richard Gustafson		UNIVERSITY OF MICHIGAN - ANN ARBOR
	BEAM: Meson Area - M2 Beam			RUTGERS UNIVERSITY
	INCLUSIVE NEUTRON PRODUCTION BY PROTONS ON PROTONS AND NUCLEI.			UNIVERSITY OF WISCONSIN - MADISON
	Request	22 May, 75	500 Hours	
	Approval	11 Mar, 76	Parasitic Running with the condition that there will be no significant interference with other work in the Meson Laboratory	
	Completed	5 Jul, 77	350 Hours	
415	PARTICLE PRODUCTION #415	Lee G. Pondrom		BROOKHAVEN NATIONAL LABORATORY
	BEAM: Meson Area - M2 Beam			UNIVERSITY OF MICHIGAN - ANN ARBOR
	MEASUREMENTS OF PI- CU TO K-SHORT, LAMBDA AND NEUTRON INCLUSIVE CROSS SECTIONS.			RUTGERS UNIVERSITY
	(For proposal #360 with the apparatus of exp #8 in the M2 beam line.)			UNIVERSITY OF WISCONSIN - MADISON
	Request	24 May, 75	100 Hours	
	Approval	28 Jun, 75	100 Hours	
	Completed	18 Oct, 76	100 Hours	
416	PARTICLE SEARCH #416	Henry J. Lubatti		UNIV. OF CALIFORNIA, DAVIS
	BEAM: Meson Area - M1 Beam			LAL, ORSAY (FRANCE)
	STREAMER CHAMBER SEARCH FOR NEW STATES WHICH DECAY SEMI-LEPTONICALLY.			UNIVERSITY OF WASHINGTON
	(Using the streamer chamber originally proposed for exp #86A with additional muon counters.)			
	Request	27 May, 75	300 Hours	
	Approval	29 May, 75	300 Hours with the understanding that the total running time for exp# 416 and exp# 86A is to remain within 800 hours	
	Completed	1 Jul, 75	400 Hours	
418	PARTICLE PRODUCTION #418	Felix Sannes		IMPERIAL COLLEGE (ENGLAND)
	BEAM: Internal Target Area (C-0)			UNIVERSITY OF ROCHESTER
	NUCLEAR SIZE DEPENDENCE FOR PARTICLE PRODUCTION AT INTERMEDIATE TRANSVERSE MOMENTUM.			RUTGERS UNIVERSITY
	(With the spectrometer used for exp #363.)			
	Request	2 Jun, 75	Unspecified	
	Approval	7 Jul, 75	500 Hours contingent upon the fact that such running does not constitute an interference with the requirements of other experiments to be run in that area	
	Completed	22 Oct, 75	900 Hours	
419	EMULSION/PROTONS @ 300 #419	Giorgio Giacomelli		UNIVERSITY OF BOLOGNA (ITALY)
	BEAM: Neutrino Area - Miscellaneous			
	SEARCH FOR SHORT LIVED PARTICLES PRODUCED BY 300 GEV PROTONS IN EMULSIONS.			
	Request	2 Jun, 75	Emulsion Exposure	
	Approval	10 Jun, 75	Emulsion Exposure	
	Completed	10 Jun, 75	1 Stack(s)	

421 EMULSION/PROTONS @ 300 #421 — Venedict P. Dzhelepov — JINR, DUBNA (RUSSIA)
BEAM: Neutrino Area - Miscellaneous
EXPOSURE OF AN EMULSION CHAMBER TO A 300 GEV/C PROTON BEAM.
Request 18 Jun, 75 Emulsion Exposure
Approval 18 Jun, 75 Emulsion Exposure
Completed 24 Jun, 75 1 Stack(s)

423 EMULSION/PROTONS @ 400 #423 — Hisahiko Sugimoto — HIROSAKI UNIVERSITY (JAPAN); ICRR, UNIVERSITY OF TOKYO (JAPAN); UNIVERSITY OF TOKYO (JAPAN); WASEDA UNIVERSITY (JAPAN)
BEAM: Neutrino Area - Miscellaneous
SEARCH FOR NEW PARTICLES IN EMULSION CHAMBERS.
Request 7 Jul, 75 Emulsion Exposure
Approval 21 Jul, 75 Emulsion Exposure
Completed 9 Dec, 75 4 Stack(s)

424 EMULSION/MUONS @ 200 #424 — Tomonori Wada — ASHIKAGA INST. OF TECH. (JAPAN); ICRR, UNIVERSITY OF TOKYO (JAPAN); OKAYAMA UNIVERSITY (JAPAN); SAITAMA UNIVERSITY (JAPAN)
BEAM: Neutrino Area - Miscellaneous
MULTIPLE PION PRODUCTION BY 200 GEV/C MUONS.
Request 23 Jun, 75 Emulsion Exposure
Approval 9 Feb, 76 Emulsion Exposure in the muon beam while it is operating for exp# 319 at a momentum in the vicinity of 300 GeV/c
Completed 8 Oct, 76 1 Stack(s)

425 K ZERO REGENERATION #425 — Valentine L. Telegdi — UNIV. OF CALIFORNIA, SAN DIEGO; UNIVERSITY OF CHICAGO; LHE, ETH HONGGERBERG (SWITZERLAND); SLAC; UNIVERSITY OF WISCONSIN - MADISON
BEAM: Meson Area - M4 Beam
PROPOSAL TO INVESTIGATE REGENERATION OF NEUTRAL K-MESONS AT VERY HIGH ENERGIES.
(Using a liquid hydrogen target; see exp #82.)
Request 24 Jun, 75 600 Hours
Approval 18 Mar, 75 600 Hours contingent upon exp# 425 providing a hydrogen target (see exp# 82)
Completed 17 May, 76 1,400 Hours

426 FRAGMENTATION PARTICLES #426 — Katsura Fukui — HANSCOM A.F.B. GEOPHYSICS LAB.; UNIVERSITY OF KIEL (GERMANY)
BEAM: Meson Area - Miscellaneous
PROPOSAL ON THE STUDY OF FRAGMENTATION PARTICLES CREATED IN A PLASTIC DETECTOR BY 300 GEV PROTONS.
Request 27 May, 75 Detector Exposure
Approval 28 Jul, 75 Detector Exposure
Completed 20 Mar, 76 16 Stack(s)

427 DETECTOR DEVELOPMENT #427 — Luke C. L. Yuan — BROOKHAVEN NATIONAL LABORATORY
BEAM: Meson Area - M1 Beam
A PROPOSAL FOR TESTING A TRANSITION RADIATION DETECTOR AND A HIGH ENERGY SHOWER DETECTOR FOR COSMIC RAY EXPERIMENTS.
Request 27 Jun, 75 50 Hours
Approval 4 Jan, 78 100 Hours during an opportunity for running in the M1-beam in January 1978
Completed 10 Jan, 78 40 Hours with only a portion of the objectives of the experiment finished due to problems with the M1-beam and the accelerator

428 EMULSION/PROTONS @ 400 #428 — Jacques D. Hebert — UNIVERSITY OF BELGRADE(YUGOSLAVIA); CRN, STRASBOURG (FRANCE); FERMILAB; UNIVERSITY OF LUND (SWEDEN); UNIVERSITY OF LYON (FRANCE); UNIVERSITY OF NANCY (FRANCE); UNIVERSITY OF OTTAWA (CANADA); UNIV. OF PARIS VI, LPG (FRANCE); UNIVERSITY OF QUEBEC (CANADA); UNIVERSITY OF SANTANDER (SPAIN); UNIVERSITY OF VALENCIA (SPAIN); UNIV. OF WESTERN ONTARIO (CANADA)
BEAM: Neutrino Area - Miscellaneous
400 GEV PROTON INTERACTIONS IN NUCLEAR EMULSION.
Request 4 Aug, 75 Emulsion Exposure
Approval 25 Aug, 75 Emulsion Exposure
Completed 9 Dec, 75 14 Stack(s)

434 EMULSION/PROTONS @ 400 #434 — Shoji Dake — KOBE UNIVERSITY (JAPAN); KONAN UNIVERSITY (JAPAN); SAITAMA UNIVERSITY (JAPAN); UNIVERSITY OF TOKYO (JAPAN); UTSUNOMIYA UNIVERSITY (JAPAN)
BEAM: Neutrino Area - Miscellaneous
CASCADE SHOWERS ORIGINATED IN JET SHOWERS.
Request 16 Sep, 75 Emulsion Exposure
Approval 20 Sep, 75 Emulsion Exposure
Completed 9 Dec, 75 3 Stack(s)

435 MUON SEARCH #435 — Robert K. Adair — BROOKHAVEN NATIONAL LABORATORY; FERMILAB; YALE UNIVERSITY
BEAM: Proton Area - Center
MEASUREMENT OF THE POLARIZATION OF PROMPT MUONS AT X = 0.14 AT P-TRANSVERSE = 0 AND P-TRANSVERSE = 1.5 GEV/C.
(Extension of measurements begun in experiment #48.)
Request 18 Sep, 75 250 Hours total including 50 hours of tests
Approval 25 Nov, 75 250 Hours of setup and running time
Completed 2 Jul, 76 250 Hours

436 DI-MUON #436 — Robert K. Adair — BROOKHAVEN NATIONAL LABORATORY; FERMILAB; YALE UNIVERSITY
BEAM: Proton Area - Center
DETERMINATION OF THE POSSIBLE DI-MUON CHARACTER OF THE PROMPT MUON FLUX.
Request 18 Sep, 75 75 Hours including 40 hours of tests
Approval 7 Oct, 75 100 Hours to be completed during the operating period due to end in Nov. 1975
Completed 29 Oct, 75 200 Hours

438 NEUTRON-NUCLEUS INELASTIC #438 — Lawrence W. Jones — UNIVERSITY OF MICHIGAN - ANN ARBOR
BEAM: Meson Area - M3 Beam
INELASTIC CROSS SECTIONS OF NEUTRONS ON NUCLEI.
Request 26 Sep, 75 500 Hours
Approval 25 Nov, 75 200 Hours
Completed 18 Apr, 77 350 Hours

439 MULTI-MUON #439 — David A. Garelick — UNIVERSITY OF MICHIGAN - ANN ARBOR
BEAM: Meson Area - M2 Beam — NORTHEASTERN UNIVERSITY
HIGH SENSITIVITY SEARCH FOR NEW STATES WHICH DECAY INTO MUONS. — TUFTS UNIVERSITY
UNIVERSITY OF WASHINGTON

Request	26 Sep, 75	500 Hours	with 200 hours for tests and 300 hours for data
	31 May, 77	1,600 Hours	to include 3 additional one-month periods of running
Approval	25 Nov, 75	400 Hours	
	24 Jun, 77	800 Hours	with the understanding that the 400-hour extension and time remaining under previous approval be used for investigation of multi-muon events
	27 Jul, 77	800 Hours	with the previous constraints on the further running removed
	24 Mar, 78	1,600 Hours	with an extension until the spring 1978 shutdown, but without overriding priority
Completed	19 May, 78	1,700 Hours	

440 LAMBDA MAGNETIC MOMENT #440 — Gerry M. Bunce — UNIVERSITY OF MICHIGAN - ANN ARBOR
BEAM: Meson Area - M2 Beam — RUTGERS UNIVERSITY
PROPOSAL FOR A NEW MEASUREMENT OF THE MAGNETIC MOMENT OF THE LAMBDA HYPERON. — UNIVERSITY OF WISCONSIN - MADISON

Request	26 Sep, 75	160 Hours	
Approval	25 Nov, 75	160 Hours	
Completed	22 Mar, 77	250 Hours	

441 LAMBDA POLARIZATION #441 — Lee G. Pondrom — UNIVERSITY OF MICHIGAN - ANN ARBOR
BEAM: Meson Area - M2 Beam — RUTGERS UNIVERSITY
A PROPOSAL TO STUDY LAMBDA POLARIZATION IN THE INCLUSIVE REACTION PROTON - PROTON TO LAMBDA PLUS ANYTHING WITH LIQUID HYDROGEN TARGET. — UNIVERSITY OF WISCONSIN - MADISON
(Extension of previous measurements of 300 GeV protons on beryllium to 400 GeV protons on hydrogen.)

Request	29 Sep, 75	150 Hours	
Approval	25 Nov, 75	150 Hours	
Completed	2 Jul, 77	400 Hours	

442 NUCLEAR FRAGMENTS #442 — Frank Turkot — FERMILAB
BEAM: Internal Target Area (C-0) — PURDUE UNIVERSITY
STUDY OF NUCLEAR FRAGMENT EMISSION IN PROTON HEAVY NUCLEUS COLLISIONS FROM 10 TO 500 GEV.
(Will use room temperature gas jet target with heavy gases.)

Request	26 Sep, 75	400 Hours	for data taking
	11 May, 77	800 Hours	to include additional time to search for quarks bound in nuclear fragments
Approval	25 Nov, 75	400 Hours	
	25 Jun, 77	400 Hours	without time for the quark search
Completed	13 Aug, 77	1,200 Hours	

444 DI-MUON #444 — A. J. Stewart Smith — UNIVERSITY OF CHICAGO
BEAM: Neutrino Area - Muon/Hadron Beam — PRINCETON UNIVERSITY
A SPECIAL REQUEST FOR HIGH-PRIORITY RUNNING TO MEASURE HIGH-MASS MUON PAIRS.
(Using the Quadrupole Triplet focusing system for producing a high intensity hadron beam.)

Request	25 Sep, 75	400 Hours	
	31 May, 77	800 Hours	with a request for a 400 hour extension for a scaling test and to increase the sensitivity at high masses
Approval	24 Nov, 75	400 Hours	
	24 Jun, 77	400 Hours	with a decision not to grant an extension
Completed	3 Jan, 78	1,100 Hours	

448 MUON #448 — William A. Loomis — UNIVERSITY OF CHICAGO
BEAM: Neutrino Area - Muon/Hadron Beam — FERMILAB
PROPOSAL FOR THE INVESTIGATION OF VIRTUAL PHOTOABSORPTION BY NUCLEAR MATTER. — HARVARD UNIVERSITY
(Using the cyclotron spectrometer and heavy targets; see proposal #257.) — MASSACHUSETTS INST. OF TECHNOLOGY
MICHIGAN STATE UNIVERSITY
TUFTS UNIVERSITY

Request	17 Oct, 75	300 Hours	
	9 Jun, 77	300 Hours	to study both photoabsorption by nuclear matter and production of charmed particles (the latter to employ a Cerenkov counter)
Approval	15 Mar, 77	Parasitic	Running for about 300 hours concurrent with exp #203
	29 Jun, 77	Parasitic	Running for about 300 hours for study of photoabsorption of nuclear matter; without the disruption required to install the Cerenkov counter
Completed	7 May, 78	900 Hours	

451 INCLUSIVE SCATTERING #451 — Donald S. Barton — UNIVERSITY OF BARI (ITALY)
BEAM: Meson Area - M6 Beam — BROWN UNIVERSITY
STUDY OF THE A-DEPENDENCE OF INCLUSIVE PROCESSES AND ASSOCIATED MULTIPLICITY. — FERMILAB
(Using the single arm spectrometer facility.) — MASSACHUSETTS INST. OF TECHNOLOGY
WARSAW HEP LABORATORY (POLAND)

Request	17 Oct, 75	600 Hours	including 100 hours of tests
Approval	30 Jun, 76	400 Hours	
Completed	6 Sep, 78	500 Hours	

456 FORM FACTOR #456 — Donald H. Stork — UNIV. OF CALIFORNIA, LOS ANGELES
BEAM: Meson Area - M1 Beam — FERMILAB
MEASUREMENT OF THE KAON FORM FACTOR. — JINR, DUBNA (RUSSIA)
(Continuation of work begun in exp #216.) — NOTRE DAME UNIVERSITY
UNIVERSITY OF PITTSBURGH

Request	17 Oct, 75	800 Hours	including 200 hours of tests
Approval	25 Nov, 75	500 Hours	
	7 Dec, 76	950 Hours	including an additional 450 hours for data taking with a request for a report on preliminary results from existing data before the start of the next running period
Completed	13 Apr, 77	1,450 Hours	

458 PHOTOPRODUCTION #458 — Wonyong Lee — COLUMBIA UNIVERSITY
BEAM: Proton Area - East — FERMILAB
PHOTOPRODUCTION EXPERIMENT AT FERMILAB. — UNIVERSITY OF ILLINOIS, CHAMPAIGN
(Using the broad band photon beam; a continuation of work begun in exp #87A and #401.)

Request	17 Oct, 75	700 Hours	
	7 May, 76	900 Hours	with 300 hours for testing, 600 hours for data
Approval	2 Jul, 76	300 Hours	with a total of 1,000 hours approved for the comination of exps #400, #401, and #458
	14 Mar, 77	1,000 Hours	with a total of 2,000 hours for the combination of expts #400,401,&458
	1 Apr, 78	Unspecified	since approved running time has been used by exp #87a
Approved/Inactive	27 Oct, 81	Unspecified	

461 EMULSION/PROTONS @ 400 #461 — Jere J. Lord — UNIV. OF AUCKLAND (NEW ZEALAND); AUSTRALIAN NAT'L. UNIV.(AUSTRALIA); UNIVERSITY OF MELBOURNE(AUSTRALIA); UNIVERSITY OF SYDNEY (AUSTRALIA); UNIVERSITY OF TASMANIA (AUSTRALIA); UNIVERSITY OF WASHINGTON
BEAM: Neutrino Area - Miscellaneous
SEARCH FOR NEW PARTICLES FROM 400 GEV PROTON COLLISIONS IN EMULSIONS.

Request	10 Nov, 75	Emulsion Exposure
Approval	26 Nov, 75	6 Stack(s)
Completed	9 Dec, 75	6 Stack(s)

462 EMULSION/PROTONS @ 400 #462 — Giorgio Giacomelli — UNIVERSITY OF BOLOGNA (ITALY); UNIVERSITY OF FIRENZE (ITALY)
BEAM: Neutrino Area - Miscellaneous
SEARCH FOR SHORT LIVED PARTICLES PRODUCED BY 400 GEV PROTONS IN EMULSIONS.

Request	18 Nov, 75	Emulsion Exposure
Approval	26 Nov, 75	Emulsion Exposure
Completed	9 Dec, 75	1 Stack(s)

463 EMULSION/PROTONS @ 400 #463 — M. I. Tretjakova — KAZAKH STATE UNIV., (KAZAKHSTAN); LEBEDEV PHYSICAL INST. (RUSSIA); ITEP, MOSCOW (RUSSIA); PNPI, ST. PETERSBURG (RUSSIA); TASHKENT, PHY.TEC.INS (UZBEKISTAN)
BEAM: Neutrino Area - Miscellaneous
THE INTERACTIONS OF PROTONS IN NUCLEAR EMULSION AT 400 GEV/C (OR 500 GEV/C).

Request	17 Nov, 75	Emulsion Exposure
Approval	26 Nov, 75	Emulsion Exposure
Completed	9 Dec, 75	2 Stack(s)

466 NUCLEAR FRAGMENTS #466 — Norbert T. Porile — ARGONNE NATIONAL LABORATORY; UNIVERSITY OF CHICAGO; UNIV. OF ILLINOIS, CHICAGO CIRCLE; PURDUE UNIVERSITY
BEAM: Proton Area - Miscellaneous
A PROPOSAL FOR THE STUDY OF HIGH-ENERGY REACTION MECHANISMS BY THE MEASUREMENT OF THE ANGULAR AND ENERGY DISTRIBUTIONS OF NUCLEAR FRAGMENTS RECOILING FROM TARGETS BOMBARDED WITH 200-300 GEV PROTONS.

Request	9 Jan, 76	500 Hours
Approval	30 Mar, 76	500 Hours to be met on an essentially parasitic basis with the understanding that this work will not constitute an interference with the rest of the proton area program
Completed	15 Feb, 88	102 Targets Exposed

467 TEST MUON IRRADIATION #467 — Melvin Freedman — ARGONNE NATIONAL LABORATORY
BEAM: Neutrino Area - Miscellaneous
PROPOSAL FOR PARASITIC DUAL TARGET IRRADIATION WITH MUON SPILL BEAM BEHIND EXP #319.

Request	13 Jan, 76	Target Exposure(s)
Approval	28 Apr, 76	Parasitic Running for a bombardment of chlorine and thallium targets downstream of exp #319 or exp #398
Completed	1 Dec, 76	4 Targets Exposed

468 PARTICLE SEARCH #468 — Phillip H. Steinberg — UNIVERSITY OF MARYLAND
BEAM: Meson Area - M2 Beam
SEARCH FOR PENETRATING MASSIVE NEUTRAL PARTICLES PRODUCED IN HIGH ENERGY PROTON COLLISIONS.

Request	21 Jan, 76	1,200 Hours
	4 Oct, 76	300 Hours in a 400 GeV proton beam at an intensity of 10 to the 9th protons/pulse
	4 Nov, 77	450 Hours including an additional 150 hours to improve the sensitivity during another run of the experiment
Approval	18 Nov, 76	300 Hours
Completed	14 Aug, 77	300 Hours

469 PARTICLE SEARCH #469 — David Cutts — UNIVERSITY OF BARI (ITALY); BROWN UNIVERSITY; CERN (SWITZERLAND); FERMILAB; MASSACHUSETTS INST. OF TECHNOLOGY
BEAM: Meson Area - M6 Beam
SEARCH FOR HEAVY LONG-LIVED PARTICLES.
(Using the single arm spectrometer facility.)

Request	23 Jan, 76	150 Hours
Approval	3 Feb, 78	150 Hours with the understanding that the schedule for this run may place the desired running for exp #451 in some jeopardy
Completed	15 May, 78	400 Hours

472 PARTICLE SEARCH #472 — Kenneth C. Stanfield — FERMILAB; UNIVERSITY OF MICHIGAN - ANN ARBOR; PURDUE UNIVERSITY
BEAM: Meson Area - M2 Beam
SEARCH FOR HEAVY PARTICLES PRODUCED IN ASSOCIATION WITH PROMPT MUONS.
(Experiment would use modified exp #357 spectrometer.)

Request	23 Jan, 76	600 Hours including 100 hours of tests
Approval	10 Mar, 76	600 Hours
Completed	29 Nov, 76	1,100 Hours

481 EMULSION/PI- @ 300 #481 — Yoshiyuki Takahashi — OSAKA CITY UNIVERSITY (JAPAN); SHINSHU UNIVERSITY (JAPAN)
BEAM: Neutrino Area - Miscellaneous
INVESTIGATION OF MULTIPLE PRODUCTION BY PI - MESONS WITH EMULSION CHAMBER.

Request	28 Apr, 76	Emulsion Exposure 10K particles per cm. sq. over a square of 10 cm x 10 cm
Approval	12 May, 76	Emulsion Exposure
Completed	18 Jan, 78	7 Stack(s)

482 NEUTRINO #482 — Barry C. Barish — CALIFORNIA INSTITUTE OF TECHNOLOGY; FERMILAB; NORTHWESTERN UNIVERSITY; UNIVERSITY OF ROCHESTER; ROCKEFELLER UNIVERSITY
BEAM: Neutrino Area - Quadrupole Triplet
STUDY OF DI-MUON EVENTS PRODUCED IN NEUTRINO INTERACTIONS.

Request	11 May, 76	500 Hours to be run with the Quadrupole Triplet train load with focus set at 200 GeV at 10 to the 13th protons per pulse
Approval	30 Jun, 76	Parasitic Running with other experiments using the neutrino beam
Completed	3 Jan, 78	1,600 Hours

486	K ZERO CROSS SECTION #486	Bruce D. Winstein		UNIVERSITY OF CHICAGO
	BEAM: Meson Area - M4 Beam			LHE, ETH HONGGERBERG (SWITZERLAND)
	PROPOSAL TO STUDY THE ATOMIC NUMBER DEPENDENCE OF THE DIFFERENCE BETWEEN PARTICLE AND ANTI-PARTICLE TOTAL CROSS SECTIONS.			UNIVERSITY OF WISCONSIN - MADISON
	(Using the apparatus of exps #82 and #425 with modifications.)			
	Request	7 May, 76	200 Hours	to be run in a modified version of the M-4 neutral beam; data taking to require 1.4 x 10 to the 17th protons into the meson production target
	Approval	30 Jun, 76	200 Hours	with a total of 800 hours approved for the combination of E-486 and E-226
	Completed	17 Mar, 77	950 Hours	
490	PARTICLE SEARCH #490	Jack Sandweiss		FERMILAB
	BEAM: Meson Area - M1 Beam			LAWRENCE BERKELEY LABORATORY
	SEARCH FOR SHORT LIVED PARTICLES USING A HIGH RESOLUTION STREAMER CHAMBER.			YALE UNIVERSITY
	Request	7 May, 76	800 Hours	to be run in a 200 GeV pi- beam of intensity 8 x 10 to the 5th particles per pulse focused to a 1 mm x 5 mm spot
	Approval	30 Jun, 76	Test Running	to study the performance of the high resolution streamer chamber
	Completed	9 Jun, 80	850 Hours	
494	DI-HADRON #494	Myron L. Good		COLUMBIA UNIVERSITY
	BEAM: Proton Area - Center			FERMILAB
	A STUDY OF DI-HADRON PRODUCTION IN PROTON COLLISIONS AT FERMILAB.			SUNY AT STONY BROOK
	(This experiment is an off-shoot of di-lepton #288.)			
	Request	10 May, 76	800 Hours	
	Approval	17 May, 76	800 Hours	
		17 Nov, 76	1,400 Hours	including an additional six weeks of running with the experiment expected to terminate in February 1977
	Completed	21 Feb, 77	1,950 Hours	
495	XI-ZERO PRODUCTION #495	Kenneth J. Heller		BROOKHAVEN NATIONAL LABORATORY
	BEAM: Meson Area - M2 Beam			UNIVERSITY OF MICHIGAN - ANN ARBOR
	PROPOSAL TO STUDY CASCADE ZERO AND ANTILAMBDA PRODUCTION AND POLARIZATION.			RUTGERS UNIVERSITY
	(Experiment would use the spectrometer of E-8.)			UNIVERSITY OF WISCONSIN - MADISON
	Request	17 May, 76	400 Hours	
	Approval	17 Nov, 76	400 Hours	
	Completed	28 Aug, 78	700 Hours	
497	CHARGED HYPERON #497	Joseph Lach		FERMILAB
	BEAM: Proton Area - Center			IOWA STATE UNIVERSITY
	ELASTIC SCATTERING OF THE HYPERONS.			YALE UNIVERSITY
	(Measurements of charged hyperon fluxes and differential elastic cross sections, and a particle search.)			
	Request	13 May, 76	1,200 Hours	with 600 hours for flux measurements and new particle search and 600 hours to measure differential cross sections
		26 Jan, 79	800 Hours	including an additional 400 hours to search for the b-particle after the beam is commissioned
	Approval	29 Jun, 76	400 Hours	initial approval
	Completed	16 Mar, 81	2,500 Hours	see proposal #697
498	DETECTOR DEVELOPMENT #498	Charles R. Gruhn		LOS ALAMOS NATIONAL LABORATORY
	BEAM: Proton Area - East			
	A MEASUREMENT OF THE RELATIVISTIC RISE IN THE MOST PROBABLE ENERGY LOSS IN THIN SOLID FILMS.			
	Request	26 May, 76	50 Hours	in an electron beam at the highest energies available
	Approval	14 Jun, 76	Parasitic Running	that will not disturb the normal proton area program
	Completed	18 Aug, 76	50 Hours	
499	EMULSION/PROTONS @ 400 #499	Junsuke Iwai		WASEDA UNIVERSITY (JAPAN)
	BEAM: Neutrino Area - Miscellaneous			
	A STUDY OF ANGULAR DISTRIBUTIONS IN PROTON-NUCLEUS COLLISIONS USING NUCLEAR EMULSIONS.			
	Request	1 Jun, 76	2 Exposure(s)	
	Approval	16 Aug, 76	Emulsion Exposure	with one stack exposed to an intensity of 600K protons/sq cm and a second to an intensity of 10K protons/sq cm
	Completed	15 Jan, 78	5 Stack(s)	
501	TEST MUON IRRADIATION #501	Kenneth Lande		BROOKHAVEN NATIONAL LABORATORY
	BEAM: Neutrino Area - Muon/Hadron Beam			UNIVERSITY OF PENNSYLVANIA
	PROPOSAL FOR A MEASUREMENT OF THE TRANSITION RATE FOR CL(37) AND AR(37) INDUCED BY MUONS AT FERMILAB ENERGIES.			
	Request	11 Aug, 76	25 Hours	an integrated flux of - about 5 x 10 to the 9th times (e/300) to the 0.7th - muons @ 75, 150, and 250 GeV
	Approval	28 Oct, 76	Target Exposure(s)	parasitic to running of upstream muon experiments
	Completed	1 Dec, 76	2 Targets Exposed	
502	MONOPOLE #502	David F. Bartlett		UNIVERSITY OF COLORADO AT BOULDER
	BEAM: Neutrino Area - Miscellaneous			GENERAL ELECTRIC R&D CENTER
	SEARCH FOR MONOPOLES ABOVE THE 15-FOOT BUBBLE CHAMBER.			
	(Would require a scuttle in the roof of the 15-foot bubble chamber building.)			
	Request	30 Jul, 76	Cosmic Ray Running	to include use of the fringe field of the 15-foot bubble chamber magnet during two long runs; approximately 7 months of data-taking requested with lexan and later with emulsion detectors
	Approval	2 Sep, 76	Cosmic Ray Running	during parasitic operation in the fringe field of the 15-foot bubble chamber magnet
	Completed	23 Jun, 80	Cosmic Ray Running	
503	EMULSION/PI- @ 300 #503	Takeshi Ogata		HIROSAKI UNIVERSITY (JAPAN)
	BEAM: Neutrino Area - Miscellaneous			ICRR, UNIVERSITY OF TOKYO (JAPAN)
	MULTIPARTICLE PRODUCTION IN HIGH ENERGY PION-NUCLEUS INTERACTIONS.			KONAN UNIVERSITY (JAPAN)
				KWANSEI GAKUIN UNIVERSITY (JAPAN)
	Request	12 Aug, 76	Emulsion Exposure	consisting of eight blocks of mulsion exposed to 50K particles/sq cm in a pi- beam of 200 GeV/c or greater
	Approval	19 Aug, 76	Emulsion Exposure	
	Completed	18 Jan, 78	4 Stack(s)	

505 PROTON POLARIZATION #505 — Samuel Peter Yamin — BROOKHAVEN NATIONAL LABORATORY; UNIVERSITY OF MICHIGAN - ANN ARBOR; RUTGERS UNIVERSITY; UNIVERSITY OF WISCONSIN - MADISON
BEAM: Meson Area - M2 Beam
A SEARCH FOR PROTON POLARIZATION IN INCLUSIVE PRODUCTION AT 300 GEV/C.

Request	16 Aug, 76	100 Hours with a change in the targetting angle of the primary proton beam for the meson area
Approval	29 Jun, 78	100 Hours with low priority during the time available for exp #495
Completed	27 Aug, 78	50 Hours

506 EMULSION/PI- @ 300 #506 — Shoji Dake — KOBE UNIVERSITY (JAPAN); KONAN UNIVERSITY (JAPAN); SAITAMA UNIVERSITY (JAPAN); UNIVERSITY OF TOKYO (JAPAN)
BEAM: Neutrino Area - Miscellaneous
CASCADE SHOWERS ORIGINATED IN JET SHOWERS DUE TO NEGATIVE PIONS.

Request	17 Aug, 76	Emulsion Exposure using two - three emulsion chambers 10 cm x 10 cm x 8 xm exposed to 10-100 particles/sq cm in a pi- beam of 200 GeV/c or greater
Approval	23 Aug, 76	Emulsion Exposure
Completed	15 Jan, 78	2 Stack(s)

507 HIGH ENERGY CHANNELING #507 — Edward N. Tsyganov — UNIV. OF CALIFORNIA, LOS ANGELES; FERMILAB; JINR, DUBNA (RUSSIA); KHARKOV PHYS-TECH INST (UKRAINE); LEHIGH UNIVERSITY; ITEP, MOSCOW (RUSSIA); SUNY AT ALBANY; TOMSK POLYTECH. INST. (USSR); INR, WARSAW (POLAND)
BEAM: Meson Area - M1 Beam
PROPOSAL TO STUDY CHANNELING AT FERMILAB.
(Using the spectrometer of exp #456.)

Request	8 Sep, 76	250 Hours use of the M-1 beam is requested in conjunction with operation of form factor #456
Approval	1 Jun, 77	250 Hours with the understanding that this activity will not delay significantly the program in the M1 beam
Completed	30 May, 77	350 Hours

508 EMULSION/PROTONS @ 500 #508 — Wladyslaw Wolter — INP, KRAKOW (POLAND)
BEAM: Meson Area - Test Beam
STUDY OF THE MECHANISM FOR MULTIPLE PRODUCTION OF PARTICLES AT HIGH ENERGIES.

Request	15 Sep, 76	Emulsion Exposure consisting of 3 emulsion stacks
Approval	24 Sep, 76	Emulsion Exposure
Completed	26 Apr, 85	7 Emulsion Stack(s)

509 EMULSION/MUONS @ 200 #509 — T. Shirai — KANAGAWA UNIVERSITY (JAPAN); KOBE UNIVERSITY (JAPAN); UNIVERSITY OF TOKYO (JAPAN)
BEAM: Neutrino Area - Miscellaneous
SEARCH FOR THE LARGE ANGLE SCATTERING OF MUONS.

Request	13 Sep, 76	Emulsion Exposure of 10 to the 6th particles/sq cm
Approval	24 Sep, 76	Emulsion Exposure
Completed	8 Oct, 76	1 Stack(s)

510 EMULSION/ELECTRONS @ HI E #510 — Kiyoshi Niu — AICHI UNIV. OF EDUCATION (JAPAN); NAGOYA UNIVERSITY (JAPAN); YOKOHAMA NATIONAL UNIV. (JAPAN)
BEAM: Proton Area - Miscellaneous
STUDY OF CASCADE SHOWERS INITIATED BY ELECTRONS.

Request	9 Sep, 76	Emulsion Exposure
Approval	24 Sep, 76	Emulsion Exposure
Completed	5 Oct, 76	6 Stack(s)

515 PARTICLE SEARCH #515 — Jerome L. Rosen — CARNEGIE-MELLON UNIVERSITY; FERMILAB; NORTHWESTERN UNIVERSITY; NOTRE DAME UNIVERSITY
BEAM: Meson Area - M1 Beam
PROPOSAL TO STUDY CHARGED PARTICLES PRODUCED IN HADRONIC INTERACTIONS.

Request	5 Oct, 76	1,000 Hours in a high intensity pi- beam @ 200 GeV/c
Approval	14 Mar, 77	800 Hours
Completed	10 Mar, 82	2,650 Hours

516 PHOTOPRODUCTION #516 — E. Thomas Nash — UNIV. OF CALIFORNIA, SANTA BARBARA; CARELTON UNIVERSITY (CANADA); UNIVERSITY OF COLORADO AT BOULDER; FERMILAB; NATIONAL RESEARCH COUNCIL (CANADA); UNIVERSITY OF OKLAHOMA; UNIVERSITY OF TORONTO (CANADA)
BEAM: Proton Area - East
A STUDY OF PHOTOPRODUCTION USING A MAGNETIC SPECTROMETER AT THE TAGGED PHOTON LAB.

Request	5 Oct, 76	1,000 Hours in the tagged photon beam assuming a primary beam of 450 GeV protons with 2.9 x 10 to the 15th protons/hour
	3 Oct, 77	1,000 Hours with 6 x 10 to the 12th protons per pulse, a 1 sec. flattop and a 10 sec. cycle
Approval	15 Nov, 77	1,000 Hours to include 400 hours for testing and 600 hours for data
Completed	1 Jun, 81	4,500 Hours

522 PROTON POLARIZATION #522 — Harold O. Ogren — INDIANA UNIVERSITY
BEAM: Internal Target Area (C-0)
A STUDY OF INCLUSIVE PROTON POLARIZATION.

Request	28 Oct, 76	840 Hours the experiment would run with the existing exp #313 set-up in the internal target area
Approval	25 Jun, 77	800 Hours conditional on cryogenic operation of the internal target area
Completed	21 Mar, 78	700 Hours

524 EMULSION/PROTONS > 500 GEV #524 — Richard J. Wilkes — UNIVERSITY OF WASHINGTON
BEAM: Meson Area - Test Beam
PROPOSAL TO STUDY INTERACTIONS OF PROTONS OF ENERGY GREATER THAN 500 GEV IN EMULSION AND HEAVY NUCLEI.

Request	18 Jan, 77	Emulsion Exposure of 10 plates would be exposed to fluxes ranging from 75,000 to 200,000 particles/sq.cm.
Approval	3 Mar, 77	Emulsion Exposure with a momentum of approximately 500 GeV/c
Completed	26 Apr, 85	6 Emulsion Stack(s)

525 EMULSION/PI- @ 300 #525 — Richard J. Wilkes — UNIVERSITY OF WASHINGTON
BEAM: Neutrino Area - Miscellaneous
PROPOSAL TO STUDY PROTON-NUCLEUS INTERACTIONS IN EMULSION PLATES WITH EMBEDDED METAL POWDER GRANULES AT 300 GEV.

Request	18 Jan, 77	Emulsion Exposure of 10 plates would be exposed in a negative beam to fluxes ranging from 75,000 - 200,000 particles/sq.cm.
	13 Dec, 77	Emulsion Exposure with a request for the beam energy to be changed to 300 GeV
Approval	3 Mar, 77	Emulsion Exposure
Completed	15 Jan, 78	2 Stack(s)

531 NEUTRINO #531 — Neville W. Reay — AICHI UNIV. OF EDUCATION (JAPAN), FERMILAB, ICRR, UNIVERSITY OF TOKYO (JAPAN), KOBE UNIVERSITY (JAPAN), KOREA UNIVERSITY, SEOUL (KOREA), MCGILL UNIVERSITY (CANADA), NAGOYA UNIVERSITY (JAPAN), OHIO STATE UNIVERSITY, OKAYAMA UNIVERSITY (JAPAN), OSAKA CITY UNIVERSITY (JAPAN), OSAKA SCIENCE EDUC. INST. (JAPAN), UNIVERSITY OF OTTAWA (CANADA), UNIVERSITY OF TORONTO (CANADA), VIRGINIA TECH, YOKOHAMA NATIONAL UNIV. (JAPAN)
BEAM: Neutrino Area - Wide Band Horn
A PROPOSAL TO STUDY WEAK DECAY LIFETIMES OF NEUTRINO PRODUCED PARTICLES IN A TAGGED EMULSION SPECTROMETER.

Request	31 Jan, 77	1,500 Hours or a total proton flux of 3 x 10 to the 18th
	19 May, 78	3,000 Hours including a second parasitic run
	8 May, 79	2,250 Hours total with an additional 1,100 hours requested for two runs of 6 x 10 to the 18th protons each, the first to be neutrinos (350 GeV pi+), the second to be antineutrinos (350 GeV pi- with the plug out)
Approval	15 Mar, 77	Parasitic Running concurrent with other neutrino experiments
	1 Jul, 79	Parasitic Running concurrent with the next 15-foot bubble chamber neutrino run with the Wide Band Horn
Completed	1 Jun, 81	3,800 Hours

533 PI-MU ATOMS #533 — Gordon B. Thomson — UNIVERSITY OF CHICAGO, STANFORD UNIVERSITY, UNIVERSITY OF WISCONSIN - MADISON
BEAM: Meson Area - M3 Beam
PROPOSAL TO MEASURE THE RATE OF FORMATION OF PI-MU ATOMS IN K-LONG M 3 DECAY.

Request	1 Feb, 77	500 Hours based on 3 x 10 to the 6th K-longs/pulse in the M3 beam
Approval	18 Mar, 77	500 Hours with the requirement that preliminary studies and tests show that costs for the experiment are reasonable
	19 Mar, 79	2,100 Hours for the additional 1,500 hours requested for tuneup and data to complete the experiment
Completed	28 Nov, 79	2,050 Hours

536 EMULSION/NEUTRINO #536 — Kiyoshi Niu — AICHI UNIV. OF EDUCATION (JAPAN), NAGOYA UNIVERSITY (JAPAN), YOKOHAMA NATIONAL UNIV. (JAPAN)
BEAM: Neutrino Area - Wide Band Horn
STUDY OF NEUTRINO INTERACTIONS IN NUCLEAR EMULSIONS.

Request	2 Feb, 77	500 Hours or 1 x 10 to the 18th protons to be run in the broad band neutrino beam on a parasitic basis with the regular neutrino program
Approval	10 Feb, 77	Parasitic Running
Completed	13 Aug, 77	2 Stack(s)

537 DI-MUON #537 — Bradley B. Cox — UNIVERSITY OF ATHENS (GREECE), FERMILAB, MCGILL UNIVERSITY (CANADA), UNIVERSITY OF MICHIGAN - ANN ARBOR, SHANDONG UNIVERSITY (PRC)
BEAM: Proton Area - West
PROPOSAL TO STUDY PBAR-N INTERACTIONS IN THE P-WEST HIGH INTENSITY LABORATORY

Request	14 Feb, 77	1,700 Hours with 300 hours of tuning and 600 hours initial data run to be followed by 800 hours for final data run, all in high intensity secondary beam
	31 Oct, 77	1,400 Hours to include 100 hours of tuneup, 300 hours of pi- @ 200 or 300 GeV, 700 hours of pi+ @ 200 or 300 GeV and 300 hours of pbar @ 100 GeV
	31 Jan, 78	2,000 Hours in high intensity secondary beam. Phase 1 would consist of 250 hours for tune up and 750 hours for data taking on di-muon production by p bars. Phase 2 would consist of 250 hours for tune up and 750 hours for data taking on di-electron production by p bars
Approval	16 Mar, 78	1,000 Hours for study of di-muon production by pbars
Completed	28 Feb, 82	2,700 Hours

540 PARTICLE SEARCH #540 — Michael J. Longo — UNIVERSITY OF MICHIGAN - ANN ARBOR
BEAM: Meson Area - M3 Beam
A SEARCH FOR NEW METASTABLE PARTICLES TRAPPED IN MATTER.

Request	22 Mar, 77	1,900 Hours with a running period of six months in the M3 beam. The beam would be used 50 - 75% of the time available.
Approval	23 May, 77	Parasitic Running conditional on negotiation of an agreement and that the experiment will be mounted and run under low priority conditions
Completed	21 Feb, 78	600 Hours

545 15-FOOT NEUTRINO/D2&HIZ #545 — George A. Snow — ILLINOIS INSTITUTE OF TECHNOLOGY, UNIVERSITY OF MARYLAND, SUNY AT STONY BROOK, TOHOKU UNIVERSITY (JAPAN), TUFTS UNIVERSITY
BEAM: Neutrino Area - Wide Band Horn
PROPOSAL FOR AN EXTENSION OF E-151/E-227 TO STUDY NEUTRINO INTERACTIONS IN DEUTERIUM IN THE 15-FOOT BUBBLE CHAMBER WITH PLATES.
(An initial run will be without plates.)

Request	18 Apr, 77	300 K Pix
	21 Dec, 77	500 K Pix to be run in the wide band beam with 1.3 x 10 to the 13th protons per pulse incident on the target at 400 GeV
Approval	16 Mar, 78	350 K Pix or equivalently 3.5 x 10 to the 18th protons; with the assumption that the test of the plate system will be successful
	28 Jun, 78	350 K Pix to be run in the 15-ft chamber without plates
Completed	17 Jan, 79	317 K Pix

546 15-FOOT NEUTRINO/H2&NE #546 — Fred Russell Huson — UNIV. OF CALIFORNIA, BERKELEY, FERMILAB, UNIVERSITY OF HAWAII AT MANOA, LAWRENCE BERKELEY LABORATORY, UNIVERSITY OF WASHINGTON, UNIVERSITY OF WISCONSIN - MADISON
BEAM: Neutrino Area - Quadrupole Triplet
HIGH ENERGY NEUTRINO AND ANTINEUTRINO INTERACTIONS IN THE 15-FOOT BUBBLE CHAMBER USING THE QUADRUPOLE TRIPLET TRAIN LOAD AND THE TWO-PLANE EMI.

Request	27 Apr, 77	250 K Pix with specific interest in an exposure of 5 x 10 to the 18th protons
Approval	29 Jun, 77	Parasitic Running concurrent with other neutrino running with the Quad Triplet train
Completed	26 Jan, 78	375 K Pix

547 EMULSION/PROTONS @ 400 #547 — C. J. Jacquot — CRN, STRASBOURG (FRANCE), UNIVERSITY OF LYON (FRANCE), UNIVERSITY OF SANTANDER (SPAIN)
BEAM: Neutrino Area - Miscellaneous
ANGULAR CORRELATIONS STUDY IN PROTON-NUCLEI JETS AT 400-500 GEV USING EMULSION TELESCOPE TECHNIQUES.

Request	27 Apr, 77	Emulsion Exposure in a 400-500 GeV proton beam with incoming flux of 5 x 10 to the 4th particles over a surface 5 x 5 cm sq.
Approval	14 Jun, 77	Emulsion Exposure
Completed	15 Jan, 78	24 Stack(s)

549 QUARK #549 — Michael J. Longo — UNIVERSITY OF MICHIGAN - ANN ARBOR; STANFORD UNIVERSITY
BEAM: Neutrino Area - Miscellaneous
A SEARCH FOR FRACTIONAL CHARGES USING ACCELERATOR AND LOW TEMPERATURE TECHNIQUES.

Request	2 May, 77	Parasitic Running to expose at least 12 niobium spheres in the vicinity of a proton beam with intensities of > 1 x 10 to the 13th per pulse
Approval	16 May, 77	Parasitic Running contingent on the target being prepared and provided by the experimenters
Approved/Inactive	1 Oct, 78	1 Target Exposure(s) as of 1 Oct 1978

552 P-N SCATTERING #552 — Felix Sannes — IMPERIAL COLLEGE (ENGLAND); UNIVERSITY OF ROCHESTER; RUTGERS UNIVERSITY
BEAM: Internal Target Area (C-0)
A PROPOSAL TO STUDY P - P ELASTIC AND P - D COHERENT SCATTERING.

Request	6 May, 77	900 Hours
Approval	25 Jun, 77	800 Hours conditional on cryogenic operation of the Internal Target Area
Completed	9 Apr, 78	950 Hours

553 NEUTRINO #553 — Paul F. Shepard — CORNELL UNIVERSITY; UNIVERSITY OF LIBRE (BELGIUM); UNIVERSITY OF LUND (SWEDEN); UNIVERSITY OF OKLAHOMA; UNIVERSITY OF PADOVA (ITALY); UNIVERSITY OF PITTSBURGH; INFN, ROME (ITALY); UNIVERSITY OF SYDNEY (AUSTRALIA); UNIVERSITY OF TORINO (ITALY); YORK UNIVERSITY (CANADA)
BEAM: Neutrino Area - Wide Band Horn
A PROPOSAL TO SEARCH FOR SHORT-LIVED PARTICLES PRODUCED BY ANTINEUTRINOS AND NEUTRINOS
(Using a hybrid emulsion-visual detecter.)

Request	6 May, 77	2,000 Hours with a specific request for 4 x 10 to the 18th protons
	5 Mar, 79	2,500 Hours total with an additional 1,000 hours for a run of at least 7 x 10 to the 18th protons with the broad band beam tuned for neutrinos
Approval	24 Jun, 77	Parasitic Running conditional on review of detector tests
	16 Nov, 77	Parasitic Running conditional on review of detector tests in January 1978
	1 Jul, 79	Parasitic Running concurrent with the next 15-foot bubble chamber neutrino run with the Wide Band Horn
Completed	1 Apr, 80	1,500 Hours

555 NEUTRAL HYPERON #555 — Thomas J. Devlin — UNIVERSITY OF MICHIGAN - ANN ARBOR; UNIVERSITY OF MINNESOTA; RUTGERS UNIVERSITY; UNIVERSITY OF WISCONSIN - MADISON
BEAM: Meson Area - M2 Beam
A PROPOSAL TO STUDY CROSS SECTIONS AND POLARIZATION IN NEUTRAL STRANGE PARTICLE PRODUCTION AT HIGH TRANSVERSE MOMENTUM.
(Using the neutral hyperon beam and associated experimental apparatus.)

Request	6 May, 77	250 Hours for tuneup and data
	19 May, 78	530 Hours for tuning and data at intensities of 1 x 10 to the 11th per pulse
Approval	15 Nov, 78	450 Hours
Completed	17 Feb, 82	650 Hours

557 HADRON JETS #557 — Ernest I. Malamud — UNIVERSITY OF ARIZONA; CALIFORNIA INSTITUTE OF TECHNOLOGY; FERMILAB; FLORIDA STATE UNIVERSITY; GEORGE MASON UNIVERSITY; UNIV. OF ILLINOIS, CHICAGO CIRCLE; INDIANA UNIVERSITY; UNIVERSITY OF MARYLAND; IHEP, PROTVINO (SERPUKHOV)(RUSSIA); RUTGERS UNIVERSITY
BEAM: Meson Area - Test Beam
PROPOSAL TO STUDY HADRON JETS WITH THE CALORIMETER TRIGGERED MULTIPARTICLE SPECTROMETER.
(Continuation of work begun in exp #260.)

Request	9 May, 77	1,600 Hours for data with a suggested run plan as follows - 400 hours at 200 GeV, 800 hours with upgraded M6-beam at 300 GeV, and 400 hours at 400 GeV
Approval	24 Jun, 77	1,600 Hours conditional on a better understanding of beam requirements for the experiment after an upgrading of the M6 beam
Completed	14 Jul, 84	1,470 Hours

564 15-FOOT & EMULSION/NEUTRINO#564 — Louis Voyvodic — FERMILAB; ILLINOIS INSTITUTE OF TECHNOLOGY; JINR, DUBNA (RUSSIA); UNIVERSITY OF KANSAS; INP, KRAKOW (POLAND); ITEP, MOSCOW (RUSSIA); IHEP, PROTVINO (SERPUKHOV)(RUSSIA); INST.FOR NUCL. RESEARCH (BULGARIA); UNIVERSITY OF SYDNEY (AUSTRALIA); UNIVERSITY OF WASHINGTON
BEAM: Neutrino Area - Wide Band Horn
DIRECT DETECTION OF SHORT-LIVED PARTICLES FROM NEUTRINO INTERACTIONS IN NUCLEAR EMULSIONS INSIDE THE 15-FOOT BUBBLE CHAMBER.

Request	11 May, 77	1,500 Hours with a specific request for neutrinos from a total proton flux of 3 x 10 to the 18th; running is proposed during the 15-foot running period with a deuterium fill planned for the spring of 1978
	8 May, 79	1,100 Hours additional to be run parasitically in the 15-ft chamber. film from two auxiliary cameras is requested for the neutrino portion of the running
Approval	24 Jun, 77	Parasitic Running with the understanding that the experiment impose only a small impact on the 15-ft chamber operations
	1 Jul, 79	Parasitic Running with the understanding that the experiment impose only a small impact on the 15-ft chamber operations
Completed	9 Mar, 81	277 K Pix

565 30-INCH HYBRID #565 — Irwin A. Pless — BROWN UNIVERSITY; FERMILAB; COLLEGE DE FRANCE (FRANCE); INDIANA UNIVERSITY; MASSACHUSETTS INST. OF TECHNOLOGY; NIJMEGEN UNIVERSITY (NETHERLANDS); OAK RIDGE NATIONAL LABORATORY; RUTGERS UNIVERSITY; STEVENS INSTITUTE OF TECHNOLOGY; UNIVERSITY OF TEL-AVIV (ISRAEL); UNIVERSITY OF TENNESSEE, KNOXVILLE; TOHOKU GAKUIN UNIVERSITY (JAPAN); TOHOKU UNIVERSITY (JAPAN); YALE UNIVERSITY
BEAM: Neutrino Area - 30 in. Hadron Beam
A STUDY OF THE DETAILED CHARACTERISTICS OF HADRON-NUCLEUS COLLISIONS USING THE FERMILAB HYBRID SPECTROMETER.
(The experiment would be run with aluminum, silver, and gold foil targets mounted inside the 30-inch hydrogen-filled bubble chamber.)

Request	2 Jun, 77	3,000 K Pix in a 400 GeV proton beam (400 hours, 1,000K pix) and a 200 GeV proton plus pion beam (800 hours, 2,000K pix)
	7 Feb, 78	2,000 K Pix to be taken as follows- 500K pix with 200 GeV incident protons 500K pix with 200 GeV incident pi+ 800K pix with 200 GeV incident pi- 200K pix with 400 GeV incident protons
Approval	16 Mar, 78	Parasitic Running with exp #570
Completed	1 Jun, 82	1,068 K Pix total for E-565 and E-570

567 PARTICLE SEARCH #567 — Michael S. Witherell — BROOKHAVEN NATIONAL LABORATORY; CEN-SACLAY (FRANCE); FERMILAB; PRINCETON UNIVERSITY; UNIVERSITY OF TORINO (ITALY)
BEAM: Proton Area - West
SEARCH FOR CHARM PRODUCTION IN 200 GEV/C HADRON INTERACTIONS.
(Using the spectrometer for exp #302 with additions.)

Request	13 Jun, 77	500 Hours
Approval	24 Jun, 77	500 Hours with 100 hours for checkout and 400 hours for data-taking
Completed	7 Nov, 79	1,650 Hours see exp #650

568 EMULSION/PI- @ 300 #568 — Jacques D. Hebert — UNIVERSITY OF BELGRADE(YUGOSLAVIA); CRN, STRASBOURG (FRANCE); FERMILAB; UNIVERSITY OF LUND (SWEDEN); UNIVERSITY OF NANCY (FRANCE); UNIVERSITY OF OTTAWA (CANADA); UNIV. OF PARIS VI, LPG (FRANCE); LRC, LYON (FRANCE); UNIVERSITY OF SANTANDER (SPAIN); UNIVERSITY OF VALENCIA (SPAIN)
BEAM: Neutrino Area - Miscellaneous
300 GEV PION INTERACTIONS IN NUCLEAR EMULSION.

Request	8 Aug, 77	Emulsion Exposure of 3 stacks in a negative beam of about 30K particles per cm sq.
Approval	16 Sep, 77	Emulsion Exposure of 3 stacks in a 300 GeV negative beam with a flux of 30K particles per cm sq over an area of 3 x 3 cm sq
Completed	15 Jan, 78	3 Stack(s)

570 30-INCH HYBRID #570 — Irwin A. Pless — BROWN UNIVERSITY; FERMILAB; COLLEGE DE FRANCE (FRANCE); INDIANA UNIVERSITY; MASSACHUSETTS INST. OF TECHNOLOGY; NIJMEGEN UNIVERSITY (NETHERLANDS); OAK RIDGE NATIONAL LABORATORY; RUTGERS UNIVERSITY; STEVENS INSTITUTE OF TECHNOLOGY; UNIVERSITY OF TEL-AVIV (ISRAEL); UNIVERSITY OF TENNESSEE, KNOXVILLE; TOHOKU GAKUIN UNIVERSITY (JAPAN); TOHOKU UNIVERSITY (JAPAN); YALE UNIVERSITY
BEAM: Neutrino Area - 30 in. Hadron Beam
PROPOSAL FOR A STUDY OF PARTICLE PRODUCTION AND DYNAMICS FROM X = 0 TO X = 1 AND THE DEPENDENCE ON INCIDENT QUANTUM NUMBERS.
(Supercedes proposal #488. Will use the forward gamma detector and the downstream ISIS system with the 30-inch hybrid spectrometer.)

Request	16 Sep, 77	2,000 K Pix to be taken with the 30-inch hybrid spectrometer exposed to two beams, 1,000K pix in a positive beam with 10% K+ and equal fractions of protons and pi+, and 1,000K pix in a negative beam with 20% pbars
Approval	16 Mar, 78	1,500 Hours for a run of 15 weeks duration; combined with exp #565
Completed	1 Jun, 82	1,068 K Pix total for E-565 and E-570

573 EMULSION/PI- @ 300 #573 — Noriyuki Ushida — AICHI UNIV. OF EDUCATION (JAPAN); NAGOYA UNIVERSITY (JAPAN); YOKOHAMA NATIONAL UNIV. (JAPAN)
BEAM: Neutrino Area - Miscellaneous
A SEARCH FOR CHARMED PARTICLES PRODUCED BY 300 GEV/C NEGATIVE PIONS IN NUCLEAR EMULSION.

Request	29 Nov, 77	3 Stack(s) exposed in a negative pion beam to an integrated flux of 7.5 x 10 to the 3rd particles per cm sq
Approval	29 Nov, 77	3 Stack(s)
Completed	15 Jan, 78	3 Stack(s)

574 EMULSION/PI- @ 300 #574 — Wladyslaw Wolter — INP, KRAKOW (POLAND)
BEAM: Neutrino Area - Miscellaneous
A STUDY OF THE MECHANISM FOR MULTIPLE PRODUCTION OF PARTICLES AT OR ABOVE 300 GEV PION INTERACTIONS IN NUCLEAR EMULSION.

Request	1 Dec, 77	3 Stack(s) exposed in a 300 GeV negative pion beam to an integrated intensity of 5 x 10 to the 4th particles per cm sq
Approval	1 Dec, 77	3 Stack(s)
Completed	18 Jan, 78	4 Stack(s)

575 EMULSION/PROTONS @ 400 #575 — Jere J. Lord — UNIVERSITY OF WASHINGTON
BEAM: Neutrino Area - Miscellaneous
PROPOSAL TO STUDY 400 GEV PROTON INTERACTIONS IN NUCLEAR EMULSION.

Request	13 Dec, 77	2 Stack(s) to be exposed in a 400 GeV proton beam focused to a diameter of less than 5-10 mm. One stacK to receive a total dose of 100K p/cm sq and the other 200K p/cm sq.
Approval	13 Dec, 77	2 Stack(s)
Completed	15 Jan, 78	2 Stack(s)

576 EMULSION/PROTONS @ 500 #576 — Jacques D. Hebert — UNIVERSITY OF BELGRADE(YUGOSLAVIA); CRN, STRASBOURG (FRANCE); FERMILAB; UNIVERSITY OF LUND (SWEDEN); UNIVERSITY OF LYON (FRANCE); UNIVERSITY OF NANCY (FRANCE); UNIVERSITY OF OTTAWA (CANADA); UNIV. OF PARIS VI, LPG (FRANCE); UNIVERSITY OF SANTANDER (SPAIN); UNIVERSITY OF VALENCIA (SPAIN)
BEAM: Neutrino Area - Miscellaneous
500 GEV PROTON INTERACTIONS IN NUCLEAR EMULSION

Request	21 Dec, 77	Emulsion Exposure exposed in a 500 GeV proton beam to a total integrated flux of 3 x 10 to the 4th particles per cm sq
Approval	20 Feb, 78	Emulsion Exposure
Completed	11 Jul, 85	1 Emulsion Stack(s)

577 ELASTIC SCATTERING #577 — Roy Rubinstein — UNIVERSITY OF ARIZONA; UNIV. OF CALIFORNIA, SAN DIEGO; CORNELL UNIVERSITY; FERMILAB
BEAM: Meson Area - M6 Beam
PROPOSAL TO MEASURE PI P ELASTIC SCATTERING AT LARGE ANGLES.

Request	30 Jan, 78	1,000 Hours to be run in a 200 GeV incident beam with a beam flux between 5 x 10 to the 7th and 5 x 10 to the 8th pions per pulse
Approval	29 Jun, 78	1,000 Hours
Completed	16 Mar, 81	1,550 Hours

580 PARTICLE SEARCH #580 — Daniel R. Green — UNIVERSITY OF ARIZONA, FERMILAB, FLORIDA STATE UNIVERSITY, NOTRE DAME UNIVERSITY, TUFTS UNIVERSITY, VANDERBILT UNIVERSITY, VIRGINIA TECH

BEAM: Meson Area - M6 Beam
A SEARCH FOR NARROW AND BROAD RESONANCES DECAYING INTO LAMBDA-LAMBDA BAR, LAMBDA-LAMBDA BAR-PI, K SHORT AND K SHORT-K SHORT-PI FROM PI- P INTERACTIONS AT 300 GEV USING THE FERMILAB MPS.

Request	31 Jan, 78	800 Hours	to be run in a pion beam with an incident flux of 1.5 x 10 to the 6th pions per pulse at 300 GeV
Approval	29 Jun, 78	800 Hours	
Completed	1 Jun, 81	800 Hours	

581 POLARIZED SCATTERING #581 — Akihiko Yokosawa — ARGONNE NATIONAL LABORATORY, CEN-SACLAY (FRANCE), FERMILAB, HIROSHIMA UNIVERSITY (JAPAN), UNIVERSITY OF IOWA, KYOTO SANGYO UNIVERSITY (JAPAN), KYOTO UNIVERSITY (JAPAN), KYOTO UNIV. OF EDUCATION (JAPAN), LAPP, D'ANNECY-LE-VIEUX (FRANCE), LOS ALAMOS NATIONAL LABORATORY, NORTHWESTERN UNIVERSITY, UN. OF OCCUP. & ENV. HEALTH(JAPAN), IHEP, PROTVINO (SERPUKHOV)(RUSSIA), RICE UNIVERSITY, UNIVERSITY DI TRIESTE (ITALY), UNIVERSITY OF UDINE (ITALY)

BEAM: Meson Area - Polarized Proton Beam
CONSTRUCTION OF A POLARIZED BEAM FACILITY IN THE MESON LABORATORY AND EXPERIMENTS USING SUCH A FACILITY.
(Using the M2-beam converted to a polarized proton/antiproton beam.)

Request	31 Jan, 78	1,200 Hours	to include- 600 hours for total cross section difference measurements 600 hours for asymmetry measurements in inclusive pion production
	30 Jan, 79	1,670 Hours	to include- 200 hours for beam measurements 1,000 hours for high p-transverse physics 220 hours for cross section measurements 250 hours for hadron production at large-x
Approval	27 Nov, 79	Unspecified	approval for the construction of a polarized beam only There is no approval yet for any experiment to use the beam.
Approved/Inactive	10 Feb, 84	Unspecified	

584 PARTICLE SEARCH #584 — Bruce D. Winstein — UNIVERSITY OF CHICAGO, STANFORD UNIVERSITY, UNIVERSITY OF WISCONSIN - MADISON

BEAM: Meson Area - M3 Beam
PROPOSAL TO SEARCH FOR THE DECAY OF NEW LONG-LIVED NEUTRAL PARTICLES WITH A MASS AND LIFETIME EXCEEDING THAT OF THE K LONG.

Request	31 Jan, 78	300 Hours	to be run in the M3 beam as modified for experiment #533
Approval	29 Jun, 78	300 Hours	with low priority
Completed	22 Jan, 80	400 Hours	

585 KAON CHARGE EXCHANGE #585 — William R. Francis — UNIV. OF CALIFORNIA, DAVIS, UNIV. OF CALIFORNIA, SAN DIEGO, CARELTON UNIVERSITY (CANADA), MICHIGAN STATE UNIVERSITY

BEAM: Meson Area - M4 Beam
A PROPOSAL TO STUDY EXCLUSIVE KN CHARGE EXCHANGE AT FERMILAB.
(The spectrometer from experiment #383 would be used.)

Request	31 Jan, 78	600 Hours	to be run immediately following the conclusion of exp #383
	13 Nov, 78	2,700 Hours	for 7 weeks of data to finish K- running and 9 weeks to repeat the experiment with a K+ beam and a deuterium target
Approval	16 Mar, 78	600 Hours	with conditions before the Meson Laboratory pause
	21 Dec, 78	1,800 Hours	with the approval of an additional 7 weeks of running to finish K- data; no commitment is made to K+ running
Completed	16 Mar, 81	3,150 Hours	

591 PARTICLE SEARCH #591 — Laszlo J. Gutay — FERMILAB, PURDUE UNIVERSITY

BEAM: Internal Target Area (C-0)
BROAD SEARCH FOR NEW HADRONIC STATES VIA HIGH RESOLUTION CHARGE AND MASS DETERMINATION OF NUCLEAR FRAGMENTS.

Request	31 Jan, 78	800 Hours	to include 200 hours for setup and 600 hours for data
Approval	21 Apr, 78	800 Hours	
Completed	8 Feb, 81	1,950 Hours	

592 NUCLEAR SCALING #592 — Sherman Frankel — ITEP, MOSCOW (RUSSIA), UNIVERSITY OF PENNSYLVANIA, COLLEGE OF WILLIAM AND MARY

BEAM: Proton Area - West
PROPOSAL FOR EXPERIMENTAL STUDY OF THE RELATIONSHIP BETWEEN HADRONIC AND NUCLEAR SCALING AT VERY HIGH ENERGIES.

Request	31 Jan, 78	300 Hours	to be run in a 400 GeV proton beam at an upstream location in P-West
Approval	17 Mar, 78	300 Hours	to be run in such a manner as not to interfere with the installation of the P-West pion beam
Completed	17 Jul, 78	500 Hours	

594 NEUTRINO #594 — James K. Walker — FERMILAB, ILLINOIS INSTITUTE OF TECHNOLOGY, MASSACHUSETTS INST. OF TECHNOLOGY, MICHIGAN STATE UNIVERSITY, NORTHERN ILLINOIS UNIVERSITY

BEAM: Neutrino Area - Dichromatic
PROPOSAL FOR A NEW NEUTRINO DETECTOR AT FERMILAB.

Request	1 Feb, 78	2,500 Hours	for data to include: Experiment A (a study of semi-leptonic neutral current reactions) to require 6 x 10 to the 18th protons utilizing the narrow band beam at 250 GeV Experiment B (neutrino electron elastic scattering) to require 6 x 10 to the 18th protons utilizing the two-horn beam
Approval	16 Mar, 78	Unspecified	
Completed	14 Jun, 82	4,400 Hours	

595 PARTICLE SEARCH #595 — Arie Bodek — CALIFORNIA INSTITUTE OF TECHNOLOGY, UNIVERSITY OF CHICAGO, FERMILAB, UNIVERSITY OF ROCHESTER, STANFORD UNIVERSITY

BEAM: Neutrino Area - 15 ft. Hadron Beam
A STUDY OF CHARM AND OTHER NEW FLAVORS PRODUCED IN PION-NUCLEON COLLISIONS.
(Continuation of work begun in exp #379.)

Request	1 Feb, 78	1,000 Hours	to include 400 hours at 300 GeV with an incident intensity of 10 to the 5th pi- per pulse and 400 hours at 250-300 GeV with incident intensity of 10 to the 6th pi- per pulse
Approval	29 Jun, 78	600 Hours	for the low-pt part of the experiment
Completed	16 Jun, 80	1,450 Hours	

596 PARTICLE SEARCH #596 — Leon M. Lederman — COLUMBIA UNIVERSITY; FERMILAB; SUNY AT STONY BROOK
BEAM: Neutrino Area - Muon/Hadron Beam
ON SEARCHING FOR HEAVY STABLE PARTICLES
(A continuation of work begun with exp #187.)

Request	3 Feb, 78	150 Hours	to be run with the beam tuned to 75 GeV and assuming 10 to the 13th primary protons incident per pulse
Approval	1 May, 78	150 Hours	
Completed	21 May, 78	200 Hours	

597 30-INCH HYBRID #597 — James J. Whitmore — UNIVERSITY OF CAMBRIDGE (ENGLAND); DUKE UNIVERSITY; FERMILAB; UNIVERSITY OF KANSAS; MICHIGAN STATE UNIVERSITY; NOTRE DAME UNIVERSITY
BEAM: Neutrino Area - 30 in. Hadron Beam
PROPOSAL FOR A HIGH STATISTICS STUDY OF PBAR-P ANNIHILATIONS AND A COMPARISON OF PBAR, P, PI+-, AND K+ INTERACTIONS ON HYDROGEN, MAGNESIUM, AND GOLD AT 100 GEV/C UTILIZING THE FERMILAB 30-INCH HYDROGEN BUBBLE CHAMBER.
(The use of thin metallic foil targets in the hydrogen is requested.)

Request	3 Feb, 78	1,450 K Pix	to be taken as follows- 1,000K pix in negative beam @ 100 GeV; 400K pix in positive beam @ 100 GeV; 50K pix in negative beam @ 360 GeV
Approval	16 Mar, 78	1,000 Hours	for a run of 10 weeks duration
Completed	3 May, 82	658 K Pix	

605 HIGH MASS PAIRS #605 — John P. Rutherfoord — CEN-SACLAY (FRANCE); CERN (SWITZERLAND); COLUMBIA UNIVERSITY; FERMILAB; KEK (JAPAN); KYOTO UNIVERSITY (JAPAN); SUNY AT STONY BROOK; UNIVERSITY OF WASHINGTON
BEAM: Meson Area - East
A STUDY OF LEPTONS AND HADRONS NEAR THE KINEMATIC LIMITS.
(Using an apparatus with higher luminosity and acceptance than experiment #288.)

Request	9 May, 78	4,000 Hours	to be run with an incident intensity greater than 10 to the 13th protons/pulse at an energy of at least 400 GeV
	28 Nov, 78	4,000 Hours	in the Phase I configuration. an incident beam of 400 GeV protons would be needed with an intensity of 3 x 10 to the 12th per pulse
Approval	19 Mar, 79	1,000 Hours	with the Phase I detector
Completed	29 Aug, 85	3,970 Hours	

608 PARTICLE SEARCH #608 — Charles N. Brown — COLUMBIA UNIVERSITY; FERMILAB; SUNY AT STONY BROOK
BEAM: Proton Area - Center
A SEARCH FOR THE ETA SUB C IN HADRONIC INTERACTIONS.
(Using the spectrometer from exp #288/494.)

Request	28 Sep, 78	100 Hours	in the P-center proton beam at an incident intensity of 3 x 10 to the 9th protons per pulse
Approval	25 Jan, 79	Parasitic Running	
Completed	7 Mar, 79	600 Hours	

609 HADRON JETS #609 — Walter Selove — ARGONNE NATIONAL LABORATORY; FERMILAB; LEHIGH UNIVERSITY; UNIVERSITY OF PENNSYLVANIA; RICE UNIVERSITY; UNIVERSITY OF WISCONSIN - MADISON
BEAM: Meson Area - M6 Beam
A STUDY OF THE STRUCTURE OF HIGH P TRANSVERSE HADRONIC INTERACTIONS.
(This proposal supersedes P-246.)

Request	2 Oct, 78	1,500 Hours	for Phase 1 to be run in a beam with 400 GeV capability with at least 10 to the 8th protons per sec incident. Phase 2 would include addition of a large aperture magnet, Cerenkov imaging device and PWC's; Phase 3 would include a request for a higher energy beam
Approval	16 Nov, 78	Unspecified	with conditions
	30 Jan, 80	1,500 Hours	
Completed	14 Feb, 84	620 Hours	

610 PARTICLE SEARCH #610 — Thomas B. W. Kirk — FERMILAB; HOWARD UNIVERSITY; UNIVERSITY OF ILLINOIS, CHAMPAIGN; UNIVERSITY OF PENNSYLVANIA; PURDUE UNIVERSITY; TUFTS UNIVERSITY
BEAM: Neutrino Area - Muon/Hadron Beam
PION PRODUCTION OF HEAVY QUARK MESON STATES DECAYING INTO THE PSI/J (3097).
(Continuation of work begun in exp #369 but with upgraded cyclotron spectrometer.)

Request	2 Oct, 78	1,000 Hours	to be run with an incident intensity of 10 to the 13th protons per pulse on the production target
Approval	21 Dec, 78	1,000 Hours	with a schedule yet to be formally determined
Completed	23 Jun, 80	1,250 Hours	see proposal #673

612 PHOTON DISSOCIATION #612 — Konstantin Goulianos — ROCKEFELLER UNIVERSITY
BEAM: Proton Area - East
A PROPOSAL TO MEASURE THE DIFFRACTIVE PHOTON DISSOCIATION ON HYDROGEN.

Request	2 Oct, 78	1,150 Hours	to be run in the tagged photon beam with 10 to the 6th incident photons per pulse
Approval	15 Nov, 78	1,150 Hours	
Completed	12 Apr, 82	1,850 Hours	

613 BEAM DUMP #613 — Byron P. Roe — UNIVERSITY OF FIRENZE (ITALY); UNIVERSITY OF MICHIGAN - ANN ARBOR; OHIO STATE UNIVERSITY; UNIVERSITY OF WISCONSIN - MADISON
BEAM: Meson Area - M2 Beam
PROPOSAL FOR A PROMPT NEUTRINO EXPERIMENT AT FERMILAB.

Request	2 Oct, 78	1,000 Hours	to obtain an exposure of 1 - 2 x 10 to the 17th protons with an incident intensity of 1 x 10 to the 12th protons/pulse
Approval	15 Nov, 78	1,000 Hours	with an expected reassessment of physics priorities and possible implications for this experiment in the fall of 1979
Completed	13 May, 82	1,800 Hours	

615 FORWARD SEARCH #615 — Kirk T. McDonald — UNIVERSITY OF CHICAGO; FERMILAB; IOWA STATE UNIVERSITY; PRINCETON UNIVERSITY
BEAM: Proton Area - West
A STUDY OF THE FORWARD PRODUCTION OF MASSIVE PARTICLES. IN PHASE ONE THE FORWARD PRODUCTION OF MUON PAIRS WOULD BE STUDIED.
(Using a forward spectrometer with mass selection.)

Request	28 Nov, 78	1,000 Hours	to be run in a 50-GeV pion beam at an incident intensity of 10 to the 10th pions per pulse
	7 May, 79	1,000 Hours	to include 600 hours of running with 250 GeV pions and 200 hours with 75 GeV pions. A primary proton intensity of 10 to the 13th per pulse on the P-West production target and 300 pulses per hour are assumed.
Approval	1 Jul, 79	1,000 Hours	
Completed	14 Jul, 84	2,260 Hours	

616	NEUTRINO #616	Frank J. Sciulli	CALIFORNIA INSTITUTE OF TECHNOLOGY
	BEAM: Neutrino Area - Dichromatic		COLUMBIA UNIVERSITY
	PROPOSAL TO MEASURE NEUTRINO STRUCTURE FUNCTIONS.		FERMILAB
	(Use of the Lab E neutrino detector to continue work begun in exp #356.)		UNIVERSITY OF ROCHESTER ROCKEFELLER UNIVERSITY

Request	29 Jan, 79	3,200 Hours	to include specifically 600 hours for checkout, calibration and background studies, and 2 x 10 to the 19th protons at 400 GeV for data
Approval	19 Mar, 79	4,000 Hours	approximately or 2 x 10 to the 19th protons to be combined with running for exp #356
Completed	22 Jan, 80	2,900 Hours	

617	CP VIOLATION #617	Bruce D. Winstein	CEN-SACLAY (FRANCE)
	BEAM: Meson Area - M3 Beam		UNIVERSITY OF CHICAGO
	A STUDY OF DIRECT CP VIOLATION IN THE DECAY OF THE NEUTRAL KAON VIA A PRECISION MEASUREMENT OF THE RATIO OF ETA 00 TO ETA +-.		

Request	30 Jan, 79	1,000 Hours	for data
Approval	19 Mar, 79	1,000 Hours	
Completed	14 Jun, 82	2,300 Hours	

619	TRANSITION MAGNETIC MOMENT #619	Thomas J. Devlin	UNIVERSITY OF MICHIGAN - ANN ARBOR
	BEAM: Proton Area - Center		UNIVERSITY OF MINNESOTA
	A MEASUREMENT OF THE SIGMA-ZERO TO LAMBDA TRANSITION MAGNETIC MOMENT.		RUTGERS UNIVERSITY UNIVERSITY OF WISCONSIN - MADISON

Request	7 May, 79	250 Hours	to be run in the diffracted proton beam (normally 400 GeV) at an intensity between 10 to the 8th and 10 to the 9th protons per pulse with a 1-sec spill
Approval	1 Jul, 79	250 Hours	
Completed	14 Jun, 82	675 Hours	

620	CHARGED HYPERON MAG MOMENT #620	Lee G. Pondrom	UNIVERSITY OF MICHIGAN - ANN ARBOR
	BEAM: Meson Area - M2 Beam		UNIVERSITY OF MINNESOTA
	PROPOSAL TO MEASURE THE MAGNETIC MOMENTS OF THE SIGMA +, SIGMA -, XI -, AND OMEGA - HYPERONS USING THE FERMILAB NEUTRAL HYPERON BEAM.		RUTGERS UNIVERSITY UNIVERSITY OF WISCONSIN - MADISON

Request	7 May, 79	300 Hours	to be run in the diffracted proton beam (350 to 400 GeV) at an intensity of 10 to the 9th protons per pulse and a 1-sec spill
Approval	1 Jul, 79	300 Hours	
Completed	22 Jan, 80	900 Hours	

621	CP VIOLATION #621	Gordon B. Thomson	UNIVERSITY OF MICHIGAN - ANN ARBOR
	BEAM: Proton Area - Center		UNIVERSITY OF MINNESOTA
	A MEASUREMENT OF THE CP VIOLATION PARAMETER ETA +-0. (Use of the neutral hyperon spectrometer is assumed.)		RUTGERS UNIVERSITY

Request	7 May, 79	1,200 Hours	to be run in 2 phases consisting of 200 hours for Phase 1 with some modifications to the present apparatus 1000 hours for Phase 2 at a later date after results from Phase 1 have been analyzed
Approval	1 Jul, 81	Unspecified	
Completed	29 Aug, 85	2,470 Hours	

622	QUARK #622	H. Richard Gustafson	UNIVERSITY OF MICHIGAN - ANN ARBOR
	BEAM: Meson Area - M2 Beam		
	PROPOSAL TO SEARCH FOR FRACTIONAL CHARGE PARTICLES FROM A MAGNETIZED BEAM DUMP.		

Request	7 May, 79	100 Hours	to be run partially in conjunction with exp #361 using the beam dump from that experiment
Approval	1 Jul, 79	Parasitic	Running in a mode that is not to interfere with the operation of exp #361
Completed	23 Jun, 80	Unspecified	

623	PARTICLE SEARCH #623	Daniel R. Green	UNIVERSITY OF ARIZONA
	BEAM: Meson Area - M6 Beam		FERMILAB
	PROPOSAL TO STUDY HIGH MASS STATES DECAYING INTO PHI-PI AND PHI-PHI PAIRS PRODUCED CENTRALLY IN 300 GEV/C PI MINUS PROTON INTERACTIONS. (Use of the Fermilab multiparticle spectrometer facility is assumed.)		FLORIDA STATE UNIVERSITY NOTRE DAME UNIVERSITY TUFTS UNIVERSITY VANDERBILT UNIVERSITY VIRGINIA TECH

Request	7 May, 79	1,000 Hours	to be run in a 300 GeV/c beam of negative pions at an intensity of a few times 10 to the 6th pions per pulse
Approval	14 Nov, 80	500 Hours	to be run before 1983
Completed	14 Jun, 82	425 Hours	

629	DIRECT PHOTON PRODUCTION #629	Charles A. Nelson, Jr.	FERMILAB
	BEAM: Meson Area - M1 Beam		MICHIGAN STATE UNIVERSITY
	DIRECT PHOTON PRODUCTION IN HADRON NUCLEUS COLLISIONS.		UNIVERSITY OF MINNESOTA NORTHEASTERN UNIVERSITY UNIVERSITY OF ROCHESTER TEXAS A&M UNIVERSITY

Request	25 Feb, 80	600 Hours	to include 200 hrs for set up, 400 hrs for data
Approval	7 Jul, 80	Unspecified	approved as a test in the M-1 beam line in the fall of 1980
Completed	9 Mar, 81	600 Hours	

630	CHARM PARTICLE #630	Jack Sandweiss	FERMILAB
	BEAM: Proton Area - Center		LAWRENCE BERKELEY LABORATORY
	STUDY OF B PARTICLE AND CHARMED PARTICLE PRODUCTION AND DECAY USING A HIGH RESOLUTION STREAMER CHAMBER.		YALE UNIVERSITY

Request	26 Feb, 80	600 Hours	
Approval	15 Mar, 80	600 Hours	
Completed	15 Mar, 82	1,150 Hours	

631	NUC CALIBRATION CROSS SECT #631	Samuel I. Baker	BROOKHAVEN NATIONAL LABORATORY
	BEAM: Neutrino Area - Miscellaneous		CERN (SWITZERLAND)
	A MEASUREMENT OF NUCLEAR CALIBRATION CROSS SECTIONS FOR PROTONS BETWEEN 100 AND 1000 GEV.		FERMILAB

Request	26 Feb, 80	25 Exposure(s)	
Approval	15 Dec, 80	Unspecified	in neutrino area
Completed	1 Jun, 81	41 Exposure(s)	

632	15-FT NEUTRINO/H2 & NE #632	Douglas R. O. Morrison and Michael W. Peters	UNIVERSITY OF BIRMINGHAM (ENGLAND) UNIV. OF CALIFORNIA, BERKELEY CEN-SACLAY (FRANCE) CERN (SWITZERLAND) FERMILAB UNIVERSITY OF HAWAII AT MANOA ILLINOIS INSTITUTE OF TECHNOLOGY IMPERIAL COLLEGE (ENGLAND) JAMMU UNIVERSITY (INDIA) UNIVERSITY OF LIBRE (BELGIUM) MAX-PLANCK INSTITUTE (GERMANY) MOSCOW STATE UNIVERSITY (RUSSIA) ITEP, MOSCOW (RUSSIA) UNIVERSITY OF OXFORD (ENGLAND) PANJAB UNIVERSITY (INDIA) IHEP, PROTVINO (SERPUKHOV)(RUSSIA) RUTGERS UNIVERSITY TUFTS UNIVERSITY

BEAM: Neutrino Area - Center
AN EXPOSURE OF THE 15-FOOT BUBBLE CHAMBER WITH A NEON-HYDROGEN MIXTURE TO A WIDEBAND NEUTRINO BEAM FROM THE TEVATRON.

Request	25 Apr, 80	250 K Pix
Approval	18 Jun, 82	1 E18th Protons Stage I approval.
	15 Dec, 83	1 E18th Protons Stage II approval.
Completed	1 Feb, 88	446 K Pix

635	NEUTRINO #635	Luke W. Mo	FERMILAB VIRGINIA TECH

BEAM: Neutrino Area - Prompt Beam
PROPOSAL TO MEASURE MUON NEUTRINO ELECTRON AND MUON ANTI-NEUTRINO ELECTRON ELASTIC SCATTERING, NEUTRINO OSCILLATIONS, AND DECAYS OF LONG-LIVED NEUTRAL PARTICLES AT THE TEVATRON OF FERMILAB.

Request	25 Apr, 80	... 3 x 10 to the 18th protons
	16 Mar, 83	Unspecified
Approval	12 Nov, 83	Unspecified Stage I approval.
Approved/Inactive	1 Feb, 88	Unspecified

636	BEAM DUMP #636	Toshio Kitagaki and Irwin A. Pless	IHEP, BEIJING (PRC) BROWN UNIVERSITY FERMILAB INDIANA UNIVERSITY MASSACHUSETTS INST. OF TECHNOLOGY OAK RIDGE NATIONAL LABORATORY TECHNION-ISRAEL INST (ISRAEL) UNIVERSITY OF TEL-AVIV (ISRAEL) UNIVERSITY OF TENNESSEE, KNOXVILLE TOHOKU GAKUIN UNIVERSITY (JAPAN) TOHOKU UNIVERSITY (JAPAN)

BEAM: Neutrino Area - Prompt Beam
NEUTRINO INTERACTION STUDIES WITH A HEAVY LIQUID BUBBLE CHAMBER AT TEVATRON ENERGIES USING A BEAM DUMP TECHNIQUE TO PRODUCE THE NEUTRINO BEAM.

Request	25 Apr, 80	2.5 E18th Protons
Approval	14 Nov, 80	Unspecified
Approved/Inactive	1 Feb, 88	Unspecified

646	15-FT BEAM DUMP #646	Michael W. Peters	UNIV. OF CALIFORNIA, BERKELEY FERMILAB UNIVERSITY OF HAWAII AT MANOA ILLINOIS INSTITUTE OF TECHNOLOGY RUTGERS UNIVERSITY STEVENS INSTITUTE OF TECHNOLOGY TUFTS UNIVERSITY

BEAM: Neutrino Area - Prompt Beam
SEARCH FOR THE TAU NEUTRINO AND STUDY OF ELECTRON NEUTRINO AND ELECTRON ANTI-NEUTRINO INTERACTIONS.

Request	25 Apr, 80	2 E18th Protons
Approval	1 Jul, 81	Unspecified
Approved/Inactive	1 Feb, 88	Unspecified

650	PARTICLE SEARCH #650	Robert C. Webb	BROOKHAVEN NATIONAL LABORATORY CEN-SACLAY (FRANCE) PRINCETON UNIVERSITY TEXAS A&M UNIVERSITY UNIVERSITY OF TORINO (ITALY)

BEAM: Proton Area - West
REQUEST FOR A CONTINUATION OF E-567.

Request	29 Apr, 80	500 Hours
Approval	7 Jul, 80	500 Hours expected to run in the spring 1981 running period.
Completed	29 Dec, 80	550 Hours

653	PARTICLE SEARCH #653	Neville W. Reay	AICHI UNIV. OF EDUCATION (JAPAN) UNIV. OF CALIFORNIA, DAVIS CARNEGIE-MELLON UNIVERSITY CHONNAM NATIONAL UNIVERSITY(KOREA) FERMILAB GIFU UNIVERSITY (JAPAN) GYEONGSANG NATIONAL UNIV. (KOREA) KINKI UNIVERSITY (JAPAN) KOBE UNIVERSITY (JAPAN) KOREA UNIVERSITY, SEOUL (KOREA) NAGOYA INST. OF TECHNOLOGY (JAPAN) NAGOYA UNIVERSITY (JAPAN) OHIO STATE UNIVERSITY OKAYAMA UNIVERSITY (JAPAN) UNIVERSITY OF OKLAHOMA OSAKA CITY UNIVERSITY (JAPAN) OSAKA SCIENCE EDUC. INST. (JAPAN) TOHO UNIVERSITY (JAPAN) UTSUNOMIYA UNIVERSITY (JAPAN) WON KWANG UNIVERSITY, IRI (KOREA)

BEAM: Neutrino Area - East
A PROPOSAL TO MEASURE CHARM AND B DECAYS VIA HADRONIC PRODUCTION IN A HYBRID EMULSION SPECTROMETER.

Request	1 May, 80	1,500 Hours
Approval	1 Jul, 81	Unspecified
Completed	15 Feb, 88	1,800 Hours

660	CHANNELING #660	Walter M. Gibson	CERN (SWITZERLAND) CHALK RIVER NUCLEAR LAB. (CANADA) FERMILAB JINR, DUBNA (RUSSIA) UNIVERSITY OF NEW MEXICO SUNY AT ALBANY UNIVERSITY OF STRASBOURG (FRANCE)

BEAM: Meson Area - M4 Beam
PROPOSAL TO STUDY THE EFFECT OF BENT CRYSTALS ON CHANNELING NEAR THE CRITICAL RADIUS OF BENDING.

Request	10 Jun, 80	300 Hours
Approval	14 Nov, 80	400 Hours
Completed	13 Jun, 82	425 Hours

663 LAMBDA POLARIZATION #663 — Hans G. E. Kobrak
UNIV. OF CALIFORNIA, DAVIS
UNIV. OF CALIFORNIA, SAN DIEGO
CARELTON UNIVERSITY (CANADA)
FERMILAB
MICHIGAN STATE UNIVERSITY

BEAM: Meson Area - M4 Beam
COMPARISON OF POLARIZATION OF INCLUSIVELY PRODUCED LAMBDAS AND ANTILAMBDAS BY PROTONS, ANTIPROTONS, KAONS AND PIONS ON HYDROGEN.

Request	29 Sep, 80	1,000 Hours
Approval	14 Nov, 80	800 Hours must be completed by July 1, 1981
Completed	1 Jun, 81	500 Hours

665 TEVATRON MUON #665 — Heidi M. Schellman
ARGONNE NATIONAL LABORATORY
UNIV. OF CALIFORNIA, SAN DIEGO
FERMILAB
FREIBURG UNIVERSITY (GERMANY)
HARVARD UNIVERSITY
UNIV. OF ILLINOIS, CHICAGO CIRCLE
INP, KRAKOW (POLAND)
LAWRENCE LIVERMORE LABORATORY
UNIVERSITY OF MARYLAND
MASSACHUSETTS INST. OF TECHNOLOGY
MAX-PLANCK INSTITUTE (GERMANY)
NORTHWESTERN UNIVERSITY
OHIO UNIVERSITY
UNIVERSITY OF PENNSYLVANIA
UNIVERSITY OF WASHINGTON
UNIVERSITY OF WUPPERTAL (GERMANY)
YALE UNIVERSITY

BEAM: Neutrino Area - Muon Beam
MUON SCATTERING WITH HADRON DETECTION AT THE TEVATRON.

Request	3 Oct, 80	3,000 Hours
Approval	1 Jul, 81	1,000 Hours
	30 Jan, 89	... Tracking system upgrade.
Data Analysis	8 Jan, 92	Unspecified

666 EMULSION EXPOSURE #666 — Richard J. Wilkes
INP, KRAKOW (POLAND)
UNIVERSITY OF WASHINGTON

BEAM: Proton Area - Center
EMULSION EXPOSURE TO SIGMA MINUS BEAM AT FERMILAB.

Request	2 Dec, 80	1 K Pix
Approval	2 Dec, 80	Unspecified
Completed	9 Mar, 81	6 Stack(s)

667 EMULSION/PI- @ 500 #667 — Wladyslaw Wolter
INP, KRAKOW (POLAND)
LEBEDEV PHYSICAL INST. (RUSSIA)
LOUISIANA STATE UNIVERSITY
TASHKENT, PHY.TEC.INS (UZBEKISTAN)

BEAM: Proton Area - East
STUDY OF PION-NUCLEUS INTERACTIONS IN PURE EMULSION STACKS AND EMULSION CHAMBERS AT ENERGY ABOVE 500 GEV.

Request	2 Dec, 80	Emulsion Exposure
Approval	28 Mar, 90	Unspecified
Completed	27 Aug, 90	Unspecified

668 EMULSION/PI- @ 800 #668 — Wladyslaw Wolter
INP, KRAKOW (POLAND)

BEAM: Unspecified Beam
STUDY OF PION NUCLEUS INTERACTIONS IN PURE EMULSION STACKS AND EMULSION CHAMBERS AT ENERGY ABOVE 800 GEV.

Request	2 Dec, 80	Emulsion Exposure
Completed	26 Apr, 85	Emulsion Exposure

672A HADRON JETS #672A — Andrzej Zieminski
FERMILAB
UNIV. OF ILLINOIS, CHICAGO CIRCLE
INDIANA UNIVERSITY
UNIVERSITY OF LOUISVILLE
UNIVERSITY OF MICHIGAN - FLINT
IHEP, PROTVINO (SERPUKHOV)(RUSSIA)

BEAM: Meson Area - West
A STUDY OF HADRONIC FINAL STATES PRODUCED IN ASSOCIATION WITH HIGH-PT JETS AND HIGH-MASS DIMUONS.

Request	1 Feb, 81	2,000 Hours for data taking plus 500 hours for setup and testing
Approval	1 Jul, 81	Unspecified
Data Analysis	8 Jan, 92	Unspecified

673 CHI MESON #673 — John W. Cooper
FERMILAB
UNIVERSITY OF ILLINOIS, CHAMPAIGN
UNIVERSITY OF PENNSYLVANIA
PURDUE UNIVERSITY
TUFTS UNIVERSITY

BEAM: Neutrino Area - Muon/Hadron Beam
CHI MESON PRODUCTION BY HADRONS.
(E-610 extension.)

Request	1 Feb, 81	1,500 Hours to be run with Dichromatic train during the fall 1981 period
Approval	1 Jul, 81	Unspecified
Completed	14 Apr, 82	1,100 Hours

683 PHOTOPRODUCTION OF JETS #683 — Marjorie D. Corcoran
BALL STATE UNIVERSITY
FERMILAB
UNIVERSITY OF IOWA
UNIVERSITY OF MARYLAND
UNIVERSITY OF MICHIGAN - ANN ARBOR
RICE UNIVERSITY
VANDERBILT UNIVERSITY

BEAM: Proton Area - Broad Band
PHOTOPRODUCTION OF HIGH PT JETS.

Request	1 Feb, 81	1,200 Hours including 500 hours for tune-up, calibration and some hadron beam running
Approval	15 Dec, 83	Unspecified Stage I approval.
	4 Apr, 87	Unspecified Stage II approval.
Data Analysis	8 Jan, 92	Unspecified

687 PHOTOPRODUCTION OF CHARM AND B #687 — Joel N. Butler and John P. Cumalat
UNIV. OF CALIFORNIA, DAVIS
UNIVERSITY OF COLORADO AT BOULDER
FERMILAB
INFN, FRASCATI (ITALY)
UNIVERSITY OF ILLINOIS, CHAMPAIGN
INFN, MILANO (ITALY)
UNIVERSITY OF MILANO (ITALY)
UNIVERSITY OF NORTH CAROLINA
NORTHWESTERN UNIVERSITY
NOTRE DAME UNIVERSITY
UNIVERSITY OF PAVIA (ITALY)
UNIV. OF PUERTO RICO - RIO PIEDRAS

BEAM: Proton Area - Broad Band
HIGH ENERGY PHOTOPRODUCTION OF STATES CONTAINING HEAVY QUARKS AND OTHER RARE PHENOMENA.

Request	1 Feb, 81	2,000 Hours including a 500 hour run with a thick target and a beam dump and another 1500 hour run with an open geometry
Approval	1 Jul, 81	Unspecified Stage I approval.
	15 Dec, 83	Unspecified Stage II approval.
Data Analysis	8 Jan, 92	Unspecified

690	PARTICLE SEARCH #690	Bruce C. Knapp	COLUMBIA UNIVERSITY
	BEAM: Neutrino Area - East		FERMILAB
	STUDY OF HADRONIC PRODUCTION AND SPECTROSCOPY OF STRANGE, CHARM AND BOTTOM PARTICLES AT THE TEVATRON.		UNIVERSITY OF GUANAJUATO (MEXICO) UNIVERSITY OF MASSACHUSETTS TEXAS A&M UNIVERSITY

Request	1 Feb, 81	1,400 Hours including 400 hours of target fragmentation measurements during installation and 1000 hours with full detector
Approval	1 Jul, 81	Unspecified
	12 Nov, 83	Unspecified Stage I approval.
	4 Apr, 87	Unspecified Stage II approval.
	8 Jan, 92	Unspecified
Data Analysis	8 Jan, 92	Unspecified

691	TAGGED PHOTON #691	Michael S. Witherell	UNIV. OF CALIFORNIA, SANTA BARBARA
	BEAM: Proton Area - East		CARELTON UNIVERSITY (CANADA)
	PROPOSAL TO DO PHOTON PHYSICS WITH THE TEVATRON AT THE TAGGED PHOTON SPECTROMETER.		CBPF (BRAZIL) UNIVERSITY OF COLORADO AT BOULDER FERMILAB NATIONAL RESEARCH COUNCIL (CANADA) UNIVERSITY OF OKLAHOMA UNIVERSITE OF SAO PAULO (BRAZIL) UNIVERSITY OF TORONTO (CANADA)

Request	1 Feb, 81	1,000 Hours
Approval	12 Nov, 83	Unspecified Stage I approval.
Completed	29 Aug, 85	1,400 Hours

700	NEUTRINO OSCILLATION #700	David J. Miller	UNIVERSITY OF BARI (ITALY)
	BEAM: Neutrino Area - Prompt Beam		ECOLE POLYTECH, PALAISEAU (FRANCE)
	STUDY OF NEUTRINO OSCILLATIONS AND SEARCH FOR THE TAU NEUTRINO.		ILLINOIS INSTITUTE OF TECHNOLOGY LONDON UNIVERSITY COLLEGE(ENGLAND) TUFTS UNIVERSITY

Request	10 Feb, 81	2.5 E18th Protons
Inactive	1 Apr, 84	

701	NEUTRINO OSCILLATION #701	Michael H. Shaevitz	UNIVERSITY OF CHICAGO
	BEAM: Neutrino Area - Dichromatic		COLUMBIA UNIVERSITY
	A SEARCH FOR NEUTRINO OSCILLATIONS WITH DELTA-M-SQUARE GREATER THAN 10 EV-SQUARE.		FERMILAB UNIVERSITY OF ROCHESTER

Request	12 Feb, 81	5.2 E18th Protons
Approval	1 Jul, 81	Unspecified
Completed	14 Jun, 82	2,250 Hours

702	PARTICLE SEARCH #702	George Glass	IHEP, BEIJING (PRC)
	BEAM: Internal Target Area (C-0)		FERMILAB
	SEARCH FOR PARTICLES WITH ANOMALOUS VALUES OF M/Q AND EXTREMELY SHORT INTERACTION LENGTHS (A REVISION OF P-607). (To use recoil spectrometer with rotating be wire filament target.)		NORTHEASTERN UNIVERSITY TEXAS A&M UNIVERSITY

Request	12 Jun, 81	400 Hours for data and approximately 3 months to build and debug the apparatus
Inactive	1 Apr, 84	

703	ELECTRON TARGET FACILITY #703	William R. Frisken	CIPP (CANADA)
	BEAM: Collision Area (D-0)		CARELTON UNIVERSITY (CANADA)
	ELECTRON-PROTON COLLISIONS AT FERMILAB (Electron-proton collisions using the canadian high energy electron ring cheer.)		CEN-SACLAY (FRANCE) CHALK RIVER NUCLEAR LAB. (CANADA) CORNELL UNIVERSITY ENRICO FERMI INSTITUTE FERMILAB UNIVERSITY OF MARYLAND MCGILL UNIVERSITY (CANADA) NATIONAL RESEARCH COUNCIL (CANADA) UNIVERSITY OF SASKATCHEWAN(CANADA) UNIVERSITY OF TORONTO (CANADA) TRIUMF (CANADA) YORK UNIVERSITY (CANADA)

Request	6 Jul, 81	1,000 Hours initial run to obtain 1 x 10 to the 4th inverse nanobarns. plus several later runs totalling 10 to the 6th inverse nanobarns
Inactive	23 Jun, 82	

704	POLARIZED BEAM #704	Akihiko Yokosawa	ARGONNE NATIONAL LABORATORY
	BEAM: Meson Area - Polarized Proton Beam		CEN-SACLAY (FRANCE)
	INTEGRATED PROPOSAL ON FIRST ROUND EXPERIMENTS WITH THE POLARIZED BEAM FACILITY.		FERMILAB HIROSHIMA UNIVERSITY (JAPAN) UNIVERSITY OF IOWA KYOTO SANGYO UNIVERSITY (JAPAN) KYOTO UNIVERSITY (JAPAN) KYOTO UNIV. OF EDUCATION (JAPAN) LAPP, D'ANNECY-LE-VIEUX (FRANCE) LOS ALAMOS NATIONAL LABORATORY NORTHWESTERN UNIVERSITY UN. OF OCCUP. & ENV. HEALTH(JAPAN) IHEP, PROTVINO (SERPUKHOV)(RUSSIA) RICE UNIVERSITY UNIVERSITY DI TRIESTE (ITALY) UNIVERSITY OF UDINE (ITALY)

Request	8 Sep, 81	1,200 Hours proposal to perform simultaneously substantial parts of experiments described in P676, P678, P674 and P677.
Approval	14 Dec, 81	Unspecified Stage I approval.
	15 Dec, 83	1,200 Hours Stage II approval.
Data Analysis	13 Aug, 90	Unspecified

705	CHI MESON #705	Bradley B. Cox	UNIVERSITY OF SOUTH ALABAMA UNIVERSITY OF ARIZONA UNIVERSITY OF ATHENS (GREECE) DUKE UNIVERSITY FERMILAB UNIVERSITY OF FIRENZE (ITALY) MCGILL UNIVERSITY (CANADA) NANJING UNIVERSITY (PRC) NORTHWESTERN UNIVERSITY PRAIRIE VIEW A&M UNIVERSITY SHANDONG UNIVERSITY (PRC) SSC LABORATORY UNIVERSITY OF VIRGINIA
	BEAM: Proton Area - West A STUDY OF CHARMONIUM AND DIRECT PHOTON PRODUCTION BY 300 GEV/C ANTIPROTON,PROTON,PI+ AND PI- BEAMS.		
	Request 1 Oct, 81 1,500 Hours Approval 14 Dec, 81 1,500 Hours Completed 15 Feb, 88 3,600 Hours		
706	DIRECT PHOTON PRODUCTION #706	Paul F. Slattery	UNIV. OF CALIFORNIA, DAVIS DELHI UNIVERSITY (INDIA) FERMILAB MICHIGAN STATE UNIVERSITY NORTHEASTERN UNIVERSITY UNIVERSITY OF OKLAHOMA PENNSYLVANIA STATE UNIVERSITY UNIVERSITY OF PITTSBURGH UNIVERSITY OF ROCHESTER
	BEAM: Meson Area - West A Comprehensive Study of Direct Photon Production in Hadron Induced Collisions		
	Request 26 Oct, 81 2,400 Hours Approval 14 Dec, 81 1,000 Hours Data Analysis 8 Jan, 92 Unspecified		
707	SIGMA MINUS BETA DECAY #707	Peter S. Cooper	UNIVERSITY OF CHICAGO FERMILAB IOWA STATE UNIVERSITY UNIVERSITY OF IOWA PNPI, ST. PETERSBURG (RUSSIA) YALE UNIVERSITY
	BEAM: Proton Area - Center MEASUREMENT OF THE ELECTRON ASYMMETRY PARAMETER IN SIGMA MINUS BETA DECAY.		
	Request 24 Nov, 81 300 Hours Rejected 15 Dec, 81		
708	ELECTRON TARGET FACILITY #708	Wonyong Lee	ARGONNE NATIONAL LABORATORY BROOKHAVEN NATIONAL LABORATORY UNIVERSITY OF CHICAGO UNIVERSITY OF COLORADO AT BOULDER COLUMBIA UNIVERSITY FERMILAB HARVARD UNIVERSITY UNIVERSITY OF ILLINOIS, CHAMPAIGN UNIVERSITY OF MICHIGAN - ANN ARBOR NIKHEF-H (NETHERLANDS) UNIVERSITY OF PENNSYLVANIA PRINCETON UNIVERSITY ROCKEFELLER UNIVERSITY
	BEAM: Collision Area (D-0) ELECTRON-PROTON INTERACTION EXPERIMENT (Supercedes proposal #659.)		
	Request 25 Nov, 81 Unspecified Inactive 23 Jun, 82		
709	FORWARD DETECTOR #709	Michael J. Longo	UNIV. OF ILLINOIS, CHICAGO CIRCLE UNIVERSITY OF MICHIGAN - ANN ARBOR
	BEAM: Collision Area (D-0) PROPOSAL FOR A FORWARD DETECTOR FOR THE D0 AREA		
	Request 11 Jan, 82 Unspecified Rejected 23 Jun, 82		
710	TOTAL CROSS-SECTION #710	Jay Orear and Roy Rubinstein	UNIVERSITY OF BOLOGNA (ITALY) CORNELL UNIVERSITY FERMILAB GEORGE MASON UNIVERSITY UNIVERSITY OF MARYLAND NORTHWESTERN UNIVERSITY
	BEAM: Collision Area (E-0) MEASUREMENTS OF ELASTIC SCATTERING AND TOTAL CROSS SECTIONS AT THE FERMILAB PBAR-P COLLIDER.		
	Request 1 Feb, 82 Unspecified Approval 23 Jun, 82 Unspecified Completed 31 May, 89 Unspecified		
711	CONSTITUENT SCATTERING #711	David A. Levinthal	ARGONNE NATIONAL LABORATORY FERMILAB FLORIDA STATE UNIVERSITY UNIVERSITY OF MICHIGAN - ANN ARBOR
	BEAM: Neutrino Area - East A PROPOSAL TO MEASURE THE ENERGY, ANGULAR, AND CHARGE DEPENDENCE OF MASSIVE DI-HADRON PRODUCTION OVER A LARGE SOLID ANGLE IN INTENSE PROTON AND PION BEAMS.		
	Request 28 Aug, 82 Unspecified Approval 1 Jul, 83 Unspecified Completed 15 Feb, 88 1,400 Hours		
712	MUON PRODUCTON #712	Patrick D. Rapp	FERMILAB GEORGE MASON UNIVERSITY
	BEAM: Collision Area (D-0) STUDY OF MUONS FROM PBAR-P COLLISIONS UP TO SQUARE ROOT OF S EQUAL TO 2 TEV.		
	Request 1 Feb, 82 Unspecified Rejected 23 Jun, 82		
713	HIGHLY IONIZING PARTICLES #713	P. Buford Price	UNIV. OF CALIFORNIA, BERKELEY HARVARD UNIVERSITY
	BEAM: Collision Area (D-0) PROPOSAL FOR A SEARCH FOR HIGHLY IONIZING PARTICLES FOR THE D0 AREA AT FERMILAB.		
	Request 29 Jan, 82 Unspecified Approval 23 Jun, 82 Unspecified Completed 31 May, 89 Unspecified		
714	LARGE ANGLE PARTICLE #714	Paul D. Grannis	BROOKHAVEN NATIONAL LABORATORY BROWN UNIVERSITY COLUMBIA UNIVERSITY FERMILAB MICHIGAN STATE UNIVERSITY SUNY AT STONY BROOK
	BEAM: Collision Area (D-0) LARGE ANGLE PARTICLE D0 GROUP		
	Request 5 Feb, 82 Unspecified Rejected 1 Jul, 83		

715	SIGMA BETA DECAY #715 BEAM: Proton Area - Center PRECISION MEASUREMENT OF THE DECAY SIGMA MINUS TO NEUTRON AND ELECTRON AND NEUTRINO.	Peter S. Cooper	UNIVERSITY OF CHICAGO ELMHURST COLLEGE FERMILAB IOWA STATE UNIVERSITY UNIVERSITY OF IOWA PNPI, ST. PETERSBURG (RUSSIA) YALE UNIVERSITY

Request	19 Feb, 82	Unspecified
Approval	23 Jun, 82	Unspecified for 3 months
Completed	14 Feb, 84	820 Hours

716	BEAM DUMP #716 BEAM: Meson Area - M2 Beam PROPOSAL FOR FURTHER BEAM DUMP NEUTRINO RUNNING	Byron P. Roe	FERMILAB UNIVERSITY OF FIRENZE (ITALY) UNIVERSITY OF MICHIGAN - ANN ARBOR UNIVERSITY OF WISCONSIN - MADISON

Request	9 Feb, 82	Unspecified
Rejected	23 Jun, 82	

717	FORWARD DETECTOR #717 BEAM: Collision Area (D-0) A FORWARD LOOKING DETECTOR FOR THE D0 AREA.	Joseph Lach	FERMILAB

Request	19 Mar, 82	Unspecified
Rejected	23 Jun, 82	

718	CALORIMETERS AT D-0 #718 BEAM: Collision Area (D-0) STUDY OF PBAR-P INTERACTIONS USING CALORIMETERS AT D-0.	Albert R. Erwin	ARGONNE NATIONAL LABORATORY UNIVERSITY OF ARIZONA FERMILAB UNIVERSITY OF PENNSYLVANIA UNIVERSITY OF WISCONSIN - MADISON

Request	1 Apr, 82	Unspecified
Rejected	23 Jun, 82	

719	ELECTRON TARGET FACILITY #719 BEAM: Collision Area (D-0) ELECTRON-PROTON INTERACTION EXPERIMENT. (This proposal supercedes proposals #703 and #708.)	Wonyong Lee	ARGONNE NATIONAL LABORATORY CARELTON UNIVERSITY (CANADA) CEN-SACLAY (FRANCE) CHALK RIVER NUCLEAR LAB. (CANADA) UNIVERSITY OF COLORADO AT BOULDER COLUMBIA UNIVERSITY FERMILAB HARVARD UNIVERSITY UNIVERSITY OF ILLINOIS, CHAMPAIGN JOHNS HOPKINS UNIVERSITY UNIVERSITY OF MARYLAND MCGILL UNIVERSITY (CANADA) UNIVERSITY OF MICHIGAN - ANN ARBOR MICHIGAN STATE UNIVERSITY NIKHEF-H (NETHERLANDS) UNIVERSITY OF PENNSYLVANIA PRINCETON UNIVERSITY RICE UNIVERSITY ROCKEFELLER UNIVERSITY UNIVERSITY OF SASKATCHEWAN(CANADA) UNIVERSITY OF TORONTO (CANADA)

Request	14 May, 82	Unspecified
Not Approved	23 Jun, 82	

720	FREE QUARK SEARCH #720 BEAM: Miscellaneous Area PROPOSAL TO SEARCH FOR +1/3E STABLE PARTICLES USING CRYOGENIC SOURCES.	John P. Schiffer	ARGONNE NATIONAL LABORATORY FERMILAB

Request	29 Jan, 82	Unspecified
Approval	15 Mar, 82	Unspecified for 3 months
	2 Jun, 82	Unspecified
Completed	8 Oct, 82	Unspecified

721	CP VIOLATION #721 BEAM: Proton Area - West AN EXPERIMENT TO STUDY CP VIOLATION IN THE DECAY OF K-LONG PRODUCED BY ANTI-PROTONS.	Jerome L. Rosen	UNIVERSITY OF ARIZONA UNIVERSITY OF ATHENS (GREECE) DUKE UNIVERSITY FERMILAB FLORIDA A&M UNIVERSITY MCGILL UNIVERSITY (CANADA) NORTHWESTERN UNIVERSITY SHANDONG UNIVERSITY (PRC)

Request	11 Jun, 82	Unspecified
Approval	12 Mar, 84	Test Running
Approved/Inactive	30 Jun, 87	Unspecified

722	D-0 STREAMER CHAMBER #722 BEAM: Collision Area (D-0) STREAMER CHAMBER EXPERIMENT AT THE TEVATRON COLLIDER.	V. Paul Kenney	UNIVERSITY OF CAMBRIDGE (ENGLAND) NOTRE DAME UNIVERSITY

Request	11 Oct, 82	Unspecified
Inactive	18 Feb, 83	

723	GRAVITATIONAL DETECTOR #723 BEAM: Collision Area (C-0) TEST OF A GRAVITATIONAL DETECTOR AT THE TEVATRON COLLIDER.	Adrian Melissinos	FERMILAB UNIVERSITY OF ROCHESTER

Request	21 Oct, 82	Unspecified
Approval	12 Mar, 84	Test Running
Completed	29 Aug, 85	Test Running

724	CALORIMETRIC DETECTOR #724 BEAM: Collision Area (D-0) COMPLETE CALORIMETRIC DETECTOR FOR THE D-0 AREA.	Michael J. Longo	CALIFORNIA INSTITUTE OF TECHNOLOGY UNIV. OF ILLINOIS, CHICAGO CIRCLE MCGILL UNIVERSITY (CANADA) UNIVERSITY OF MICHIGAN - ANN ARBOR NOTRE DAME UNIVERSITY

Request	26 Oct, 82	Unspecified
Rejected	1 Jul, 83	

725	DIFFRACTION DISSOCIATION #725 BEAM: Collision Area (D-0) A PROPOSAL TO MEASURE SINGLE AND DOUBLE DIFFRACTION DISSOCIATION AT THE FERMILAB PBAR-P COLLIDER. +----------+ Request 1 Nov, 82 Unspecified Rejected 1 Jul, 83	Konstantin Goulianos	ROCKEFELLER UNIVERSITY
726	CALORIMETRIC DETECTOR #726 BEAM: Collision Area (D-0) PROPOSED CALORIMETRIC DETECTOR FOR THE D-0 AREA. +----------+ Request 1 Nov, 82 Unspecified Rejected 1 Jul, 83	Maris A. Abolins	UNIVERSITY OF ARIZONA FERMILAB MICHIGAN STATE UNIVERSITY UNIVERSITY OF PENNSYLVANIA
727	FORWARD CALORIMETER #727 BEAM: Collision Area (D-0) SPLIT-FIELD MAGNET SPECTROMETER AND ELECTROMAGNETIC SHOWER DETECTOR FOR D-0. +----------+ Request 2 Nov, 82 Unspecified Withdrawn 16 May, 83	Jerome L. Rosen	NORTHWESTERN UNIVERSITY
728	MUON PRODUCTION #728 BEAM: Collision Area (D-0) STUDY OF MUONS FROM PBAR-P COLLISIONS UP TO SQUARE ROOT OF S EQUAL TO 2 TEV. (This proposal supercedes proposal #712.) +----------+ Request 1 Nov, 82 Unspecified Rejected 1 Jul, 83	Daniel R. Green	UNIVERSITY OF ARIZONA FERMILAB FLORIDA STATE UNIVERSITY UNIVERSITY OF MARYLAND VIRGINIA TECH
729	EMULSION/PROTONS @ 1 TEV #729 BEAM: Meson Area - Test Beam PROPOSAL TO STUDY CHARM AND MULTIPARTICLE PRODUCTION IN 1 TEV PROTON-EMULSION COLLISIONS +----------+ Request 24 Nov, 82 Unspecified Approval 5 Dec, 83 Emulsion Exposure Completed 26 Apr, 85 2 Emulsion Stack(s)	Atul Gurtu	TATA INSTITUTE (INDIA)
730	EMULSION/SIGMA-MINUS @ 250 #730 BEAM: Proton Area - Center EMULSION EXPOSURE TO 250 GEV SIGMA-MINUS. +----------+ Request 5 Jan, 83 Unspecified Approval 10 Feb, 84 Unspecified Completed 10 Feb, 84 4 Hours	Richard J. Wilkes	INP, KRAKOW (POLAND) INST.FOR NUCL. RESEARCH (BULGARIA) UNIVERSITY OF WASHINGTON
731	CP VIOLATION #731 BEAM: Meson Area - Center A MEASUREMENT OF THE MAGNITUDE OF (E'/E) IN THE NEUTRAL KAON SYSTEM TO A PRECISION OF .001. +----------+ Request 1 Feb, 83 Unspecified Approval 1 Jul, 83 Unspecified Completed 15 Feb, 88 3,100 Hours	Bruce D. Winstein	CEN-SACLAY (FRANCE) UNIVERSITY OF CHICAGO ELMHURST COLLEGE FERMILAB PRINCETON UNIVERSITY
732	XI-ZERO DECAY #732 BEAM: Proton Area - Center A SEARCH FOR THE DECAY NEUTRAL CASCADE TO PROTON AND NEGATIVE PION. +----------+ Request 1 Feb, 83 Unspecified Rejected 25 Jun, 85	Marleigh C. Sheaff	UNIVERSITY OF MICHIGAN - ANN ARBOR UNIVERSITY OF MINNESOTA RUTGERS UNIVERSITY UNIVERSITY OF WISCONSIN - MADISON
733	NEUTRINO INTERACTIONS #733 BEAM: Neutrino Area - Center PROPOSAL TO STUDY HIGH ENERGY NEUTRINO INTERACTIONS WITH THE TEVATRON QUADRUPOLE TRIPLET BEAM. +----------+ Request 1 Feb, 83 Unspecified 16 Sep, 83 Unspecified Approval 12 Nov, 83 Unspecified Stage I approval. Completed 1 Feb, 88 4,100 Hours	Raymond L. (Chip) Brock	FERMILAB UNIVERSITY OF FLORIDA MASSACHUSETTS INST. OF TECHNOLOGY MICHIGAN STATE UNIVERSITY
734	HYPERON PRODUCTION #734 BEAM: Proton Area - Center PRIMAKOFF PRODUCTION OF HYPERON EXCITED STATES. +----------+ Request 1 Apr, 83 Unspecified Inactive 21 May, 86	Michael V. Hynes	UNIV. OF CALIFORNIA, LOS ANGELES LOS ALAMOS NATIONAL LABORATORY
735	PARTICLE SEARCH #735 BEAM: Collision Area (C-0) SEARCH FOR A DECONFINED QUARK GLUON PHASE OF STRONGLY INTERACTING MATTER IN PBAR-P INTERACTIONS AT SQUARE ROOT OF S EQUAL TO 2 TEV. +----------+ Request 11 Apr, 83 Unspecified 16 Sep, 83 Unspecified Approval 15 Dec, 83 Unspecified Stage I approval. Completed 31 May, 89 Unspecified	Laszlo J. Gutay	DUKE UNIVERSITY FERMILAB IOWA STATE UNIVERSITY NOTRE DAME UNIVERSITY PURDUE UNIVERSITY UNIVERSITY OF WISCONSIN - MADISON
736	D-0 QUARK SEARCH #736 BEAM: Collision Area (D-0) A PROPOSAL TO CONDUCT A QUARK SEARCH AT THE FERMILAB COLLIDER. +----------+ Request 11 Apr, 83 Unspecified Rejected 1 Jul, 83	Robert K. Adair	BROOKHAVEN NATIONAL LABORATORY YALE UNIVERSITY
737	BATISS EXPERIMENT #737 BEAM: Unspecified Beam STUDY OF HIGH ENERGY NEUTRINOS WITH A DEEP UNDERWATER DETECTOR OF A MASS GREATER THAN 10 TO THE 6TH TONS. +----------+ Request 25 Apr, 83 Unspecified Rejected 12 Nov, 83	Peter Kotzer	KAZAKH STATE UNIV., (KAZAKHSTAN) MOSCOW STATE UNIVERSITY (RUSSIA) UNIVERSITY OF WASHINGTON WESTERN WASHINGTON UNIVERSITY

738	NARROW BAND #738	Charles Baltay	COLUMBIA UNIVERSITY
	BEAM: Neutrino Area - Center		
	LETTER OF INTENT TO RUN IN THE NARROW BAND AND BEAM AT TEVATRON II.		
	Request 3 Jun, 83 Unspecified		
	Withdrawn 26 Apr, 84		
739	ELECTRON-POSITRON #739	Nelson Cue and Chih-Ree Sun	UNIV. OF CLAUDE BERNARD (FRANCE)
	BEAM: Proton Area - East		FERMILAB
	MEASUREMENTS OF CRYSTAL-ASSISTED ELECTRON-POSITRON PAIR CREATION.		LAPP, D'ANNECY-LE-VIEUX (FRANCE)
			SUNY AT ALBANY
	Request 9 Sep, 83 Unspecified		
	Rejected 19 Apr, 85		
740	D-0 DETECTOR #740	Paul D. Grannis and Hugh Elliott Montgomery	UNIVERSIDAD DE LOS ANDES(COLOMBIA)
	BEAM: Collision Area (D-0)		UNIVERSITY OF ARIZONA
	STUDY OF PROTON ANTI-PROTON COLLISIONS USING A LARGE DETECTOR AT D-0.		BOSTON UNIVERSITY
			BROOKHAVEN NATIONAL LABORATORY
			BROWN UNIVERSITY
			UNIVERSIDAD DE BUENOS AIRES
			UNIV. OF CALIFORNIA, DAVIS
			UNIV. OF CALIFORNIA, IRVINE
			UNIV. OF CALIFORNIA, RIVERSIDE
			CBPF (BRAZIL)
			CEN-SACLAY (FRANCE)
			CINVESTAV-IPN (MEXICO)
			COLUMBIA UNIVERSITY
			DELHI UNIVERSITY (INDIA)
			FERMILAB
			FLORIDA STATE UNIVERSITY
			UNIVERSITY OF HAWAII AT MANOA
			UNIV. OF ILLINOIS, CHICAGO CIRCLE
			INDIANA UNIVERSITY
			IOWA STATE UNIVERSITY
			JINR, DUBNA (RUSSIA)
			KOREA UNIVERSITY, SEOUL (KOREA)
			INP, KRAKOW (POLAND)
			KYUNGSUNG UNIVERSITY, PUSAN(KOREA)
			LAWRENCE BERKELEY LABORATORY
			UNIVERSITY OF MARYLAND
			UNIVERSITY OF MICHIGAN - ANN ARBOR
			MICHIGAN STATE UNIVERSITY
			MOSCOW STATE UNIVERSITY (RUSSIA)
			UNIVERSITY OF NEBRASKA
			SUNY AT STONY BROOK
			NEW YORK UNIVERSITY
			NORTHEASTERN UNIVERSITY
			NORTHERN ILLINOIS UNIVERSITY
			NORTHWESTERN UNIVERSITY
			NOTRE DAME UNIVERSITY
			UNIVERSITY OF OKLAHOMA
			PANJAB UNIVERSITY (INDIA)
			PNPI, ST. PETERSBURG (RUSSIA)
			IHEP, PROTVINO (SERPUKHOV)(RUSSIA)
			PURDUE UNIVERSITY
			RICE UNIVERSITY
			UNIV. FEDERAL DO RIO DE JANEIRO
			UNIVERSITY OF ROCHESTER
			SEOUL NATIONAL UNIVERSITY (KOREA)
			SSC LABORATORY
			TATA INSTITUTE (INDIA)
			TEXAS A&M UNIVERSITY
			UNIVERSITY OF TEXAS AT ARLINGTON
	Request 9 Sep, 83 Unspecified		
	Approval 10 Feb, 84 Unspecified		
	Data Analysis 20 Feb, 96		
741	COLLIDER DETECTOR #741	Melvyn Jay Shochet and Alvin V. Tollestrup	ARGONNE NATIONAL LABORATORY
	BEAM: Collision Area (B-0)		BRANDEIS UNIVERSITY
	STUDY OF PROTON ANTI-PROTON COLLISIONS USING A LARGE DETECTOR AT B-0.		UNIVERSITY OF CHICAGO
			FERMILAB
			INFN, FRASCATI (ITALY)
			HARVARD UNIVERSITY
			UNIVERSITY OF ILLINOIS, CHAMPAIGN
			KEK (JAPAN)
			LAWRENCE BERKELEY LABORATORY
			UNIVERSITY OF PENNSYLVANIA
			INFN, PISA (ITALY)
			PURDUE UNIVERSITY
			ROCKEFELLER UNIVERSITY
			RUTGERS UNIVERSITY
			TEXAS A&M UNIVERSITY
			UNIVERSITY OF TSUKUBA (JAPAN)
			UNIVERSITY OF WISCONSIN - MADISON
	Request 1 Apr, 82 Unspecified		
	Approval 1 Apr, 82 Unspecified		
	Completed 31 May, 89 Unspecified		
742	STRANGE QUARK #742	Joseph Lach	UNIVERSITY OF CHICAGO
	BEAM: Proton Area - Center		ELMHURST COLLEGE
	LETTER OF INTENT TO MEASURE OMEGA MINUS POLARIZATION AND MAGNETIC MOMENT.		FERMILAB
			IOWA STATE UNIVERSITY
			UNIVERSITY OF IOWA
			PNPI, ST. PETERSBURG (RUSSIA)
			YALE UNIVERSITY
	Request 13 Jun, 83 Unspecified		
	Inactive 15 Jun, 85		

743	CHARM PRODUCTION #743 BEAM: Meson Area - Test Beam PROPOSAL TO MEASURE OPEN CHARM PRODUCTION IN PROTON-PROTON COLLISIONS AT 1 TEV WITH LEBC-FMPS.	Stephen Reucroft	ITP, AACHEN (GERMANY) CERN (SWITZERLAND) CRN, STRASBOURG (FRANCE) DUKE UNIVERSITY FERMILAB FLORIDA STATE UNIVERSITY IHEP, BERLIN-ZEUTHEN (GERMANY) UNIVERSITY OF KANSAS UNIVERSITY OF L'ETAT (BELGIUM) UNIVERSITY OF LIBRE (BELGIUM) LPNHE, UN. OF P & M CURIE (FRANCE) UNIVERSITY OF MICHIGAN - ANN ARBOR MICHIGAN STATE UNIVERSITY NORTHEASTERN UNIVERSITY NOTRE DAME UNIVERSITY TATA INSTITUTE (INDIA) VANDERBILT UNIVERSITY VIENNA INSTITUTE FUR HEP (AUSTRIA)
	Request 16 Sep, 83 Unspecified Approval 16 Dec, 83 Unspecified Stage I approval. Completed 29 Aug, 85 1,256 K Pix		
744	CHARGED INTERACTIONS #744 BEAM: Neutrino Area - Center HIGH STATISTICS STUDIES OF CHARGED CURRENT INTERACTIONS USING THE TEVATRON QUAD TRIPLET BEAM.	Frank S. Merritt	UNIVERSITY OF CHICAGO COLUMBIA UNIVERSITY FERMILAB UNIVERSITY OF ROCHESTER
	Request 16 Sep, 83 Unspecified Approval 17 Nov, 83 Unspecified Stage I approval. Completed 29 Aug, 85 1,900 Hours		
745	MUON NEUTRINO #745 BEAM: Neutrino Area - Center MUON NEUTRINO EXPERIMENT USING THE TOHOKU HIGH RESOLUTION ONE METER BUBBLE CHAMBER.	Toshio Kitagaki	IHEP, BEIJING (PRC) BROWN UNIVERSITY FERMILAB INDIANA UNIVERSITY MASSACHUSETTS INST. OF TECHNOLOGY NAGOYA UNIVERSITY (JAPAN) OAK RIDGE NATIONAL LABORATORY UNIVERSITY OF TENNESSEE, KNOXVILLE TOHOKU GAKUIN UNIVERSITY (JAPAN) TOHOKU UNIVERSITY (JAPAN)
	Request 10 Sep, 83 Unspecified Approval 16 Dec, 83 Parasitic Running Completed 1 Feb, 88 553 K Pix		
746	PROMPT BEAM FACILITY #746 BEAM: Neutrino Area - Prompt Beam LETTER OF INTENT TO SEARCH FOR NEW PARTICLES FROM THE PROMPT BEAM FACILITY.	James K. Walker	FERMILAB MASSACHUSETTS INST. OF TECHNOLOGY MICHIGAN STATE UNIVERSITY
	Request 1 Sep, 83 Unspecified Withdrawn 2 Jun, 86		
747	CHARGED PARTICLES #747 BEAM: Proton Area - Broad Band A SEARCH FOR FRACTIONALLY CHARGED PARTICLES AT THE TEVATRON.	Alan A. Hahn	CALIFORNIA INSTITUTE OF TECHNOLOGY UNIV. OF CALIFORNIA, IRVINE FERMILAB LAWRENCE BERKELEY LABORATORY LAWRENCE LIVERMORE LABORATORY LOS ALAMOS NATIONAL LABORATORY UNIVERSITY OF ROCHESTER SAN FRANCISCO STATE UNIVERSITY UNIVERSITY OF TORONTO (CANADA)
	Request 27 Feb, 84 Unspecified Approval 1 Apr, 85 Unspecified Completed 2 Aug, 85 Unspecified		
748	BEAUTY & CHARM PRODUCTION #748 BEAM: Unspecified Beam LETTER OF INTENT TO STUDY BEAUTY AND CHARM AT THE TEVATRON USING HIGH RESOLUTION STEAMER CHAMBER AND A DOWNSTREAM SPECTROMETER.	Jack Sandweiss	FERMILAB NEW YORK UNIVERSITY UNIVERSITY OF VRIJE (BELGIUM) YALE UNIVERSITY
	Request 7 May, 84 Unspecified Withdrawn 2 Oct, 84		
749	CHANNELING #749 BEAM: Meson Area - Bottom LETTER OF INTENT TO STUDY MATERIAL AND FABRICATION ASPECTS OF CRYSTALS USED FOR CHANNELING.	James S. Forster	CHALK RIVER NUCLEAR LAB. (CANADA) FERMILAB UNIVERSITY OF NEW MEXICO SUNY AT ALBANY
	Request 19 Jul, 84 400 Hours Withdrawn 1 Oct, 84		
750	MULTIPARTICLE PRODUCTION #750 BEAM: Neutrino Area - Miscellaneous A PROPOSAL TO STUDY MULTIPARTICLE PRODUCTION IN INTERACTIONS OF 1 TEV PROTONS WITH EMULSION NUCLEI.	Ram K. Shivpuri	DELHI UNIVERSITY (INDIA)
	Request 27 Jun, 84 Emulsion Exposure beam at or near 1 TeV protons of flux approximately 5 x 10 to the 4th protons/sq cm over an area of (8 x 3)sq cm Approval 23 Jul, 84 Emulsion Exposure Completed 11 Jul, 85 1 Emulsion Stack(s)		
751	EMULSION EXPOSURE @ 1 TEV #751 BEAM: Meson Area - Test Beam PROPOSAL TO STUDY 1 TEV PROTON INTERACTIONS IN EMULSION.	Piyare L. Jain	SUNY AT BUFFALO
	Request 27 Jun, 84 Emulsion Exposure Approval 2 Jul, 84 Emulsion Exposure Completed 26 Apr, 85 1 Emulsion Stack(s)		
752	PARTICLE COLLISIONS #752 BEAM: Unspecified Beam PROPOSAL TO SEARCH FOR ANOMALOUSLY LARGE HADRON CROSS SECTIONS AT SHORT DISTANCES.	James W. Cronin	UNIVERSITY OF CHICAGO TECHNION-ISRAEL INST (ISRAEL)
	Request 23 Oct, 84 200 Hours Withdrawn 8 Dec, 86		

753 CHANNELING STUDIES #753 — James S. Forster — BELL NORTHERN RESEARCH LAB(CANADA); CHALK RIVER NUCLEAR LAB. (CANADA); FERMILAB; UNIVERSITY OF NEW MEXICO; SUNY AT ALBANY
BEAM: Meson Area - Bottom
PROPOSAL TO IMPROVE THE DEFLECTION OF HIGH ENERGY PARTICLE BEAMS BY CHANNELING IN BENT CRYSTALS OF SI AND GE.

Request	28 Sep, 84	400 Hours
Approval	20 Nov, 84	Unspecified
Completed	5 Jul, 85	150 Hours

754 CHANNELING TESTS #754 — Chih-Ree Sun — FERMILAB; GENERAL ELECTRIC R&D CENTER; SUNY AT ALBANY; SANDIA LABORATORIES; SSC LABORATORY
BEAM: Meson Area - Bottom
CRYSTAL CHANNELING TESTS IN M-BOTTOM INCLUDING FOCUSING WITH DEFORMED CRYSTALS AND STUDIES OF HIGH Z CRYSTALS.

Request	1 Oct, 84	300 Hours
Approval	20 Nov, 84	Unspecified
Approved/Inactive	24 Dec, 91	

755 BEAUTY & CHARM STUDY #T755 — Richard D. Majka and Anna Jean Slaughter — FERMILAB; YALE UNIVERSITY
BEAM: Meson Area - Test Beam
A HIGH SENSITIVITY STUDY OF BEAUTY AND CHARM IN HADROPRODUCTION AT THE TEVATRON.

Request	2 Oct, 84	Unspecified
Approval	25 Nov, 86	Unspecified
Completed	15 Feb, 88	Unspecified

756 MAGNETIC MOMENT #756 — Kam-Biu Luk — UNIVERSITY OF ARIZONA; UNIV. OF CALIFORNIA, BERKELEY; FERMILAB; INDIANA UNIVERSITY; LAWRENCE BERKELEY LABORATORY; UNIVERSITY OF MICHIGAN - ANN ARBOR; UNIVERSITY OF MINNESOTA; RUTGERS UNIVERSITY
BEAM: Proton Area - Center
MEASUREMENT OF THE MAGNETIC MOMENT OF THE OMEGA MINUS HYPERON.

Request	8 Oct, 84	1,000 Hours
Approval	25 Jun, 85	1,000 Hours Stage I approval.
Completed	15 Feb, 88	1,700 Hours

757 MUON DEFLECTION #757 — Jorge G. Morfin — FERMILAB; UNIVERSITY OF ILLINOIS, CHAMPAIGN; UNIVERSITY OF WASHINGTON; UNIVERSITY OF WISCONSIN - MADISON
BEAM: Neutrino Area - Muon Beam
LETTER OF INTENT FOR A PROPOSAL TO STUDY MOMENTUM RESOLUTION FOR MUONS ABOVE 300 GEV IN MAGNETIZED IRON.

Request	12 Dec, 84	Test Running
Rejected	14 Dec, 85	

758 EMULSION EXPOSURE #758 — Mitsuko Kazuno and Hiroshi Shibuya — NAGOYA UNIVERSITY (JAPAN); TOHO UNIVERSITY (JAPAN)
BEAM: Meson Area - Test Beam
STUDY OF THE MECHANISM OF MULTIPARTICLE PRODUCTION IN EMULSION NUCLEI @ 800 GEV PROTONS.

Request	11 Mar, 85	Unspecified
Approval	11 Mar, 85	Unspecified
Completed	26 Apr, 85	2 Emulsion Stack(s)

759 EMULSION EXPOSURE #759 — Yoshihiro Tsuzuki — KOBE UNIVERSITY (JAPAN); OSAKA CITY UNIVERSITY (JAPAN); OSAKA SCIENCE EDUC. INST. (JAPAN)
BEAM: Meson Area - Test Beam
A STUDY OF NUCLEAR INTERACTIONS OF 800 GEV PROTONS IN EMULSION.

Request	11 Mar, 85	Unspecified
Approval	11 Mar, 85	Unspecified
Completed	26 Apr, 85	2 Emulsion Stack(s)

760 CHARMONIUM STATES #760 — Rosanna Cester — UNIV. OF CALIFORNIA, IRVINE; FERMILAB; UNIVERSITY OF FERRARA (ITALY); INFN, GENOVA (ITALY); NORTHWESTERN UNIVERSITY; PENNSYLVANIA STATE UNIVERSITY; UNIVERSITY OF TORINO (ITALY)
BEAM: Accumulator Ring
A PROPOSAL TO INVESTIGATE THE FORMATION OF CHARMONIUM STATES USING THE PBAR ACCUMULATOR RING.

Request	29 Mar, 85	Unspecified
Approval	25 Jun, 85	Unspecified
Data Analysis	10 Jan, 92	Unspecified

761 HYPERON RADIATIVE DECAY #761 — Alexei A. Vorobiev — IHEP, BEIJING (PRC); UNIVERSITY OF BRISTOL (ENGLAND); CBPF (BRAZIL); FERMILAB; UNIVERSITY OF IOWA; ITEP, MOSCOW (RUSSIA); PNPI, ST. PETERSBURG (RUSSIA); UNIV. FEDERAL DO RIO DE JANEIRO; UNIVERSITE OF SAO PAULO (BRAZIL); YALE UNIVERSITY
BEAM: Proton Area - Center
PROPOSAL TO STUDY HYPERON RADIATIVE DECAY.

Request	3 Apr, 85	Unspecified
Approval	25 Jun, 85	Unspecified Stage I approval.
Completed	27 Aug, 90	Unspecified

762 EMULSION/PROTONS @ 800 GEV #762 — Shoji Dake — AOYAMA GAKUIN UNIVERSITY (JAPAN); ICRR, UNIVERSITY OF TOKYO (JAPAN); KOBE UNIVERSITY (JAPAN); OKAYAMA UNIVERSITY (JAPAN); OSAKA SCIENCE EDUC. INST. (JAPAN)
BEAM: Meson Area - Test Beam
CASCADE SHOWERS ORIGINATING IN PROTON-NUCLEUS COLLISIONS.

Request	11 Jun, 85	Unspecified
Approval	21 Jun, 85	Unspecified
Completed	11 Jul, 85	18 Emulsion Stack(s)

763 EMULSION/PROTONS @ 800 GEV #763 — Takeshi Ogata — ICRR, UNIVERSITY OF TOKYO (JAPAN); KOBE UNIVERSITY (JAPAN); OKAYAMA UNIVERSITY (JAPAN); OSAKA SCIENCE EDUC. INST. (JAPAN)
BEAM: Meson Area - Test Beam
PROTON-NUCLEUS INTERACTIONS AT TEVATRON ENERGY.

Request	11 Jun, 85	Unspecified
Approval	21 Jun, 85	Unspecified
Completed	11 Jul, 85	2 Emulsion Stack(s)

764 EMULSION EXPOSURE #764 — Hirotada Nanjo — HIROSAKI UNIVERSITY (JAPAN)
BEAM: Meson Area - Test Beam
EXCLUSIVE INVESTIGATION OF MULTIPLE PRODUCTION IN RAPIDITY SPACE.

Request	11 Jun, 85	Unspecified
Approval	21 Jun, 85	Unspecified
Completed	11 Jul, 85	1 Emulsion Stack(s)

765 EMULSION/PROTONS @ 800 GEV #765 — K. Imaeda — OKAYAMA UNIVERSITY (JAPAN)
BEAM: Meson Area - Test Beam
TRANSVERSE MOMENTUM MEASUREMENT OF SECONDARY PARTICLES IN PROTON-EMULSION COLLISIONS AT 800 GEV.

Request	20 Jun, 85	Unspecified
Approval	21 Jun, 85	Unspecified
Completed	11 Jul, 85	7 Emulsion Stack(s)

766 MR TUNNEL NEUTRONS #T766 — Joseph B. McCaslin — FERMILAB; LAWRENCE BERKELEY LABORATORY
BEAM: Collision Area (Miscellaneous)
MEASUREMENTS OF THE NEUTRON SPECTRUM IN THE TEVATRON TUNNEL WITH APPLICATION TO THE SSC.

Request	11 Jul, 85	Unspecified
Approval	17 Jul, 85	Unspecified
Completed	13 Oct, 85	Unspecified

767 MUON CALORIMETRY #767 — Yasushi Muraki — CHUO UNIVERSITY (JAPAN); ICRR, UNIVERSITY OF TOKYO (JAPAN); KEK (JAPAN); NAGOYA UNIVERSITY (JAPAN)
BEAM: Neutrino Area - Muon Beam
MEASUREMENT OF DIRECT ELECTRON PAIR PRODUCTION CROSS-SECTION IN THE TEVATRON MUON BEAM.

Request	29 Aug, 85	Unspecified
Rejected	1 Jul, 86	

768 POLARIZED SCATTERING #768 — Alan D. Krisch — BROOKHAVEN NATIONAL LABORATORY; CERN (SWITZERLAND); FERMILAB; LHE, ETH HONGGERBERG (SWITZERLAND); UNIVERSITY OF MARYLAND; MASSACHUSETTS INST. OF TECHNOLOGY; UNIVERSITY OF MICHIGAN - ANN ARBOR; NOTRE DAME UNIVERSITY; TEXAS A&M UNIVERSITY
BEAM: Proton Area - West
PROTON - PROTON ELASTIC SCATTERING WITH A POLARIZED TARGET.

Request	12 Nov, 85	Unspecified
Rejected	30 Jun, 87	

769 PION & KAON CHARM PROD. #769 — Jeffrey A. Appel — CBPF (BRAZIL); FERMILAB; UNIVERSITY OF MISSISSIPPI; NORTHEASTERN UNIVERSITY; UNIVERSITY OF TORONTO (CANADA); TUFTS UNIVERSITY; UNIVERSITY OF WISCONSIN - MADISON; YALE UNIVERSITY
BEAM: Proton Area - East
PION AND KAON PRODUCTION OF CHARM AND CHARM-STRANGE STATE.

Request	14 Dec, 85	Unspecified
Approval	14 Dec, 85	Unspecified
Data Analysis	15 Feb, 88	1,900 Hours

770 QUAD TRIPLET NEUTRINO #770 — Wesley H. Smith — UNIVERSITY OF CHICAGO; COLUMBIA UNIVERSITY; FERMILAB; UNIVERSITY OF ROCHESTER; UNIVERSITY OF WISCONSIN - MADISON
BEAM: Neutrino Area - Center
HIGH STATISTICS STUDIES OF CHARGED CURRENT INTERACTIONS USING THE TEVATRON QUAD TRIPLET BEAM.

Request	27 Dec, 85	Unspecified
Approval	27 Dec, 85	Unspecified Stage I approval.
Completed	1 Feb, 88	1,600 Hours

771 BEAUTY PRODUCTION BY PROTONS #771 — Bradley B. Cox — UNIVERSITY OF SOUTH ALABAMA; UNIVERSITY OF ATHENS (GREECE); BROWN UNIVERSITY; UNIV. OF CALIFORNIA, BERKELEY; UNIV. OF CALIFORNIA, LOS ANGELES; DUKE UNIVERSITY; FERMILAB; UNIVERSITY OF HOUSTON; JINR, DUBNA (RUSSIA); UNIVERSITY OF LECCE (ITALY); MASSACHUSETTS INST. OF TECHNOLOGY; MCGILL UNIVERSITY (CANADA); NANJING UNIVERSITY (PRC); NORTHWESTERN UNIVERSITY; UNIVERSITY OF PAVIA (ITALY); UNIVERSITY OF PENNSYLVANIA; PRAIRIE VIEW A&M UNIVERSITY; SHANDONG UNIVERSITY (PRC); VANIER COLLEGE (CANADA); UNIVERSITY OF VIRGINIA; UNIVERSITY OF WISCONSIN - MADISON
BEAM: Proton Area - West
PROPOSAL TO STUDY BEAUTY PRODUCTION AND OTHER HEAVY QUARK PHYSICS ASSOCIATED WITH DIMUON PRODUCTION IN 800 (925) GEV/C PP INTERACTIONS.

Request	10 Dec, 86	Unspecified
Approval	4 Apr, 87	Unspecified
Data Analysis	8 Jan, 92	Unspecified

772 DIMUONS #772 — Joel M. Moss — CASE WESTERN RESERVE UNIVERSITY; FERMILAB; UNIV. OF ILLINOIS, CHICAGO CIRCLE; LOS ALAMOS NATIONAL LABORATORY; SUNY AT STONY BROOK; NORTHERN ILLINOIS UNIVERSITY; RUTGERS UNIVERSITY; UNIVERSITY OF SOUTH CAROLINA; UNIVERSITY OF TEXAS AT AUSTIN; UNIVERSITY OF WASHINGTON
BEAM: Meson Area - East
STUDY OF THE NUCLEAR ANTIQUARK SEA VIA P+N -> DIMUONS.

Request	11 Mar, 86	Unspecified
Approval	1 Jul, 86	Unspecified
Completed	15 Feb, 88	1,700 Hours

773	ETA00 & ETA+- PHASE DIFFERENCE #773	George D. Gollin	UNIVERSITY OF CHICAGO ELMHURST COLLEGE FERMILAB UNIVERSITY OF ILLINOIS, CHAMPAIGN RUTGERS UNIVERSITY
	BEAM: Meson Area - Center MEASUREMENT OF PHASE DIFFERENCE BETWEEN ETA 00 AND ETA +- TO A PRECISION OF 1/2 DEGREE.		
	Request 11 Mar, 86 Unspecified Approval 1 Jul, 86 Unspecified 29 Jun, 89 Unspecified Stage II approval. Completed 30 Sep, 91 Unspecified		
774	ELECTRON BEAM DUMP #774	Michael B. Crisler	FERMILAB UNIVERSITY OF ILLINOIS, CHAMPAIGN INP, KRAKOW (POLAND) NORTHEASTERN UNIVERSITY
	BEAM: Proton Area - Broad Band ELECTRON BEAM DUMP PARTICLE SEARCH IN THE WIDE BAND HALL.		
	Request 4 Apr, 86 Unspecified Approval 10 Dec, 86 Unspecified Completed 27 Aug, 90 Unspecified		
775	CDF UPGRADE #775	William C. Carithers, Jr. and Giorgio Bellettini	IHEP, ACADEMIA SINICA (TAIWAN) ARGONNE NATIONAL LABORATORY UNIVERSITY OF BOLOGNA (ITALY) BRANDEIS UNIVERSITY UNIV. OF CALIFORNIA, LOS ANGELES CIPP (CANADA) UNIVERSITY OF CHICAGO DUKE UNIVERSITY FERMILAB INFN, FRASCATI (ITALY) HARVARD UNIVERSITY HIROSHIMA UNIVERSITY (JAPAN) UNIVERSITY OF ILLINOIS, CHAMPAIGN JOHNS HOPKINS UNIVERSITY KEK (JAPAN) LAWRENCE BERKELEY LABORATORY MASSACHUSETTS INST. OF TECHNOLOGY UNIVERSITY OF MICHIGAN - ANN ARBOR MICHIGAN STATE UNIVERSITY UNIVERSITY OF NEW MEXICO OSAKA CITY UNIVERSITY (JAPAN) UNIVERSITY OF PADOVA (ITALY) UNIVERSITY OF PENNSYLVANIA INFN, PISA (ITALY) UNIVERSITY OF PITTSBURGH PURDUE UNIVERSITY UNIVERSITY OF ROCHESTER ROCKEFELLER UNIVERSITY RUTGERS UNIVERSITY TEXAS A&M UNIVERSITY TEXAS TECH UNIVERSITY UNIVERSITY OF TSUKUBA (JAPAN) TUFTS UNIVERSITY WASEDA UNIVERSITY (JAPAN) UNIVERSITY OF WISCONSIN - MADISON YALE UNIVERSITY
	BEAM: Collision Area (B-0) CDF UPGRADE (Level-3 Trigger; Silicon Vertex (#775A); and Muon System (#775B))		
	Request 28 May, 86 Unspecified Approval 1 Jul, 86 Unspecified Phase I approval. Data Analysis 20 Feb, 96		
776	NUCLEAR CAL. CROSS SECTIONS#776	Samuel I. Baker	BROOKHAVEN NATIONAL LABORATORY CERN (SWITZERLAND) FERMILAB
	BEAM: Miscellaneous Area MEASUREMENT OF NUCLEAR CALIBRATION CROSS SECTIONS FOR PROTONS GREATER THAN 400 GEV.		
	Request 6 Aug, 86 Unspecified Approval 7 Jan, 87 Unspecified Completed 15 Feb, 88 Unspecified		
777	MR TUNNEL NEUTRONS #777	Joseph B. McCaslin	FERMILAB LAWRENCE BERKELEY LABORATORY SSC CENTRAL DESIGN GROUP
	BEAM: Collision Area (Miscellaneous) NEUTRON FLUX MEASUREMENTS IN THE TEVATRON TUNNEL.		
	Request 29 Oct, 86 Unspecified Approval 7 Jan, 87 Unspecified Completed 11 May, 87 Unspecified		
778	MAGNET APERTURE STUDIES #778	Rodney E. Gerig and Richard Talman	CERN (SWITZERLAND) CORNELL UNIVERSITY FERMILAB UNIVERSITY OF HOUSTON SSC CENTRAL DESIGN GROUP SLAC
	BEAM: Collision Area (Miscellaneous) STUDY OF THE SSC MAGNET APERTURE CRITERION.		
	Request 18 Oct, 86 Unspecified Approval 10 Dec, 86 Unspecified Completed 21 Jan, 91 Unspecified		
779	HIGH RATE CALORIMETER STUDY#779	David F. Anderson	FERMILAB
	BEAM: Meson Area - West PROPOSAL TO BUILD A VERY HIGH RATE CALORIMETER.		
	Request 29 Oct, 86 Unspecified Rejected 10 Dec, 86		
780	CHARM PRODUCTION BY PROTONS#780	Ronald J. Lipton and Douglas M. Potter	UNIV. OF CALIFORNIA, DAVIS CARNEGIE-MELLON UNIVERSITY UNIVERSITY OF OKLAHOMA
	BEAM: Neutrino Area - East STUDY OF CHARM PRODUCED BY 850 GEV PROTONS.		
	Request 1 Mar, 87 Unspecified Rejected 14 Dec, 87		

781 LARGE-X BARYON SPECTROMETER#781 James S. Russ
BEAM: Proton Area - Center
SEGMENTED LARGE-X BARYON SPECTROMETER (SELEX).

IHEP, BEIJING (PRC)
BOGAZICI UNIVERSITY (TURKEY)
UNIVERSITY OF BRISTOL (ENGLAND)
CARNEGIE-MELLON UNIVERSITY
CBPF (BRAZIL)
FERMILAB
UNIVERSITY OF HAWAII AT MANOA
UNIVERSITY OF IOWA
MAX-PLANCK INSTITUTE (GERMANY)
MOSCOW STATE UNIVERSITY (RUSSIA)
ITEP, MOSCOW (RUSSIA)
UNIV. FEDERAL DO PARAIBA (BRAZIL)
PNPI, ST. PETERSBURG (RUSSIA)
IHEP, PROTVINO (SERPUKHOV)(RUSSIA)
UNIVERSITY OF ROCHESTER
INFN, ROME (ITALY)
UN.AUTO.DE SAN LUIS POTOSI(MEXICO)
UNIVERSITE OF SAO PAULO (BRAZIL)
UNIVERSITY OF TEL-AVIV (ISRAEL)
INFN, TRIESTE (ITALY)

Request	4 Mar, 87	Unspecified
Approval	24 Oct, 88	Unspecified
In Progress	20 Feb, 97	
Data Analysis	3 Sep, 97	

782 MUONS IN 1M BUBBLE CHAMBER #782 Toshio Kitagaki
BEAM: Neutrino Area - NK Beam
A MUON EXPOSURE IN THE TOHOKU HIGH RESOLUTION BUBBLE CHAMBER.

IHEP, BEIJING (PRC)
BROWN UNIVERSITY
FERMILAB
MASSACHUSETTS INST. OF TECHNOLOGY
OAK RIDGE NATIONAL LABORATORY
SENSYU UNIVERSITY (JAPAN)
SUGIYAMA JOGAKUEN UNIV. (JAPAN)
UNIVERSITY OF TENNESSEE, KNOXVILLE
TOHOKU GAKUIN UNIVERSITY (JAPAN)
TOHOKU UNIVERSITY (JAPAN)

Request	4 Feb, 87	Unspecified
Approval	16 Jul, 87	Unspecified
Completed	21 Jul, 90	330 K Pix

783 TEVATRON BEAUTY FACTORY #783 Neville W. Reay
BEAM: Collision Area (C-0)
LETTER OF INTENT FOR A TEVATRON COLLIDER BEAUTY FACTORY.

UNIV. OF CALIFORNIA, DAVIS
CARNEGIE-MELLON UNIVERSITY
FERMILAB
OHIO STATE UNIVERSITY
UNIVERSITY OF OKLAHOMA

Request	4 Mar, 87	Unspecified
Inactive	23 Dec, 92	

784 BOTTOM AT THE COLLIDER #784 Nigel S. Lockyer
BEAM: Unspecified Beam
PROPOSAL FOR RESEARCH & DEVELOPMENT: VERTEXING, TRACKING AND DATA ACQUISITION FOR THE BOTTOM COLLIDER DETECTOR.

UNIVERSIDAD DE LOS ANDES(COLOMBIA)
UNIV. OF CALIFORNIA, DAVIS
FERMILAB
UNIVERSITY OF FLORIDA
UNIVERSITY OF HOUSTON
ILLINOIS INSTITUTE OF TECHNOLOGY
UNIVERSITY OF IOWA
NORTHEASTERN UNIVERSITY
NORTHERN ILLINOIS UNIVERSITY
OHIO STATE UNIVERSITY
UNIVERSITY OF OKLAHOMA
UNIVERSITY OF PENNSYLVANIA
PRAIRIE VIEW A&M UNIVERSITY
PRINCETON UNIVERSITY
UNIV. OF PUERTO RICO - RIO PIEDRAS
UN.SAN FRANCISCO DE QUITO(ECUADOR)
YALE UNIVERSITY

Request	2 Jan, 89	Unspecified	
Approval	30 Jan, 89	Unspecified	Approval of Phase I (bench tests) and Phase II (beam tests). Phase III (C0 run at the Tevatron Collider) deferred pending results of simulation studies.
Completed	8 Jan, 92	Unspecified	

785 LOW ENERGY ANTIMATTER #785 Billy Bonner and Lawrence Pinsky
BEAM: Miscellaneous Area
ANTIMATTER PHYSICS AT LOW ENERGY (AMPLE)

UNIVERSITY OF HOUSTON
RICE UNIVERSITY

Request	12 Mar, 87	Unspecified
Withdrawn	24 Oct, 88	

786 TEVATRON MUON #786 Richard Wilson
BEAM: Neutrino Area - Muon Beam
WEAK INTERACTIONS AND HEAVY QUARK PHYSICS WITH THE TEVATRON MUON BEAM.

ARGONNE NATIONAL LABORATORY
UNIV. OF CALIFORNIA, SAN DIEGO
FERMILAB
FREIBURG UNIVERSITY (GERMANY)
HARVARD UNIVERSITY
UNIV. OF ILLINOIS, CHICAGO CIRCLE
INP, KRAKOW (POLAND)
UNIVERSITY OF MARYLAND
MASSACHUSETTS INST. OF TECHNOLOGY
MAX-PLANCK INSTITUTE (GERMANY)
UNIVERSITY OF WASHINGTON
UNIVERSITY OF WUPPERTAL (GERMANY)
YALE UNIVERSITY

Request	10 May, 87	Unspecified
Rejected	29 Jun, 88	

787 PARTICLE SEARCH #787 Alfred T. Goshaw
BEAM: Collision Area (C-0)
PARTICLE SEARCH (PHASE II OF E-735).

DEPAUW UNIVERSITY
DUKE UNIVERSITY
FERMILAB
IOWA STATE UNIVERSITY
NOTRE DAME UNIVERSITY
PURDUE UNIVERSITY
UNIVERSITY OF WISCONSIN - MADISON

Request	30 Jun, 87	Unspecified
Rejected	1 May, 89	

788	NEUTRINO OSCILLATIONS #788 BEAM: Neutrino Area - Center NEUTRINO OSCILLATIONS AND CROSS-SECTIONS IN A TAGGED NEUTRINO LINE.	Robert H. Bernstein	FERMILAB UNIV. OF PARIS VI, LPG (FRANCE)

Request	11 Aug, 87	Unspecified
Inactive	23 Dec, 92	

789	B-QUARK MESONS & BARYONS #789 BEAM: Meson Area - East MEASUREMENT OF THE PRODUCTION AND DECAY INTO TWO-BODY MODES OF B-QUARK MESONS AND BARYONS.	Daniel M. Kaplan and Jen-Chieh Peng	ABILENE CHRISTIAN UNIVERSITY IHEP, ACADEMIA SINICA (TAIWAN) UNIVERSITY OF CHICAGO FERMILAB LAWRENCE BERKELEY LABORATORY LOS ALAMOS NATIONAL LABORATORY NORTHERN ILLINOIS UNIVERSITY UNIVERSITY OF SOUTH CAROLINA

Request	9 Nov, 87	Unspecified
Approval	24 Oct, 88	Unspecified
Data Analysis	8 Jan, 92	Unspecified

790	CALORIMETER FOR ZEUS #790 BEAM: Neutrino Area - Test Beam CALORIMETER MODULE CALIBRATION FOR ZEUS DETECTOR.	Frank J. Sciulli	ARGONNE NATIONAL LABORATORY COLUMBIA UNIVERSITY UNIVERSITY OF IOWA LOUISIANA STATE UNIVERSITY OHIO STATE UNIVERSITY PENNSYLVANIA STATE UNIVERSITY VIRGINIA TECH UNIVERSITY OF WISCONSIN - MADISON

Request	5 Jun, 87	Unspecified
Approval	17 Dec, 87	Unspecified
Completed	27 Aug, 90	Unspecified

791	HADROPRODUCTION HEAVY FLAVORS #791 BEAM: Proton Area - East Search for the Flavor-Changing Neutral-Current Decays	Jeffrey A. Appel and Milind Vasant Purohit	UNIV. OF CALIFORNIA, SANTA CRUZ CBPF (BRAZIL) UNIVERSITY OF CINCINNATI CINVESTAV-IPN (MEXICO) FERMILAB ILLINOIS INSTITUTE OF TECHNOLOGY KANSAS STATE UNIVERSITY UNIVERSITY OF MISSISSIPPI OHIO STATE UNIVERSITY PRINCETON UNIVERSITY UN.AUTONOMA DE PUEBLA (MEXICO) UNIV. FEDERAL DO RIO DE JANEIRO UNIVERSITY OF SOUTH CAROLINA STANFORD UNIVERSITY UNIVERSITY OF TEL-AVIV (ISRAEL) TUFTS UNIVERSITY UNIVERSITY OF WISCONSIN - MADISON YALE UNIVERSITY

Request	10 Nov, 87	Unspecified
Approval	29 Jun, 88	Unspecified
Data Analysis	8 Jan, 92	Unspecified

792	NUCLEAR FRAGMENTS #792 BEAM: Meson Area - East STUDY OF FRAGMENTATION PRODUCTS FROM THE REACTION 800 GEV P + 197 AU.	Kjell Aleklett and Lembit Sihver	LAL, ORSAY (FRANCE) UPPSALA UNIVERSITY (SWEDEN)

Request	15 Jan, 88	Unspecified
Approval	15 Jan, 88	Unspecified
Completed	15 Feb, 88	Unspecified

793	EMULSION EXPOSURE 1000 GeV #793 BEAM: Proton Area - Miscellaneous Emulsion Exposure to 1000 GeV, or highest energy protons.	Jere J. Lord	KAZAKH STATE UNIV., (KAZAKHSTAN) WASHINGTON NATURAL PHILOSOPHY INS. UNIVERSITY OF WASHINGTON

Request	19 Feb, 88	Unspecified
Approval	21 Sep, 88	Unspecified
Approved/Inactive	13 Jan, 94	

794	AXION HELIOSCOPE #794 BEAM: Unspecified Beam CONSTRUCTION AND OPERATION OF AN AXION HELIOSCOPE.	Karl Van Bibber	UNIV. OF CALIFORNIA, BERKELEY CERN (SWITZERLAND) LAWRENCE BERKELEY LABORATORY LAWRENCE LIVERMORE LABORATORY OHIO STATE UNIVERSITY TEXAS A&M UNIVERSITY TEXAS ACCELERATOR CENTER

Request	5 Mar, 88	Unspecified
Inactive	23 Dec, 92	

795	WARM LIQUID CALORIMETRY TEST #795 BEAM: Meson Area - Test Beam TEST OF ELECTRON/HADRON COMPENSATION FOR WARM LIQUID CALORIMETRY.	Morris Pripstein	UNIVERSITY OF ALABAMA UNIV. OF CALIFORNIA, BERKELEY CEN-SACLAY (FRANCE) CERN (SWITZERLAND) FERMILAB COLLEGE DE FRANCE (FRANCE) HARVARD UNIVERSITY KYOTO UNIVERSITY (JAPAN) LAPP, D'ANNECY-LE-VIEUX (FRANCE) LAWRENCE BERKELEY LABORATORY

Request	1 Mar, 88	Unspecified
Approval	24 Oct, 88	Unspecified
Completed	23 Dec, 91	Unspecified

796	CP VIOLATION #796 BEAM: Proton Area - Center A MEASUREMENT OF THE CP VIOLATION PARAMETER N+-0 THE SON OF E621.	Gordon B. Thomson	UNIVERSITY OF MINNESOTA RUTGERS UNIVERSITY

Request	1 Jun, 88	Unspecified
Withdrawn	4 Jan, 94	

797	FINE-GRAINED ELECTROMAG. CAL. #T797 BEAM: Proton Area - East FINE-GRAINED ELECTROMAGNETIC CALORIMETRY.	H. Richard Gustafson and Rudolf P. Thun	UNIVERSITY OF MICHIGAN - ANN ARBOR

Request	31 Aug, 88	Unspecified
Approval	1 Apr, 90	Unspecified
Completed	20 May, 90	Unspecified

798	SSC DETECTOR TEST #T798 BEAM: Proton Area - East PROPOSAL TO BUILD A SYNCHROTRON-RADIATION DETECTOR FOR TAGGING ELECTRONS AT THE SSC.	Priscilla Cushman and Roger W. Rusack	ROCKEFELLER UNIVERSITY YALE UNIVERSITY

Request	20 Jul, 88	Unspecified
Approval	30 Jan, 89	Unspecified Stage I approval.
Completed	2 May, 90	Unspecified

799	CP VIOLATION #799 BEAM: Neutrino Area - Muon Beam PROPOSAL TO SEARCH FOR RARE KAON DECAY.	Katsushi Arisaka and Robert S. Tschirhart	UNIVERSITY OF ARIZONA UNIV. OF CALIFORNIA, LOS ANGELES UNIV. OF CALIFORNIA, SAN DIEGO UNIVERSITY OF CHICAGO UNIVERSITY OF COLORADO AT BOULDER ELMHURST COLLEGE FERMILAB OSAKA UNIVERSITY (JAPAN) RICE UNIVERSITY RUTGERS UNIVERSITY UNIVERSITY OF VIRGINIA UNIVERSITY OF WISCONSIN - MADISON

Request	2 Jan, 89	Unspecified	
Approval	29 Jun, 89	Unspecified Stage I approval for phases 1 and 2.	
	10 Jul, 91	Unspecified Stage II approval deferred.	
In Progress	1 Oct, 91		

800	MAGNETIC MOMENT #800 BEAM: Proton Area - Center MEASUREMENT OF THE MAGNETIC MOMENT OF THE OMEGA MINUS HYPERON.	Kenneth A. Johns and Regina A. Rameika	UNIVERSITY OF ARIZONA DEPAUW UNIVERSITY FERMILAB UNIVERSITY OF MICHIGAN - ANN ARBOR UNIVERSITY OF MINNESOTA

Request	1 Mar, 88	Unspecified	
Approval	5 Oct, 88	Unspecified	
Completed	8 Jan, 92	Unspecified	

801	PHOTON TOTAL XSECTION-URANIUM #801 BEAM: Proton Area - Broad Band MEASUREMENT OF THE TOTAL CROSS SECTION OF REAL AND VIRTUAL PHOTON ABSORBTION ON URANIUM NUCLEI AT ENERGIES OF HUNDREDS OF GEV.	G. L. Bayatian	YEREVAN PHYSICS INST. (ARMENIA)

Request	10 Oct, 88	Unspecified	
Rejected	26 Dec, 89		

802	MUONS IN EMULSION #802 BEAM: Neutrino Area - Muon Beam DEEP INELASTIC MUON INTERACTION WITH NUCLEAR TARGETS USING EMULSION TELESCOPE TECHNIQUE.	Lali Chatterjee and Dipak Ghosh	FERMILAB JADAVPUR UNIVERSITY (INDIA)

Request	12 Dec, 88	Emulsion Stack(s)	
Approval	8 Feb, 89	Emulsion Stack(s)	1st stage approval - exposure of stacks of G5 nuclear emulsion plates to the main muon beam.
Completed	30 Dec, 91	Unspecified	

803	NEUTRINO OSCILLATIONS #803 BEAM: Main Injector Area Muon Neutrino to Tau Neutrino Oscillations	Neville W. Reay	AICHI UNIV. OF EDUCATION (JAPAN) UNIVERSITY OF ATHENS (GREECE) UNIV. OF CALIFORNIA, DAVIS UNIV. OF CALIFORNIA, LOS ANGELES CHONNAM NATIONAL UNIVERSITY(KOREA) FERMILAB GIFU UNIVERSITY (JAPAN) GYEONGSANG NATIONAL UNIV. (KOREA) HIROSAKI UNIVERSITY (JAPAN) ILLINOIS INSTITUTE OF TECHNOLOGY INDIANA UNIVERSITY KANSAS STATE UNIVERSITY KINKI UNIVERSITY (JAPAN) KOBE UNIVERSITY (JAPAN) KOREA ADV. INST OF SCIENCE (KOREA) KOREA UNIVERSITY, SEOUL (KOREA) UNIVERSITY OF MICHIGAN - ANN ARBOR ITEP, MOSCOW (RUSSIA) NAGOYA INST. OF TECHNOLOGY (JAPAN) OKAYAMA UNIVERSITY (JAPAN) OSAKA CITY UNIVERSITY (JAPAN) OSAKA SCIENCE EDUC. INST. (JAPAN) OSAKA UNIV. OF COMMERCE (JAPAN) SEOUL NATIONAL UNIVERSITY (KOREA) SOAI UNIVERSITY (JAPAN) UNIVERSITY OF SOUTH CAROLINA TECHNION-ISRAEL INST (ISRAEL) TOHO UNIVERSITY (JAPAN) TUFTS UNIVERSITY UTSUNOMIYA UNIVERSITY (JAPAN) YOKOHAMA NATIONAL UNIV. (JAPAN)

Request	6 Apr, 89	Unspecified
Unscheduled	24 Nov, 93	

804	KAON PHYSICS AT MAIN INJECTOR #804 BEAM: Main Injector Area HIGH PRECISION, HIGH SENSITIVITY KAON PHYSICS AT THE MAIN INJECTOR	Bruce D. Winstein	UNIV. OF CALIFORNIA, IRVINE CEN-SACLAY (FRANCE) UNIVERSITY OF CHICAGO FERMILAB UNIVERSITY OF ILLINOIS, CHAMPAIGN RUTGERS UNIVERSITY YALE UNIVERSITY

Request	14 Jun, 88	Unspecified
Unconsidered	14 Jun, 88	

805	IMB NEUTRINO OSCILLATIONS #805	Wojciech Gajewski	BOSTON UNIVERSITY BROOKHAVEN NATIONAL LABORATORY UNIV. OF CALIFORNIA, IRVINE CLEVELAND STATE UNIVERSITY UNIVERSITY OF HAWAII AT MANOA LONDON UNIVERSITY COLLEGE(ENGLAND) LOUISIANA STATE UNIVERSITY UNIVERSITY OF MARYLAND NOTRE DAME UNIVERSITY WARSAW UNIVERSITY, INP, (POLAND)
	BEAM: Main Injector Area Long Baseline Oscillation Experiment using a High Intensity Neutrino Beam from the Fermilab Main Injector to the IMB Water Cerenkov Detector		
	Request 24 Aug, 89 Unspecified Inactive 23 Dec, 92		
806	MP BEAMLINE UPGRADE #806	Akihiko Yokosawa	ARGONNE NATIONAL LABORATORY CEN-SACLAY (FRANCE) FERMILAB HIROSHIMA UNIVERSITY (JAPAN) UNIVERSITY OF IOWA KEK (JAPAN) KYOTO SANGYO UNIVERSITY (JAPAN) KYOTO UNIVERSITY (JAPAN) KYOTO UNIV. OF EDUCATION (JAPAN) LAPP, D'ANNECY-LE-VIEUX (FRANCE) LOS ALAMOS NATIONAL LABORATORY NORTHEASTERN UNIVERSITY NORTHWESTERN UNIVERSITY UN. OF OCCUP. & ENV. HEALTH(JAPAN) IHEP, PROTVINO (SERPUKHOV)(RUSSIA) RICE UNIVERSITY UNIVERSITY DI TRIESTE (ITALY) UNIVERSITY OF UDINE (ITALY)
	BEAM: Meson Area - Polarized Proton Beam ENERGY UPGRADE OF THE MP BEAMLINE AND PROPOSED EXPERIMENTS		
	Request 28 Sep, 89 Unspecified Withdrawn 7 Mar, 90		
807	WARM HEAVY LIQUID CALORIMETRY #T807	Scott Teige	RUTGERS UNIVERSITY
	BEAM: Proton Area - East WARM HEAVY LIQUID CALORIMETRY: A PROPOSAL TO MEASURE PERFORMANCE OF CANDIDATE MATERIALS		
	Request 26 Dec, 89 Unspecified Approval 9 Feb, 90 Unspecified Completed 1 May, 90 Unspecified		
808	B-PHYSICS #T808	Howard S. Goldberg	UNIV. OF ILLINOIS, CHICAGO CIRCLE UNIVERSITY OF LOUISVILLE UNIVERSITY OF MICHIGAN - ANN ARBOR UNIVERSITY OF PITTSBURGH IHEP, PROTVINO (SERPUKHOV)(RUSSIA)
	BEAM: Meson Area - West B-MESON HADROPRODUCTION, INCLUDING MEASUREMENTS OF CROSS-SECTIONS, LIFETIMES, AND MIXING.		
	Request 1 Mar, 90 Unspecified Inactive 23 Dec, 92		
809	DIRECT PHOTON SPIN DEPENDENCE #809	Akira Masaike and Sandibek B. (Sergei) Nurushev	ARGONNE NATIONAL LABORATORY CEN-SACLAY (FRANCE) FERMILAB UNIVERSITY OF IOWA KEK (JAPAN) KYOTO SANGYO UNIVERSITY (JAPAN) KYOTO UNIVERSITY (JAPAN) KYOTO UNIV. OF EDUCATION (JAPAN) LAPP, D'ANNECY-LE-VIEUX (FRANCE) LOS ALAMOS NATIONAL LABORATORY INFN, MESSINA (ITALY) NEW MEXICO STATE UNIVERSITY NORTHWESTERN UNIVERSITY OKAYAMA UNIVERSITY (JAPAN) OSAKA CITY UNIVERSITY (JAPAN) IHEP, PROTVINO (SERPUKHOV)(RUSSIA) RICE UNIVERSITY UNIVERSITY DI TRIESTE (ITALY) UNIVERSITY OF UDINE (ITALY)
	BEAM: Meson Area - Polarized Proton Beam STUDY OF THE SPIN DEPENDENCE OF DIRECT-GAMMA PRODUCTION AT HIGH P		
	Request 7 Mar, 90 Unspecified Inactive 23 Dec, 92		
810	STRUCTURE FUNCTIONS #810	Richard Wilson	UNIV. OF CALIFORNIA, SAN DIEGO FERMILAB HARVARD UNIVERSITY UNIV. OF ILLINOIS, CHICAGO CIRCLE UNIVERSITY OF WUPPERTAL (GERMANY)
	BEAM: Neutrino Area - Muon Beam MEASUREMENT OF NUCLEON STRUCTURE FUNCTIONS WITH HIGH STATISTICAL ACCURACY AND LOW SYSTEMATIC ERRORS, USING MUON BEAMS FROM THE TEVATRON.		
	Request 5 Mar, 90 Unspecified Inactive 23 Dec, 92		
811	PBAR P ELASTIC SCATTERING #811	Jay Orear	CERN (SWITZERLAND) CORNELL UNIVERSITY FERMILAB
	BEAM: Collision Area (E-0) PBAR P ELASTIC SCATTERING.		
	Request 14 Mar, 90 Unspecified Approval 9 Jul, 92 Unspecified Data Analysis 20 Feb, 96		
812	CPT AND GRAVITY TESTS #812	Gerald A. Smith	UNIV. OF CALIFORNIA, IRVINE GSI, DARMSTADT (GERMANY) FERMILAB INTEGRATED ACCELERATOR TECHNOLOGY UNIVERSITY OF IOWA LOS ALAMOS NATIONAL LABORATORY MANNE SIEGBAHN INSTITUTE (SWEDEN) MAX-PLANCK INSTITUTE (GERMANY) UNIVERSITY OF MICHIGAN - ANN ARBOR UNIVERSITY OF NEW MEXICO PENNSYLVANIA STATE UNIVERSITY RUTGERS UNIVERSITY UNIVERSITY DI TRIESTE (ITALY)
	BEAM: Accumulator Ring PRECISION TESTS OF CPT AND GRAVITY USING LOW ENERGY ANTIMATTER AT FERMILAB.		
	Request 19 Feb, 90 Unspecified Inactive 30 Jun, 94		

813	SMALL PHYSICS #813	Lawrence W. Jones	UNIVERSITY OF HAWAII AT MANOA
	BEAM: Unspecified Beam		LODZ UNIVERSITY
	I. A QUANTITATIVE TEST OF THE LANDAU-MIGDAL-POMMERANCHUK EFFECT; II. HADRON INCLUSIVE DISTRIBUTIONS AT HIGH X; III. NEUTRON POLARIZATION		UNIVERSITY OF MICHIGAN - ANN ARBOR UNIVERSITY OF WASHINGTON
	Request 2 Mar, 90 Unspecified		
	Rejected 5 May, 93		
814	PRIMAKOFF PRODUCTION #814	Vladimir Chaloupka	UNIVERSITY OF ROCHESTER
	BEAM: Proton Area - Center		UNIVERSITY OF WASHINGTON
	SEARCH FOR PRIMAKOFF PRODUCTION OF HYBRID MESONS.		
	Request 28 Feb, 90 Unspecified		
	Inactive 23 Dec, 92		
815	NEUTRINO #815	Michael H. Shaevitz and Robert H. Bernstein	UNIVERSITY OF CINCINNATI
	BEAM: Neutrino Area - Center		COLUMBIA UNIVERSITY
	Precision Measurements of Neutrino Neutral Current Interactions Using a Sign-Selected Beam		FERMILAB KANSAS STATE UNIVERSITY NORTHWESTERN UNIVERSITY UNIVERSITY OF OREGON UNIVERSITY OF ROCHESTER XAVIER UNIVERSITY
	Request 7 Mar, 90 Unspecified		
	9 Oct, 90 Unspecified		
	Approval 10 Jul, 91 Unspecified Stage I approval for Phase I granted.		
	9 Jul, 92 Unspecified Stage I approval for 10 E18th Protons on target		
	24 Jun, 94 Unspecified 1E18 protons on target at an intensity between 1 and 3 E13 protons / pulse		
	In Progress 15 Jun, 96		
	Data Analysis 5 Sep, 97		
816	SDC DETECTOR MUON BEAM TESTS #T816	Henry J. Lubatti	UNIVERSITY OF COLORADO AT BOULDER
	BEAM: Neutrino Area - Muon Beam		FERMILAB
	SSC Detector Muon Sub-System Beam Tests		UNIVERSITY OF ILLINOIS, CHAMPAIGN UNIVERSITY OF MARYLAND OSAKA CITY UNIVERSITY (JAPAN) UNIVERSITY OF ROCHESTER TEMPLE UNIVERSITY TUFTS UNIVERSITY UNIVERSITY OF WASHINGTON UNIVERSITY OF WISCONSIN - MADISON
	Request 1 May, 90 Unspecified		
	Approval 30 Oct, 90 Unspecified		
	Completed 8 Jan, 92 Unspecified		
817	SILICON STRIP DETECTOR TEST #817	James P. Alexander	UNIV. OF CALIFORNIA, SANTA BARBARA
	BEAM: Neutrino Area - Muon Beam		CORNELL UNIVERSITY
	Double-sided silicon strip detector prototype evaluation.		
	Request 1 May, 90 Unspecified		
	Approval 9 Jul, 90 Unspecified		
	Completed 15 Aug, 90 Unspecified		
818	LEAD GLASS DETECTOR TEST #818	Scott Teige	INDIANA UNIVERSITY
	BEAM: Unspecified Beam		UNIVERSITY OF LOUISVILLE
	Proposal to use the NWA Electron Test Beam at Fermilab for Tests of a Lead Glass Calorimeter Prototype		MOSCOW STATE UNIVERSITY (RUSSIA) IHEP, PROTVINO (SERPUKHOV)(RUSSIA)
	Request 26 Jun, 90 Unspecified		
	Withdrawn 30 Apr, 91		
819	EMPACT DETECTOR TEST FOR SSC #819	Louis S. Osborne	UNIVERSITY OF HOUSTON
	BEAM: Neutrino Area - Muon Beam		INDIANA UNIVERSITY
	EMPACT Muon Telescope Evaluation at Fermilab		JINR, DUBNA (RUSSIA) MASSACHUSETTS INST. OF TECHNOLOGY
	Request 28 Jun, 90 Unspecified		
	Approval 15 Aug, 91 Unspecified		
	Completed 15 Oct, 91 Unspecified		
820	MUON NEUTRINO MAGNETIC MOMENT #820	Nikos D. Giokaris	FERMILAB
	BEAM: Miscellaneous Area		UNIVERSITY OF MARYLAND
	Search for the muon neutrino magnetic moment at the 10 to the -10 Bohr magneton level using the Booster at Fermilab		NORTHEASTERN UNIVERSITY NORTHERN ILLINOIS UNIVERSITY UNIVERSITY OF ROCHESTER ROCKEFELLER UNIVERSITY
	Request 13 Jul, 90 Unspecified		
	Inactive 30 Jun, 94		
821	NEUTRON MEASUREMENTS AT NWA #T821	Kenneth A. Johns	UNIVERSITY OF ARIZONA
	BEAM: Neutrino Area - West		BALL STATE UNIVERSITY
	Neutron Measurements at NWA		FERMILAB UNIVERSITY OF MICHIGAN - ANN ARBOR UNIVERSITY OF MINNESOTA NORTHERN ILLINOIS UNIVERSITY RICE UNIVERSITY
	Request 14 Aug, 90 Unspecified		
	Approval 14 Aug, 90 Unspecified		
	Completed 8 Jan, 92 Unspecified		
822	NEUTRINO OSCILLATIONS #822	Maury C. Goodman	ARGONNE NATIONAL LABORATORY
	BEAM: Main Injector Area		FERMILAB
	A Long-Baseline Neutrino Oscillation Experiment from Fermilab to Soudan		LEBEDEV PHYSICAL INST. (RUSSIA) UNIVERSITY OF MINNESOTA ITEP, MOSCOW (RUSSIA) UNIVERSITY OF OXFORD (ENGLAND) RUTHERFORD-APPLETON LABS.(ENGLAND) SSC LABORATORY TEXAS A&M UNIVERSITY TUFTS UNIVERSITY WESTERN WASHINGTON UNIVERSITY
	Request 24 Aug, 90 Unspecified		
	Withdrawn 24 Oct, 95		

823	D-0 DETECTOR UPGRADE #823 BEAM: Collision Area (D-0) D0 Detector Upgrade	Hugh Elliott Montgomery and Hendrick J. Weerts	INST.OF PHYS.ACADEMY OF SCI(CZECH) UNIVERSIDAD DE LOS ANDES(COLOMBIA UNIVERSITY OF ARIZONA BOSTON UNIVERSITY BROOKHAVEN NATIONAL LABORATORY BROWN UNIVERSITY UNIVERSIDAD DE BUENOS AIRES UNIV. OF CALIFORNIA, DAVIS UNIV. OF CALIFORNIA, IRVINE UNIV. OF CALIFORNIA, RIVERSIDE CBPF (BRAZIL) CEN-SACLAY (FRANCE) CHARLES UNIVERSITY (CZECH) CINVESTAV-IPN (MEXICO) COLUMBIA UNIVERSITY CZECH TECHNICAL UNIVERSITY (CZECH) DELHI UNIVERSITY (INDIA) FERMILAB FLORIDA STATE UNIVERSITY UNIVERSITY OF HAWAII AT MANOA UNIV. OF ILLINOIS, CHICAGO CIRCLE INDIANA UNIVERSITY IOWA STATE UNIVERSITY JINR, DUBNA (RUSSIA) UNIVERSITY OF KANSAS KOREA UNIVERSITY, SEOUL (KOREA) INP, KRAKOW (POLAND) KYUNGSUNG UNIVERSITY, PUSAN(KOREA) LAWRENCE BERKELEY LABORATORY LOUISIANA TECH UNIVERSITY UNIVERSITY OF MARYLAND UNIVERSITY OF MICHIGAN - ANN ARBOR MICHIGAN STATE UNIVERSITY MOSCOW STATE UNIVERSITY (RUSSIA) ITEP, MOSCOW (RUSSIA) UNIVERSITY OF NEBRASKA SUNY AT STONY BROOK NEW YORK UNIVERSITY NORTHEASTERN UNIVERSITY NORTHERN ILLINOIS UNIVERSITY NORTHWESTERN UNIVERSITY NOTRE DAME UNIVERSITY UNIVERSITY OF OKLAHOMA PANJAB UNIVERSITY (INDIA) PNPI, ST. PETERSBURG (RUSSIA) IHEP, PROTVINO (SERPUKHOV)(RUSSIA) PURDUE UNIVERSITY RICE UNIVERSITY UNIV. FEDERAL DO RIO DE JANEIRO UNIVERSITY OF ROCHESTER SEOUL NATIONAL UNIVERSITY (KOREA) TATA INSTITUTE (INDIA) TEXAS A&M UNIVERSITY UNIVERSITY OF TEXAS AT ARLINGTON

Request	4 Oct, 90	Unspecified	
Approval	11 Jul, 91	Unspecified	Stage I / Step 1 approval granted. Stage I / Step 2 and 3 approval deferred.
Unscheduled	11 Jul, 91		

824	DUMAND NEUTRINO OSCILLATIONS #824 BEAM: Main Injector Area Neutrino Beam from the Proposed Main Injector to the DUMAND Detector	Medford S. Webster	RWTH, AACHEN (GERMANY) UNIVERSITY OF BERNE (SWITZERLAND) BOSTON UNIVERSITY UNIVERSITY OF HAWAII AT MANOA ICRR, UNIVERSITY OF TOKYO (JAPAN) UNIVERSITY OF KIEL (GERMANY) KINKI UNIVERSITY (JAPAN) KOBE UNIVERSITY (JAPAN) SCRIPPS INST. OF OCEANOGRAPHY/UCSD TOHOKU UNIVERSITY (JAPAN) VANDERBILT UNIVERSITY UNIVERSITY OF WASHINGTON UNIVERSITY OF WISCONSIN - MADISON

Request	4 Oct, 90	Unspecified	
Inactive	23 Dec, 92		

825 SDC PROTOTYPE DETECTORS #825 James R. Bensinger

BEAM: Unspecified Beam

Testing of Prototype Detectors for the Solenoidal Detector Collaboration

ARGONNE NATIONAL LABORATORY
UNIVERSITY OF ARIZONA
BRANDEIS UNIVERSITY
BRATSLAVA STATE UNIVERSITY (CZECH)
UNIVERSITY OF BRISTOL (ENGLAND)
BROWN UNIVERSITY
UNIV. OF CALIFORNIA, DAVIS
UNIV. OF CALIFORNIA, LOS ANGELES
UNIV. OF CALIFORNIA, RIVERSIDE
UNIV. OF CALIFORNIA, SAN DIEGO
UNIV. OF CALIFORNIA, SANTA CRUZ
CHIBA UNIVERSITY (JAPAN)
UNIVERSITY OF CHICAGO
UNIVERSITY OF COLORADO AT BOULDER
DUKE UNIVERSITY
FERMILAB
FLORIDA STATE UNIVERSITY
UNIVERSITY OF FLORIDA
FUKUI UNIVERSITY (JAPAN)
GOMEL STATE UNIVERSITY (BYELARUS)
HARVARD UNIVERSITY
UNIVERSITY OF HAWAII AT MANOA
HIROSHIMA INST. OF TECH. (JAPAN)
HIROSHIMA UNIVERSITY (JAPAN)
IBARAKI COLLEGE OF TECH. (JAPAN)
UNIV. OF ILLINOIS, CHICAGO CIRCLE
UNIVERSITY OF ILLINOIS, CHAMPAIGN
INDIANA UNIVERSITY
IOWA STATE UNIVERSITY
JINR, DUBNA (RUSSIA)
JOHNS HOPKINS UNIVERSITY
KEK (JAPAN)
KYOTO UNIVERSITY (JAPAN)
LAWRENCE BERKELEY LABORATORY
UNIVERSITY OF LIVERPOOL (ENGLAND)
UNIVERSITY OF MARYLAND
UNIVERSITY OF MICHIGAN - ANN ARBOR
UNIVERSITY OF MINNESOTA
ACADEMY OF SCI. OF BSSR (BYELARUS)
UNIVERSITY OF MISSISSIPPI
MIYAZAKI UNIVERSITY (JAPAN)
NAGOYA UNIVERSITY (JAPAN)
NIIGATA UNIVERSITY (JAPAN)
NOTRE DAME UNIVERSITY
OAK RIDGE NATIONAL LABORATORY
OHIO STATE UNIVERSITY
OKAYAMA UNIVERSITY (JAPAN)
OSAKA CITY UNIVERSITY (JAPAN)
OSAKA UNIVERSITY (JAPAN)
UNIVERSITY OF OXFORD (ENGLAND)
PENNSYLVANIA STATE UNIVERSITY
UNIVERSITY OF PENNSYLVANIA
UNIVERSITY OF PISA (ITALY)
UNIVERSITY OF PITTSBURGH
PURDUE UNIVERSITY
RICE UNIVERSITY
UNIVERSITY OF ROCHESTER
ROCKEFELLER UNIVERSITY
RUTGERS UNIVERSITY
RUTHERFORD-APPLETON LABS.(ENGLAND)
SAGA UNIVERSITY (JAPAN)
SAITAMA COLLEGE OF HEALTH (JAPAN)
SLOVAK ACADEMY OF SCIENCE (CZECH)
SOFIA STATE UNIVERSITY (BULGARIA)
SSC LABORATORY
SLAC
TASHKENT, PHY.TEC.INS (UZBEKISTAN)
IHEP, TBILISI STATE UNIV (GEORGIA)
TEXAS A&M UNIVERSITY
UNIVERSITY OF TEXAS AT DALLAS
TOHOKU GAKUIN UNIVERSITY (JAPAN)
TOHOKU UNIVERSITY (JAPAN)
TOKYO INST. OF TECHNOLOGY (JAPAN)
TOKYO METROPOLITAN UNIV. (JAPAN)
TOKYO UNIV. OF AGR. & TECH.(JAPAN)
UNIVERSITY OF TOKYO (JAPAN)
UNIVERSITY OF TSUKUBA (JAPAN)
TUFTS UNIVERSITY
VIRGINIA TECH
WAKAYAMA MEDICAL COLLEGE (JAPAN)
UNIVERSITY OF WASHINGTON
UNIVERSITY OF WISCONSIN - MADISON
YEREVAN PHYSICS INST. (ARMENIA)

Request	1 Oct, 90	Unspecified
Inactive	23 Dec, 92	

826 HYPERON MEASUREMENTS #826 Kenneth A. Johns and Regina A. Rameika

BEAM: Proton Area - Center

An Expression of Interest to Continue Hyperon Measurements at Fermilab

UNIVERSITY OF ARIZONA
FERMILAB
UNIVERSITY OF MICHIGAN - ANN ARBOR
UNIVERSITY OF MINNESOTA

Request	8 Oct, 90	Unspecified
Inactive	23 Dec, 92	

827	MICRO-BCD #827 BEAM: Collision Area (C-0) B Physics at the TEV I; Micro-BCD	Nigel S. Lockyer	UNIVERSIDAD DE LOS ANDES(COLOMBIA) UNIV. OF CALIFORNIA, DAVIS FERMILAB UNIVERSITY OF FLORIDA UNIV. OF ILLINOIS, CHICAGO CIRCLE ILLINOIS INSTITUTE OF TECHNOLOGY UNIVERSITY OF IOWA UNIVERSITY OF MONTREAL (CANADA) SUNY AT ALBANY OAK RIDGE NATIONAL LABORATORY UNIVERSITY OF OKLAHOMA UNIVERSITY OF PENNSYLVANIA PRAIRIE VIEW A&M UNIVERSITY PRINCETON UNIVERSITY UNIV. OF PUERTO RICO - RIO PIEDRAS UN.SAN FRANCISCO DE QUITO(ECUADOR) SPACE SCIENCE LAB., U.C., BERKELEY UNIVERSITY OF WISCONSIN - MADISON YALE UNIVERSITY
	Request 8 Oct, 90 Unspecified Rejected 10 Jul, 91		
828	B-MESON CP VIOLATION #828 BEAM: Collision Area (Miscellaneous) Letter of Intent to Measure CP Violation in B Meson Decay at the Fermilab Collider	Sheldon L. Stone	FERMILAB UNIVERSITY OF FLORIDA UNIVERSITY OF MICHIGAN - ANN ARBOR SYRACUSE UNIVERSITY
	Request 26 Sep, 90 Unspecified Withdrawn 22 Jun, 91		
829	HEAVY FLAVORS AT TPL #829 BEAM: Proton Area - East Study of Heavy Flavors at TPL, Continuation of E-791	David C. Christian and Michael D. Sokoloff	UNIVERSITY OF CINCINNATI CINVESTAV-IPN (MEXICO) FERMILAB ILLINOIS INSTITUTE OF TECHNOLOGY UNIVERSITY OF MASSACHUSETTS PRINCETON UNIVERSITY UN.AUTONOMA DE PUEBLA (MEXICO) UNIVERSITY OF TEL-AVIV (ISRAEL) TUFTS UNIVERSITY UNIVERSITY OF WISCONSIN - MADISON YALE UNIVERSITY
	Request 8 Oct, 90 Unspecified Rejected 28 Feb, 94		
830	CDF UPGRADE #830 BEAM: Collision Area (B-0) Proposal for an Upgraded CDF Detector	William C. Carithers, and Jr. Alfred T. Goshaw	IHEP, ACADEMIA SINICA (TAIWAN) ARGONNE NATIONAL LABORATORY UNIVERSITY OF BOLOGNA (ITALY) BRANDEIS UNIVERSITY UNIV. OF CALIFORNIA, LOS ANGELES CIPP (CANADA) UNIVERSITY OF CHICAGO DUKE UNIVERSITY FERMILAB UNIVERSITY OF FLORIDA INFN, FRASCATI (ITALY) INFN, TRIESTE/UN. DI UDINE (ITALY) UNIVERSITY OF GENEVA (SWITZERLAND) HARVARD UNIVERSITY HIROSHIMA UNIVERSITY (JAPAN) UNIVERSITY OF ILLINOIS, CHAMPAIGN JOHNS HOPKINS UNIVERSITY UNIVERSITY OF KARLSRUHNE (GERMANY) KEK (JAPAN) LAWRENCE BERKELEY LABORATORY MASSACHUSETTS INST. OF TECHNOLOGY UNIVERSITY OF MICHIGAN - ANN ARBOR MICHIGAN STATE UNIVERSITY UNIVERSITY OF NEW MEXICO OHIO STATE UNIVERSITY OSAKA CITY UNIVERSITY (JAPAN) UNIVERSITY OF PADOVA (ITALY) UNIVERSITY OF PENNSYLVANIA INFN, PISA (ITALY) UNIVERSITY OF PITTSBURGH PURDUE UNIVERSITY UNIVERSITY OF ROCHESTER ROCKEFELLER UNIVERSITY RUTGERS UNIVERSITY TEXAS A&M UNIVERSITY TEXAS TECH UNIVERSITY UNIVERSITY OF TSUKUBA (JAPAN) TUFTS UNIVERSITY WASEDA UNIVERSITY (JAPAN) UNIVERSITY OF WISCONSIN - MADISON YALE UNIVERSITY
	Request 9 Oct, 90 Unspecified Unscheduled 11 Jul, 91		

831 HEAVY QUARK PHOTOPRODUCTION #831 — John P. Cumalat and Luigi Moroni

BEAM: Proton Area - Broad Band

A High Statistics Study of States Containing Heavy Quarks Using the Wideband Photon Beam and the E687 Multiparticle Spectrometer

UNIV. OF CALIFORNIA, DAVIS
CBPF (BRAZIL)
CINVESTAV-IPN (MEXICO)
UNIVERSITY OF COLORADO AT BOULDER
FERMILAB
INFN, FRASCATI (ITALY)
UNIVERSITY OF ILLINOIS, CHAMPAIGN
KOREA UNIVERSITY, SEOUL (KOREA)
INFN, MILANO (ITALY)
UNIVERSITY OF MILANO (ITALY)
UNIVERSITY OF NORTH CAROLINA
UNIVERSITY OF PAVIA (ITALY)
UN.AUTONOMA DE PUEBLA (MEXICO)
UNIV. OF PUERTO RICO - MAYAGUEZ
UNIVERSITY OF SOUTH CAROLINA
UNIVERSITY OF TENNESSEE, KNOXVILLE
VANDERBILT UNIVERSITY
UNIVERSITY OF WISCONSIN - MADISON
YEONSEI UNIVERSITY (KOREA)

Request	17 Oct, 90	Unspecified
	1 Sep, 92	5,000 Hours 1000 hours for setup and 4000 hours for data taking
Approval	7 Dec, 92	Unspecified
In Progress	15 Sep, 96	
Data Analysis	25 Aug, 97	

832 CP VIOLATION #832 — Edward C. Blucher

BEAM: Neutrino Area - Muon Beam

Proposal for a New Tevatron Search for Direct CP Violation in the 2pi decays of the Neutral Kaon

UNIVERSITY OF ARIZONA
UNIV. OF CALIFORNIA, LOS ANGELES
UNIV. OF CALIFORNIA, SAN DIEGO
UNIVERSITY OF CHICAGO
UNIVERSITY OF COLORADO AT BOULDER
ELMHURST COLLEGE
FERMILAB
OSAKA UNIVERSITY (JAPAN)
RICE UNIVERSITY
RUTGERS UNIVERSITY
UNIVERSITY OF VIRGINIA
UNIVERSITY OF WISCONSIN - MADISON

Request	18 Oct, 90	Unspecified
In Progress	26 Oct, 96	

833 K-SHORT DECAYS #833 — Gordon B. Thomson

BEAM: Meson Area - Center

Letter of Intent to Measure the Branching Ratio for the K-short Decay

UNIV. OF CALIFORNIA, LOS ANGELES
UNIVERSITY OF CHICAGO
ELMHURST COLLEGE
FERMILAB
UNIVERSITY OF ILLINOIS, CHAMPAIGN
RUTGERS UNIVERSITY

Request	19 Oct, 90	Unspecified
Inactive	30 Aug, 95	

834 DIRECT PHOTON #834 — Paul F. Slattery

BEAM: Meson Area - West

Direct Photon Production #834

DELHI UNIVERSITY (INDIA)
FERMILAB
MICHIGAN STATE UNIVERSITY
UNIVERSITY OF MINNESOTA
NORTHEASTERN UNIVERSITY
PENNSYLVANIA STATE UNIVERSITY
UNIVERSITY OF PITTSBURGH
RAJASTHAN UNIVERSITY (INDIA)
UNIVERSITY OF ROCHESTER

Request	19 Oct, 90	Unspecified
Inactive	23 Dec, 92	

835 CHARMONIUM STATES #835 — Rosanna Cester and Stephen H. Pordes

BEAM: Accumulator Ring

Study of Charmonium States formed in Antiproton-proton Annihilations

MOU Executed.

UNIV. OF CALIFORNIA, IRVINE
FERMILAB
UNIVERSITY OF FERRARA (ITALY)
INFN, GENOVA (ITALY)
NORTHWESTERN UNIVERSITY
UNIVERSITY OF TORINO (ITALY)

Request	16 Oct, 90	Unspecified
Approval	7 Dec, 92	Unspecified
In Progress	1 Oct, 96	

836 SUPERCONDUCTING DETECTOR TEST #836 — Robert G. Wagner

ARGONNE NATIONAL LABORATORY

BEAM: Unspecified Beam

Proposal for a Beam Test of a Superconducting Thin Film Strip Particle Detector

Request	3 Oct, 90	24 Hours in three 8 hour shifts
Withdrawn	8 Jan, 92	

837 EMPACT/TEXAS TEST #837 — Michael D. Marx

SUNY AT STONY BROOK

BEAM: Unspecified Beam

EMPACT/TEXAS Beam Test(s)

Request	12 Oct, 90	Unspecified
Inactive	23 Dec, 92	

838 POLARIZED BEAM #838 — Akihiko Yokosawa

BEAM: Meson Area - Polarized Proton Beam

Continuation of E-704 and Simultaneous Measurement of Chi-2 Production

ARGONNE NATIONAL LABORATORY
CEN-SACLAY (FRANCE)
FERMILAB
UNIVERSITY OF IOWA
KYOTO SANGYO UNIVERSITY (JAPAN)
KYOTO UNIVERSITY (JAPAN)
KYOTO UNIV. OF EDUCATION (JAPAN)
LAPP, D'ANNECY-LE-VIEUX (FRANCE)
LOS ALAMOS NATIONAL LABORATORY
INFN, MESSINA (ITALY)
NEW MEXICO STATE UNIVERSITY
NORTHWESTERN UNIVERSITY
UN. OF OCCUP. & ENV. HEALTH(JAPAN)
OKAYAMA UNIVERSITY (JAPAN)
OLD DOMINION UNIVERSITY
OSAKA CITY UNIVERSITY (JAPAN)
OSAKA UNIV. OF COMMERCE (JAPAN)
IHEP, PROTVINO (SERPUKHOV)(RUSSIA)
RICE UNIVERSITY
UNIVERSITY DI TRIESTE (ITALY)
UNIVERSITY OF UDINE (ITALY)

Request	1 Oct, 90	Unspecified
Rejected	19 Feb, 91	

839 FIBER TRACKING TEST #839 — Seymour Margulies
UNIV. OF CALIFORNIA, LOS ANGELES
FERMILAB
UNIV. OF ILLINOIS, CHICAGO CIRCLE
NOTRE DAME UNIVERSITY
OSAKA CITY UNIVERSITY (JAPAN)
PENNSYLVANIA STATE UNIVERSITY
PURDUE UNIVERSITY
RICE UNIVERSITY
UNIVERSITY OF TEXAS AT DALLAS
UNIVERSITY OF TSUKUBA (JAPAN)
BEAM: Neutrino Area - Muon Beam
Scintillating Fiber Tracker - Beam Test

Request	25 Sep, 90	Unspecified
Approval	15 Apr, 91	Unspecified
Completed	8 Jan, 92	Unspecified

840 SPAGHETTI CALORIMETRY TEST #840 — Adam Para
FERMILAB
BEAM: Meson Area - Polarized Proton Beam
Spaghetti calorimetry in '91 test beam cycle

Request	11 Oct, 90	592 Hours 1. Systematic studies of the laminated prototype (160 hrs.) 2. Studies of the RGB prototype (56 hrs.) 3. Dichromatic calorimeter (80 hrs.) 4. Liquid scintillator prototype (56 hrs.) 5. Two-segment fiber prototype (240 hrs.)
Approval	8 Aug, 91	Unspecified
Completed	8 Jan, 92	Unspecified

841 CALORIMETER BEAM TEST #T841 — Lawrence E. Price
ARGONNE NATIONAL LABORATORY
CEN-SACLAY (FRANCE)
FERMILAB
IOWA STATE UNIVERSITY
LAWRENCE BERKELEY LABORATORY
NORTHEASTERN UNIVERSITY
PURDUE UNIVERSITY
UNIVERSITY OF ROCHESTER
ROCKEFELLER UNIVERSITY
UNIVERSITY OF SOUTH CAROLINA
VIRGINIA TECH
WESTINGHOUSE ELECTRIC CORPORATION
UNIVERSITY OF WISCONSIN - MADISON
YALE UNIVERSITY
BEAM: Meson Area - Test Beam
Proposal for Beam Test of Scintillator Calorimeter Prototypes at Fermilab during FY 1991

Request	8 Oct, 90	Unspecified
Approval	28 Mar, 91	Unspecified
Completed	8 Jan, 92	Unspecified

842 RADIATION EXPOSURE #842 — David G. Underwood
ARGONNE NATIONAL LABORATORY
BEAM: Proton Area - Broad Band
Proposed Radiation Measurement in the Wideband Neutral Dump Area

Request	6 Nov, 90	Unspecified
Approval	15 Aug, 91	Unspecified
Completed	8 Jan, 92	Unspecified

843 EMULSION EXPOSURE 600 GeV #843 — C. O. Kim
CHONNAM NATIONAL UNIVERSITY(KOREA)
KOREA UNIVERSITY, SEOUL (KOREA)
BEAM: Neutrino Area - Muon Beam
Interactions of 600 Gev Muons with Emulsion Nuclei

Request	24 Oct, 90	Unspecified
Approval	1 Jul, 91	Unspecified
Completed	13 Jul, 91	Unspecified

844 TRD/SHOWER COUNTER TEST #844 — Simon P. Swordy
ENRICO FERMI INSTITUTE
BEAM: Meson Area - Polarized Proton Beam
Transition Radiation Detector/EM Shower Counter Calibration

Request	28 Nov, 90	40 Hours
Approval	11 Oct, 91	Unspecified
Completed	26 Dec, 91	Unspecified

845 TEVATRON BEAUTY #845 — Peter E. Schlein
UNIV. OF CALIFORNIA, LOS ANGELES
CERN (SWITZERLAND)
COLLEGE DE FRANCE (FRANCE)
INP, KRAKOW (POLAND)
MAX-PLANCK INSTITUTE (GERMANY)
NANJING UNIVERSITY (PRC)
IHEP, PROTVINO (SERPUKHOV)(RUSSIA)
YALE UNIVERSITY
BEAM: Unspecified Beam
A Dedicated Beauty Experiment for the Tevatron Collider

Request	7 Jan, 91	Unspecified
Rejected	10 Jul, 91	

846 FRACTIONAL CHARGE IMPURITIES #846 — Unil Perera
UNIVERSITY OF PITTSBURGH
BEAM: Meson Area - West
Search for Fractional Charge Impurities

Request	1 Feb, 91	Unspecified
Inactive	23 Dec, 92	

847 CALORIMETER TEST #847 — Lawrence R. Sulak
BOSTON UNIVERSITY
BEAM: Unspecified Beam
Beam Test for scintillating fiber / lead alloy calorimeter prototype

Request	13 Feb, 91	Unspecified
Completed	8 Jan, 92	

848 GAS CALORIMETRY FOR SDC #848 — Nikos D. Giokaris
ABILITY ENGINEERING TECHNOLOGY
FERMILAB
JINR, DUBNA (RUSSIA)
UNIVERSITY OF ROCHESTER
ROCKEFELLER UNIVERSITY
UNIVERSITY OF WISCONSIN - MADISON
YEREVAN PHYSICS INST. (ARMENIA)
BEAM: Neutrino Area - Test Beam
High Pressure Sampling Gas Calorimetry for the SDC Calorimeter

Request	29 Mar, 91	Unspecified
Approval	29 Oct, 91	Unspecified
Completed	23 Dec, 91	Unspecified

849 BARIUM FLUORIDE CALORIMETER #849 — Hans G. E. Kobrak
BEAM: Neutrino Area - Test Beam
Request for Test Beam Time for Barium Fluoride Calorimeter Development
BROOKHAVEN NATIONAL LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
UNIV. OF CALIFORNIA, SAN DIEGO
CARNEGIE-MELLON UNIVERSITY
OAK RIDGE NATIONAL LABORATORY
PRINCETON UNIVERSITY
TATA INSTITUTE (INDIA)

Request	11 Apr, 91	Unspecified	Two (2) "beam on" periods of about 1 month each, separated by a data analysis period of about 1 month.
Approval	18 Sep, 91	Unspecified	
Completed	8 Jan, 92	Unspecified	

850 DIAMOND RADIATION DETECTOR TEST #850 — Melissa Franklin
BEAM: Meson Area - Test Beam
Fermilab Test Beam Time of Diamond Radiation Detectors
UNIV. OF CALIFORNIA, SANTA BARBARA
HARVARD UNIVERSITY
KEK (JAPAN)
LAWRENCE LIVERMORE LABORATORY
OHIO STATE UNIVERSITY
PRINCETON UNIVERSITY
UNIVERSITY OF ROCHESTER
RUTGERS UNIVERSITY
SSC LABORATORY
STANFORD UNIVERSITY

Request	1 May, 91	Unspecified
Approval	8 Jan, 92	Unspecified
Withdrawn	8 Jan, 92	Unspecified

851 FIBER IRRADIATION STUDIES #851 — Seymour Margulies and Jadwiga Warchol
BEAM: Collision Area (C-0)
Fiber Irradiation Studies in the C0 Region
UNIV. OF CALIFORNIA, LOS ANGELES
FERMILAB
UNIV. OF ILLINOIS, CHICAGO CIRCLE
NOTRE DAME UNIVERSITY
OAK RIDGE NATIONAL LABORATORY
OSAKA CITY UNIVERSITY (JAPAN)
PENNSYLVANIA STATE UNIVERSITY
PURDUE UNIVERSITY
RICE UNIVERSITY
UNIVERSITY OF TEXAS AT DALLAS
UNIVERSITY OF TSUKUBA (JAPAN)

Request	1 May, 91	Unspecified
Approval	14 Aug, 91	Unspecified
Completed	8 Jan, 92	Unspecified

852 PIXEL DETECTOR TEST #T852 — Eric Arens
BEAM: Neutrino Area - Muon Beam
Pixel Detector Test at NM
FERMILAB
LAWRENCE BERKELEY LABORATORY

Request	8 May, 91	Unspecified
Approval	9 Sep, 91	Unspecified
Completed	23 Dec, 91	Unspecified

853 TEVATRON CRYSTAL EXTRACTION #853 — C. Thornton Murphy
BEAM: Collision Area (C-0)
A Test of Low Intensity Extraction from the Tevatron Using Channeling in a Bent Crystal
ARGONNE NATIONAL LABORATORY
UNIV. OF CALIFORNIA, LOS ANGELES
FAIRFIELD UNIVERSITY
FERMILAB
JINR, DUBNA (RUSSIA)
UNIVERSITY OF NEW MEXICO
SUNY AT ALBANY
PNPI, ST. PETERSBURG (RUSSIA)
IHEP, PROTVINO (SERPUKHOV)(RUSSIA)
SOUTWESTERN MEDICAL CENTER
UNIVERSITY OF TEXAS AT AUSTIN
VANDERBILT UNIVERSITY
UNIVERSITY OF VIRGINIA

Request	22 May, 91	100 Hours	of dedicated Tevatron time, during which only protons need to be circulating.
	10 May, 93	72 Hours	
Approval	10 May, 93	72 Hours	
Data Analysis	20 Feb, 96		

854 MUON FLUXES IN THE DEBUNCHER #854 — Alan D. Bross
BEAM: Debuncher Ring
Proposal to Measure the Flux of Ciculating Muons in the Debuncher.
COLUMBIA UNIVERSITY
FERMILAB

Request	11 Jul, 91	Unspecified
Approval	8 Jan, 92	Unspecified
Completed	8 Jan, 92	Unspecified

855 dE/dx MUONS #855 — George R. Kalbfleisch
BEAM: Neutrino Area - Muon Beam
Test Beam Request to Directly Measure dE/dx of High Energy Muons from 150 to 650 GeV/c in Muon Laboratory
UNIVERSITY OF OKLAHOMA
SSC LABORATORY

Request	3 Aug, 91	Unspecified
Approval	18 Nov, 91	Unspecified
Completed	8 Jan, 92	Unspecified

856 INTEGRATED PIXEL DETECTOR TEST#856 — Sherwood I. Parker
BEAM: Neutrino Area - Muon Beam
An Integrated Pixel Detector - Test Beam Request
UNIVERSITY OF HAWAII AT MANOA
LAWRENCE BERKELEY LABORATORY
STANFORD UNIVERSITY

Request	4 Oct, 91	Unspecified
Approval	11 Oct, 91	Unspecified
Completed	8 Jan, 92	Unspecified

857 SPIN-TENSOR #857 — L. I. Sarycheva
BEAM: Unspecified Beam
Proposal to measure all components of the depolarization tensor.
MOSCOW STATE UNIVERSITY (RUSSIA)

Request	10 Dec, 91	Unspecified
Inactive	23 Dec, 92	

858 ELASTIC SCATTERING SPIN EFFECTS #858 Alan D. Krisch
BEAM: Unspecified Beam
Spin Effects in High Proton-Proton Elastic Scattering

FERMILAB
INDIANA UNIVERSITY
JINR, DUBNA (RUSSIA)
KEK (JAPAN)
UNIVERSITY OF MICHIGAN - ANN ARBOR
MOSCOW STATE UNIVERSITY (RUSSIA)
UNIVERSITY OF NORTH CAROLINA
IHEP, PROTVINO (SERPUKHOV)(RUSSIA)

Request	6 Jan, 92	Unspecified
Rejected	30 Jul, 92	

859 CP VIOLATION IN HYPERON DECAY #859 Shao Yuan Hsueh
BEAM: Unspecified Beam
CP Violations in Hyperon Decay

FERMILAB

Request	2 Jan, 92	Unspecified
Withdrawn	13 Jan, 94	

860 SEARCH FOR NEUTRINO OSCILLATIONS#860 Wonyong Lee
BEAM: Debuncher Ring
A Search for Neutrino Oscillations using the Fermilab Debuncher.

BROOKHAVEN NATIONAL LABORATORY
COLUMBIA UNIVERSITY
FERMILAB
KANGNUNG NATIONAL UNIV. (KOREA)
KOREA UNIVERSITY, SEOUL (KOREA)
SEOUL NATIONAL UNIVERSITY (KOREA)

Request	14 Jan, 92	Unspecified
Withdrawn	17 Jan, 96	

861 ANTIPROTON DECAY #T861 Steve Geer
BEAM: Accumulator Ring
Test of Backgrounds for an Antiproton Decay Search Experiment at the Antiproton Accumulator

UNIV. OF CALIFORNIA, LOS ANGELES
FERMILAB
PENNSYLVANIA STATE UNIVERSITY

Request	10 Feb, 92	24 Hours
Completed	29 Oct, 92	

862 ANTI-HYDROGEN DETECTION #862 David C. Christian
BEAM: Accumulator Ring
Detection of Relativistic Anti-Hydrogen Atoms produced by Pair Production with Positron Capture

UNIV. OF CALIFORNIA, IRVINE
FERMILAB

Request	27 Aug, 92	Unspecified
In Progress	10 Nov, 96	
Data Analysis	18 Sep, 97	

863 NUCLEON SPIN #863 Aldo Penzo
BEAM: Meson Area - Polarized Proton Beam
Nucleon Spin Structure Studies with Polarized Proton and Antiproton Beams

ARGONNE NATIONAL LABORATORY
CEN-SACLAY (FRANCE)
CNRS, MARSEILLE (FRANCE)
UNIVERSITY OF IOWA
KYOTO SANGYO UNIVERSITY (JAPAN)
KYOTO UNIVERSITY (JAPAN)
KYOTO UNIV. OF EDUCATION (JAPAN)
LAPP, D'ANNECY-LE-VIEUX (FRANCE)
INFN, MESSINA (ITALY)
NEW MEXICO STATE UNIVERSITY
UN. OF OCCUP. & ENV. HEALTH(JAPAN)
OKAYAMA UNIVERSITY (JAPAN)
OSAKA CITY UNIVERSITY (JAPAN)
IHEP, PROTVINO (SERPUKHOV)(RUSSIA)
RICE UNIVERSITY
UNIVERSITY DI TRIESTE (ITALY)

Request	31 Aug, 92	7 Months
Rejected	7 Dec, 92	

864 MAXIMUM ACCEPTANCE DETECTOR #T864 James D. Bjorken and Cyrus C. Taylor
BEAM: Collision Area (C-0)
Maximum Acceptance Detector for the Fermilab Collider (MAX)

CASE WESTERN RESERVE UNIVERSITY
DUKE UNIVERSITY
FERMILAB
LOS ALAMOS NATIONAL LABORATORY
UNIVERSITY OF MICHIGAN - ANN ARBOR
SLAC
VIRGINIA TECH

Request	1 Sep, 92	Unspecified
Approval	24 May, 93	Unspecified
Completed	20 Dec, 95	

865 CHARM AND BEAUTY DECAYS #865 Daniel M. Kaplan
BEAM: Meson Area - East
High-Sensitivity Study of Charm and Beauty Decays.

ABILENE CHRISTIAN UNIVERSITY
UNIV. OF CALIFORNIA, LOS ANGELES
CEN-SACLAY (FRANCE)
CERN (SWITZERLAND)
CINVESTAV-IPN (MEXICO)
FERMILAB
ILLINOIS INSTITUTE OF TECHNOLOGY
IOWA STATE UNIVERSITY
UNIVERSITE DE LAUSANNE
NORTHERN ILLINOIS UNIVERSITY
UNIVERSITY OF SOUTH CAROLINA
UNIVERSITY OF TEXAS AT DALLAS

Request	1 Sep, 92	Unspecified
Withdrawn	4 Feb, 94	

866 ANTI(U-QUARK)/ANTI(D-QUARK) DIST#866 Michael J. Leitch
BEAM: Meson Area - East
Measurement of x distribution of the ratio of anti(u-quark) to anti(d-quark) in the proton

ABILENE CHRISTIAN UNIVERSITY
ARGONNE NATIONAL LABORATORY
FERMILAB
GEORGIA STATE UNIVERSITY
ILLINOIS INSTITUTE OF TECHNOLOGY
LOS ALAMOS NATIONAL LABORATORY
LOUISIANA STATE UNIVERSITY
NEW MEXICO STATE UNIVERSITY
OAK RIDGE NATIONAL LABORATORY
TEXAS A&M UNIVERSITY
VALPARAISO UNIVERSITY

Request	2 Sep, 92	Unspecified
Approval	7 Dec, 92	Unspecified
In Progress	14 Sep, 96	
Data Analysis	6 Aug, 97	

867	HIDDEN CHARM AND BEAUTY #867 BEAM: Proton Area - West A Proposal to Continue the Study of Hidden Charm and Beauty States by Triggering on High Transverse Momentum Single Muons and High Mass Dimuons in 800 GeV/c pN Interactions	Bradley B. Cox	UNIVERSITY OF SOUTH ALABAMA UNIV. OF CALIFORNIA, BERKELEY UNIV. OF CALIFORNIA, LOS ANGELES FERMILAB UNIVERSITY OF HOUSTON JINR, DUBNA (RUSSIA) UNIVERSITY OF LECCE (ITALY) MCGILL UNIVERSITY (CANADA) ACADEMY OF SCI. OF BSSR (BYELARUS) NANJING UNIVERSITY (PRC) NORTHWESTERN UNIVERSITY UNIVERSITY OF PAVIA (ITALY) UNIVERSITY OF PENNSYLVANIA PRAIRIE VIEW A&M UNIVERSITY SHANDONG UNIVERSITY (PRC) IHEP, TBILISI STATE UNIV (GEORGIA) VANIER COLLEGE (CANADA) UNIVERSITY OF VIRGINIA UNIVERSITY OF WISCONSIN - MADISON YEREVAN PHYSICS INST. (ARMENIA)
	Request 3 Sep, 92 Unspecified Rejected 28 Feb, 94		
868	ANTIPROTON DECAY #868 BEAM: Accumulator Ring Proposal to Search for Antiproton Decay at the Fermilab Antiproton Accumulator	Steve Geer	UNIV. OF CALIFORNIA, LOS ANGELES FERMILAB UNIVERSITY OF MICHIGAN - ANN ARBOR UNIVERSITY OF NEBRASKA PENNSYLVANIA STATE UNIVERSITY
	Request 24 Sep, 92 Unspecified Data Analysis 24 Jul, 95		
869	GEM DETECTOR AT THE SSC #869 BEAM: Meson Area - West Testing of Components for the GEM Detector at the Superconducting Super Collider Laboratory: A Proposal to the Fermi National Accelerator Laboratory	Barry C. Barish and William J. Willis	FERMILAB SSC LABORATORY
	Request 11 Nov, 92 Unspecified Withdrawn 4 Jan, 94		
870	PROTOTYPE DETECTORS FOR THE SDC #870 BEAM: Meson Area - Polarized Proton Beam PROTOTYPE DETECTORS FOR THE SDC #870	George H. Trilling	FERMILAB LAWRENCE BERKELEY LABORATORY SSC LABORATORY
	Request 1 Jan, 93 Unspecified Withdrawn 4 Jan, 94		
871	CP VIOLATION #871 BEAM: Meson Area - Center A Search for CP Violation in the Decays of Cascade minus / Anti-Cascade plus and Neutral Lambda / Neutral Anti-Lambda Hyperons	Kam-Biu Luk and Edmond Craig Dukes	IHEP, ACADEMIA SINICA (TAIWAN) UNIVERSITY OF SOUTH ALABAMA UNIV. OF CALIFORNIA, BERKELEY FERMILAB UNIVERSITY OF GUANAJUATO (MEXICO) ILLINOIS INSTITUTE OF TECHNOLOGY UNIVERSITE DE LAUSANNE LAWRENCE BERKELEY LABORATORY UNIVERSITY OF MICHIGAN - ANN ARBOR NEW MEXICO STATE UNIVERSITY UNIVERSITY OF VIRGINIA
	Request 21 Mar, 93 Unspecified Approval 29 Jun, 94 Unspecified Stage I approval. In Progress 20 Feb, 97		
872	TAU NEUTRINO #872 BEAM: Proton Area - West BEAM DUMP #872	Vittorio Paolone	AICHI UNIV. OF EDUCATION (JAPAN) UNIVERSITY OF ATHENS (GREECE) UNIV. OF CALIFORNIA, DAVIS CHANGWON NATIONAL UNIV. (KOREA) CHONNAM NATIONAL UNIVERSITY(KOREA) FERMILAB COLLEGE DE FRANCE (FRANCE) GYEONGSANG NATIONAL UNIV. (KOREA) KANSAS STATE UNIVERSITY KOBE UNIVERSITY (JAPAN) KON-KUK UNIVERSITY (KOREA) KOREAN NTNL.UN.OF EDUCATION(KOREA) UNIVERSITY OF MINNESOTA NAGOYA UNIVERSITY (JAPAN) OSAKA SCIENCE EDUC. INST. (JAPAN) UNIVERSITY OF SOUTH CAROLINA TOHO UNIVERSITY (JAPAN) TUFTS UNIVERSITY UTSUNOMIYA UNIVERSITY (JAPAN)
	Request 26 Mar, 93 Unspecified Approval 29 Jun, 94 Unspecified Stage I approval granted. 10 to the 18th protons-on-target minimum. In Progress 20 Feb, 97		
873	BOOSTER NEUTRINOS #873 BEAM: Booster Accelerator Letter of Intent to Perform a Neutrino Experiment using the Fermilab 8 GEV Booster	Fred J. Federspiel and H. White	LOS ALAMOS NATIONAL LABORATORY
	Request 21 Oct, 94 Unspecified Unconsidered 21 Oct, 94		
874	CHARGED PION LIFETIME #874 BEAM: Meson Area - West Precision Measurement of the Lifetime of Charged Pions	Steve Geer	DUKE UNIVERSITY FERMILAB UNIVERSITY OF NEBRASKA ROCKEFELLER UNIVERSITY
	Request 9 Nov, 94 Unspecified Withdrawn 16 Dec, 96		

875	NEUTRINO OSCILLATIONS #875 BEAM: Main Injector Area A Long-baseline Neutrino Oscillation Experiment at Fermilab	Stanley G. Wojcicki	ARGONNE NATIONAL LABORATORY IHEP, BEIJING (PRC) CALIFORNIA INSTITUTE OF TECHNOLOGY COLUMBIA UNIVERSITY FERMILAB INDIANA UNIVERSITY JINR, DUBNA (RUSSIA) LAWRENCE LIVERMORE LABORATORY LEBEDEV PHYSICAL INST. (RUSSIA) UNIVERSITY COLLEGE LONDON (ENGLAND) UNIVERSITY OF MINNESOTA ITEP, MOSCOW (RUSSIA) OAK RIDGE NATIONAL LABORATORY UNIVERSITY OF OXFORD (ENGLAND) PNPI, ST. PETERSBURG (RUSSIA) IHEP, PROTVINO (SERPUKHOV)(RUSSIA) RUTHERFORD-APPLETON LABS.(ENGLAND) STANFORD UNIVERSITY SUSSEX UNIVERSITY (ENGLAND) TEXAS A&M UNIVERSITY UNIVERSITY OF TEXAS AT AUSTIN TUFTS UNIVERSITY WESTERN WASHINGTON UNIVERSITY
	Request 9 Feb, 95 Unspecified Unscheduled 2 May, 95		
876	CDF HARD DIFFRACTION STUDIES #876 BEAM: Collision Area (B-0) Proposal for Hard Diffraction Studies in CDF	Mike G. Albrow	IHEP, ACADEMIA SINICA (TAIWAN) ARGONNE NATIONAL LABORATORY UNIVERSITY OF BOLOGNA (ITALY) BRANDEIS UNIVERSITY UNIV. OF CALIFORNIA, LOS ANGELES CIPP (CANADA) UNIVERSITY OF CHICAGO DUKE UNIVERSITY FERMILAB INFN, FRASCATI (ITALY) HARVARD UNIVERSITY HIROSHIMA UNIVERSITY (JAPAN) UNIVERSITY OF ILLINOIS, CHAMPAIGN JOHNS HOPKINS UNIVERSITY KEK (JAPAN) LAWRENCE BERKELEY LABORATORY MASSACHUSETTS INST. OF TECHNOLOGY UNIVERSITY OF MICHIGAN - ANN ARBOR MICHIGAN STATE UNIVERSITY UNIVERSITY OF NEW MEXICO OSAKA CITY UNIVERSITY (JAPAN) UNIVERSITY OF PADOVA (ITALY) UNIVERSITY OF PENNSYLVANIA INFN, PISA (ITALY) UNIVERSITY OF PITTSBURGH PURDUE UNIVERSITY UNIVERSITY OF ROCHESTER ROCKEFELLER UNIVERSITY RUTGERS UNIVERSITY TEXAS A&M UNIVERSITY TEXAS TECH UNIVERSITY UNIVERSITY OF TSUKUBA (JAPAN) TUFTS UNIVERSITY WASEDA UNIVERSITY (JAPAN) UNIVERSITY OF WISCONSIN - MADISON YALE UNIVERSITY
	Request 17 Jan, 95 Unspecified Data Analysis 20 Feb, 96		
877	AXION SEARCH #877 BEAM: Beam Not Applicable Measurement of the Magnetically-Induced QED Birefringence of the Vacuum and an Improved Laboratory Search for Axions	Siu Au Lee	COLORADO STATE UNIVERSITY FERMILAB JOINT INST. FOR LAB. ASTROPHYSICS SSC LABORATORY
	Request 28 Mar, 95 Unspecified Unconsidered 28 Mar, 95		
878	SPIN STRUCTURE FUNCTION PHYSICS #878 BEAM: Main Injector Area Spin Structure Function Physics at Fermilab.	Joel M. Moss	LOS ALAMOS NATIONAL LABORATORY
	Request 7 Nov, 95 Unspecified Unconsidered 7 Nov, 95		
879	B PHYSICS TEST BEAM PROGRAM #879 BEAM: Meson Area - Test Beam A Test Beam Program for Future B Physics Experiments at Fermilab	Joel N. Butler and Walter Selove	CARNEGIE-MELLON UNIVERSITY FERMILAB UNIVERSITY OF PENNSYLVANIA SYRACUSE UNIVERSITY
	Request 16 Mar, 95 Unspecified Unconsidered 16 Mar, 95		
880	B PHYSICS TEST BEAM PROGRAM #880 BEAM: Meson Area - Test Beam Proposal for Test Beam Running of the CLEO III RICH Detector	Sheldon L. Stone	CARNEGIE-MELLON UNIVERSITY FERMILAB UNIVERSITY OF MINNESOTA SYRACUSE UNIVERSITY WAYNE STATE UNIVERSITY
	Request 16 Mar, 95 Unspecified Unconsidered 16 Mar, 95 Data Analysis 19 May, 97		
881	AUGER PROJECT R&D #881 BEAM: Beam Not Applicable A Request for Fermilab R&D Support for the Pierre Auger Project.	Paul M. Mantsch	FERMILAB
	Request 6 Nov, 95 Unspecified Unscheduled 8 Oct, 96		
882	SEARCH FOR LOW MASS MONOPOLES #882 BEAM: Beam Not Applicable A Search for Low Mass Monopoles	George R. Kalbfleisch	UNIVERSITY OF OKLAHOMA
	Request 15 Aug, 95 Unspecified Unscheduled 23 Jul, 96		

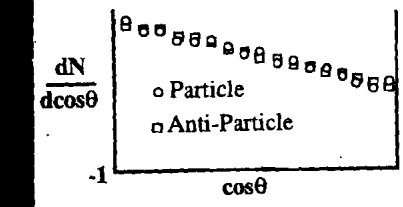
883	COSMIC RAY CALORIMETER CALIB. #883 BEAM: Meson Area - West Calibration of Cosmic Ray "Thin Ionization Calorimeter" Unconsidered 26 Oct, 95 Data Analysis 6 Aug, 97	James H. Adams	LEBEDEV PHYSICAL INST. (RUSSIA) MOSCOW STATE UNIVERSITY (RUSSIA) NAVAL RESEARCH LABORATORY
884	COSMIC RAY DETECTOR TEST #884 BEAM: Meson Area - West A proposal for a Beam Test of the Advanced Thin Ionization Calorimeter Detector Unconsidered 1 Feb, 96	Sun Kee Kim	LOUISIANA STATE UNIVERSITY UNIVERSITY OF MARYLAND MAX-PLANCK INSTITUTE (GERMANY) MOSCOW STATE UNIVERSITY (RUSSIA) NAVAL RESEARCH LABORATORY SEOUL NATIONAL UNIVERSITY (KOREA) SOUTHERN UNIVERSITY, BATON ROUGE
885	SLOAN DIGITAL SKY SURVEY #885 BEAM: Beam Not Applicable SLOAN DIGITAL SKY SURVEY Unscheduled 9 Feb, 96	Richard G. Kron	FERMILAB
886	PICOSECOND X-RAY SOURCE #886 BEAM: A0 Facility Compton Scattering X-Ray Experiments at the Fermilab Electron Source Facility Unscheduled 8 Oct, 96	Patrick L. Colestock and Adrian C. Melissinos	FERMILAB UNIVERSITY OF ROCHESTER
887	PET ACCELERATOR #887 BEAM: Beam Not Applicable A RFQ Linear Accelerator for PET Isotope Production Unscheduled 21 Jun, 95	Ralph Pasquinelli	FERMILAB
888	P-BAR+NUCLEI STUDIES #888 BEAM: Main Injector Area P-Bar + A Studies of the Nuclear Equation-of-State Unconsidered 15 Jul, 96	Vic. E. Viola	INDIANA UNIVERSITY
889	NEUTRINOS AT THE BOOSTER #889 BEAM: Booster Accelerator Letter of Intent to Study Neutrino Oscillations Using the Fermilab Booster Beam Unconsidered 6 Aug, 96	Alexander Abashian	VIRGINIA TECH
890	PLASMA WAKE-FIELD ACCELERATOR #890 BEAM: A0 Facility Advanced Accelerator Test at the Fermilab Electron Source Facility Unscheduled 8 Oct, 96	James R. Rosenzweig	UNIV. OF CALIFORNIA, LOS ANGELES FERMILAB
891	DARK MATTER SEARCH #891 BEAM: Beam Not Applicable The Cryogenic Dark Matter Search (CDMS) Unscheduled 4 Mar, 96	Roger L. Dixon	FERMILAB
892	CMS AT FERMILAB #892 BEAM: Beam Not Applicable The U.S. Compact Muon Solenoid (CMS) Collaboration at Fermilab Unscheduled 8 Oct, 96	Daniel R. Green	FERMILAB
893	LHC ACCELERATOR #893 BEAM: Beam Not Applicable Design and Construction of Interaction Regions at the CERN Large Hadron Collider (LHC) Unscheduled 8 Oct, 96	James B. Strait	FERMILAB
894	CPT TEST #894 BEAM: Main Injector Area An Experiment Studying Kl - Ks Interference to Test CPT Conservation at the Planck Scale Unconsidered 7 Oct, 96	Gordon B. Thomson	RUTGERS UNIVERSITY TRIUMF (CANADA)
895	PIXEL DETECTOR TEST #895 BEAM: Meson Area - Test Pixel Detector Test Withdrawn 28 Jan, 98	Simon Kwan	FERMILAB
896	RADIO COHERENCE TEST #896 BEAM: Main Injector Area Test of the Principle of Radio Coherence Unconsidered 4 Nov, 96	David Besson	UNIVERSITY OF KANSAS

897	BTeV #897 BEAM: Collision Area (C-0) BTeV: A Heavy Quark Program at C0 +----------+ Unconsidered 18 May, 97	Joel N. Butler and Sheldon Stone	UNIV. OF CALIFORNIA, DAVIS CARNEGIE-MELLON UNIVERSITY CBPF (BRAZIL) UNIVERSITY OF COLORADO AT BOULDER FERMILAB UNIVERSITY OF FLORIDA ILLINOIS INSTITUTE OF TECHNOLOGY UNIVERSITY OF ILLINOIS, CHAMPAIGN INFN, MILANO (ITALY) UNIVERSITY OF MINNESOTA NANJING UNIVERSITY (PRC) NEW MEXICO STATE UNIVERSITY SUNY AT ALBANY NORTHWESTERN UNIVERSITY OHIO STATE UNIVERSITY INFN, PAVIA (ITALY) UNIVERSITY OF PENNSYLVANIA UNIV.OF PUERTO RICO - MAYAGUEZ UNIV.OF SCI & TECH., HEFEI (PRC) SHANDONG UNIVERSITY (PRC) SYRACUSE UNIVERSITY UNIVERSITY OF TENNESSEE, KNOXVILLE TUFTS UNIVERSITY VALPARAISO UNIVERSITY VANDERBILT UNIVERSITY UNIVERSITY OF WISCONSIN - MADISON YALE UNIVERSITY
898	MiniBooNE #898 BEAM: Booster Accelerator An Experiment to Measure nu-mu->nu-e Oscillations and nu-mu Disappearance at the Fermilab Booster +----------+ Unconsidered 16 May, 97	Janet M. Conrad and William Charles Louis	UNIV.OF CALIFORNIA, RIVERSIDE UNIVERSITY OF CINCINNATI COLUMBIA UNIVERSITY) EMBRY RIDDLE AERONAUTICAL UNIV. FERMILAB LOS ALAMOS NATIONAL LABORATORY LOUISIANA STATE UNIVERSITY LOUISIANA TECH UNIVERSITY
899	PARTICLE PRODUCTION #899 BEAM: Collision Area (C-0) Particle Production at Zero Degrees from the +----------+ Rejected 16 May, 97	Michael Longo	CASE WESTERN RESERVE UNIVERSITY LOUISIANA STATE UNIVERSITY UNIVERSITY OF MICHIGAN FERMILAB UNIVERSITY OF TENNESSEE
900	D-0 FORWARD PROTON DETECTOR #900 BEAM: Collision Area (D-0) A Forward Proton Detector at D-0 +----------+ Unconsidered 17 Sep, 97	Harry Weerts and Hugh E. Montgomery	INST.OF PHYS.ACADEMY OF SCI(CZECH) UNIVERSIDAD DE LOS ANDES(COLOMBIA UNIVERSITY OF ARIZONA BOSTON UNIVERSITY BROOKHAVEN NATIONAL LABORATORY BROWN UNIVERSITY UNIVERSIDAD DE BUENOS AIRES UNIV. OF CALIFORNIA, DAVIS UNIV. OF CALIFORNIA, IRVINE UNIV. OF CALIFORNIA, RIVERSIDE CBPF (BRAZIL) CEN-SACLAY (FRANCE) CHARLES UNIVERSITY (CZECH) CINVESTAV-IPN (MEXICO) COLUMBIA UNIVERSITY CZECH TECHNICAL UNIVERSITY (CZECH) DELHI UNIVERSITY (INDIA) FERMILAB FLORIDA STATE UNIVERSITY UNIVERSITY OF HAWAII AT MANOA UNIV. OF ILLINOIS, CHICAGO CIRCLE INDIANA UNIVERSITY IOWA STATE UNIVERSITY JINR, DUBNA (RUSSIA) UNIVERSITY OF KANSAS KOREA UNIVERSITY, SEOUL (KOREA) INP, KRAKOW (POLAND) KYUNGSUNG UNIVERSITY, PUSAN(KOREA) LAWRENCE BERKELEY LABORATORY LOUISIANA TECH UNIVERSITY UNIVERSITY OF MARYLAND UNIVERSITY OF MICHIGAN - ANN ARBOR MICHIGAN STATE UNIVERSITY MOSCOW STATE UNIVERSITY (RUSSIA) ITEP, MOSCOW (RUSSIA) UNIVERSITY OF NEBRASKA SUNY AT STONY BROOK NEW YORK UNIVERSITY NORTHEASTERN UNIVERSITY NORTHERN ILLINOIS UNIVERSITY NORTHWESTERN UNIVERSITY NOTRE DAME UNIVERSITY UNIVERSITY OF OKLAHOMA PANJAB UNIVERSITY (INDIA) PNPI, ST. PETERSBURG (RUSSIA) IHEP, PROTVINO (SERPUKHOV)(RUSSIA) PURDUE UNIVERSITY RICE UNIVERSITY UNIV. FEDERAL DO RIO DE JANEIRO UNIVERSITY OF ROCHESTER SEOUL NATIONAL UNIVERSITY (KOREA) TATA INSTITUTE (INDIA) TEXAS A&M UNIVERSITY UNIVERSITY OF TEXAS AT ARLINGTON
901	RECYCLER ELECTRON COOLING #901 BEAM: Beam Not Applicable Recycler Medium Energy Electron Cooling Experiment +----------+ Unscheduled 14 Nov, 97	Gerald Jackson	IHEP, BEIJING (PRC) BUDKER INST. NUCLEAR PHYS (RUSSIA) FERMILAB INDIANA UNIVERSITY
902	EXOTIC ATOMS #902 BEAM: Main Injector Area Particle Mass Measurement and Strong Interaction Studies with Exotic Atoms Using X-Ray Crystal Spectrometer +----------+ Unconsidered 24 Sep, 97	Yuri M. Ivanov	PNPI, ST. PETERSBURG (RUSSIA)

*** End of Report ***

E-871

$$\frac{dN}{d\cos\theta} = 1/2\,(1 + \alpha_\Xi \alpha_\Lambda \cos\theta)$$



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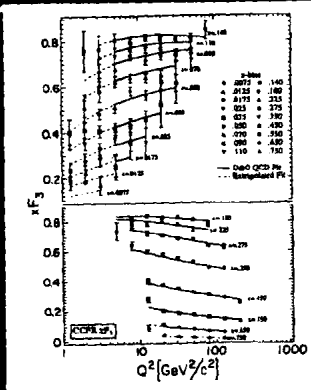
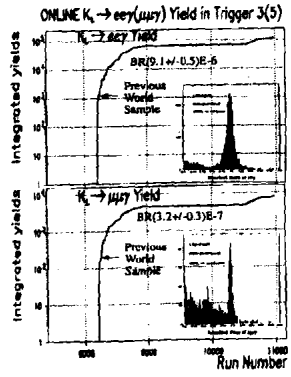


KTeV
E-799



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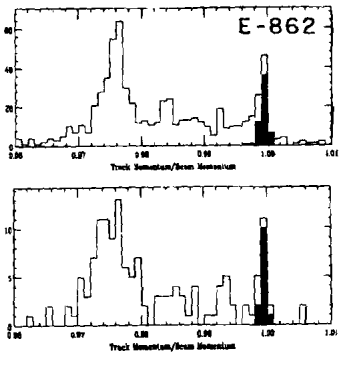
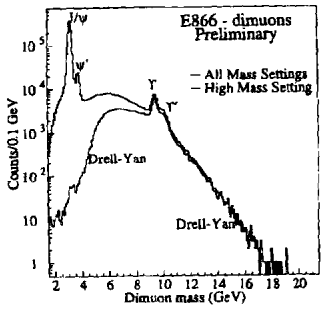
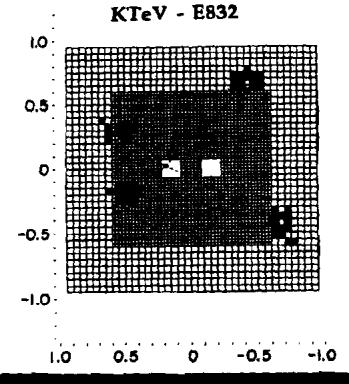


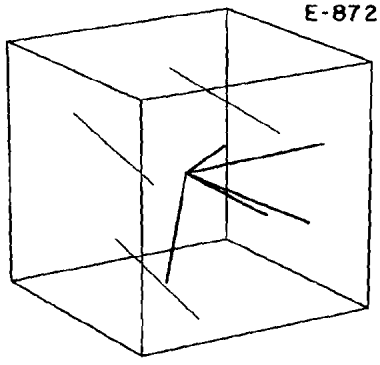
Dimuon Mass Spectra



KTeV - E832



E-872



E-781