Fermilab Research Program 1996

Workbook

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INTRODUCTION

The Fermilab Research Program Workbook is now into its third decade (the first one was produced in June 1975). Although its original intent was to provide program information to the Physics Advisory Committee's annual extended meeting, it now provides a yearly "snapshot" of the Fermilab program, including the progress in analyzing experiments that have completed their data-taking.

Major contributions to this Workbook have come from many people, especially Angela Gonzales for the artwork, Jud Parker for the upkeep of databases, Taiji Yamanouchi for advice and encouragement, and Jackie Coleman who puts it all together.

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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	Withdrawn/Inactive	Proposals that were not considered at the request of the spokesperson or that are no longer being considered for other reasons.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, 882 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	Feb 1996
APPROVED PROPOSALS																											
Completed	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
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
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
PENDING PROPOSALS																											
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
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
"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
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
OBSOLETE PROPOSALS																											
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
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
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
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

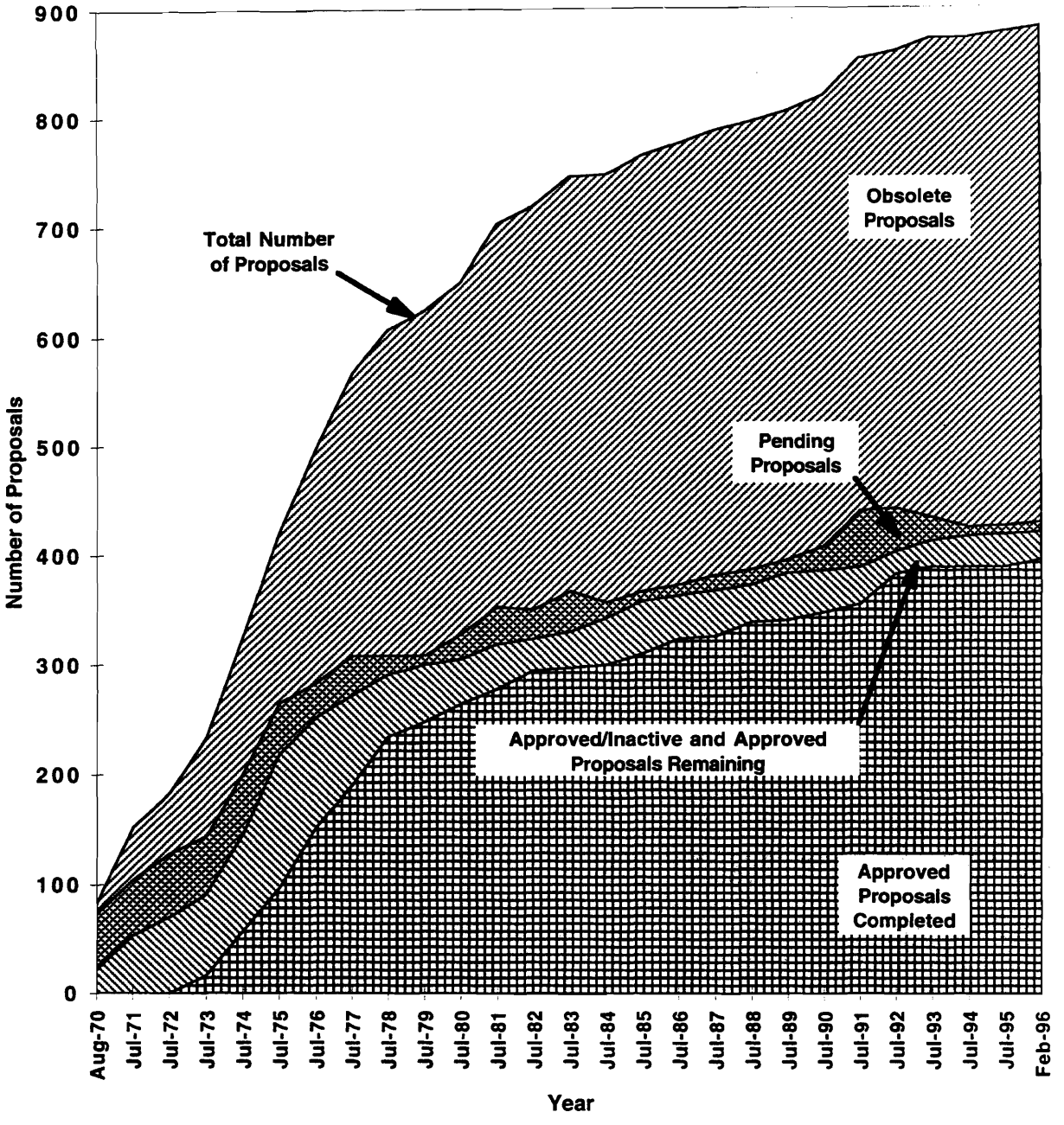


Figure 1. Growth of the Fermilab research program. The total number of approved experiments is obtained by adding the numbers shown as completed and those remaining and approved/inactive. Pending proposals are those which are unconsidered, deferred or "not approved"; obsolete proposals are rejected or withdrawn/inactive. Note that in this figure and in Table 1, "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 1987, 1990 and 1991.

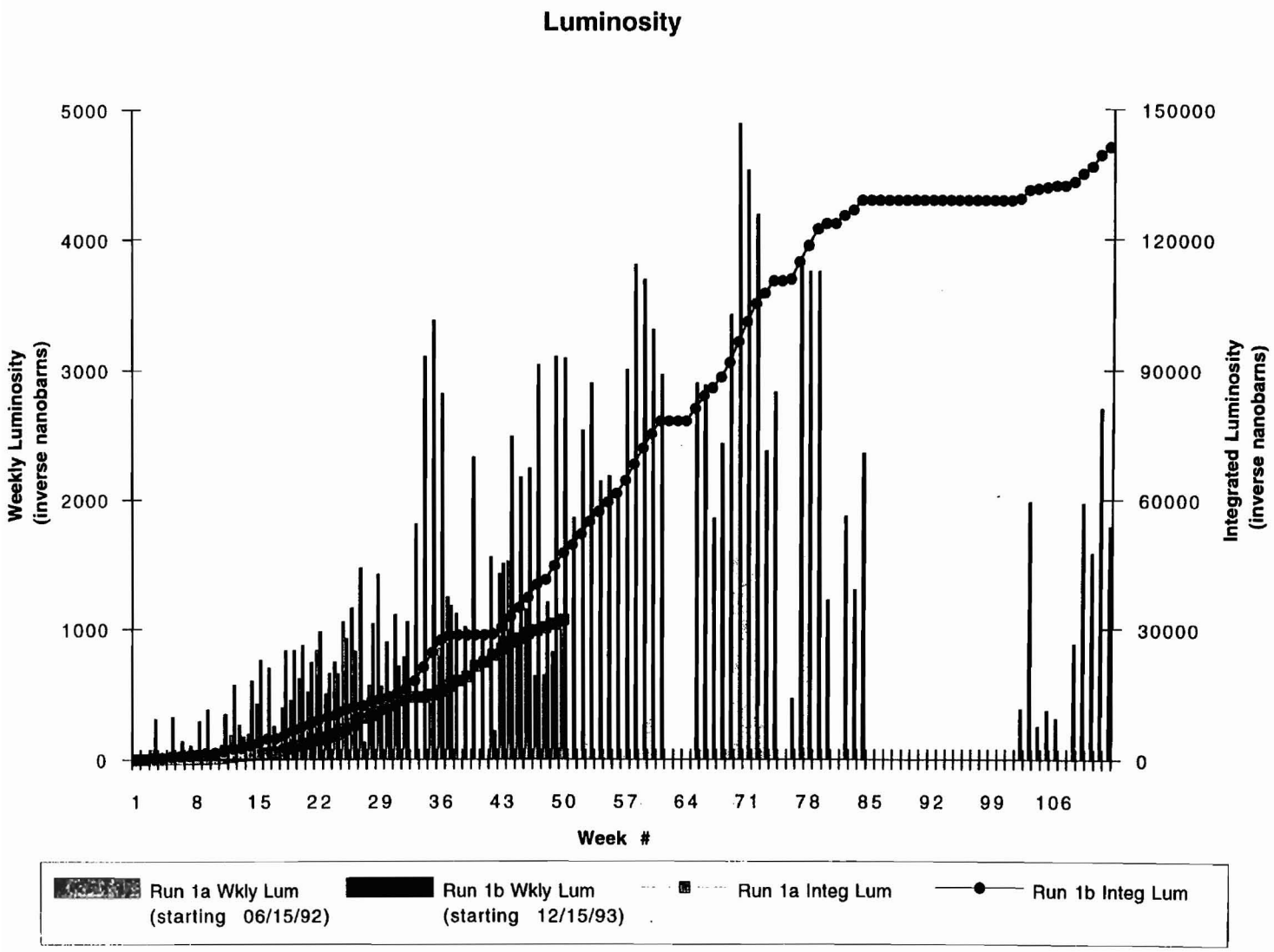


Figure 2. Tevatron Collider operation during the 1992-1993 and 1994-96 running periods - luminosity per week and integrated luminosity.

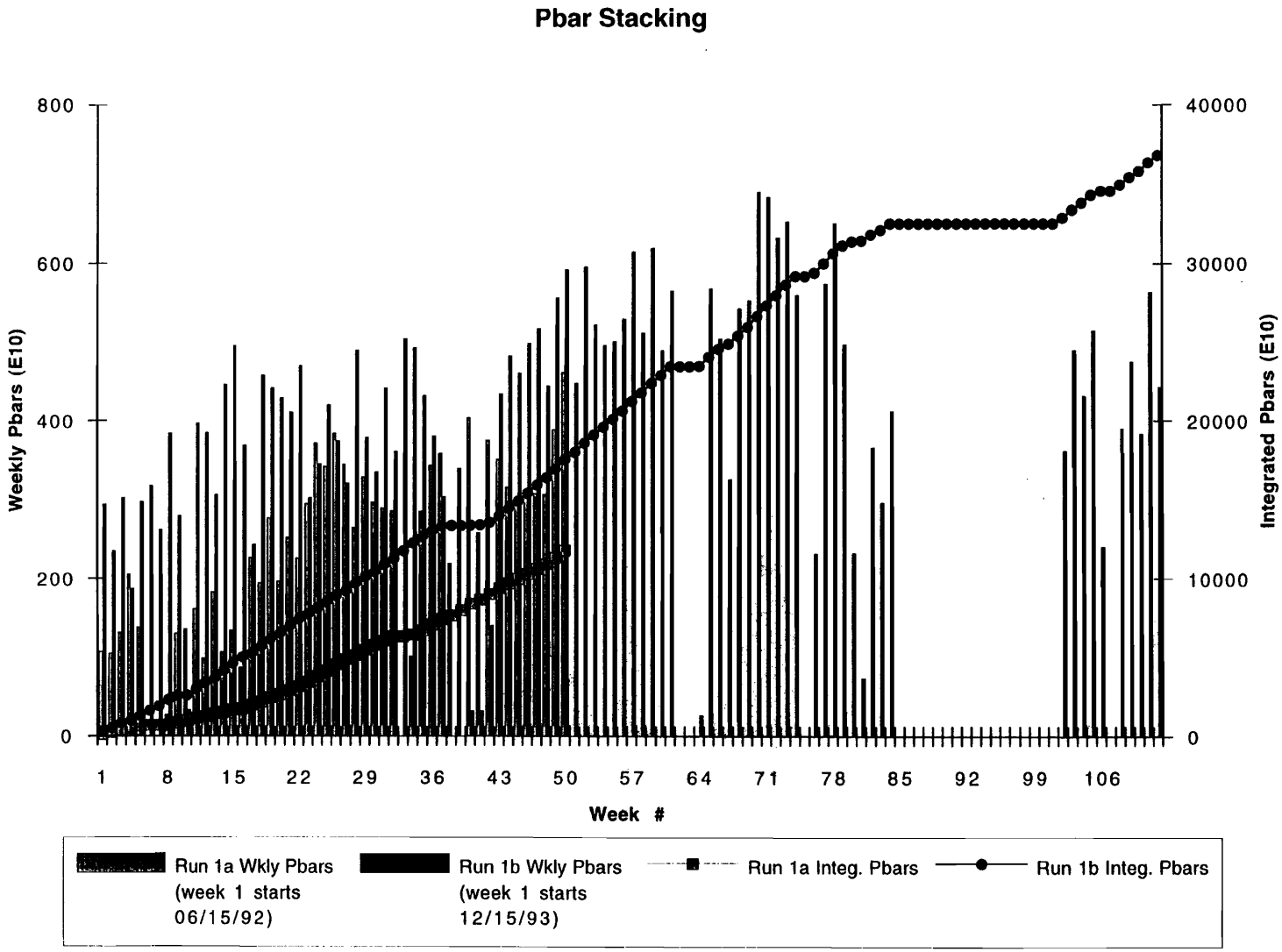


Figure 3. Tevatron Collider operation during the 1992-1993 and 1994-96 running periods - antiproton stacking per week and integrated stacking.

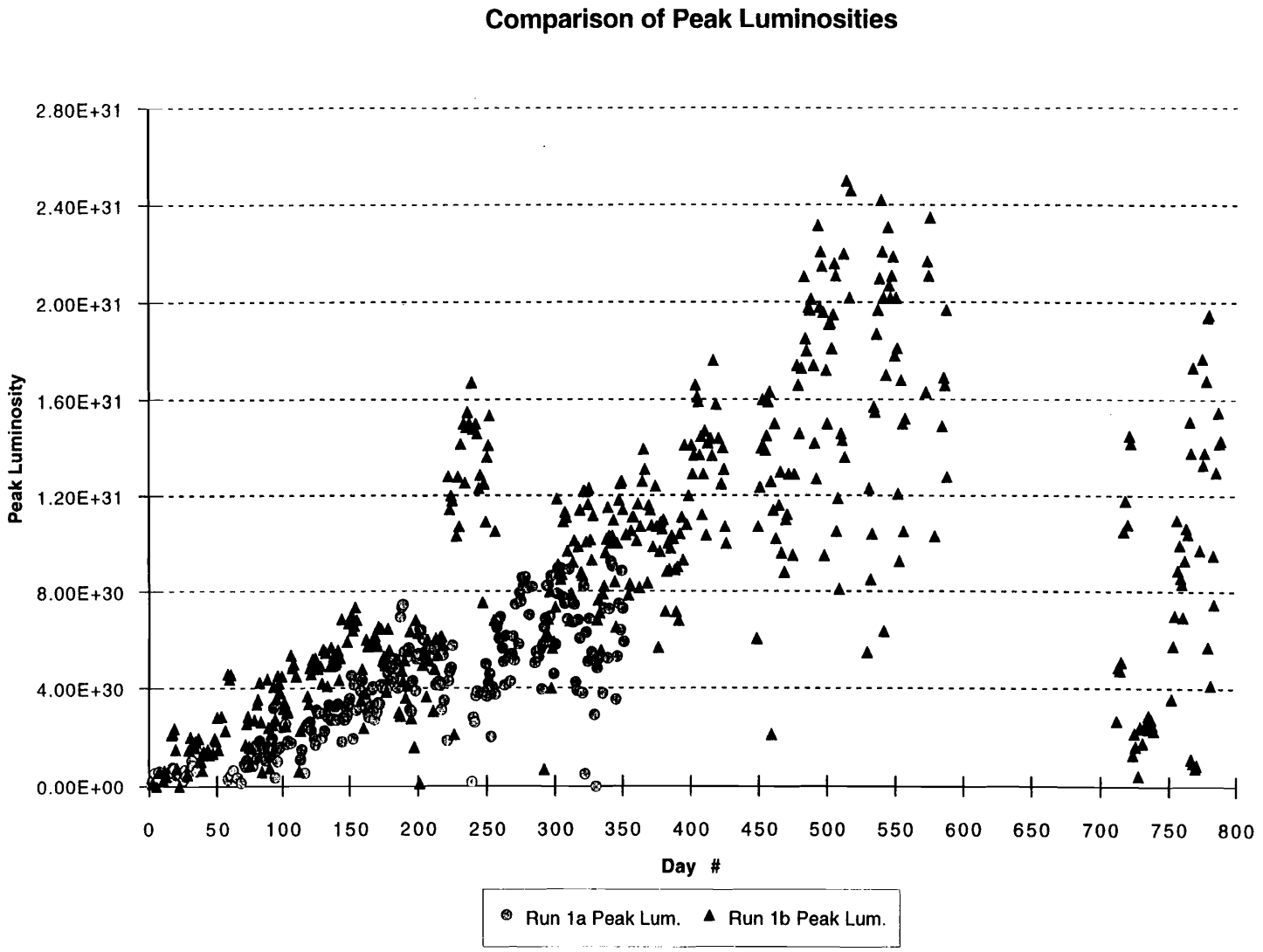


Figure 4. Tevatron Collider operation during the 1992-1993 and 1994-96 running periods - daily peak luminosity.

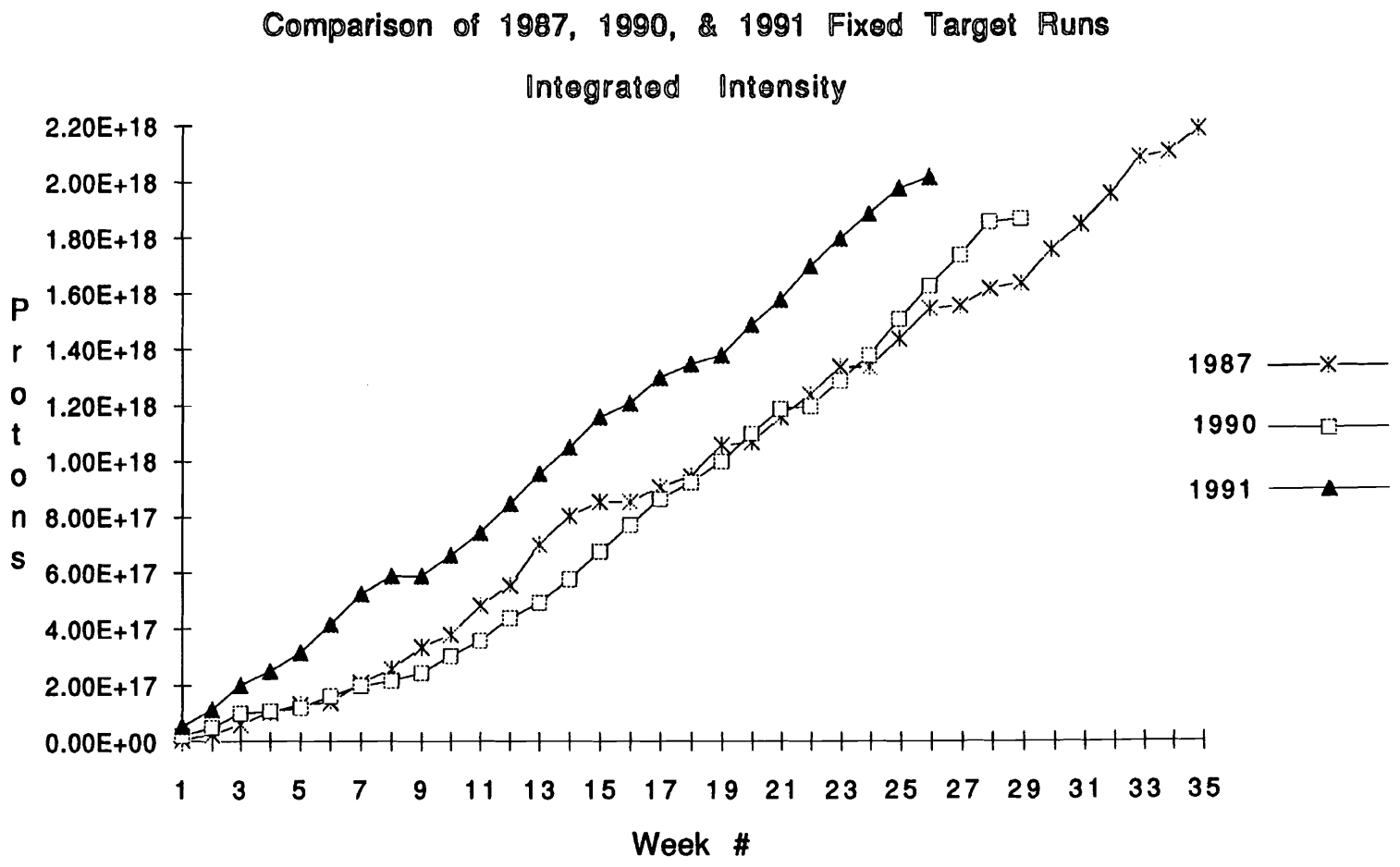


Figure 5. Integrated intensity for the 1987, 1990 and 1991 Fixed Target running periods.

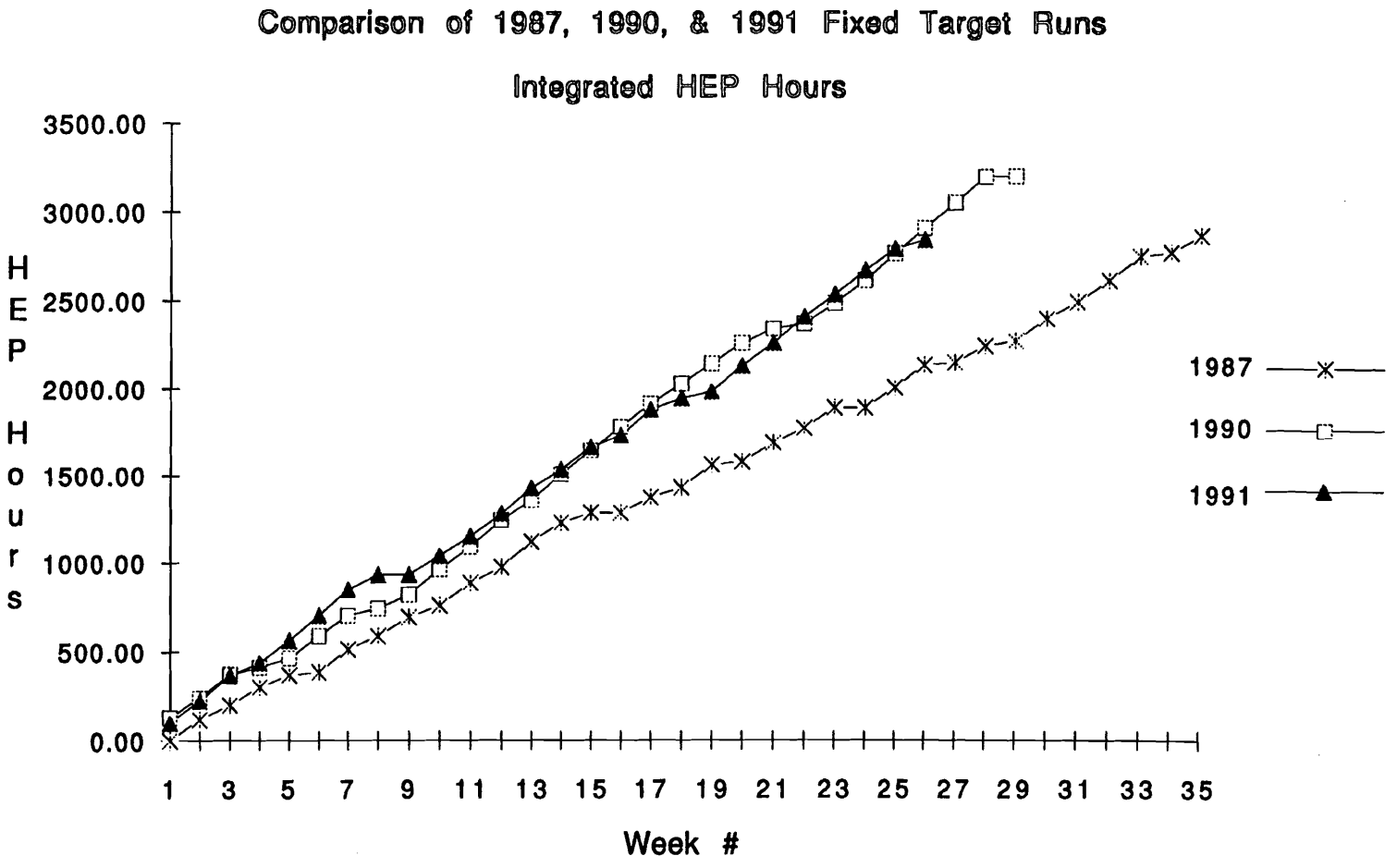


Figure 6. Integrated high energy physics hours for the 1987, 1990 and 1991 Fixed Target running periods.

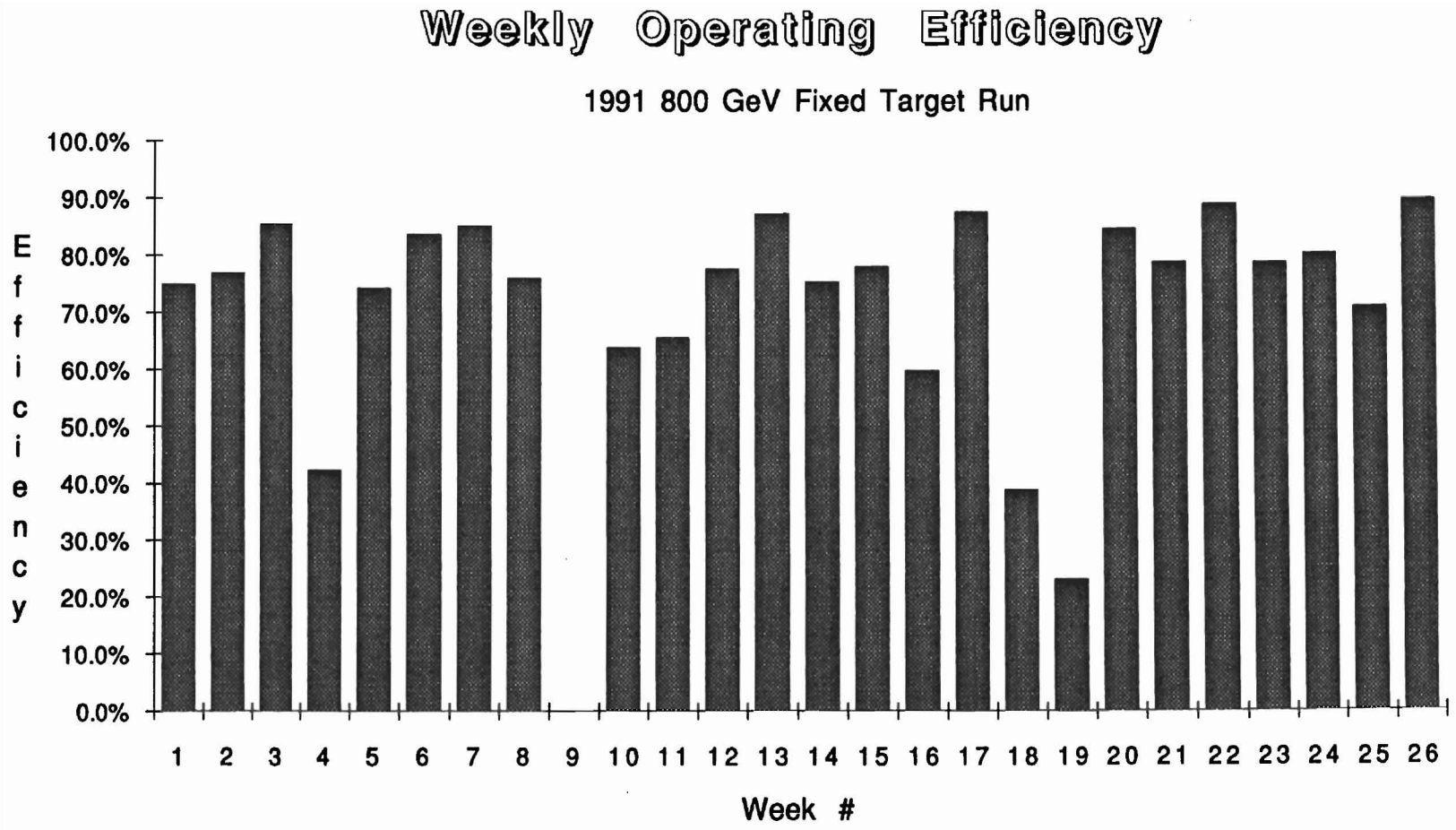


Figure 7. Weekly Operating Efficiency - 1991 Fixed Target Run

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 not yet completed 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). For the 1996 fixed-target run, Tevatron intensities are expected to be ~3×10^{13} protons per ~20 sec spill every ~60 seconds, to be shared amongst the several running experiments.

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		Neutrino Beam
						1.5×10^8 ν_τ		
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	$\pi^-, \Sigma^-, \Xi^-, \Omega^-$, $\pi^+, p, \Sigma^+, \Xi^+$, $\bar{\Omega}^+$	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	$\approx 4 \times 10^7$		

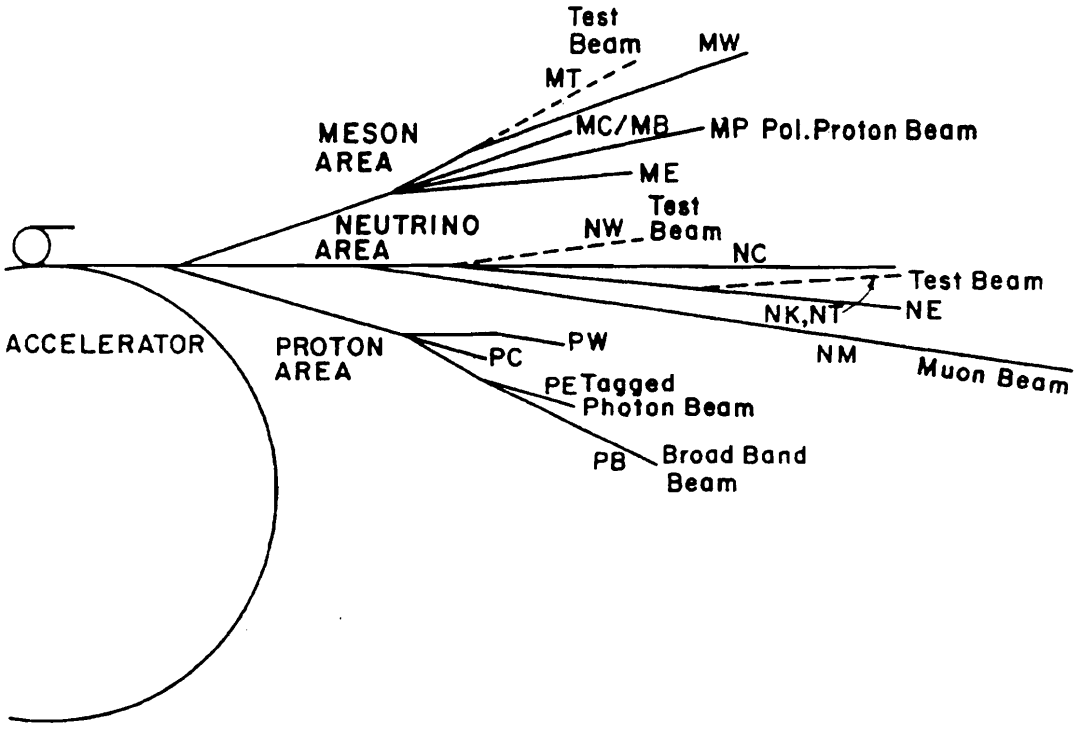


Figure 8. Layout of Fermilab Fixed Target beams. Properties of individual beams are given in Table 2.

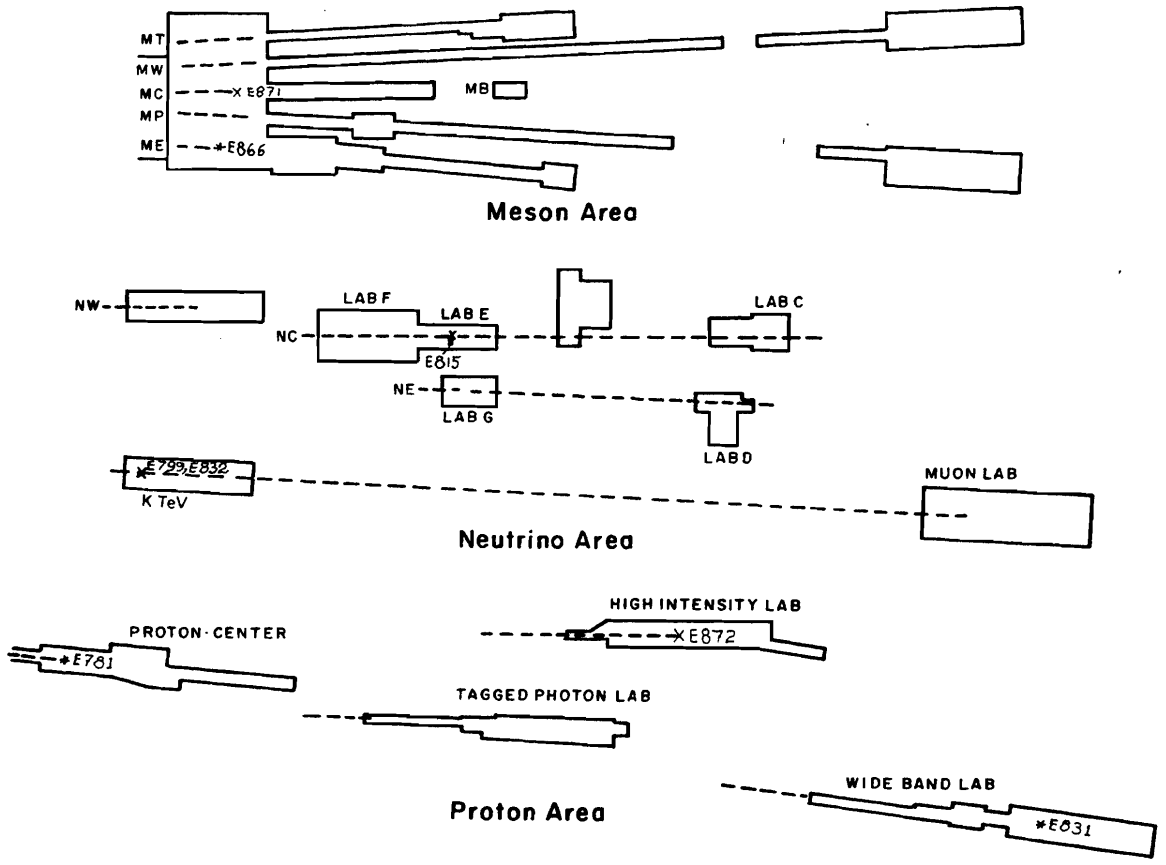


Figure 9. Schematic of the Fixed Target experimental areas with locations of major experiments currently approved for the next Fixed Target run. Not shown are experiments E-803 and E-875, which will use a neutrino beam from the Main Injector. The drawings are not to scale.

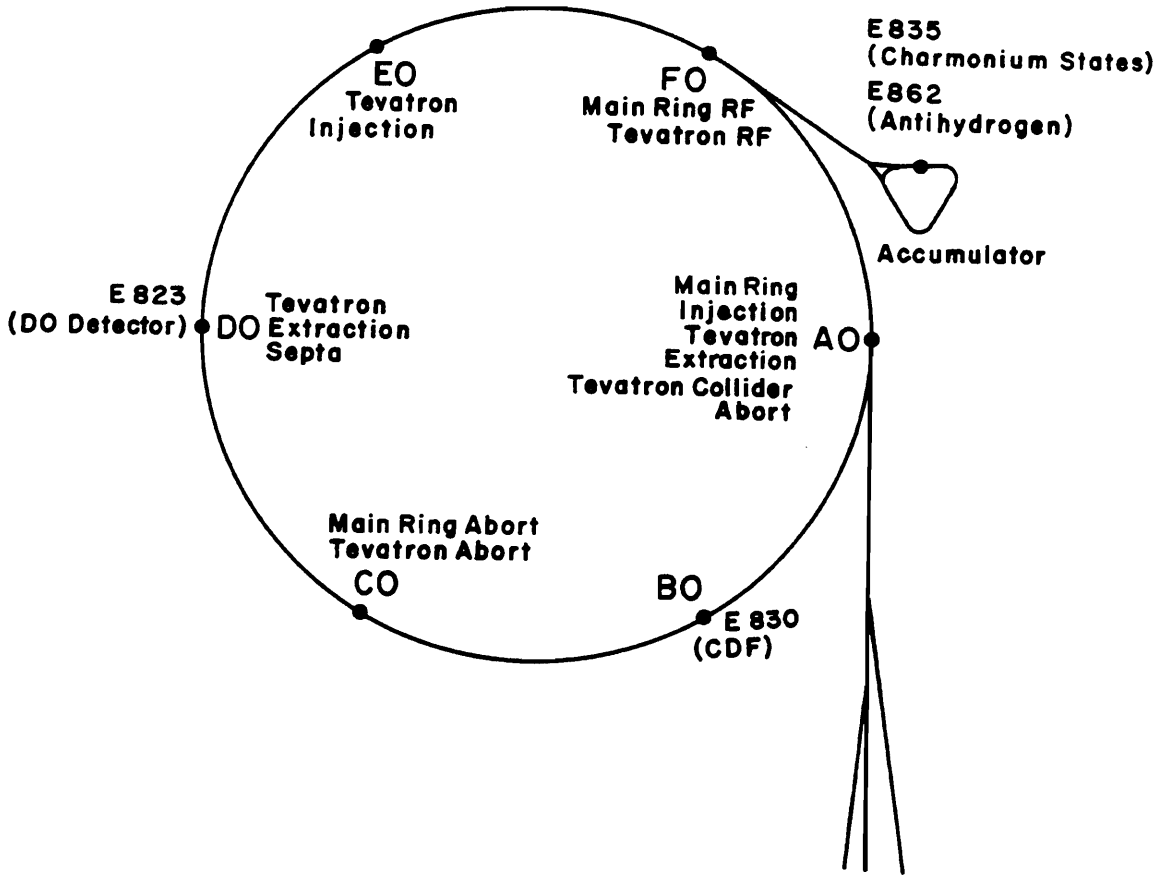


Figure 10. Locations in the Tevatron of the approved $p\bar{p}$ Collider experiments and the two experiments using the Antiproton Accumulator.

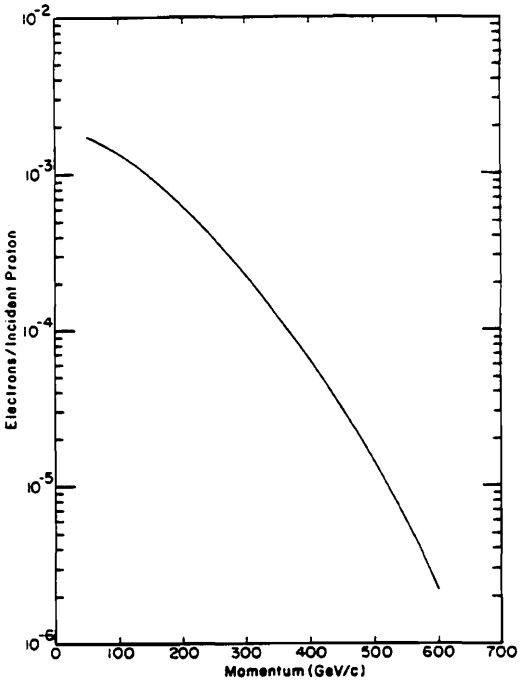


Figure 11.

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

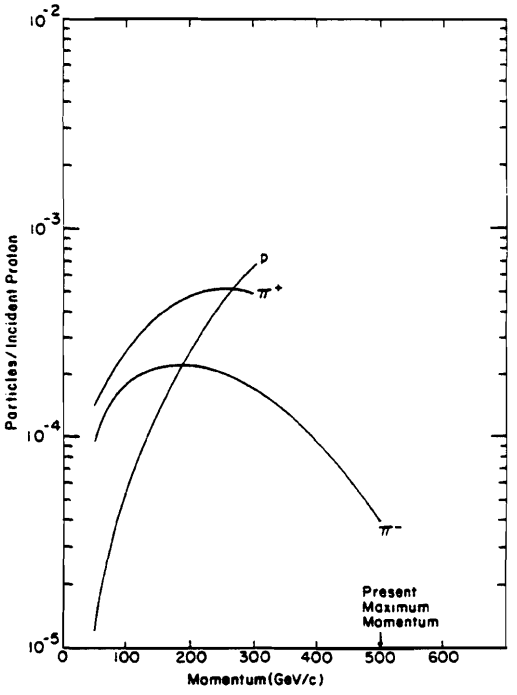


Figure 12.

Proton Area: Hadron flux in the Tagged Photon Laboratory.

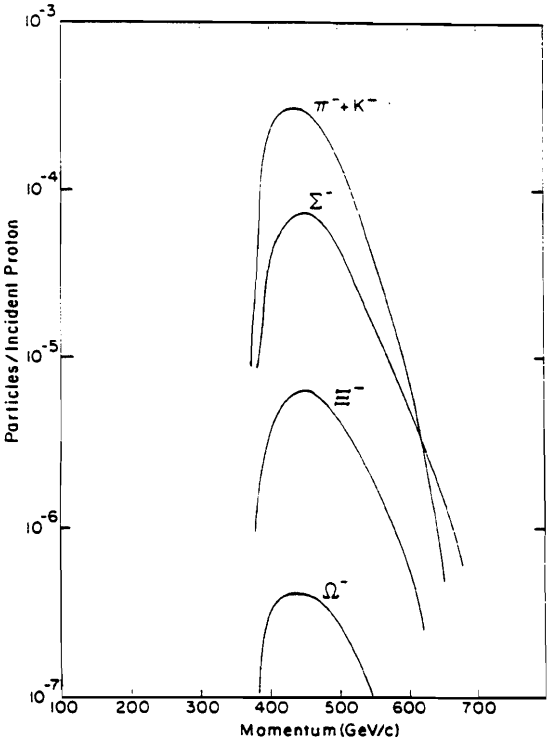


Figure 13.

Proton Area: Fluxes in the Proton Center Hyperon Facility.

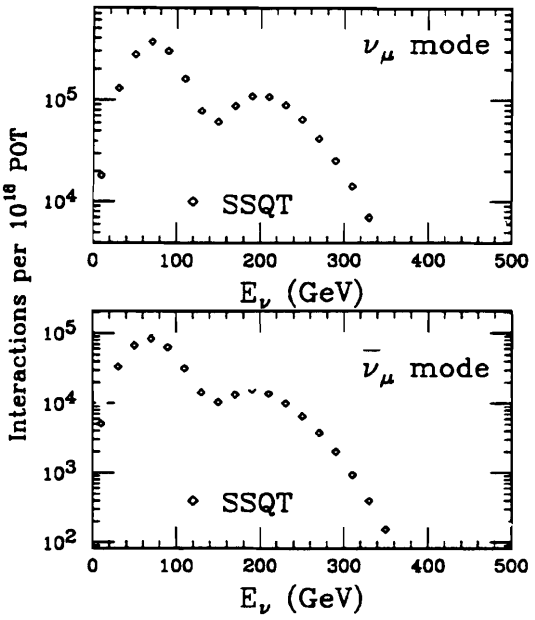


Figure 14.

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

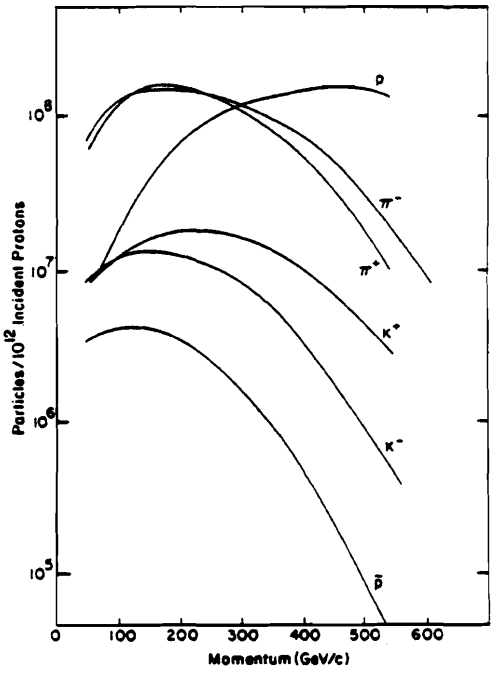


Figure 15.

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. Future editions of this Workbook will provide more information as it becomes available.

It should be noted that there are some other future new experimental area possibilities under consideration. Examples are an experimental area to use 400 MeV protons from the Linac, and 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 $\sim 1\times10^{32}\text{cm}^{-2}\text{sec}^{-1}$ 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.]

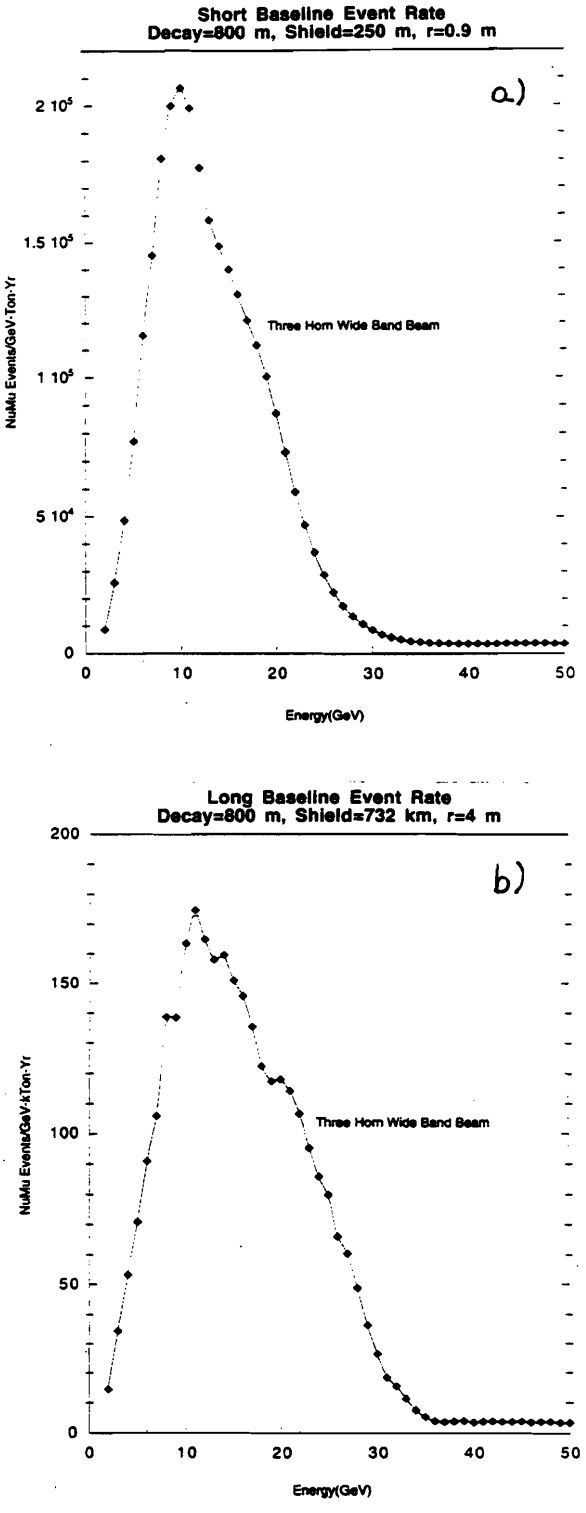


Figure 16. Main Injector, 120 GeV protons: Neutrino event rates for a) short-baseline (per ton), and b) long-baseline (per kton). One year is taken as 3.7×10^{20} incident protons.

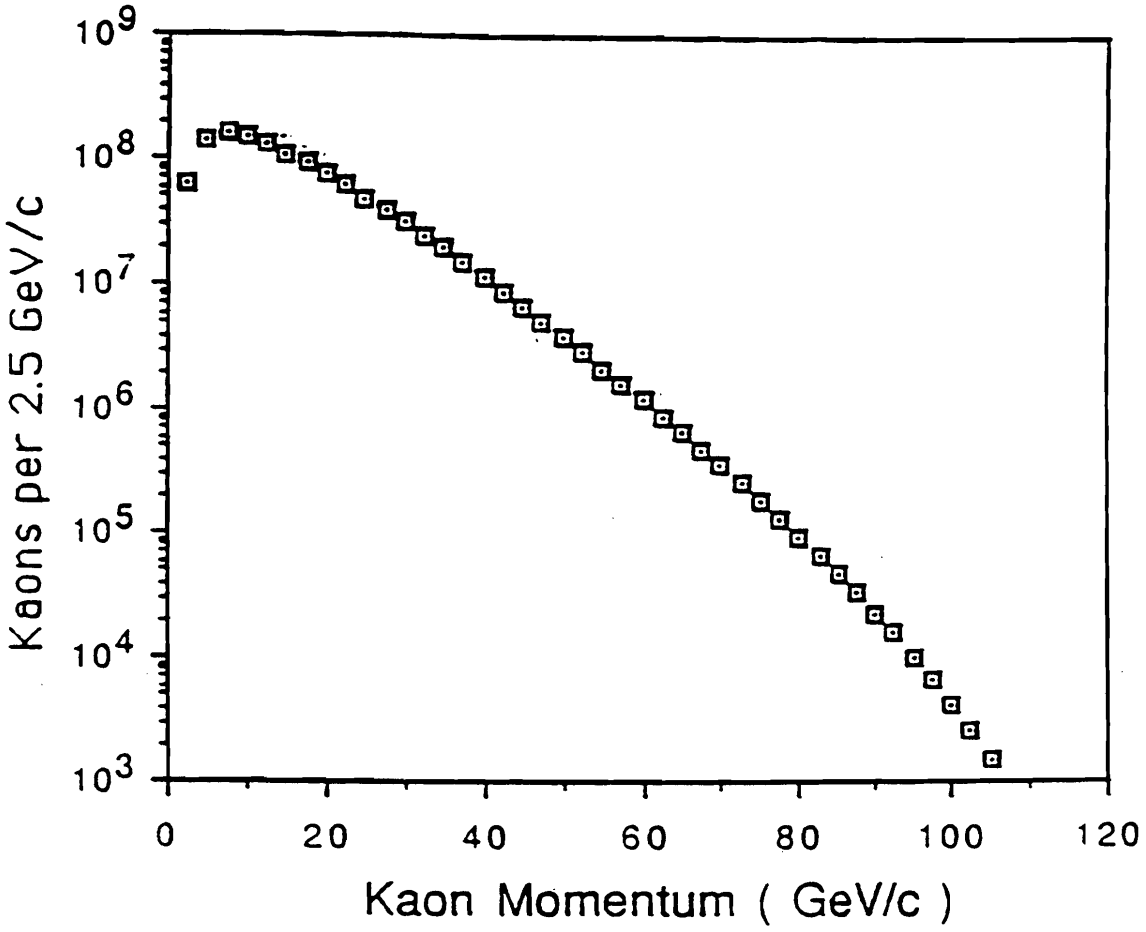


Figure 17. Main Injector: K^0 flux per 2.5 GeV assuming 3×10^{13} protons on a 50 cm target, 12 μstr beam, at 24 mrad targeting angle, including absorbers and filters.

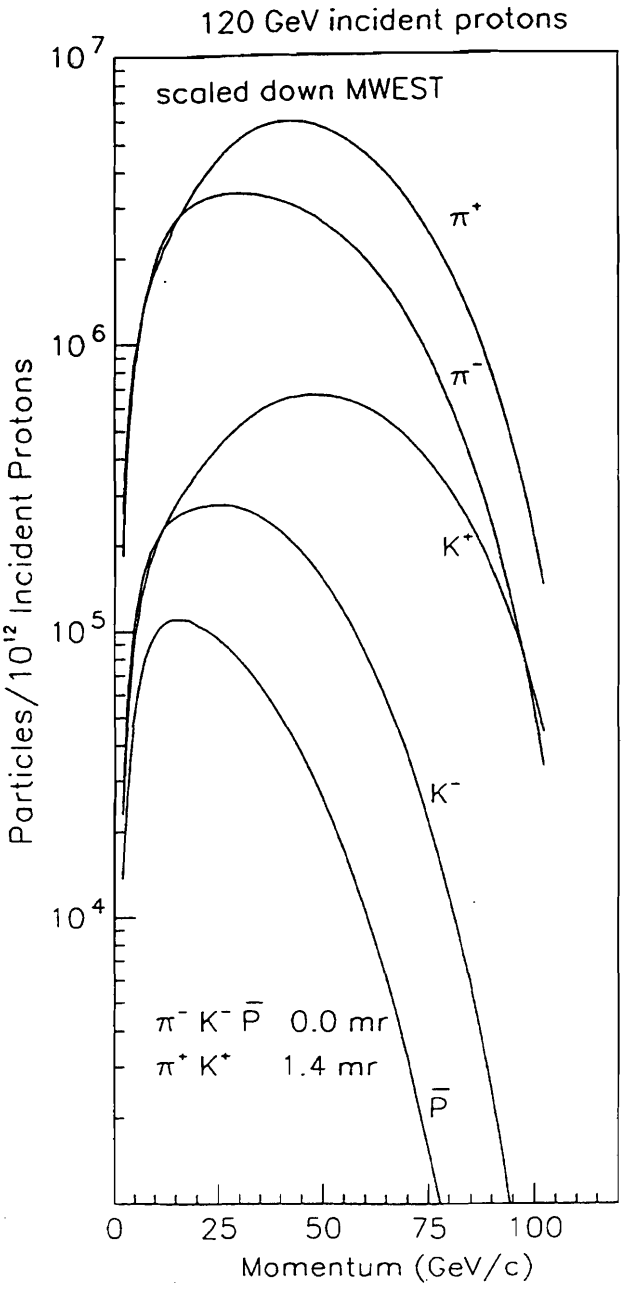


Figure 18. Main Injector: Fluxes in the MW beamline.

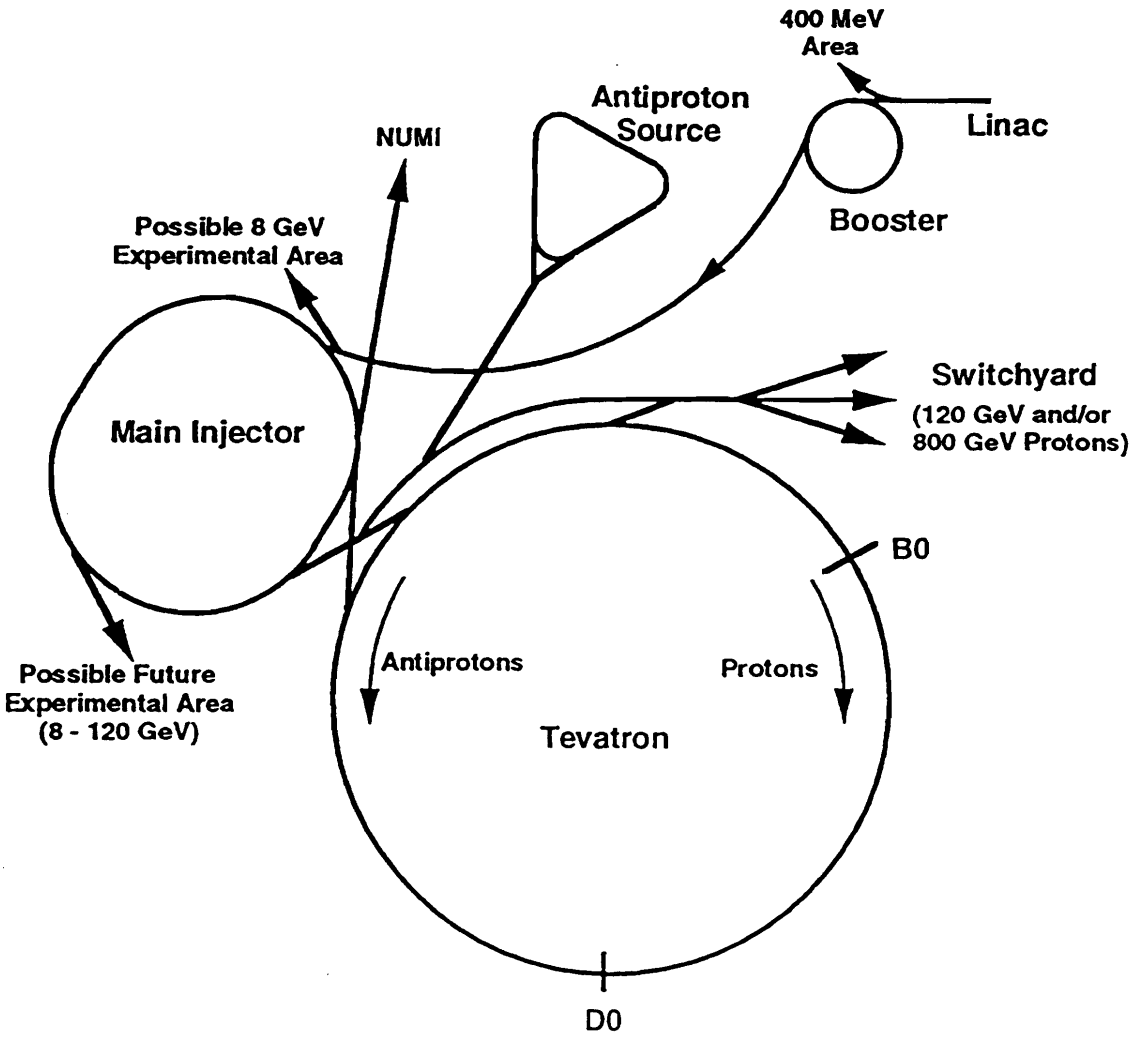


Figure 19. Schematic layout of possible future experimental areas. (Note that NUMI is the proposed neutrino beamline from the Main Injector.)

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 and Monte Carlo) and providing support for experimental activities.

The systems currently supported centrally by the Computing Division include the UNIX Farms and the FNALU and CLUBS UNIX systems. The Computing Division also supports a VAX/Alpha cluster FNALD and the UNIX systems for CDF, and the VAX/Alpha clusters and UNIX systems for D0. The multiprocessor farm systems composed of commercial workstations dominate the installed computing capacity at the lab and have allowed CDF and D0 to reconstruct events as fast as the data is accumulated in a very cost-effective manner. A production system for the Sloan Digital Sky Survey is also being commissioned. Other systems include the mail server FNAL and the tape copy facilities.

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 collaborations to function efficiently.

The Feynman Computing Center is rapidly developing into a major data center. Three tape libraries provide approximately 35 Terabytes of robotically-accessible tape storage. This number is expected to grow significantly over the next few years. Several hundreds of terabytes of additional data reside in the tape vault. Hundreds of tape drives and more than nearly three terabytes of spinning disk are also online at present.

The computing power delivered by the central farm systems reached almost 6000 VUPs (VAX 11/780 equivalents) per month in late 1995 and has stayed approximately at that level. Many thousands of additional VUPs are delivered by other systems for physics analysis and simulation. Figures 20-21 illustrate computer usage over the past few years.

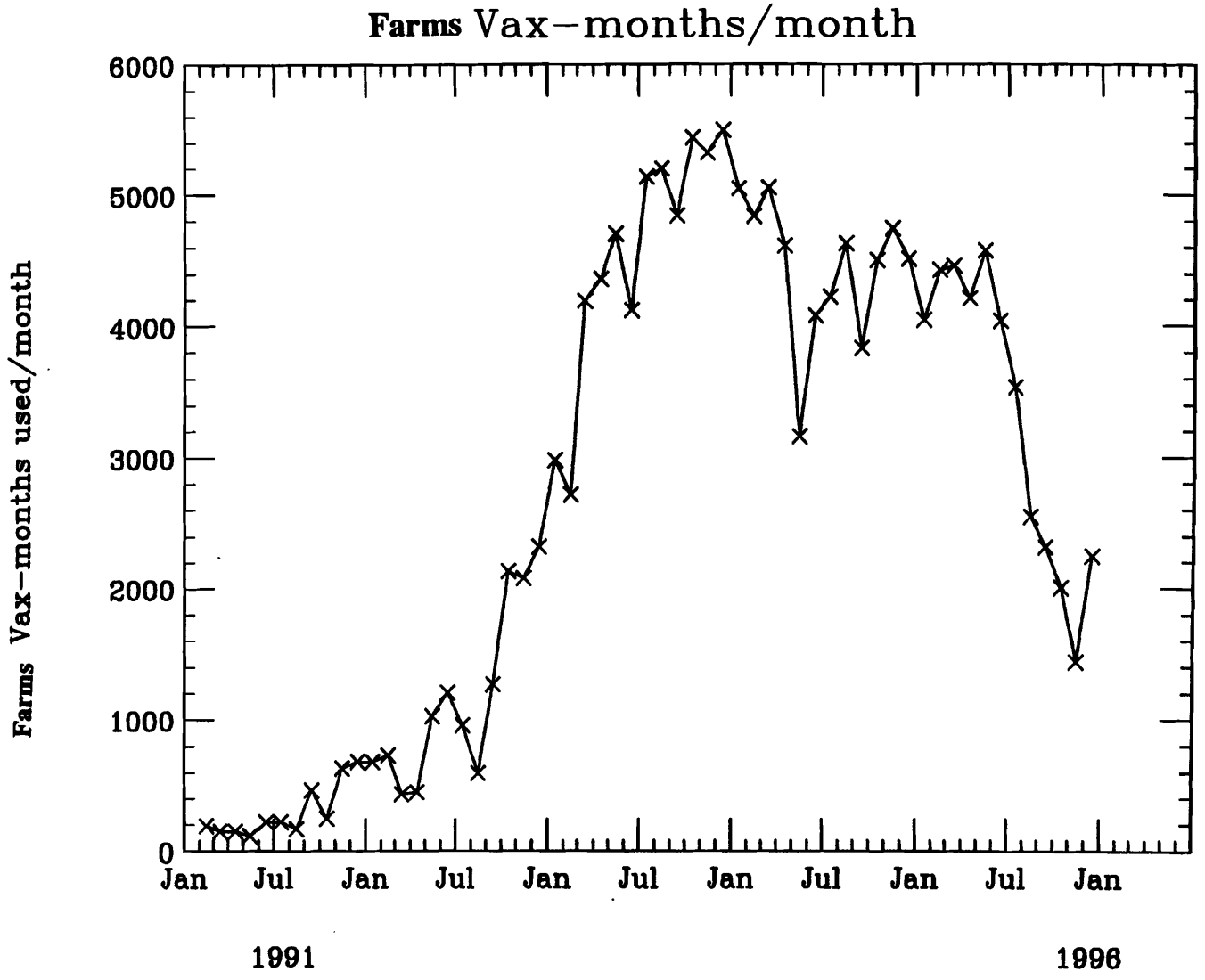


Figure 20. Total monthly farm use (in Vax-months) since 1991.

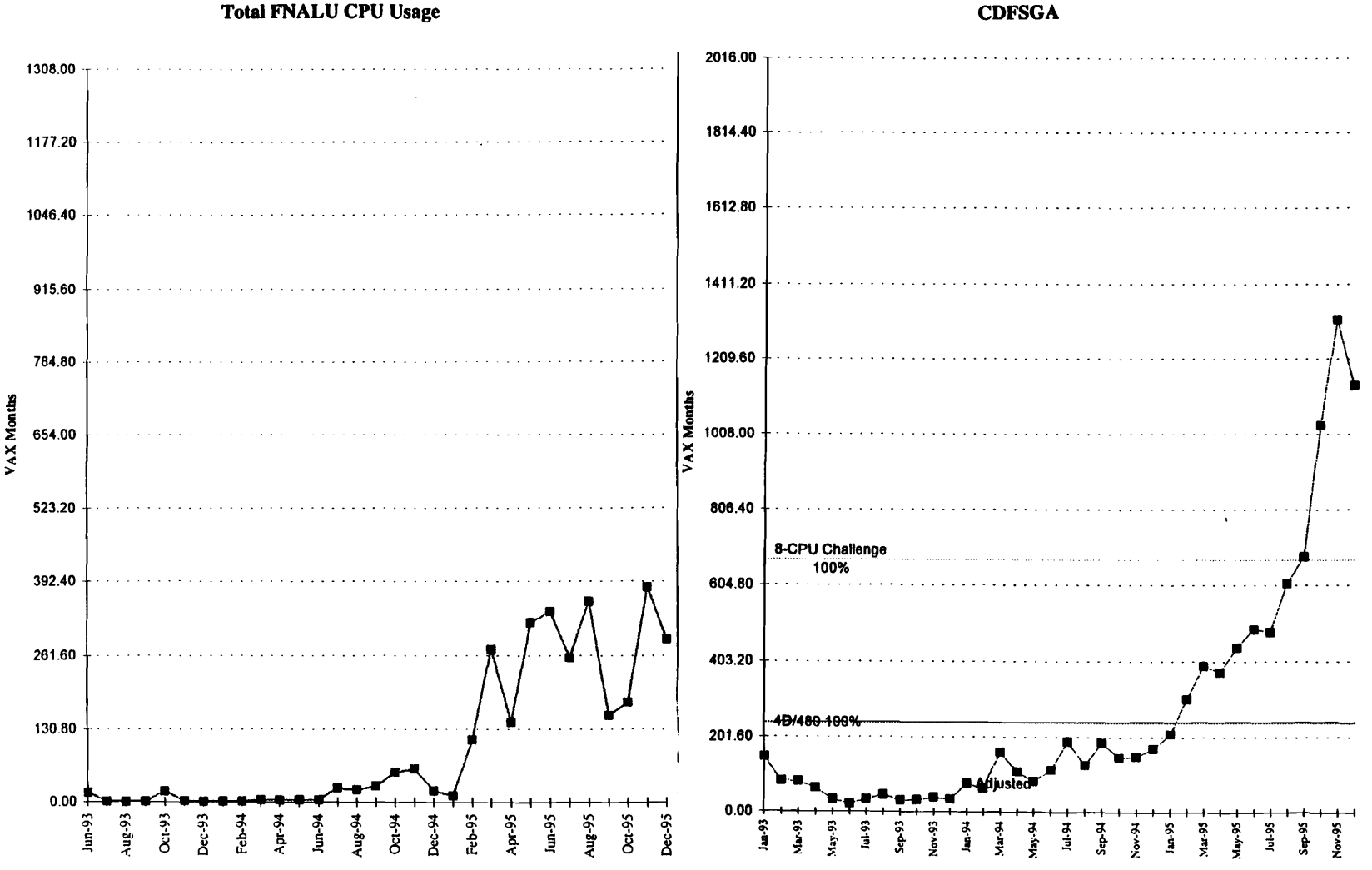
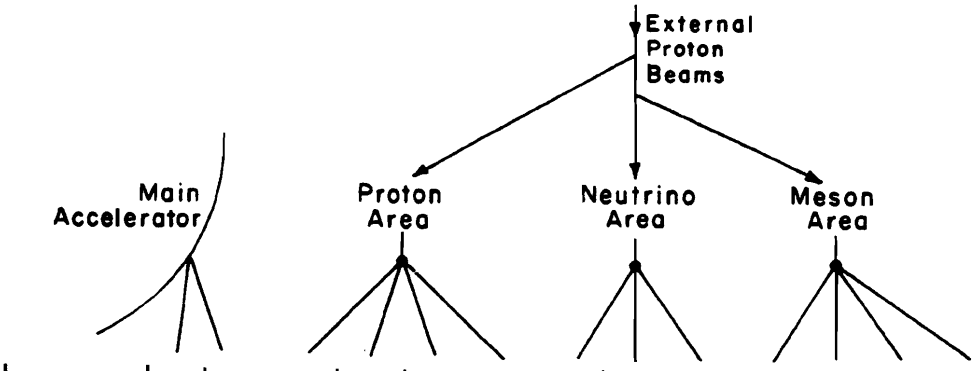


Figure 21. Total monthly use (in Vax-months) of FNALU and CDFSGA over the past 2 1/2 years.

SECTION VI. MAJOR RESEARCH ACTIVITIES DURING 1995 AND 1996

Information on the Fermilab Research Program during the 1994-96 Collider run is given in the following pages. Figure 22 shows when the experiments ran; Table 4 describes the major research activities in a little more detail.



Month	BO	DO	PB	PE	PC	PW	NM	NC	NE	ME	MC	MW	MT	Comments
January 1995	775	740												
February														
March														
April														900x900 GeV Collider Run
May														
June														
July														
August														Shutdown
September														
October														Collider Startup & Studies
November														
December	775	740												900x900 GeV
														315x315 GeV
														OFF
January 1996	775	740												900x900 GeV Collider Run
February	End	End												Shutdown

Figure 22. Major experiments running at Fermilab in 1995 and 1996 (through February).

TABLE 4. DESCRIPTION OF MAJOR RESEARCH ACTIVITIES DURING 1995 AND EARLY 1996

EXP. #	AREA
	COLLIDER
740	Studies of 900×900 and 315×315 GeV $\bar{p}p$ collisions using the D0 detector - data-taking
775	Studies of 900×900 and 315×315 GeV $\bar{p}p$ collisions using the CDF detector - 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 page 38, is a summary of the current status of the experimental program. Figure 23, based on the Situation Report, illustrates by beam line the major approved experiments.

Fermi National Accelerator Laboratory
Experimental Program Situation Report as of February 20, 1996

The Experimental Program situation at Fermilab is summarized below. The experiments are listed by experimental area under categories that best describe their status as of February 20, 1996. 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); and Beam from the Main Injector (MAIN INJECTOR).

Total number of approved experiments - 421

Beam Area & Line		Experiment	Spokesperson(s)	
(Only experiments which have completed since January 1, 1992 are listed.)				
A. Experiments that are completed (376)				**Last Run**
MA	MP	SPAGHETTI CALORIMETRY TEST #840	Para	JAN 8, 1992
	MT	CALORIMETER BEAM TEST #T841	Price	JAN 8, 1992
NA	NM	SDC DETECTOR MUON BEAM TESTS #T816	Lubatti	JAN 8, 1992
		FIBER TRACKING TEST #839	Margulies	JAN 8, 1992
		dE/dx MUONS #855	Kalbfleisch	JAN 8, 1992
		INTEGRATED PIXEL DETECTOR TEST#856	Parker	JAN 8, 1992
	NT	BARIUM FLUORIDE CALORIMETER #849	Kobrak	JAN 8, 1992
	NW	NEUTRON MEASUREMENTS AT NWA #T821	Johns	JAN 8, 1992
PA	PB	RADIATION EXPOSURE #842	Underwood	JAN 8, 1992
	PC	MAGNETIC MOMENT #800	Johns, Rameika	JAN 8, 1992
COL	C-0	FIBER IRRADIATION STUDIES #851	Margulies, Piekarz	JAN 8, 1992
		MAXIMUM ACCEPTANCE DETECTOR #T864	Bjorken, Taylor	FEB 20, 1996
DBNCHR	RING	MUON FLUXES IN THE DEBUNCHER #854	Bross	JAN 8, 1992
ACCUM	RING	ANTIPROTON DECAY #T861	Geer	OCT 29, 1992
UNSPEC	BEAM	BOTTOM AT THE COLLIDER #784	Lockyer	JAN 8, 1992
		CALORIMETER TEST #847	Sulak	JAN 8, 1992
B. Experiments that are analyzing data (20)				**Last Run**
MA	ME	B-QUARK MESONS & BARYONS #789	Kaplan, Peng	JAN 8, 1992
	MP	POLARIZED BEAM #704	Yokosawa	AUG 13, 1990
	MC	ETA00 & ETA+- PHASE DIFFERENCE #773	Gollin	SEP 30, 1991
	MW	HADRON JETS #672A	Zieminski	JAN 8, 1992
		DIRECT PHOTON PRODUCTION #706	Slattery	JAN 8, 1992
NA	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
	PW	BEAUTY PRODUCTION BY PROTONS #771	Cox	JAN 8, 1992
COL	B-0	COLLIDER DETECTOR #741	Shochet, Tollestrup	MAY 31, 1989
		CDF UPGRADE #775	Carithers, Jr., 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
		ANTIPROTON DECAY #868	Geer	JUL 24, 1995
C. Experiments that are in progress (1)				
NA	NM	CP VIOLATION #799	Wah, Yamanaka	
E. Experiments that are being installed (9)				
MA	ME	ANTI(U-QUARK)/ANTI(D-QUARK) DIST#866	McGaughey	
	MC	CP VIOLATION #871	Luk, Dukes	
NA	NC	NEUTRINO #815	Shaevitz, Bernstein	
	NM	CP VIOLATION #832	Hsiung, Winstein	
PA	PB	HEAVY QUARK PHOTOPRODUCTION #831	Cumalat	
	PC	LARGE-X BARYON SPECTROMETER#781	Russ	
	PW	TAU NEUTRINO #872	Lundberg, Paolone	
ACCUM	RING	CHARMONIUM STATES #835	Cester	
		ANTI-HYDROGEN DETECTION #862	Christian	
G. Other approved experiments (4)				
COL	B-0	CDF UPGRADE #830	Carithers, Jr., Bellettini	
	D-0	D-0 DETECTOR UPGRADE #823	Grannis, Montgomery	
MAIN	INJECTOR	NEUTRINO OSCILLATIONS #803	Reay	
		NEUTRINO OSCILLATIONS #875	Wojcicki	
Pending proposals (9)				
MA	MT	B PHYSICS TEST BEAM PROGRAM #879	Butler, Selove	
		B PHYSICS TEST BEAM PROGRAM #880	Butler, Stone	
	MW	CHARGED PION LIFETIME #874	Geer	
MAIN	INJECTOR	KAON PHYSICS AT MAIN INJECTOR #804	Winstein	
		SPIN STRUCTURE FUNCTION PHYSICS #878	Moss	
BOOSTR		BOOSTER NEUTRINOS #873	Federspiel, White	
OTHER		AXION SEARCH #877	Lee	
		AUGER PROJECT R&D #881	Mantsch	
		SEARCH FOR LOW MASS MONOPOLES #882	Kalbfleisch	

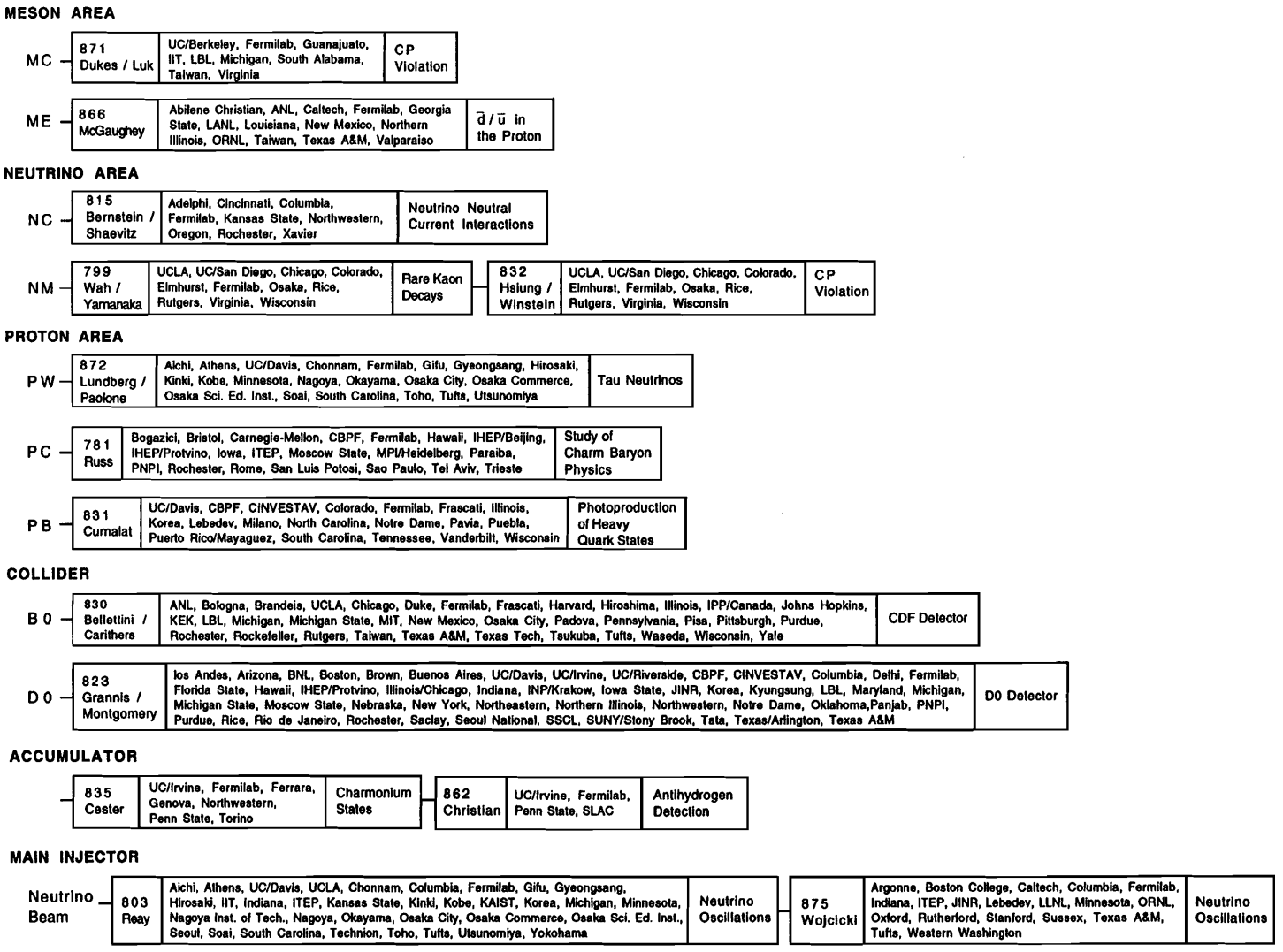


Figure 23. Fermilab experimental program. All major approved experiments not yet completed by the beginning of 1996 are shown here.

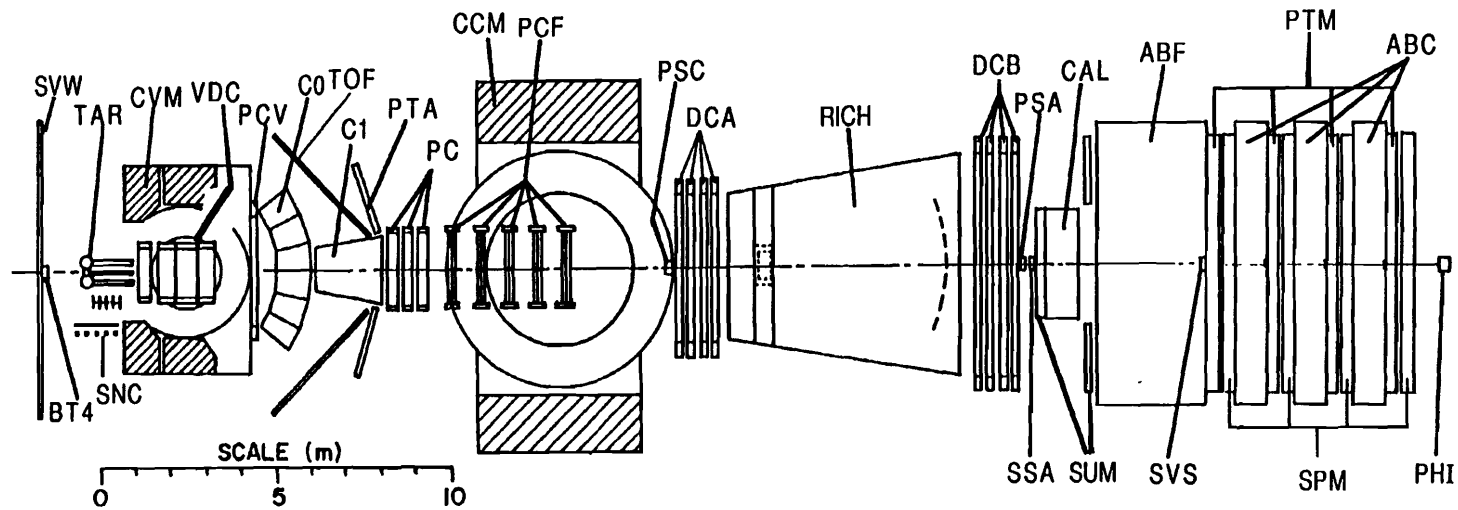
SECTION VIII. SUMMARIES OF APPROVED EXPERIMENTS

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).

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	1468	101
Non-US institutions	771	86

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 1995 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. Inst. 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., Fermilab Pub 95/395-E, submitted to Z. Phys. C.

Proton and Deuteron Structure Functions in Muon Scattering at 470 GeV, M. R. Adams et al., Fermilab Pub 95/396-E.

Theses

Erik Ramberg, University of Maryland, Neutral Pion and Eta Production in Deep Inelastic Muon Scattering at 480 GeV (1989).

Perry Anthony, Massachusetts Institute of Technology, Bose-Einstein Correlations in Deep-Inelastic Muon Scattering (1990).

Martin Erdmann, University of Freiburg i.Br., Lifetime of the Coloured Proton in Muon-Proton Scattering (1990).

Stephen Magill, University of Illinois/Chicago, Xe/D_2 Cross Section Ratio from Muon Scattering at 490 Gev/C (1990).

Douglas G. Michael, Harvard University, A Study of Transverse Momentum and Jets (1990).

Stephen O'Day, University of Maryland, Charged Hadron Multiplicities in 490 GeV Deep Inelastic Muon Scattering (1990).

James J. Ryan, Massachusetts Institute of Technology, Particle Production in Deep Inelastic Muon Scattering (1991).

Alexander Salvarani, University of California/San Diego, Xe/D_2 Raio of Charged Hadron Distributions from Muon Scattering at 490 GeV/c (1991).

Silhacen Aid, University of Maryland, Measurement of the Ratio of Neutron Cross Section to Proton Cross Section in Muon Deep Inelastic Scattering at 490 GeV/c (1991).

Anwar Bhatti, University of Washington, The Ratio of the Proton and Neutron Structure Functions in 90 GeV/c Deep Inelastic Muon Scattering (1991).

Uwe Ecker, Wuppertal, Distributions of Charged Hadrons Observed in Deep Inelastic Muon-Deuterium Scattering at 490 GeV (1991).

Douglas Jansen, University of Washington, Transverse Momentum and the Energy Flow of Charged Hadrons Produced in 490 GeV/c Deep Inelastic Muon Scattering (1991).

Arnd Roser, Wuppertal, Hadron Multiplicities in Deep Inelastic Muon-Nucleon Scattering with a Maximum Center of Mass Energy of 30 GeV (1992).

Michael Schmitt, Harvard University, Deep Inelastic Exclusive ρ^0 Production using 485 GeV Muons (1991).

Stefan Söldner-Rembold, Technischen Universitaät München, Die Erzeugung von Hadronen in der Myon-Streuung an Deuterium und Zenonkernen bei 480 GeV (1992).

Robert D. Kennedy, University of California at San Diego, Measurement of the Neutron and Proton Structure Functions F_2 in Inelastic Muon Scattering (1992).

Mark David Baker, Massachusetts Institute of Technology, Azimuthal Asymmetry and Transverse Momentum of Hadrons in Deep Inelastic Muon Scattering at 490 GeV (1993).

Janet Conrad, Harvard University, A Study of the Q^2 Dependence of the QCD Coupling Constant from the Transverse Momentum of Jets in Deep Inelastic Muon Scattering (1993).

Detlev Hantke, Technischen Universitaät Munchen, Untersuchung der Produktion von neutralen seltsamen Teilchen in der tief-inelastischen Myon-Nukleon-Streuung bei einer Strahlenergie von 490 GeV (1993).

Henry Clark, Ohio State University, Nuclear Decay Following Deep Inelastic Scattering at 500 GeV (1993).

Mathias Wilhelm, University of Freiburg, Hadronisation in schweren Kernen (1993).

Rurngsheng Guo, University of Illinois/Chicago, The Study of Bose-Einstein Correlation in Deep-Inelastic Muon-Nucleus Scattering at 465 GeV/c (1994).

Timothy J. Carroll, University of Illinois/Chicago, Observation of Nuclear Shadowing at Low x_{bj} in Carbon, Calcium and Lead (1994).

Panagiotis Spentzouris, Northwestern University, Measurement of the Structure Function Ratio F_2^n/F_2^p in Muon-Nucleon Scattering at Low x and Q^2 (1994).

William Dougherty, University of Washington, Charge Distributions of Leading Hadrons from 475 GeV Muon-Nucleus Scattering (1994).

Ashutosh Kotwal, Harvard University, Proton and Deuteron Structure Functions in Muon Scattering at 470 GeV (1995).

Patrick Madden, University of California/San Diego, Measurement of Forward Hadron Multiplicity in Inelastic Muon Scattering on Nuclei (1995).

Arijit Banerjee, University of Pennsylvania, Backward Particle Production in Muon Scattering at 470 GeV (1995).

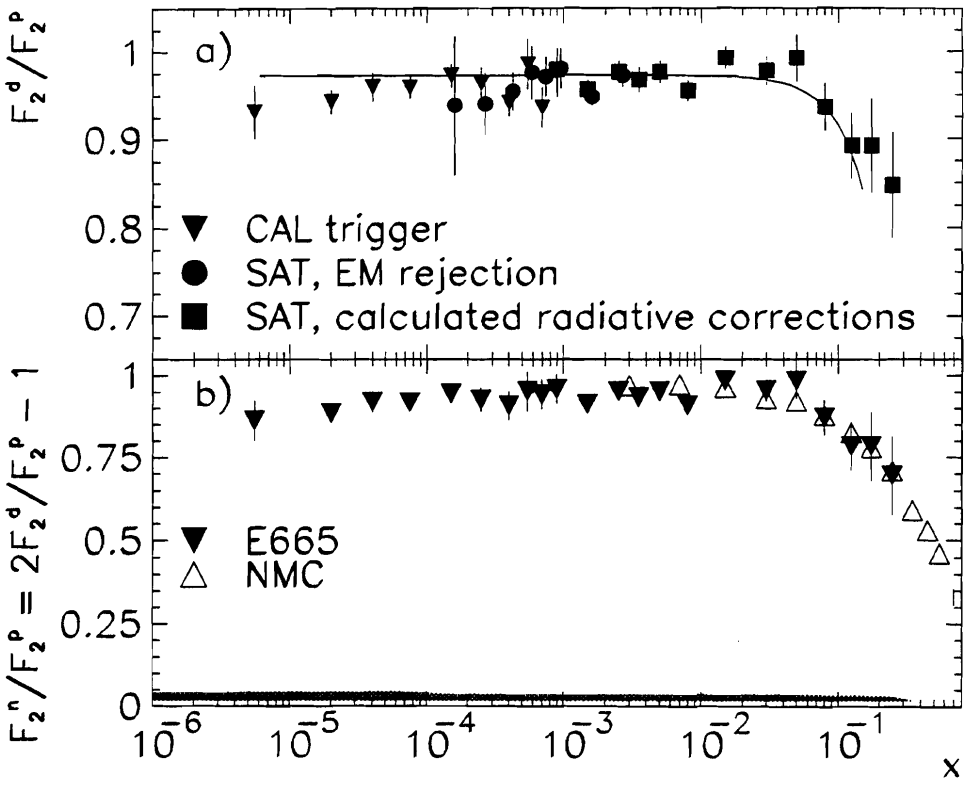


Figure 1. Final neutron-to-proton structure function ratio from the full 1991 data sample. The x region below 2×10^{-3} is unique to E-665.

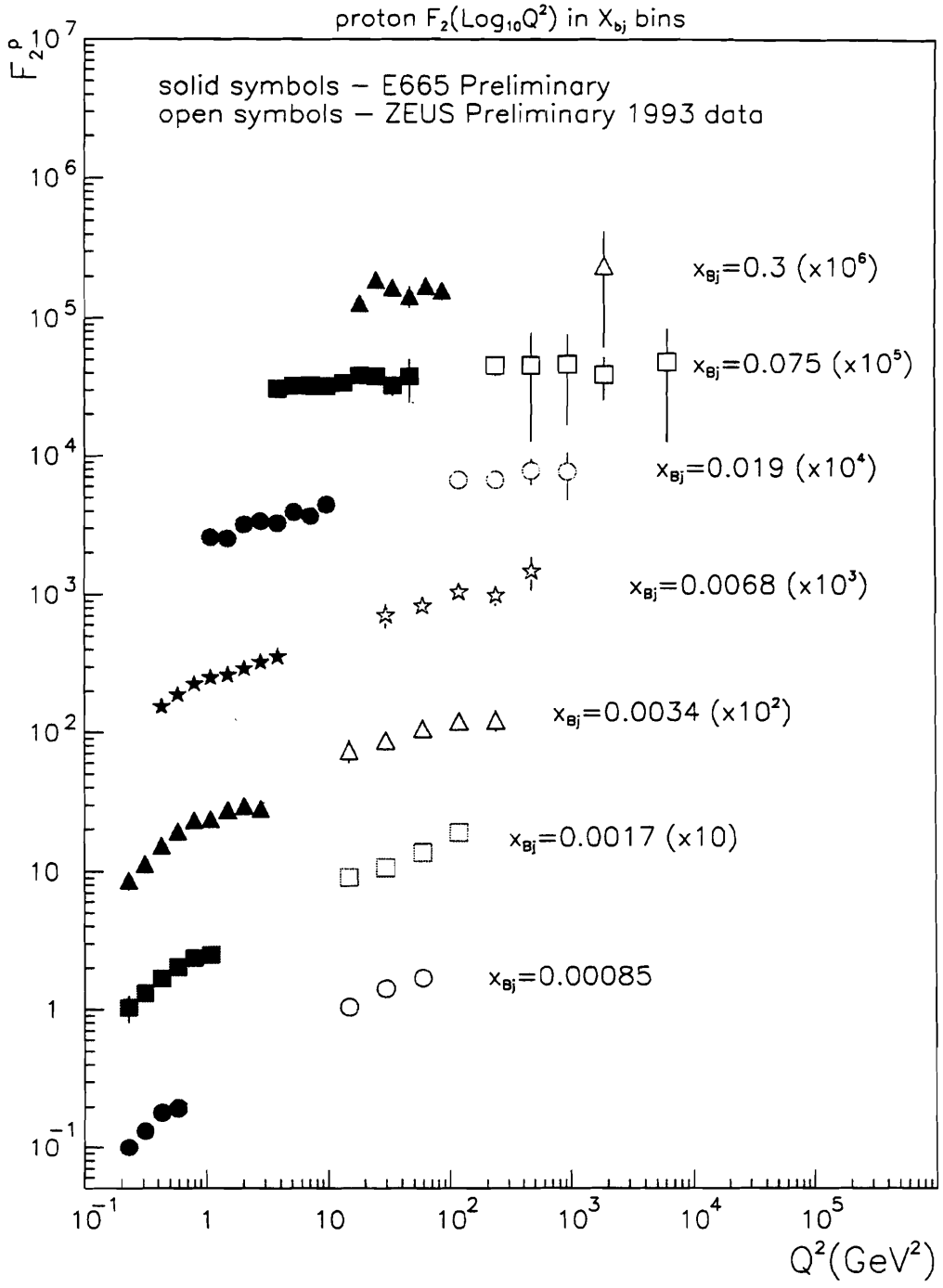
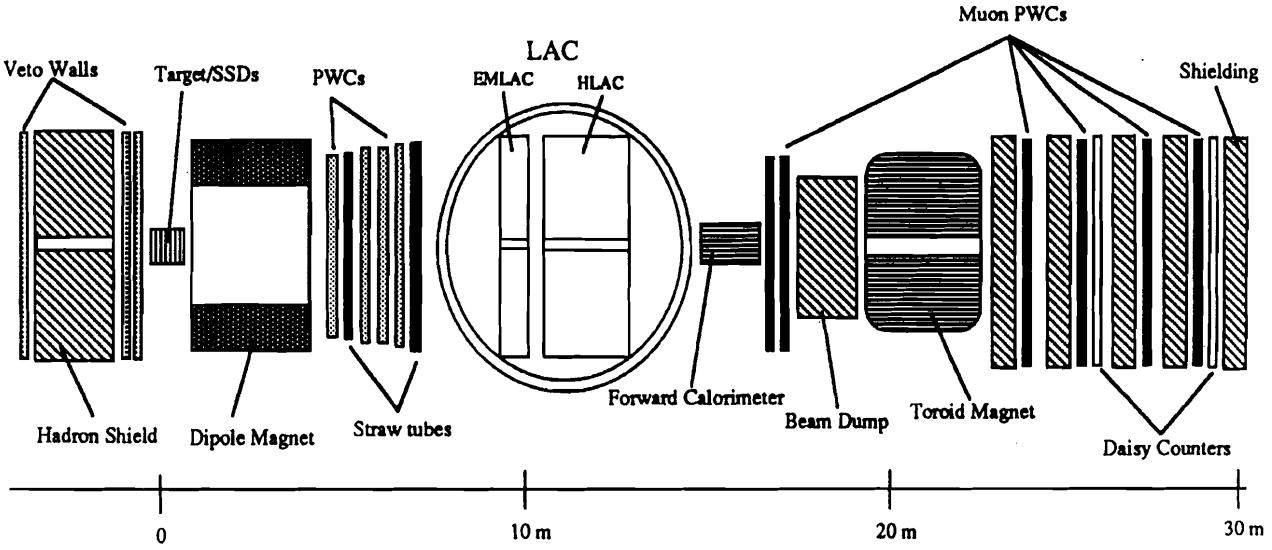


Figure 2. The structure function F_2 (x, Q^2) measured at low x and compared to HERA results.



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 ± 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., Fermilab-PUB-95/298-E, submitted to Phys. Rev. D.

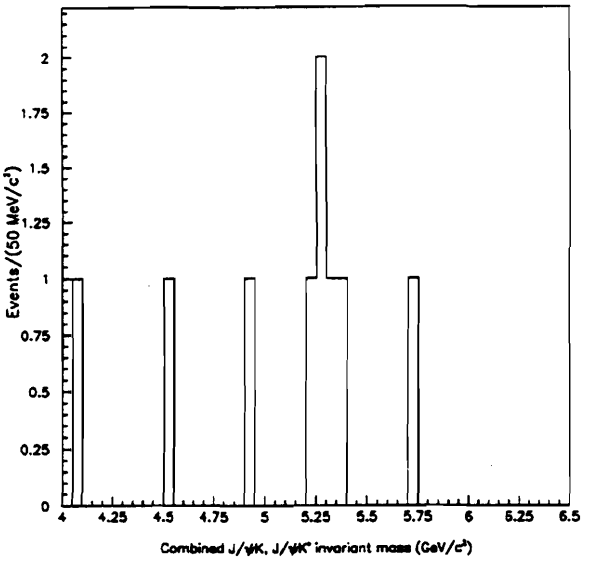


Figure 1. Combined $J/\psi K^{\pm}$, $J/\psi K^{0*}$ invariant mass.

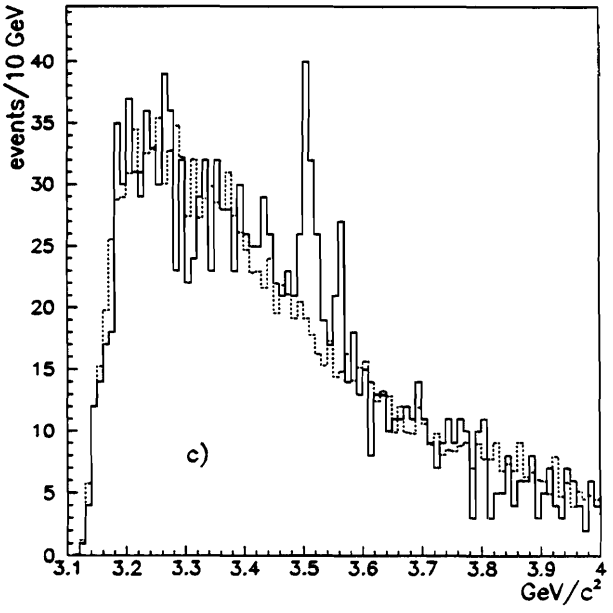
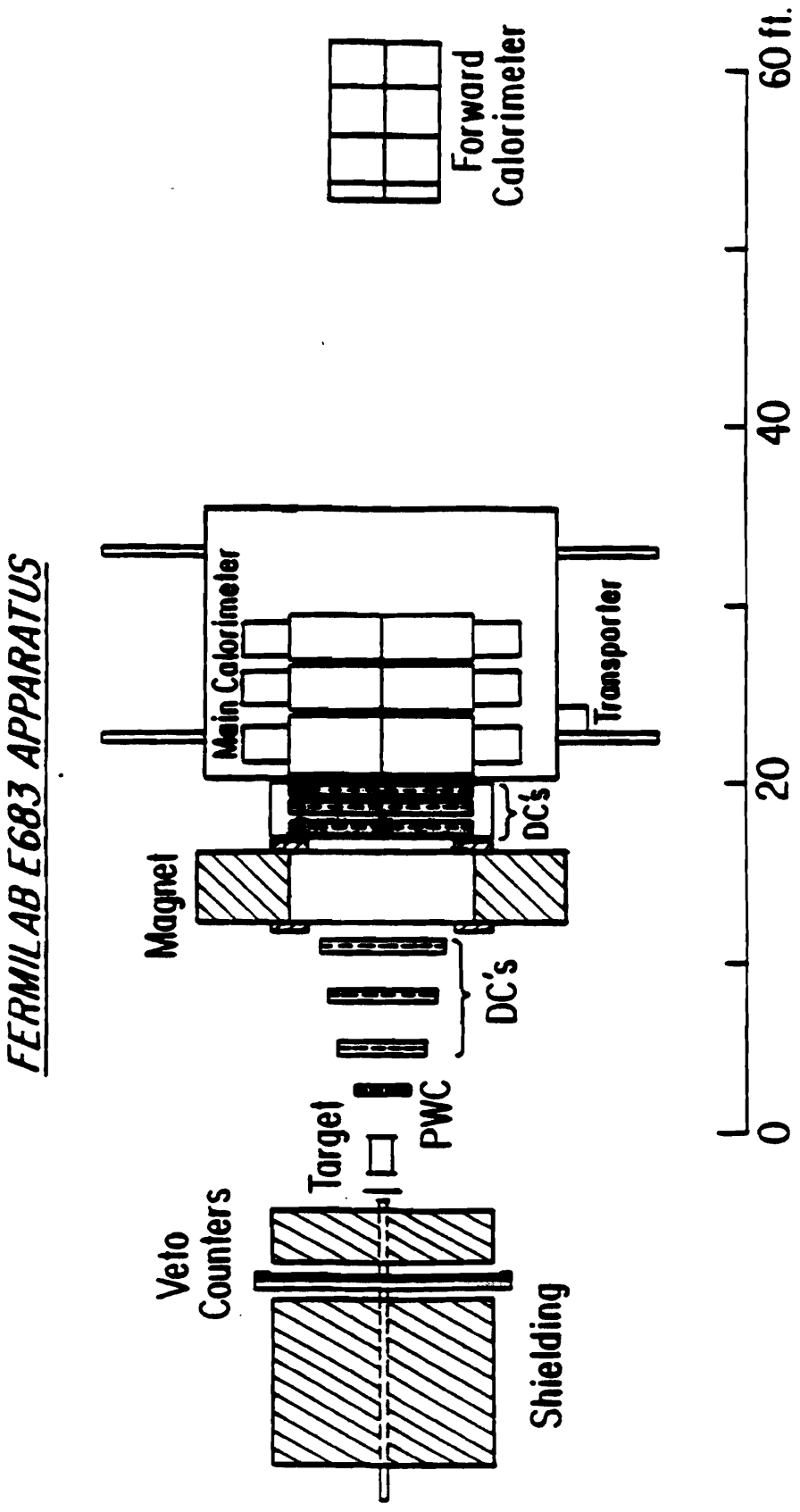


Figure 2. Mass distribution of e^+e^- J/ψ (solid histogram) with calculated background (dashed histogram) showing peaks corresponding to χ_{c1} and χ_{c2}.


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. The QCD processes of interest are QCD Compton scattering $\gamma q \rightarrow gq$ (which dominates at high x_t), and quark-gluon fusion $\gamma g \rightarrow q\bar{q}$. These processes are very distinctive, with the photon coupling as a point particle, giving all its energy to the two high-p_t jets, and producing no beam jet. The three-jet topology allows the separation of the direct-coupling processes from vector-meson-dominance-type processes, which produce the four-jet topology familiar in pp and πp interactions. Due to the lack of a beam jet and the large energy in the parton-parton frame, these jet events are expected to be very clean compared to jets produced in a π or p beam. We will measure the cross sections of both three-jet and four-jet events as functions of x_t, p_t, and y, and compare to QCD calculations. Full second-order calculations for these processes have been done by Jeff Owens at FSU.

Photoproduction of jets has a number of interesting features. The QCD Compton process is especially interesting and unique, since the gluon jet appears at the lowest order, well separated from the quark jet. Also, the angular distribution of the Compton process allows a separation of quark and gluon jets, allowing comparisons of their fragmentations. The quark-gluon fusion process probes the gluon structure function of the proton, and the four-jet events probe the high-x structure function of the photon.

The A-dependence of jet production from nuclei is of interest. 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. Also, in regions where the Compton diagram dominates, differences in propagation of quarks and gluons through nuclear matter might be observed.

Other processes which can be studied in this experiment include a higher-twist process, $\gamma q \rightarrow (\pi,p) + q$, and QED Compton scattering, $\gamma q \rightarrow \gamma q$. Confirmation of higher-twist processes is an important test of higher order effects in QCD. The A-dependence of the QED Compton process is an especially clean way to study the propagation of partons through nuclear matter.

Photons in the momentum range 100 to 400 GeV/c are 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 comprised 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. The forward calorimeter measures the energy flow in the region from $\theta_{cm} = 0^o$ to about 20^o. The main calorimeter had a measured energy resolution of $35\%/\sqrt{E}$ for electromagnetic particles and $75\%/\sqrt{E}$ plus a 5% constant term for hadronic particles.

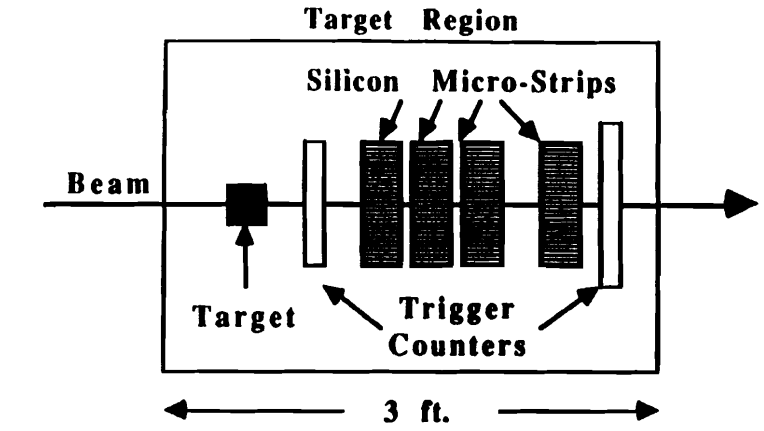
E-683 began data-taking in June of 1991, when the fixed-target program resumed. Data-taking was complete in January of 1992. A total of about 10 million triggers were recorded to tape, fairly equally divided between hydrogen, deuterium, and six different nuclear targets. Analysis is proceeding, both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

Three 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, and to date two Physical Review Letters and two articles in Nuclear Instruments and Methods have been published.

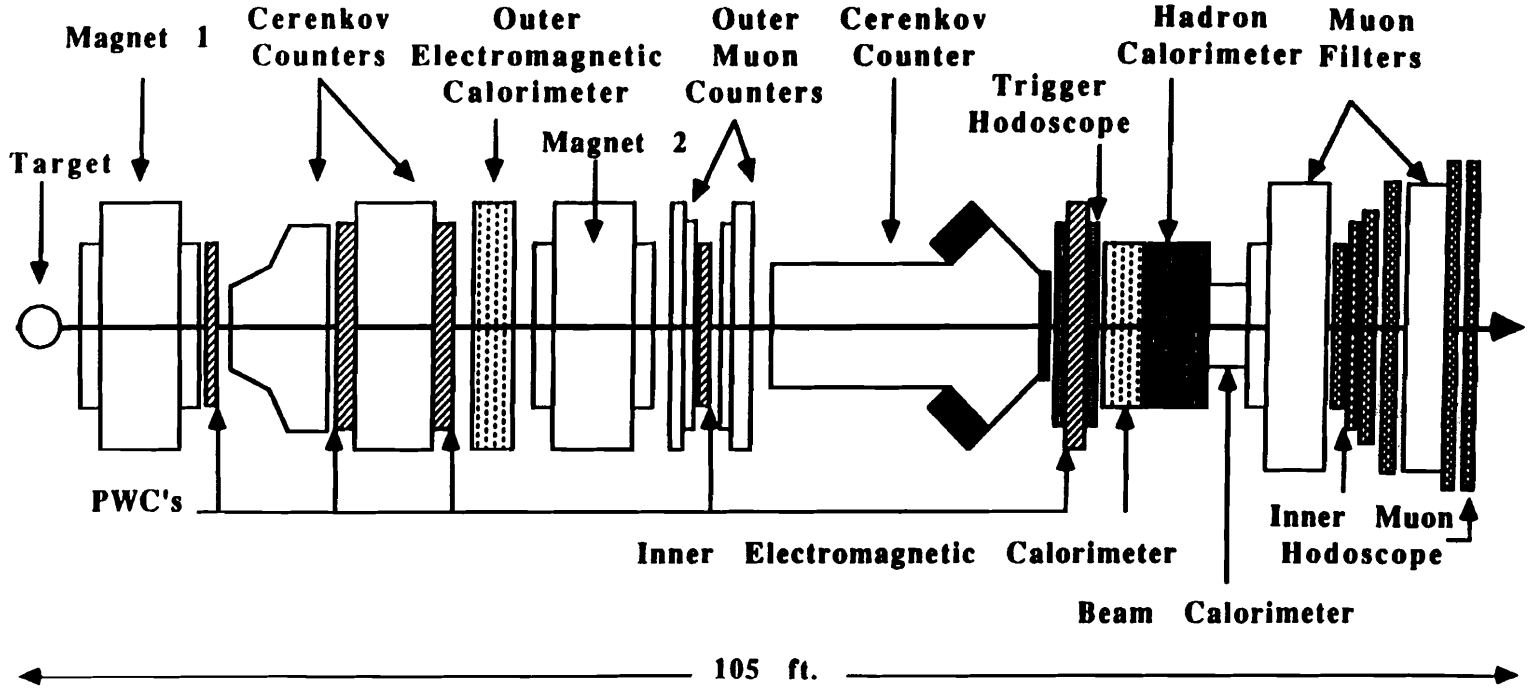
1995 Theses

M. Traynor, Rice University, Ph.D. thesis, Search for Evidence of Photoproduction of Higher-Twist QCD Events at Experiment 683 at Fermi National Accelerator Laboratory, October 1995.

D. Alton, Ball State University, M.S. thesis, Evidence for the Existence of Jets in Photon-Proton Interactions at Center-of-Mass Energies from 18 to 28 GeV, December 1995.


Target Region
Silicon Micro-Strips
Beam
Target
Trigger Counters
3 ft.

E-687


Magnet 1
Cerenkov Counters
Outer Electromagnetic Calorimeter
Outer Muon Counters
Cerenkov Counter
Hadron Calorimeter
Muon Filters
Target
Magnet 2
Trigger Hodoscope
PWC's
Inner Electromagnetic Calorimeter
Beam Calorimeter
Inner Muon Hodoscope
105 ft.

E-687 (Butler / Cumalat) Photoproduction of Charm and B

INFN / Bologna (Italy), UC / Davis, Colorado, Fermilab, INFN / Frascati (Italy), Illinois, Korea (Korea), INFN / Milano (Italy), Milano (Italy), North Carolina, Northwestern, Notre Dame, Pavia (Italy), Puerto Rico / Mayaguez, South Carolina, Tennessee, Western Kentucky, Vanderbilt

Status: *Data Analysis*

E-687 is a photoproduction experiment in the Wide-Band Photon Beam. Interactions of photons whose energies are typically above 200 GeV are analyzed in a multiparticle spectrometer. The physics goal of the experiment is to reconstruct large samples of particles containing heavy quarks, charm and bottom, in order to study the dynamics of heavy quark photoproduction, to carry out detailed studies of the weak decays of charm mesons and baryons, to study the decays of charm mesons and baryons, and to study J/ψ photoproduction. The spectrometer consists of two large analysis magnets, each having 30" × 50" aperture and transverse momentum kicks of up to 1 GeV/c; an 8400 element silicon microstrip detector with pitch varying from 25 microns to 100 microns; a system of proportional chambers with 13,500 wires of 2 and 3 mm spacing; three atmospheric gas Cerenkov counters each having about 100 cells; two electromagnetic calorimeters for photon reconstruction and electron identification; a gas hadron calorimeter for triggering, total energy measurement and neutral hadron reconstruction; and a muon identification system consisting of scintillation counters and proportional tubes.

In the first run of the experiment, in 1987/88, over 70 million events were collected. For the 1990 run, a beam tagging system was installed which measured the incident electron energy to better than 2%. The inner electromagnetic calorimeter was replaced with a scintillating fiber calorimeter. A new high speed data acquisition system, based on the Fermilab PANDA system, was installed. In the 1990/91 run, more than 500 million events were collected with an improved trigger. The total data set contains more than 10^5 fully reconstructed examples of charm decay. These data have been entirely reconstructed and turned into Data Summary Tapes.

In 1994, 10 papers were published in refereed journals, one more was submitted and is undergoing review, and several more analyses are converging towards submission. This brings the total publications from the 1990-91 run to 27. Many results from E-687 appear in the recent compilation of particle properties by the Particle Data Group[1]. In many cases, E-687 has presented new results and in other cases has produced results which rival or exceed current world averages in precision.

The physics highlights of E-687 include the most precise measurements of the lifetimes of charm mesons and baryons, detailed studies of the

semileptonic decays of the D and D_s mesons, observation of charm mesons with one unit of orbital angular momentum, the confirmation of the existence of an excited charm baryon state, observation and study of Cabibbo-suppressed decays of both charm mesons and charm baryons, study of decay modes of Λ_c's containing charged sigmas, detailed analyses of the Dalitz plots of the D and D_s mesons, and further studies of the Ω_c^0. The figures illustrate the extent and diversity of E-687's physics results.

The lifetimes[2,3,4] for the Ξ_c^+, Λ_c^+, and Ξ_c^0, baryons were measured to higher precision than in previous measurements. The hierarchy of lifetimes observed for the charm baryons, $\tau(\Xi_c^0) < \tau(\Lambda_c^+) < \tau(\Xi_c^+)$, allows discrimination between theoretical models for the various components of the decay channels and the interference effects. This pattern of lifetimes most closely matches the predictions of Guberina et al., as indicated by the dotted lines in the figure. The lifetimes of the D^0,[5] the D^+,[5] and of the D_s^+,[6] have also been measured with unprecedented accuracy.

We observe the Ω_c^0 baryon with quark content of css in the $\Omega_c^0 \to \Omega^-\pi^+$ decay channel[7]. The ARGUS experiment observes $\Omega_c^0 \to \Xi^-K^-\pi^+\pi^+$ at about the same statistical level. The CLEO experiment observes neither of these decays and claims no evidence for the existence of the Ω_c^0. E-687 has recently observed[8] a signal in the decay mode at the same mass as previous observations of the $\Omega_c^0 \to \Sigma^+K^-K^-\pi^+$, thereby confirming its existence. We have also confirmed[9] the existence of the excited charm baryon $\Lambda_c^{*+} \to \Lambda_c^+\pi^+\pi^-$ as first observed by ARGUS and also observed by CLEO.

Detailed analyses of the Dalitz plots of D and D^+ mesons decaying into the $K\pi\pi$ final state have been published[10]. Analyses of decays D^+ and D_s into $KK\pi$ and 3π final states are now in progress.

Studies of semi-leptonic decays of charm mesons[11] $D^0 \to K^-\mu^+\nu$ and $D_s^+ \to \phi\mu^+\nu$,[12] along with determination of the form factors for $D^+ \to \bar{K}^{*0}\mu^+\nu$,[13] have been published. We also presented the first observation of a Cabibbo-suppressed decay of the charm baryon $\Lambda_c^+ \to pK^-K^+$,[14] and studied the Cabibbo-suppressed $D^0 \to \pi^-\pi^+$ and $D^0 \to K^-K^+$ decay modes[15]. Studies of D^0 decays into four charged particles are now in progress.

We have begun the study of charm mesons with higher angular momentum states[16]. Two examples of the decays of L=1 mesons, $D_2^*(2460)^0 \to D^+\pi^-$ and a very clean $D_{s1}(2536)^+ \to D^{*+}K^0$, are illustrated.

We have published the world's largest sample (325) of events with two charm particles fully reconstructed[17]. The correlations between the D and $\bar{D}$ mesons are strongly dependent on the underlying partonic properties, distributions, interactions, and fragmentation. Most distributions, such as for the rapidity gap difference $\Delta Y_{D\bar{D}}$, agree well with the simple photon-gluon fusion model, coupled with the usual parton structure functions and our detector response. The most striking deviation involves the softer acoplanarity distribution in $\Delta\phi$ between the $D\bar{D}$ pair, indicating a harder intrinsic $k_\perp$

distribution for gluons within the target nucleons than had been previously postulated. These results can be compared to recent studies of heavy quark correlations at next-to-leading order QCD[18]. Studies of production asymmetries (differences between charm and anti-charm) in photoproduction are also in progress.

E-687 data have also provided excellent input for studies in preparation for the follow-on experiment E-831.

Additional description of the physics of E-687 can be found in Reference 19. We look forward to continuing to investigate phenomena involving the charm quark and other photoproduction-related topics at the high level of sensitivity provided by the data set obtained in the 1990-91 run.

References

1. Review of Particle Properties, Particle Data Group, Phys. Rev. Lett. D50, (1994).
2. Measurement of the Mass and Lifetime of the Ξ_c^+, P. L. Frabetti et al., Phys. Rev. Lett. 70, 1381 (1993).
3. Measurement of the Λ_c^+ Lifetime, P. L. Frabetti et al., Phys. Rev. Lett. 70, 1755 (1993).
4. Measurement of the Lifetime of the Ξ_c^0, P. L. Frabetti et al., Phys. Rev. Lett. 70, 2058 (1993).
5. Precise Measurement of the D^0 and D^+ Meson Lifetimes, P. L. Frabetti, et al., Phys. Lett. B323, 459 (1994).
6. Precise Measurement of the $D_s^\pm$ Lifetime, P. L. Frabetti et al., Phys. Rev. Lett. 71, 827 (1993).
7. First Evidence of $\Omega_c^0 \rightarrow \Omega^-\pi^+$, P. L. Frabetti et al., Phys. Lett. B300, 190 (1993).
8. Observation and Mass Measurement of $\Omega_c^0 \rightarrow \Sigma^+K^-K^-\pi^+$, P. L. Frabetti et al., Phys. Lett. B338, 106 (1994).
9. Observation of an Excited State of the Λ_c^+ Baryon, P. L. Frabetti et al., Phys. Rev. Lett. 72, 961 (1994).
10. Analysis of Three D $\rightarrow$ KKπ Dalitz Plots, P. L. Frabetti et al., Phys. Lett. B331, 217 (1994).
11. Study of $D^0 \rightarrow K^-\mu^+\nu$ in High Energy Photoproduction, P. L. Frabetti et al., Phys. Lett. B315, 203 (1993).
12. Measurement of the Form Factors for the Decay $D_s^+ \rightarrow \phi\text{-}\mu^+\nu$, P. L. Frabetti et al., Phys. Lett. B328, 184 (1994).

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

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

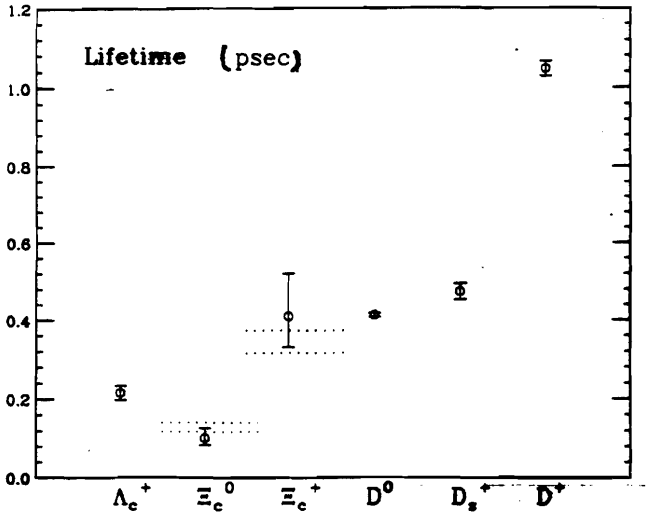
15. A Measurement of the Cabibbo-Suppressed Decays $D^0 \rightarrow \pi^-\pi^+$ and $D^0 \rightarrow K^-K^+$, P. L. Frabetti et al., Phys. Lett. B321, 295 (1994).

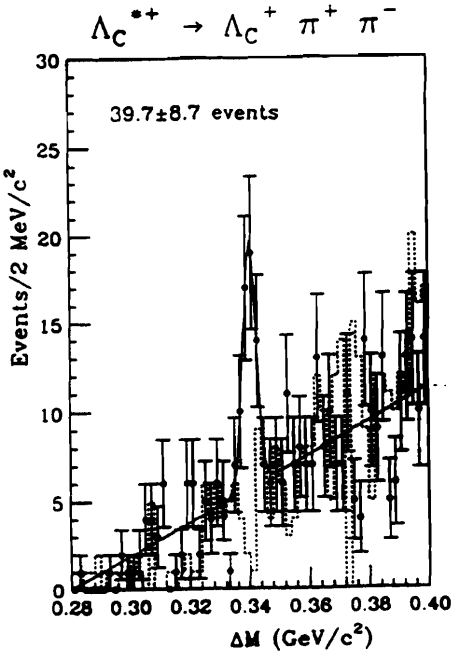
16. Measurement of the Masses and Widths of L=1 Charm Mesons, P. L. Frabetti et al., Phys. Rev. Lett. 72, 324 (1994).

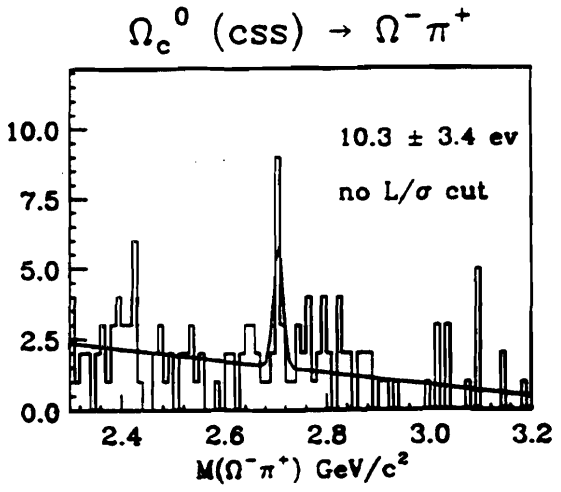
17. Studies of $D\bar{D}$ Correlations in High Energy Photoproduction, P. L. Frabetti et al., Phys. Lett. B308, 193 (1993).

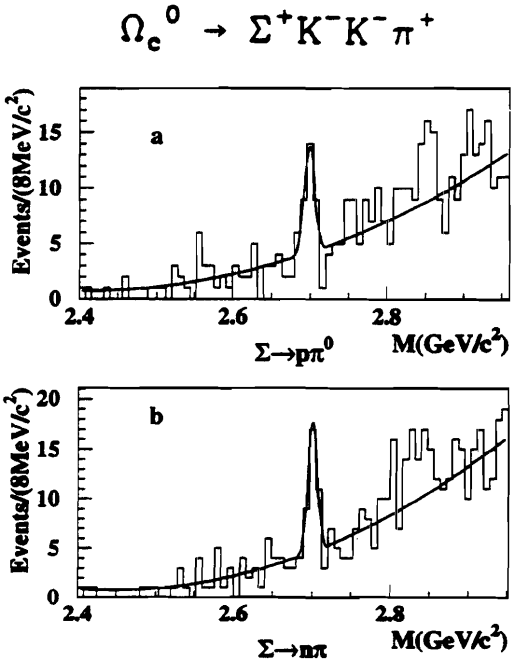
18. Heavy Quark Correlations in Photon-Hadron Collisions, S. Frixione et al., CERN-TH 6921/93.

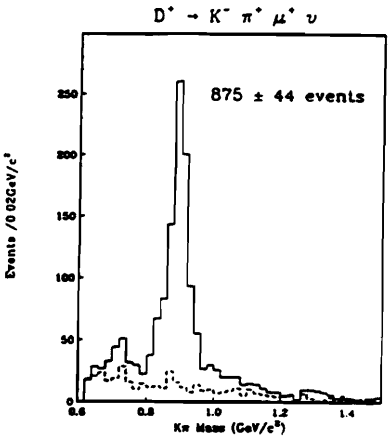
19. Charming Photons: A Report from E-687, J. Butler and P. H. Garbincius, Fermilab Report, April-June 1993, pg. 1.

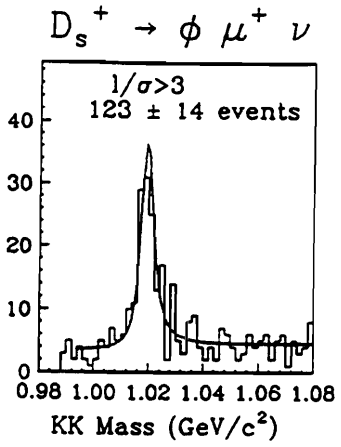

Lifetime (psec)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Λ_c^+
Ξ_c^0
Ξ_c^+
D^0
D_s^+
D^+

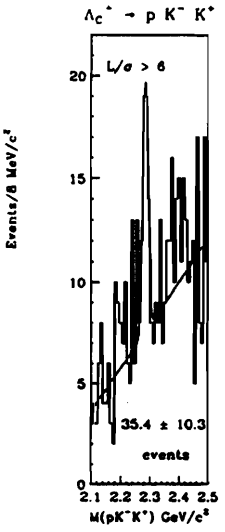

$\Lambda_c^{*+} \rightarrow \Lambda_c^+ \pi^+ \pi^-$
39.7±8.7 events
Events/2 MeV/c²
30
25
20
15
10
5
0
0.28 0.30 0.32 0.34 0.36 0.38 0.40
ΔM (GeV/c²)

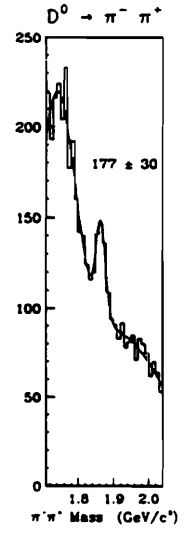

Ω_c^0 (css) → $\Omega^-\pi^+$
10.3 ± 3.4 ev
no L/σ cut
10.0
7.5
5.0
2.5
0.0
2.4 2.6 2.8 3.0 3.2
M($\Omega^-\pi^+$) GeV/c²

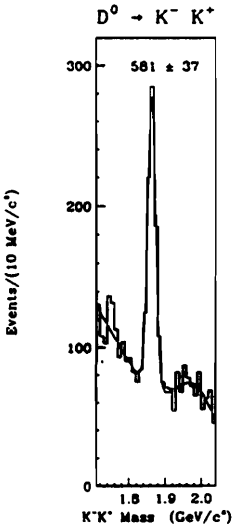

$\Omega_c^0 \rightarrow \Sigma^+K^-K^-\pi^+$
a
Events/(8MeV/c²)
15
10
5
0
2.4 2.6 2.8
$\Sigma \rightarrow p\pi^0$
M(GeV/c²)
b
Events/(8MeV/c²)
20
15
10
5
0
2.4 2.6 2.8
$\Sigma \rightarrow n\pi$
M(GeV/c²)

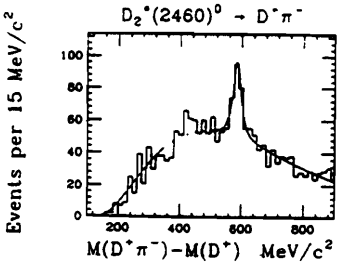

D⁺ → K⁻ π⁺ μ⁺ ν
875 ± 44 events
Kπ Mass (GeV/c²)

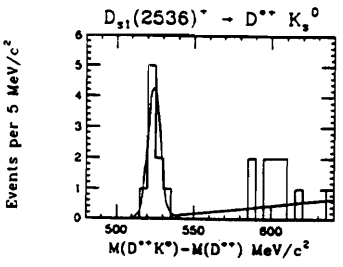

Ds⁺ → φ μ⁺ ν
l/σ>3
123 ± 14 events
KK Mass (GeV/c²)

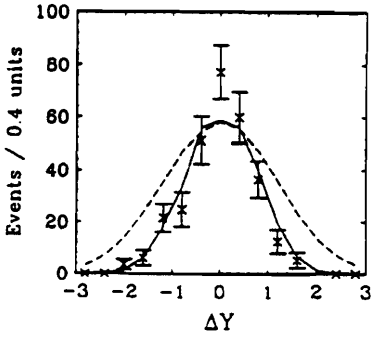

Λc⁺ → p K⁻ K⁺
L/σ > 6
35.4 ± 10.3
events
M(pK⁻K⁺) GeV/c²

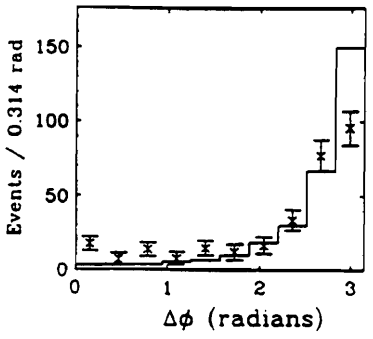

D⁰ → π⁻ π⁺
177 ± 30
π⁻π⁺ Mass (GeV/c²)

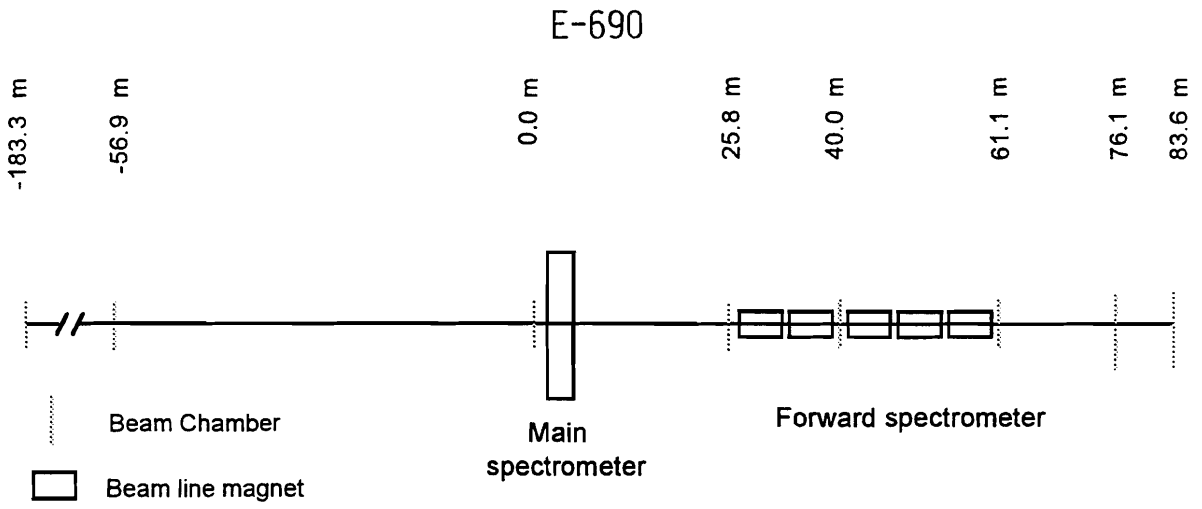

D⁰ → K⁻ K⁺
581 ± 37
K⁻K⁺ Mass (GeV/c²)

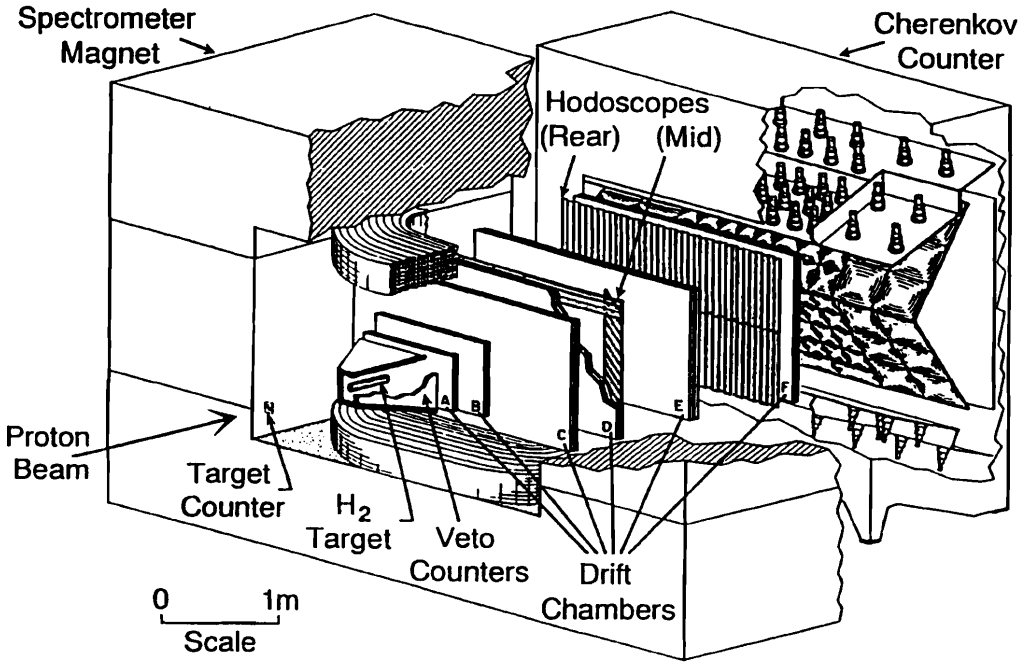

D2*(2460)⁰ → D*π⁻
Events per 15 MeV/c²
M(D⁺π⁻)−M(D⁺) MeV/c²


Ds1(2536)⁺ → D** Ks⁰
Events per 5 MeV/c²
M(D**K⁰)−M(D**) MeV/c²


Events / 0.4 units
ΔY


Events / 0.314 rad
Δφ (radians)





Main Spectrometer

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

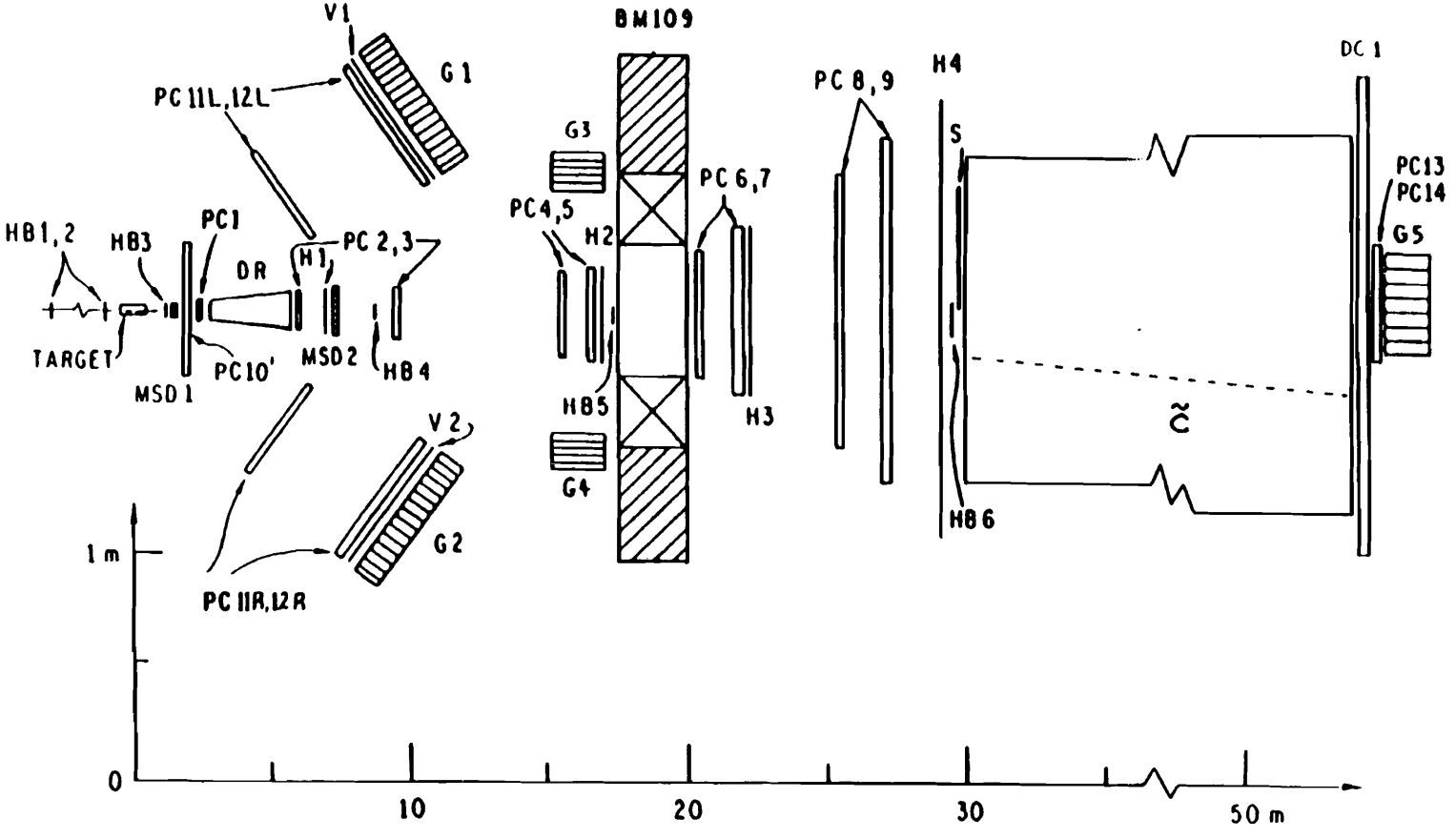
Columbia, Fermilab, Guanajuato (Mexico), Massachusetts, Texas A&M

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.


V1
G1
PC 11L,12L
BM109
G3
PC 6,7
PC 8,9
H4
DC 1
S
PC13
PC14
G5
PC4,5
H2
HB1,2
HB3
PC1
PC 2,3
DR
H1
TARGET
PC10'
MSD2
HB4
MSD 1
HB5
H3
G4
HB6
V2
G2
1 m
PC 11R,12R
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.

The following data are being analyzed:

$\Delta\sigma_L^{Tot}(pp)$ and $\Delta\sigma_L^{Tot}(\bar{p}p)$, $\bar{p}^{\uparrow}p \rightarrow \pi^{\pm}x$,

$p^{\uparrow}p \rightarrow (\Lambda,\Sigma^0)\ X$, $p^{\uparrow}p \rightarrow (\text{direct } \gamma)\ X$, and

detailed analyses of $p^{\uparrow}p \rightarrow \pi^0 X$ at $x_F = 0$.

The following data are published in Physics Letters:

$p^{\uparrow}p \rightarrow \pi^0 X$, $\bar{p}^{\uparrow}p \rightarrow \pi^0 X$ at large x_F,

$p^{\uparrow}p \rightarrow (\pi^0, \eta)X$ at $x_F = 0$,

A_{LL} measurement in $p^{\uparrow}p^{\uparrow} \rightarrow \pi^0 X$ at $x_F = 0$, and

$p^{\uparrow}p \rightarrow \pi^{\pm} X$ at $x_F = 0$ to 1.0.

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).

Papers Being Prepared on the E-704 Data

High-x_F Single- and Double-Spin Asymmetry in Λ Production

Large-x_F Spin Asymmetry in π^+ and π^- Production by 200-GeV Polarized Antiprotons

Differences in Total Cross Sections, $\Delta\sigma_L$

Complete Asymmetry Analysis on High x_T π^0 Production

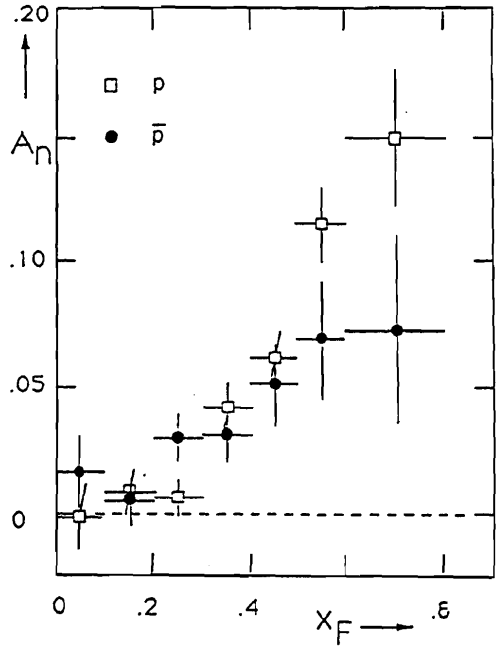
Comments on data analysis and future plans:

1. We plan to finish the analysis of single-spin asymmetry A-N in π^0 production at high p_T at 90° in the c.m.s. in p(pol.)p-interactions. Final

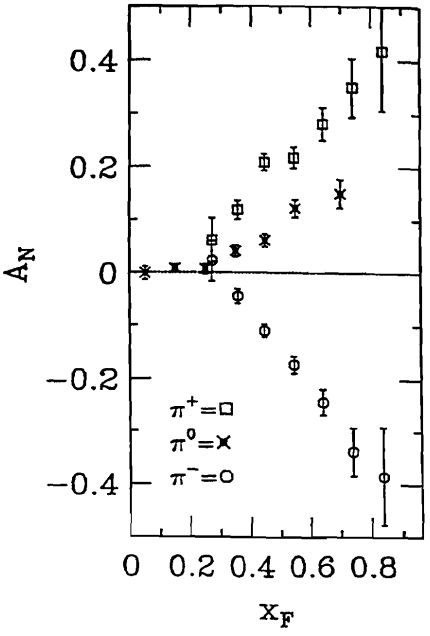
results should include the impact on the asymmetry of charged particles associated with π^0 in both the same solid angle and in the opposite one. A scaling behavior of asymmetry in the hard interactions should be eventually checked at 200 GeV.

2. The π^0 and $\eta(550)$ invariant cross sections in pp- and $\bar{p}p$ interactions can be obtained from the data. The kinematic region will be as follows: $x_F \sim 0$; $1 < p_T < 5$ GeV/c. The interest is, do we see some dip in the cross section behavior. If we do, this dip (or break in the slope of cross section) should be connected with some structure in the asymmetry behavior at the same p_T values.

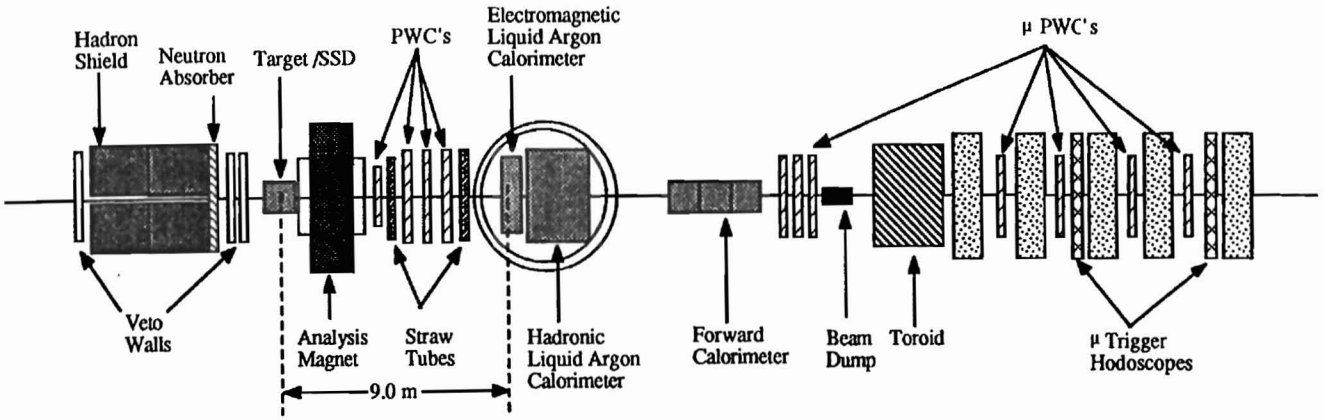
3. We will study from our data a single-spin asymmetry A_N in the η-meson production at large x_F in both pp and $\bar{p}p$ interactions. The kinematic region will be as follows: $0.3 < x_F < 0.8$ and $p_T \sim 1$ GeV/c. Earlier we saw a significant asymmetry in the $\pi^+\pi^-\pi^0$ production in the same kinematic region. Is it a case for η?



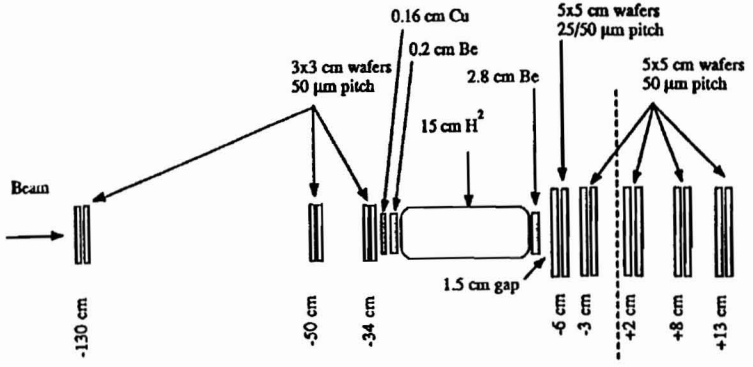
The asymmetry A_N in the reactions $P+P \rightarrow \pi^0+X$ and $\bar{P}+P \rightarrow \pi^0+X$ at 200 GeV in different regions of x_F, integrated over p_T from 0.5 to 2 GeV/c.



x_F dependence of the asymmetry A_N for π^+ (squares) and π^- (circles) production in the $p^{\uparrow}p$ reaction. For comparison, π^0 data (crosses) are also shown.



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 now exist 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 have also recently become 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 includes 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 minimize the impact of incident beam halo on the experiment. There are six planes of 50 μm pitch silicon strip detectors upstream of the target. Different targets allow for investigation of the nuclear dependence of the various processes. Immediately downstream of the target is a pair of silicon strip detectors, with 25 μm pitch in the central region and 50 μm pitch on their outer edges, followed by eight additional silicon strip planes of 50 μm pitch. The large aperture (122×91 cm^2) conventional analysis magnet provides a transverse momentum impulse of 450 MeV to charged particles. Downstream of the magnet are four proportional wire chamber modules, each containing four planes with 2.54 mm pitch. There are also two straw tube drift chambers, each with four planes in each of two views. The drift chamber resolutions are

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 is 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 is located behind the electromagnetic calorimetry within the liquid argon cryostat. An iron and scintillator calorimeter intercepts the forward cone passing through a central hole in the liquid argon calorimeters. Downstream of the forward calorimeter is a muon identification system provided by E-672. For the purposes of E-706, the spectrometer triggers 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 have completed their Ph.D. research using this data sample. These students have 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.

Inclusive high transverse momentum neutral meson and direct photon cross section measurements for incident negative pions and protons at 500 GeV have been published (PRD 45, R3899; PRL 68, 2584; and PRD 48, 5). The results of studies of the hadronic jets produced in association with neutral pions and direct photons, including fragmentation and angular distributions, are reported in PRD 49, 3106.

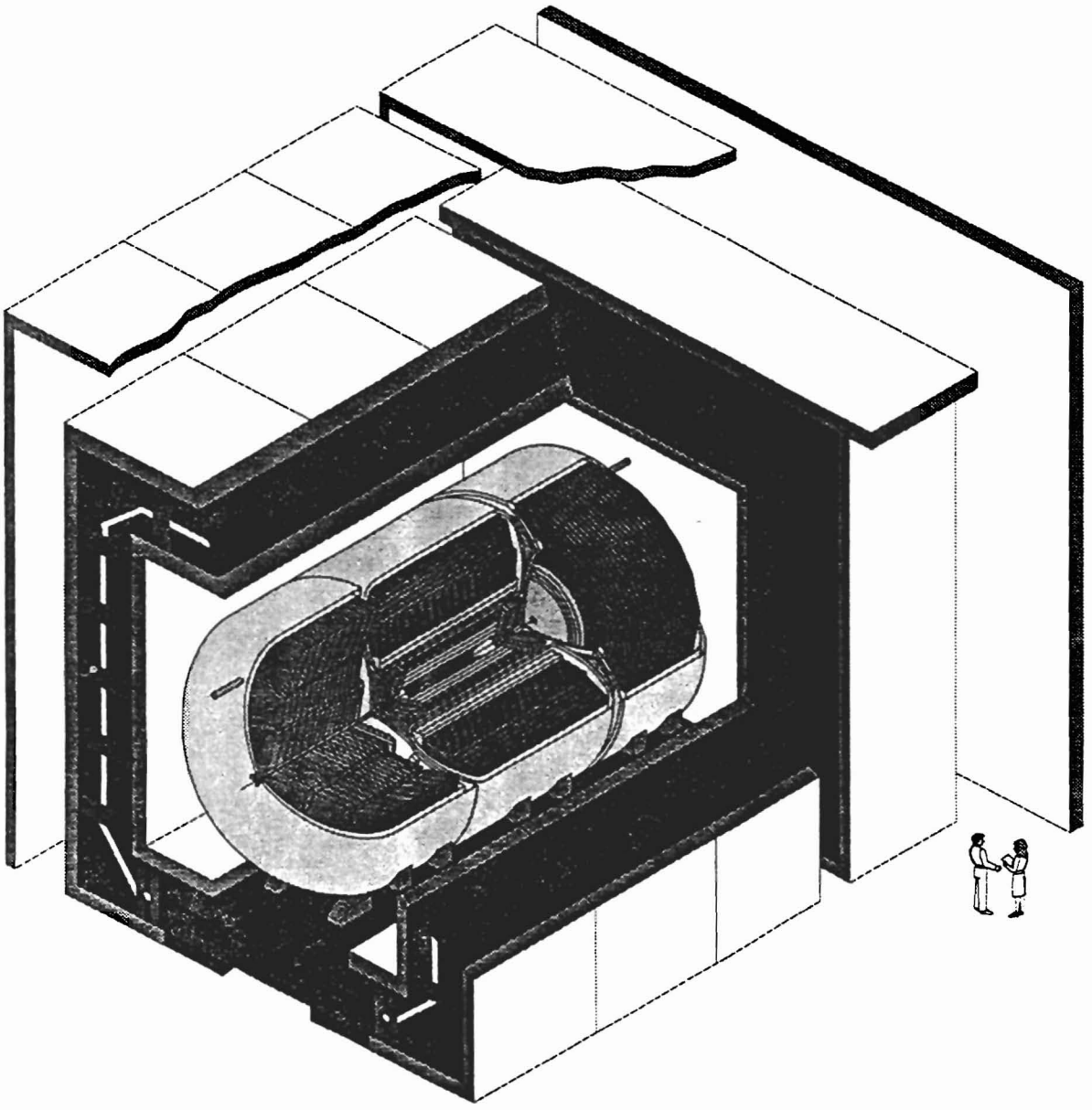
During the 1990 fixed-target run, about 30 million triggers induced by a negative 0.5 TeV beam incident on beryllium and copper targets were recorded. These data provide more than a factor of fifteen increase in sensitivity relative to that acquired during our initial run. Prior to the 1991 fixed-target 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.

Nine students have completed their Ph.D. research using the data accumulated during the 1990-91 fixed-target runs. We have measured the cross sections for neutral pion, eta, omega and direct photon production at high transverse mometum in interactions of 0.5 TeV negative pions on nuclear targets. The nuclear dependence of these measurements has been investigated. High statistics studies of photon-plus-jet and neutral-pion-plus-jet events have been carried out. 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 been completed.

It is expected that within the next year seven additional graduate students will complete their Ph.D. research based on the 1990-91 data samples. We will report upon the production of neutral pions, etas and direct photons at high transverse momentum by both positive and negative 0.5 TeV beams as well as by 0.8 TeV primary protons. The variety of targets employed in this experiment allows us to investigate the nuclear dependence of these results. Additional studies of the jets recoiling against the high transverse momentum trigger particles are also in progress.

The large-acceptance MWest multiparticle spectrometer has already 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.

E-740/823



DØ Detector

The Run I configuration of the D0 detector. The central tracking detectors are surrounded by the liquid argon calorimeter and the muon tracking system.

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

los Andes (Colombia), Arizona, BNL, Boston, Brown, Buenos Aires (Argentina), UC/Davis, UC/Irvine, UC/Riverside, CBPF (Brazil), CINVESTAV (Mexico), Columbia, Delhi (India), Fermilab, Florida State, Hawaii, IHEP/Protvino (Russia), Illinois/Chicago, Indiana, INP/Krakow (Poland), Iowa State, JINR (Russia), Korea (Korea), Kyungsung (Korea), LBL, 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), SSCL, SUNY/Stony Brook, Tata (India), Texas/Arlington, Texas A&M

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 consists of three major subsystems. Innermost is a central tracking system containing vertex, forward and outer drift chambers. There is no central magnetic field. The drift chamber resolution is ~60 μm (vertex) and 180 μm (forward and outer). The tracking system also includes a transition radiation detector to aid in electron identification; it provides a rejection of about 50 against single pions. The tracking chambers are 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 is 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 contains 116,000 channels. Data recording is initiated by a three-level trigger system: the first (Level 0) is 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) is a software filter implemented on a farm of 48 VAX Station 4000 computers with full event information available. A supplementary Level 1.5 trigger refines the Level 1 muon 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 taking data in Run Ib. The detector has been 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 bandwidth to tape was approximately doubled and now is 1.6 MHz which corresponds to an event rate of 3Hz. As of December 1995, an additional 85 pb^{-1} of collider data has been accumulated.

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, with a mass of about 200 GeV, in February 1995. This is a major accomplishment in understanding the Standard Model. We will refine our measurements of the properties and decays of the top quark as we continue to take data in Run Ib.

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. Results published from Run Ia data include the W and Z production cross sections, and p_T distributions. The production of dibosons ($W\gamma$, $Z\gamma$, WW, WZ) through trilinear couplings, a test of the Standard Model, has been studied with Run Ia 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 commence in 1995. 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 1.5 accept rate of 1 kHz and a Level 2 output of 5-10 Hz. The new triggering elements will include the fiber tracking and preshower detectors.

Publications

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

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

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

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

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

Search for High Mass Top Quark Production in $p\bar{p}$ 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 $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Rev. Lett. 74, 3548 (1995).

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

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

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

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

W and Z Boson Production in $p\bar{p}$ 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 $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, Phys. Lett. B357, 500 (1995).

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

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

Jet Production via Strongly-Interacting Color-Singlet Exchange in $p\bar{p}$ Collisions, accepted for publication in Phys. Rev. Lett. (1995).

Studies of Topological Distributions of Inclusive Three- and Four-Jet Events in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1800 GeV with the D0 Detector, submitted to Phys. Rev. D (1995).

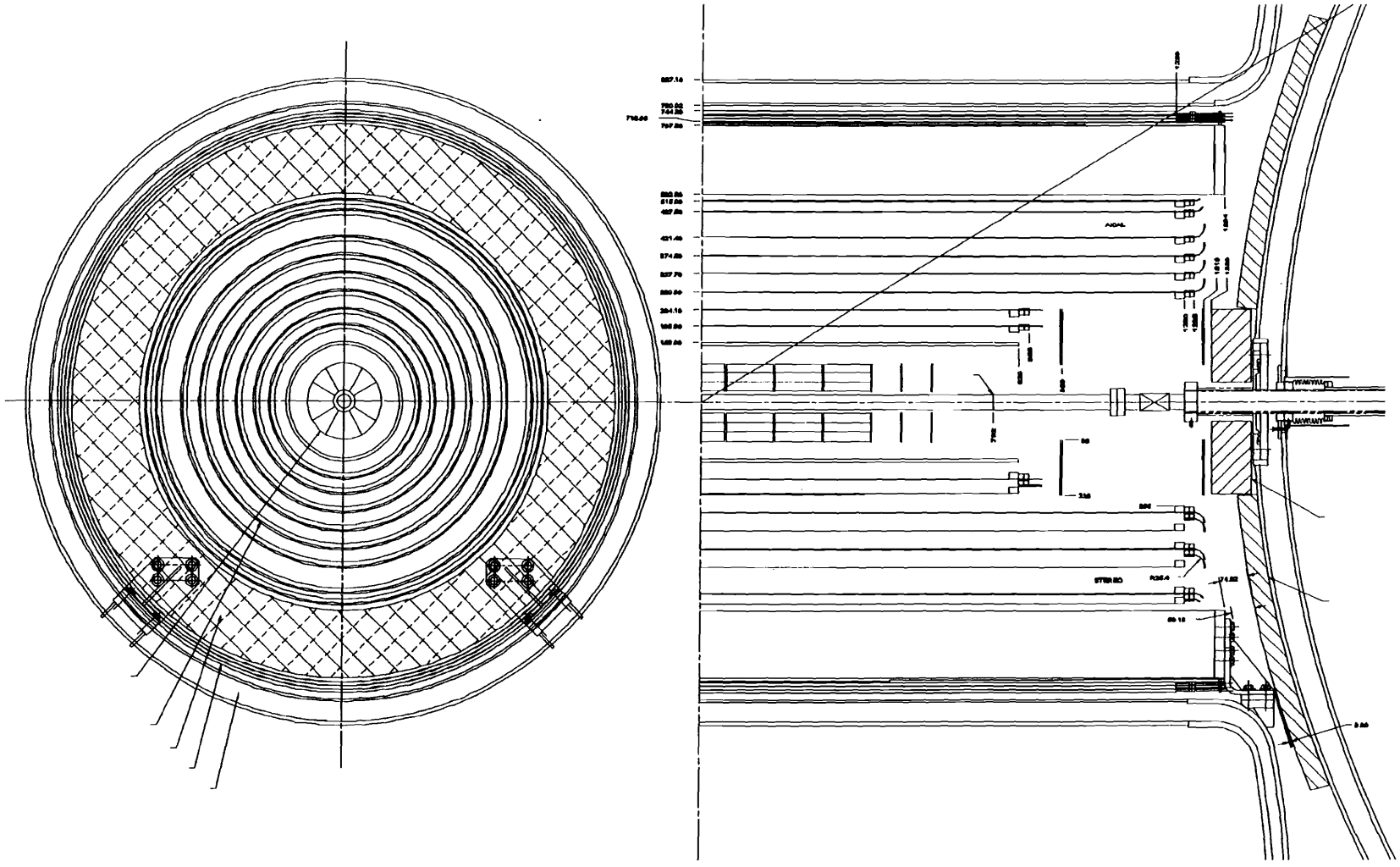
Search for Light Top Squarks in $p\bar{p}$ Collisions at 1.8 TeV, submitted to Phys. Rev. Lett. (1995).

Search for $\tilde{W}_1\tilde{Z}_2$ Production Via Trilepton Final States in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, submitted to Phys. Rev. Lett. (1995).

Search for Right-Handed W Bosons and Heavy W in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, submitted to Phys. Rev. Lett. (1995).

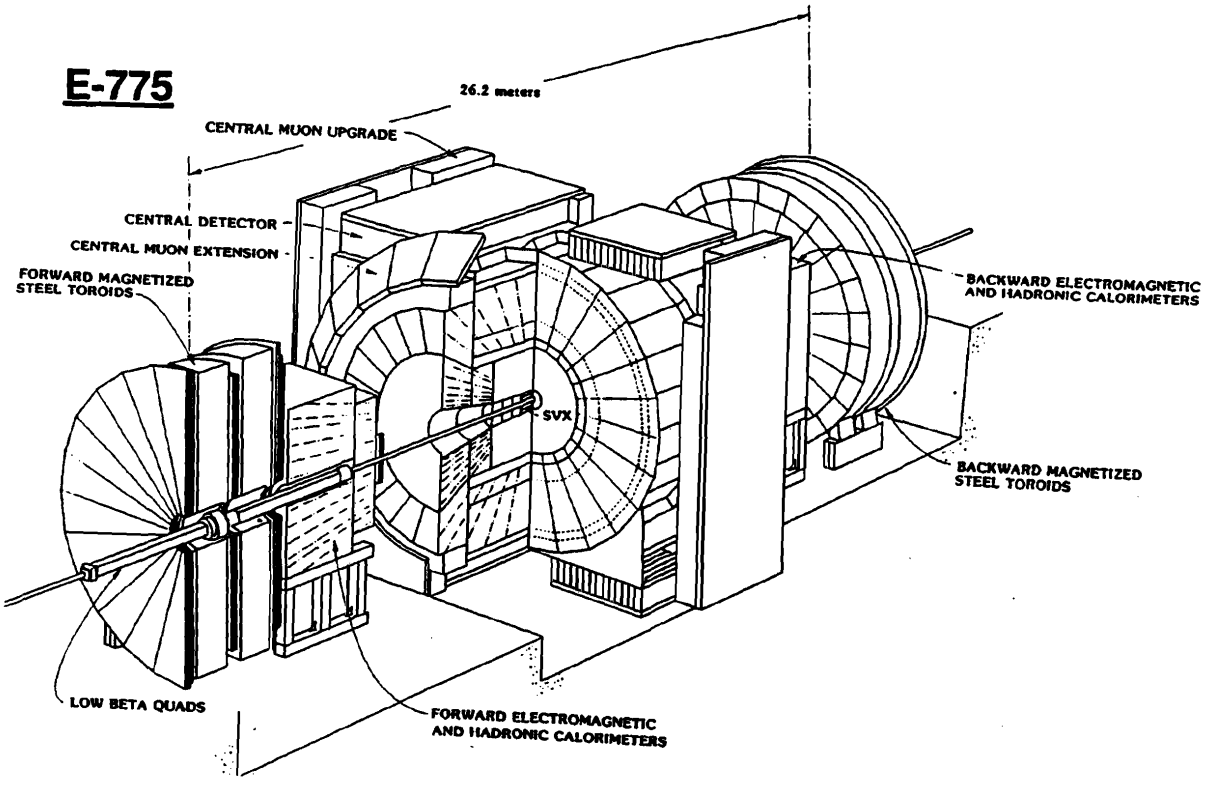
Theses

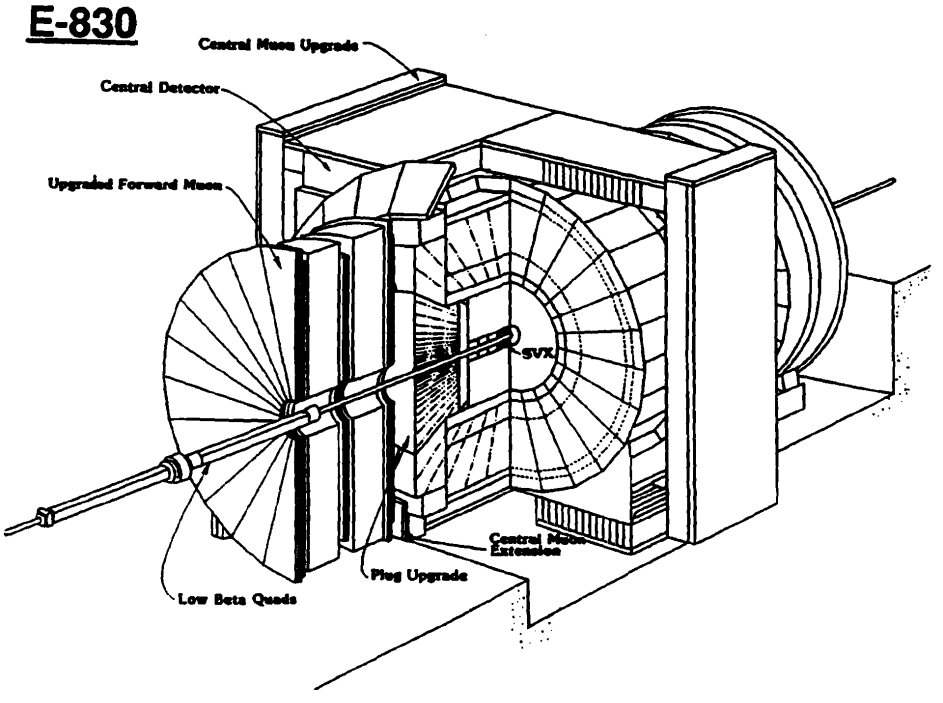
F. Feinstein	Univ. Paris Sud	December 1987
T. Behnke	SUNY/Stony Brook	August 1989
D. Pizzuto	SUNY/Stony Brook	December 1991
R. Astur	Michigan State University	June 1992
S. Rajagopalan	Northwestern University	June 1992
J. Bantley	Northwestern University	June 1992
J. Kotcher	New York University	October 1992
B. Pi	Michigan State University	November 1992
T. Heuring	SUNY/Stony Brook	May 1993
T. Geld	University of Michigan	May 1993
S. Durston	University of Rochester	June 1993
A. Milder	University of Arizona	August 1993
J. Yu	SUNY/Stony Brook	August 1993
D. Norman	University of Maryland	September 1993
J. Cochran	SUNY/Stony Brook	December 1993
A. Pluquet	Saclay/Univ. Paris	January 1994
R. Hirosky	University of Rochester	January 1994
J. Thompson	SUNY/Stony Brook	April 1994
J. Borders	University of Rochester	April 1994
Q. Zhu	New York University	April 1994
R. Hall	Univ. of California/Riverside	May 1994
M. Paterno	SUNY/Stony Brook	May 1994
B. May	University of Arizona	August 1994
D. Chakraborty	SUNY/Stony Brook	September 1994
M. Pang	Iowa State University	November 1994
V. Balamurali	University of Notre Dame	November 1994
G. Landsberg	SUNY/Stony Brook	November 1994
B. Abbott	Purdue University	December 1994
R. Demina	Northeastern University	December 1994
C. Murphy	Indiana University	April 1995
H. Johari	Northeastern University	April 1995
S. Snyder	SUNY/Stony Brook	May 1995
D. Elvira	Buenos Aires	May 1995
C. Gerber	Buenos Aires	May 1995
G. Lima	CBPF	May 1995
G. Eppley	Rice University	May 1995
M. Goforth	Florida State University	June 1995
J. Jiang	SUNY/Stony Brook	June 1995
A. Smith	University of Arizona	August 1995
S. Fahey	Michigan State University	August 1995
R. Madden	Florida State University	August 1995
P. Rubinov	SUNY/Stony Brook	August 1995
T. Huehn	Univ. of California/Riverside	September 1995
H. Xu	Brown University	September 1995
J. Balderston	University of Hawaii	October 1995
E. James	University of Arizona	November 1995
C. Kim	Korea University	December 1995
C. Cretsinger	University of Rochester	December 1995
Y. Liu	Northwestern University	December 1995



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.

CDF


E-775
26.2 meters
CENTRAL MUON UPGRADE
CENTRAL DETECTOR
CENTRAL MUON EXTENSION
FORWARD MAGNETIZED STEEL TOROIDS
BACKWARD ELECTROMAGNETIC AND HADRONIC CALORIMETERS
SVX
BACKWARD MAGNETIZED STEEL TOROIDS
LOW BETA QUADS
FORWARD ELECTROMAGNETIC AND HADRONIC CALORIMETERS


E-830
Central Muon Upgrade
Central Detector
Upgraded Forward Muon
SVX
Central Muon Extension
Plug Upgrade
Low Beta Quads

E-741 / 775 / 830 (Bellettini / Carithers) Collider Detector at Fermilab

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:	*E-741 - Data Analysis*
	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 with the Fermilab Tevatron Collider.

The heart of the CDF central detector is a 3.0-meter-long, 1.5-meter-radius, 1.4 Tesla superconducting solenoid with tracking chambers in the magnetic field for momentum analysis of charged particles. The solenoid is 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 completing 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-741

For E-741 the detector had a commissioning run in 1987, accumulating 33 nb^{-1} of integrated luminosity. In that run the Level 3 Trigger was not yet in place. The major physics run for E-741 was from June, 1988 to June, 1989 when a total of 4.7 pb^{-1} of integrated luminosity was accumulated on tape with the complete detector. The detector and data aquisition system coped well with the delivered peak luminosities of $2\times10^{30}cm^{-2}sec^{-1}$ -- a rate which was twice the design luminosity of the Tevatron Collider. Data reconstruction for this run was complete by the end of calendar 1989 and analysis of this data continues.

CDF as E-775

E-775 is the upgraded version of CDF for Collider Runs Ia and Ib. The new upgrades to CDF for E-775 for Collider Run Ia were extensive:

1. A new 1.5 inch diameter beryllium beam pipe with a 0.020 inch wall thickness was installed to replace the 2.0 inch diameter pipe used in 1989;
2. A new 4-layer, 46,000 channel Silicon microstrip Vertex Detector was installed around the beampipe to detect secondary vertices;
3. A new set of Vertex Time Projection Chambers with 4 cm drift spaces and 8,600 wires replaced the old 15 cm drift space devices;
4. New low noise preamplifiers were added to these Vertex TPCs;
5. New higher gain preamplifiers were installed on the inner layers of the Central Drift Chamber and the chamber gain was reduced to increase the lifetime of the device;
6. New amplifiers were installed on the outer layers of the Central Drift Chamber to give dE/dx information from 54 layers;
7. A vacuum leak in the solenoid cryostat was repaired;
8. 50 square meters of new wire chambers were added just behind the 1.1 radiation length thick solenoid as preradiator detectors;
9. 630 tons of steel was added to beef up the central muon detection;
10. 856 new chambers were added behind the steel walls and above/below the return yoke steel of the magnet to detect muons with rapidity less than 0.5;
11. An additional 1632 muon chambers and scintillators were added to extend the central muon coverage from rapidity of 0.5 to 1.0;
12. The forward (rapidity greater than 2.0) muon chambers and scintillators interspersed in the forward magnetic toroids were removed, refurbished with finer phi segmentation and reinstalled;
13. The gas calorimeter chamber gains were lowered to ease operation at ten times the original design luminosity;
14. 24,000 channels of new front-end electronics were installed on the gas calorimeters to compensate the gain change mentioned above, to shorten the integration times, and to reduce noise to the trigger system;
15. High voltage feedback was installed on the gas calorimeters to keep the gain stable with changing temperature and atmospheric pressure;
16. The existing multiplexed Analog to Digital Converter (ADC) cards were replaced with faster versions to reduce the front-end readout time from 18 to 3 milliseconds;
17. New luminosity monitors were installed;
18. Dual Fastbus Event Builders were installed to increase the data acquisition system rate capability by a factor of four to about 25 Hz;
19. The data acquisition system rate capability to 8 mm magnetic tape was increased from 1.2 to 8 Hertz;

20. The Level Two trigger processors were speeded up from 40 μsec to 20 μsec processing time per event;
21. A new Neural Net Level Two trigger was installed to make possible an isolation requirement on photon and electron triggers;
22. The computing power in the Level Three trigger farm was increased by a factor of 25 using UNIX based processors;
23. The offline code (and identical Level Three trigger code) was ported to UNIX;
24. 1000 Mips of offline computing was installed in offline farms; and
25. A robotic tape silo with 1.2 Terabytes of storage was installed for fast access to the data.

For Collider Run Ib, several upgrades were installed:

26. The SVX was replaced with a radiation-hard version, the SVX'. This device has similar acceptance but much improved signal-to-noise performance;
27. The DAQ system bandwidth has increased considerably with the addition of Fastbus Readout Controllers (FRC), VME-based scanner processors, and a very fast Ultranet hub connection to connect the scanners with the Level 3 trigger processors;
28. The Level 2 trigger processors have been replaced by a faster, more flexible system based on the DEC Alpha processor; and
29. New front-end electronics for the central electromagnetic strip chambers were added to allow a track match with strip clusters at Level 2 of the trigger.

In Collider Run Ia, CDF rolled into the B0 Collision Hall at the end of March, 1992, and first collisions were seen in May, 1992. During Run Ia, the E-775 detector functioned well, taking data at luminosities up to 9×10^{30} $cm^{-2}sec^{-1}$ with 90% livetime and an overall data-taking efficiency of 71%. 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 18×10^{30} $cm^{-2}sec^{-1}$ with 90% livetime and an overall data-taking efficiency of about 80%. Data-taking began on January 19, 1994, and by January 23, 1995, a total integrated luminosity of 50.9 pb^{-1} had been recorded. The first-pass event reconstruction for this Run Ib data is nearly complete, and data analysis is continuing.

A total of 100 papers on CDF results have been published or submitted for publication. The main highlight to date is a paper on the observation of the top quark submitted for publication on February 24, 1995, using 48 pb^{-1} of Run Ib data and all of the Run Ia data. Ninety-eight graduate students have submitted theses for their degrees based on CDF data.

CDF as E-830

E-830 is the upgraded version of CDF for Collider Run II, where the spacing between Tevatron bunches will decrease from 3500 nsec to 396 sec and luminosities much greater than $10^{31}cm^{-2}sec^{-1}$ are expected. The goal of this upgrade project is to improve the detector to enable it to operate at a luminosity of $2\times10^{32}cm^{-2}sec^{-1}$ with a Tevatron bunch spacing as small as 132 nsec. The major components of the E-830 CDF upgrade are:

a) Replace the plug and forward gas calorimeters with a new scintillator-based calorimeter enabling the forward muon toroids to be moved closer to the interaction region;

b) Upgrade the front-end electronics and trigger systems to accommodate data-taking at higher rates with shorter Tevatron bunch spacings;

c) Upgrade the data acqusition system to increase throughput and reliability;

d) Replace the silicon vertex detector with a device capable of withstanding higher radiation and with a readout system matched to 132 nsec spacing;

e) Add a fiber tracker between the silicon vertex detector and the existing central drift chamber to insure continued quality of tracking pattern recognition and accuracy;

f) Replace the main CTC tracking chamber with a higher-granularity straw tracker; and

g) Enhance the off-line computing capability to provide for efficient production of physics results as the quantity of data increases.

The CDF Collaboration has increased dramatically in size since 1989. Nineteen new universities and national laboratories have joined to double the number of collaborating institutions to 36. A total of 459 physicists are now members, up from 187 in 1989. Of these 459, 142 are graduate students, 99 hold post-doctoral positions, and 218 are permanent staff.

Publications

The CDF Detector: An Overview, Nucl. Instrum. Methods in Physics Research, 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 $\Lambda_b \rightarrow J/\psi\, \Lambda^0$ 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).

Measurement of Correlated μ-$\bar{b}$ Jet Cross Sections in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, submitted to Phys. Rev. D, August, 1995. FERMILAB-PUB-95/289-E.

Measurement of σB ($W \rightarrow e\nu$) and σB ($Z^0 \rightarrow e^+e^-$) in $p\bar{p}$ Collisions at $\sqrt{s}$ = 1.8 TeV, submitted to Phys. Rev. Lett., September, 1995. FERMILAB-PUB-95/301-E.

Measurement of the Mass of the B^0_s Meson, submitted to Phys. Rev. D, September, 1995. FERMILAB-PUB-95/317-E.

Reconstruction of $B^0 \rightarrow J/\psi\ K^0_s$ and Measurement of Branching Ratios Involving $B \rightarrow J/\psi\ K^*$, submitted to Phys. Rev. Lett., November, 1995. FERMILAB-PUB-95/368-E.

Search for the Rare Decay $W^{\pm} \rightarrow \pi^{\pm} + \gamma$, submitted to Phys. Rev. Lett., December, 1995. FERMILAB-PUB-95/386-E.

Search for Gluino and Squark Cascade Decays at the Fermilab Tevatron Collider, submitted to Phys. Rev. Lett., December, 1995. FERMILAB-PUB-95/399-E.

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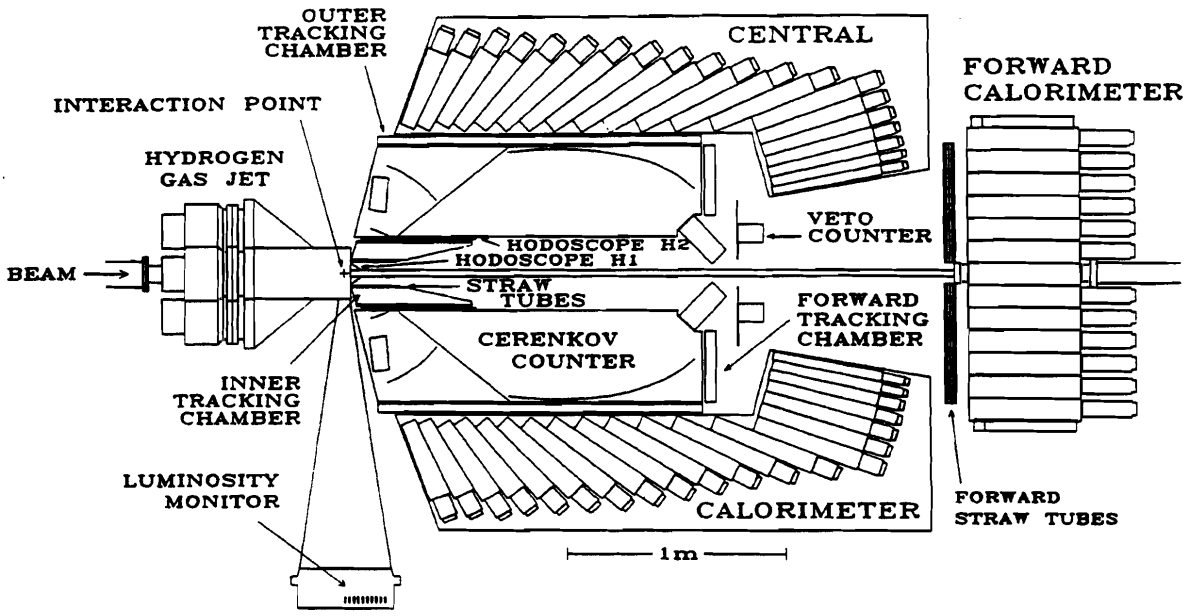
E-760 Detector Schematic



E-760 (Cester) 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, Pennsylvania State, INFN/Torino (Italy), Torino (Italy)

Status: *Data Analysis*

Experiment E-760 studied charmonium states formed in $\bar{p}p$ collisions. A cooled antiproton beam of up to 4×10^{11} $\bar{p}$'s circulating in the Fermilab Antiproton Accumulator ring intercepts a high density hydrogen jet. States can be formed directly in $\bar{p}p$ interactions which are not directly accessible in e^+e^- interactions. The antiproton beam is cooled to $\Delta p/p = 2\times10^{-4}$ which allows sub-MeV widths of charmonium states to be measured directly for the first time.

The apparatus is optimized to detect charmonium states in the presence of the hadronic background through their decays to final states containing electrons and/or photons (e.g. $p\bar{p} \rightarrow \chi \rightarrow J/\psi\,\gamma \rightarrow e^+e^-\gamma$, $p\bar{p} \rightarrow \eta_c \rightarrow \gamma\gamma$). The main element of the detector is the central electromagnetic calorimeter, which consists of a cylindrical array of 1280 lead-glass Cerenkov counters. This is augmented in the forward direction by a planar electromagnetic calorimeter. Inside the central calorimeter are two scintillator hodoscopes, tracking chambers and a 16-cell threshold Cerenkov counter for electron identification.

E-760 took its first data with the complete apparatus in 1990. Energy scans performed at the J/ψ and ψ' found remarkably clean signals and demonstrated the capability of the detector and the Antiproton Source; precision measurements of the χ_1 and χ_2 line parameters have been published. The experiment took 31 pb^{-1} of data in 1991, concentrating on measuring the $\gamma\gamma$ decay rate of the χ_2 state, a search for the η_c', and measuring the η_c width. The line widths of both the J/ψ and the ψ' were also measured and a rich field of light-quark resonances which decay to neutrals is under study. The major achievement of the second run, however, was the discovery of the $^1P_1$ state: this was found as a result of an energy scan around the center of mass of the χ states in the mode $\bar{p}p \rightarrow {}^1P_1 \rightarrow J/\psi\,\pi^0 \rightarrow e^+e^-\gamma\gamma$.

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).

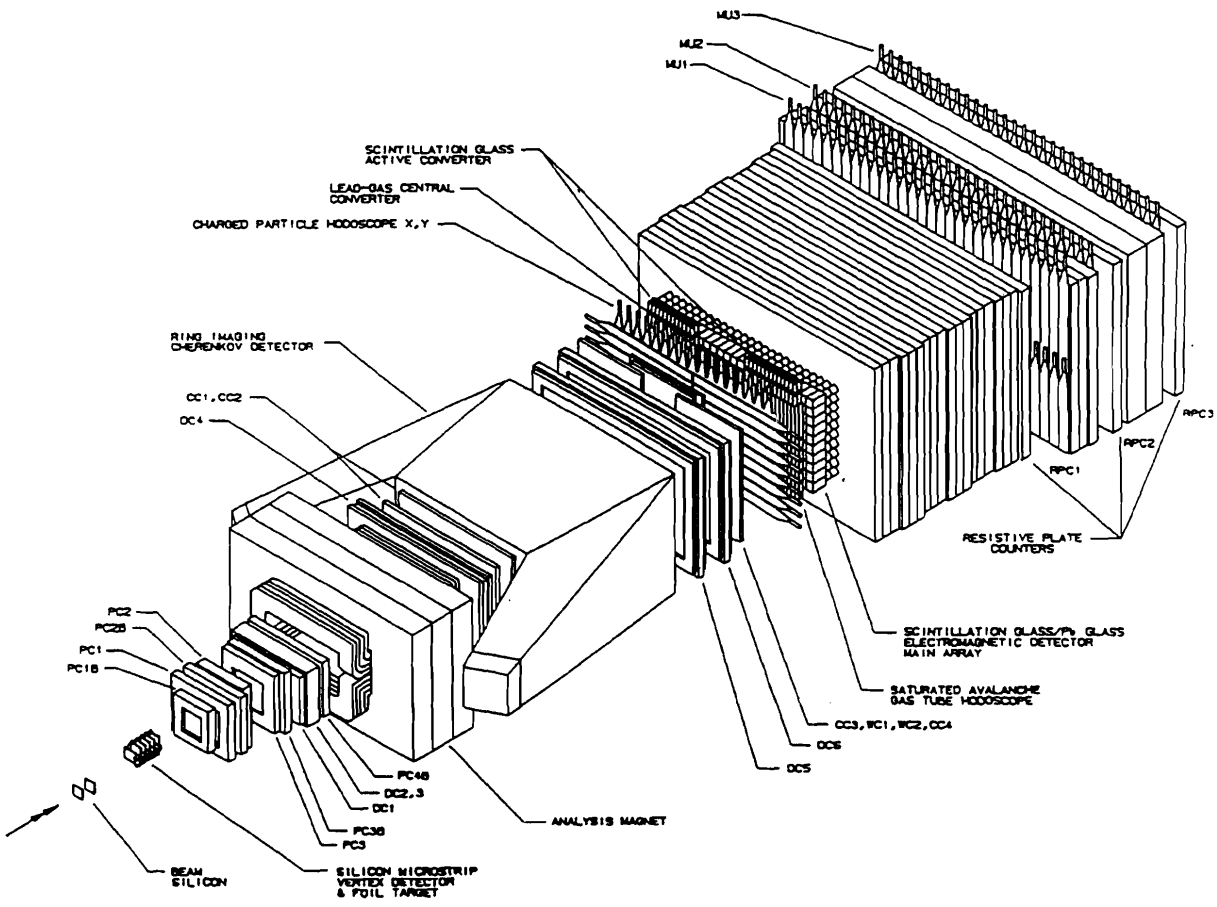
Study of the Angular Distribution of the Reaction $\bar{p}p \rightarrow \chi_2 \rightarrow J/\psi\gamma \rightarrow e^+e^-\gamma$, T. A. Armstrong et al., Phys. Rev. D48, 3037 (1993).

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).

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, 126 million dimuon triggers and 62 million single muon triggers were acquired in 800 Gev/c p-Si interactions. These data are presently being analyzed to extract beauty and hidden charm physics via the signatures

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

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

$$pN \rightarrow \text{charmonium states + anything}$$
$$\hookrightarrow J/\psi + \text{charged or neutral } \pi\text{'s}$$

At present, Pass I processing of the dimuon data has been completed and some 20K to 35K $J/\psi \rightarrow \mu\mu$ decays have been reconstructed (the number depending on cuts necessary for the physics under study). Pass II processing of these data is beginning. Some B's have already been extracted from the J/ψ data in a quick survey of a small portion of the data.

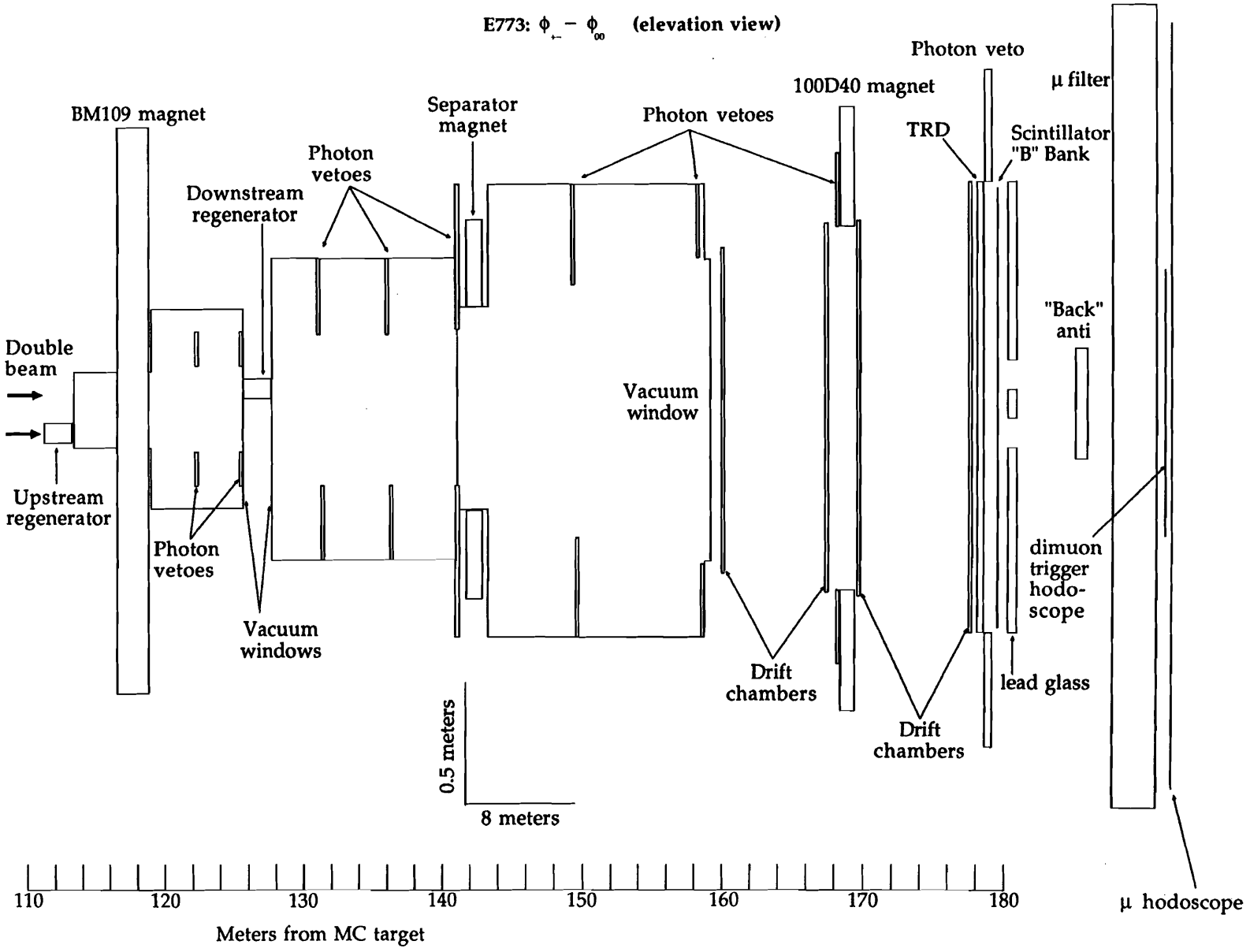
In addition, the enhancement tentatively designated as the $^3D_2$ state of charmonium observed in 300 GeV/c $\pi^{\pm}N$ interactions in E-705 via its decay

$$^3D_2 \rightarrow J/\psi\pi^+\pi^-$$
$$\hookrightarrow \mu\mu$$

has been observed in the 800 GeV/c pN interactions in E-771. Work is proceeding on a search for the $^1P_1$ state which was observed in E-705 $\pi^{\pm}$ and proton interactions via its decay

$$^1P_1 \rightarrow J/\psi\pi^0$$
$$\hookrightarrow \mu\mu$$

Pass I processing of single muon data has just begun. It is expected that most of the Pass I single muon processing will be finished by late spring 1994. Some B candidates have already been isolated in this data in a preliminary scan.


E773: $\phi_{+-} - \phi_{00}$ (elevation view)
Photon veto
100D40 magnet
μ filter
BM109 magnet
Separator magnet
Photon vetoes
TRD
Scintillator "B" Bank
Photon vetoes
Downstream regenerator
"Back" anti
Double beam
Vacuum window
Upstream regenerator
Photon vetoes
dimuon trigger hodo-scope
Vacuum windows
Drift chambers
lead glass
Drift chambers
0.5 meters
8 meters
110
120
130
140
150
160
170
180
Meters from MC target
μ hodoscope

E-773 (Gollin) Measurement of the Phase Difference Between η_{00} and η_{+-} to a Precision of 1°

Chicago, Elmhurst, Fermilab, Illinois, Rutgers

Status: *Data Analysis*

The ratios of the amplitudes for K_L and K_S to decay into pairs of pions are

$$\eta_{00} = \frac{\mathrm{Amp}(K_L \to \pi^0\pi^0)}{\mathrm{Amp}(K_S \to \pi^0\pi^0)} \text{ and } \eta_{+-} = \frac{\mathrm{Amp}(K_L \to \pi^+\pi^-)}{\mathrm{Amp}(K_S \to \pi^+\pi^-)}.$$

The magnitudes of η_{00} and η_{+-}, measured by Fermilab E-731, are nearly identical. Given the approximate equality of $|\eta_{00}|$ and $|\eta_{+-}|$, CPT conservation requires $\Delta\phi$, the phase difference between η_{00} and η_{+-}, to be at most a fraction of a degree.

To avoid systematic uncertainties associated with imperfect knowledge of kaon beam flux, detector acceptance, and resolution smearing effects, E-773 measures $\pi\pi$ decays using a double beam technique similar to that employed by E-731, our ε' experiment. One beam passes through a thin regenerator at the start of the fiducial decay volume, while the other beam traverses a thick regenerator 12 meters further upstream. The separation is chosen to make the $\pi\pi$ decay rate inside the decay volume insensitive to $\Delta\phi$ for K_S from the upstream regenerator, and maximally sensitive to $\Delta\phi$ for K_S from the downstream regenerator. The regenerators switch beams between beam spills; data were recorded simultaneously for $\pi^0\pi^0$ and $\pi^+\pi^-$ decays in both beams. The double ratio of rates,

$$R \equiv \frac{\Gamma_{00}(\text{upstream})/\Gamma_{00}(\text{downstream})}{\Gamma_{+-}(\text{upstream})/\Gamma_{+-}(\text{downstream})},$$

differs from unity by about 0.7% per degree of $\Delta\phi$. "Upstream" and "downstream" refer to the beams containing regenerators in the upstream and downstream positions.

The E-773 detector is similar to the E-731 detector downstream of the two regenerators; both regenerators are solid scintillator to reduce backgrounds from inelastic K_S production. The $\pi^0\pi^0$ final states are measured in an 804-element lead glass array, while the $\pi^+\pi^-$ decays are detected in a 2000-channel drift chamber spectrometer. The neutral mode trigger requires four photons to strike the lead glass array; the glass and chambers are the same as those used by E-731.

We recorded about 450 million triggers during the first half of the 1991 fixed-target run (we reconfigured the detector for E-799 during the second half of the run). Before fiducial cuts, there are approximately 10^6 $K \to \pi\pi$ decays in

our data sample, which yields a measurement accuracy of 1° for $\Delta\phi$. We have finished our analysis, and have shown results at conferences in 1994 and 1995.

Our measurements include the phase difference between η_{00} and η_{+-} ($\Delta\phi$), the phase of η_{+-}(ϕ_{+-}), the K_L-K_S mass difference (Δm), the K_S lifetime (τ), and the magnitude and phase of $\eta_{+-\gamma}$. We find:

$$\begin{aligned}
\phi_{+-} &= (43.53 \pm 0.58 \pm 0.49)^\circ \\
\Delta m &= (0.5297 \pm 0.0030 \pm 0.0022) \times 10^{10} \\
\tau_S &= (0.8941 \pm 0.0014 \pm 0.0009) \times 10^{-10} \\
|\eta_{+-\gamma}| &= (2.359 \pm 0.062 \pm 0.040) \times 10^{-3} \\
\phi_{+-\gamma} &= (43.8 \pm 3.5 \pm 1.9)^\circ \\
\Delta\phi &= (0.62 \pm 0.71 \pm 0.75)^\circ
\end{aligned}$$

Shown in the accompanying figure are acceptance-corrected decay distributions for $\pi^+\pi^-$ and $\pi^0\pi^0$ decays from the upstream-regenerator beam in a restricted energy range. The interference between the K_L and K_S decay amplitudes is clearly visible.

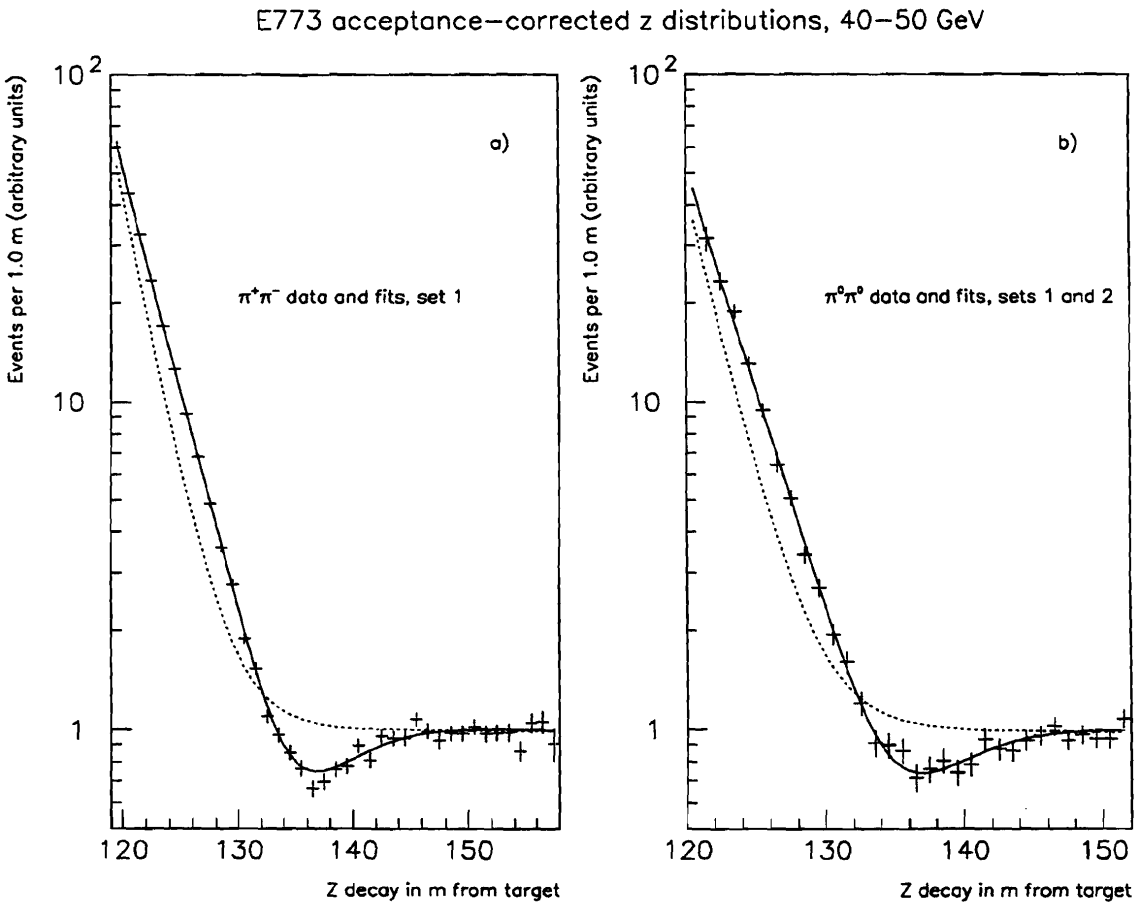
Publications

CPT Tests in the Neutral Kaon System, B. Schwingenheueur et al., Phys. Rev. Lett. 74, 4376 (1995).

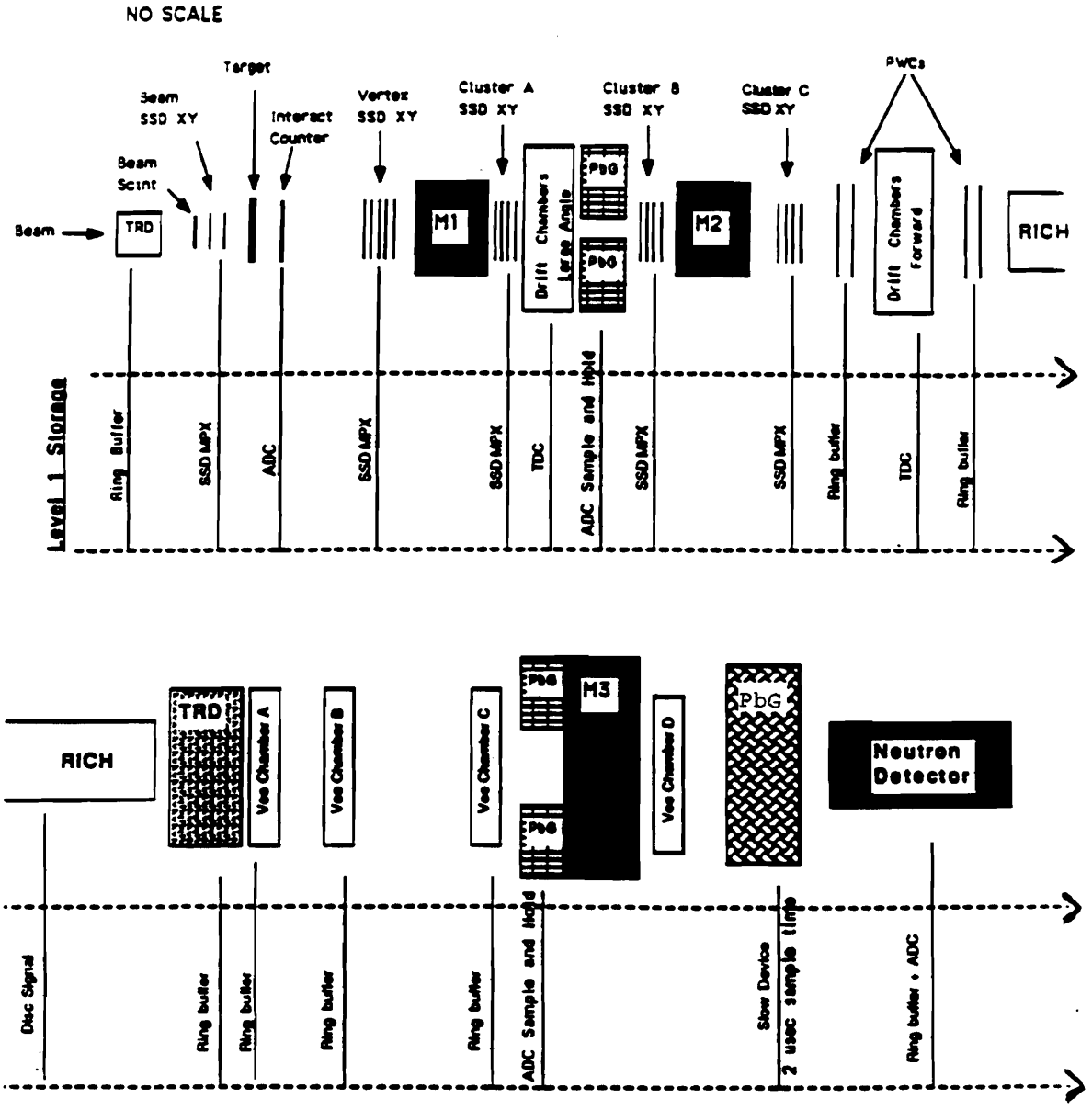
New Measurement of the CP Violation Parameter $\eta_{+-\gamma}$, J. N. Matthews et al., Phys. Rev. Lett. 75, 2803 (1995).

Theses

B. Schwingenheueur, University of Chicago
R. Briere, University of Chicago
J. Matthews, Rutgers University


E773 acceptance–corrected z distributions, 40–50 GeV
Events per 1.0 m (arbitrary units)
10^2
10
1
a)
$\pi^+\pi^-$ data and fits, set 1
120
130
140
150
Z decay in m from target
b)
$\pi^0\pi^0$ data and fits, sets 1 and 2

E-781


NO SCALE
Target
Beam SSD XY
Interact Counter
Vertex SSD XY
Cluster A SSD XY
Cluster B SSD XY
Cluster C SSD XY
PWCs
Beam Scint
Beam
TRD
M1
Drift Chambers Large Angle
PbG
PbG
M2
Drift Chambers Forward
RICH
Level 1 Storage
Ring Buffer
SSD MPX
ADC
SSD MPX
SSD MPX
TDC
ADC Sample and Hold
SSD MPX
SSD MPX
Ring buffer
TDC
Ring buffer
RICH
TRD
Vee Chamber A
Vee Chamber B
Vee Chamber C
PbG
M3
PbG
Vee Chamber D
PbG
Neutron Detector
Disc Signal
Ring buffer
Ring buffer
Ring buffer
Ring buffer
ADC Sample and Hold
Slow Device
2 usec sample time
Ring buffer + ADC

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: *No Data Yet*

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.

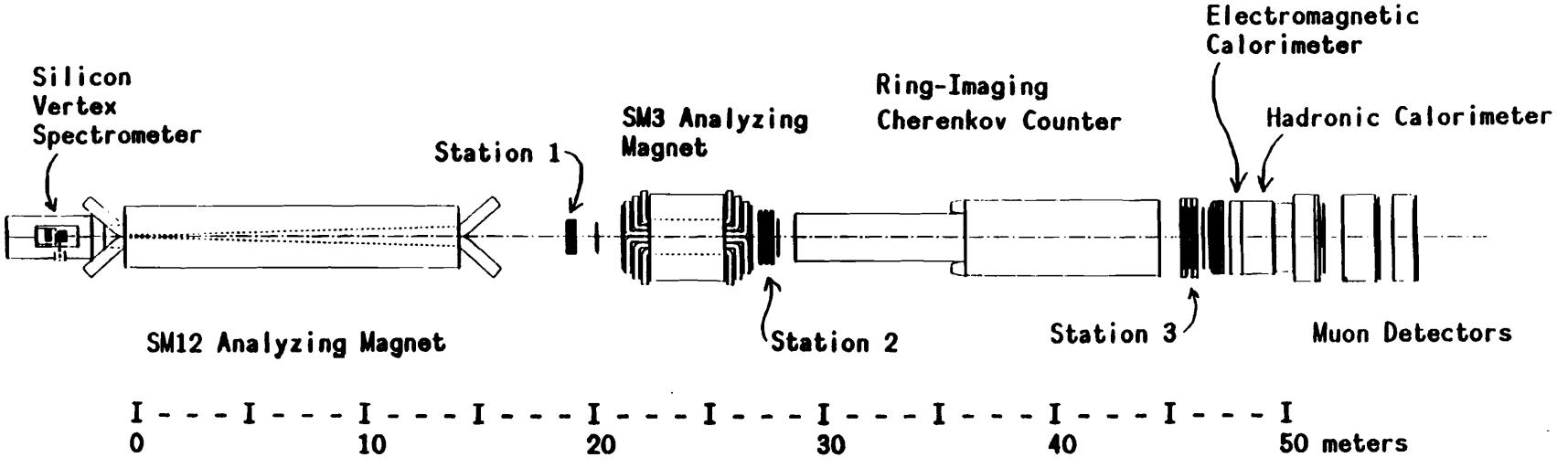
The charm trigger for E-781 is based on impact parameter, to provide a topology-independent trigger. All charm particles have a finite decay length, albeit short. A high resolution tracking device close to the target can select charm candidates on the basis of one or more tracks with a sufficiently large 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. This allows one to achieve 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 is expected to give a charm enrichment factor at large x of at least 100. It was tested and verified in the 1991 fixed-target run.

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 is now being installed and anticipates an extremely productive run in the 1996 fixed-target period.



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 is 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 have been 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 × y × z (mm^3)	Total live interactions
1	charm	1000A	Au	50 × 0.1 × 0.8	4×10^{11}
2	charm	1000A	Be	50 × 0.1 × 0.8	1×10^{11}
3	beauty	1500A	Au	50 × 0.2 × 3	3×10^{13}
4	charm	900A	Au	50 × 0.15 × 1.5	7×10^{10}
5	charm	900A	Be	50 × 0.15 × 1.5	1×10^{11}
6	charm→ dileptons	900A	Au	50 × 0.15 × 1.5	4×10^{11}
7	charmonium	2400A	Cu	Beam dump	2×10^{13}
8	charmonium	2400A	Be	50 × 100 × 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

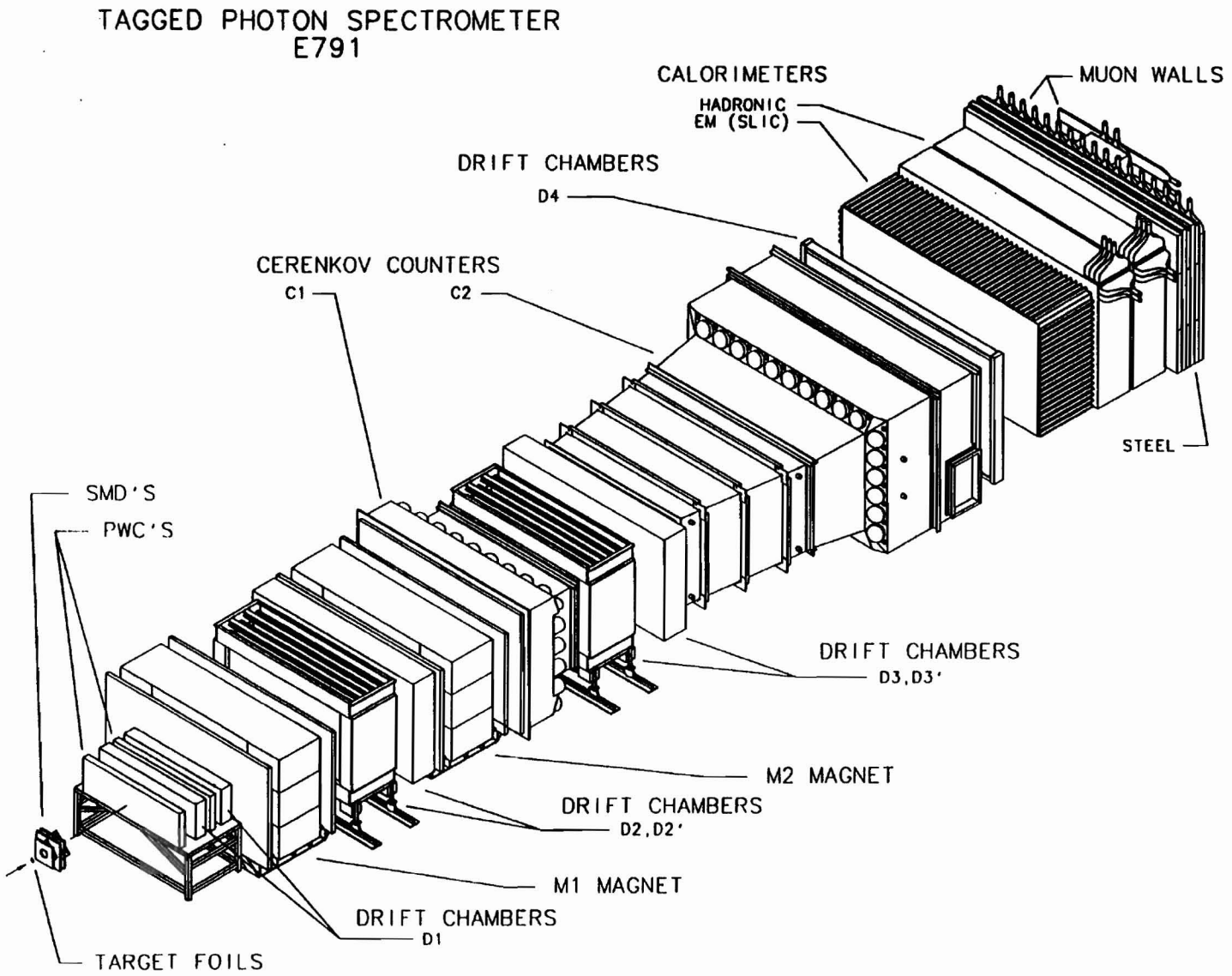
upstream of the beam dump. During the 1990 test run we also took data with three different targets to measure the A dependence of J/ψ production at x_F near 0.[5] These data supplement the results previously published by our collaboration in E-772.

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[1-11] and preprints.[12,13] Four M.S. theses[14-17] and two Ph.D. dissertations[18,19] 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. Meth. A306, 439 (1991).
9. B. Turko et al., IEEE Trans. Nucl. Sci. 39, 758 (1992).
10. D. M. Kaplan et al., Nuct. Instr. Meth. A330, 33 (1993).
11. D. M. Kaplan et al., Nucl. Instr. Meth. A336, 116 (1993).
12. C. N. Brown et al., to be submitted to Phys. Rev. D (1996).
13. M. H. Schub et al., to be submitted to Nucl. Instr. Meth. (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 at Berkeley, December, 1992.
19. Y. C. Chen, Ph.D. thesis, National Cheng-Kun University, Taiwan, December, 1993.


TAGGED PHOTON SPECTROMETER
E791
CALORIMETERS
HADRONIC
EM (SLIC)
MUON WALLS
DRIFT CHAMBERS
D4
CERENKOV COUNTERS
C1
C2
STEEL
SMD'S
PWC'S
DRIFT CHAMBERS
D3,D3'
M2 MAGNET
DRIFT CHAMBERS
D2,D2'
M1 MAGNET
DRIFT CHAMBERS
D1
TARGET FOILS

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

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: *E-769, E-791 - 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 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). It should be possible to reconstruct a couple of hundreds of beauty decays partially and a few B decays fully.

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 degree to which two-body decays dominate, the role of final state interactions and, of course, the pattern of lifetimes of the charm-strange baryons. E-791, being a very high-statistics as well as open-geometry experiment, is ideal for

observing rare branching ratios into fully charged modes and has good background rejection for γ and π^0 modes.

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 will also allow precision studies of charm hadroproduction. The experiment's sample of partially reconstructed B mesons should be sufficient to extract the total $b\bar{b}$ production cross-section.

E-791 is simultaneously exploring challenging new technologies. 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 or are working on physics analyses based on E-691 or E-769 data. A total of 13 Ph.D. theses based on E-769 have been accepted, with an additional two expected. All more recent Ph.D. students, 25 as of this writing, have both their hardware and analysis experience with E-791. The first five 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).

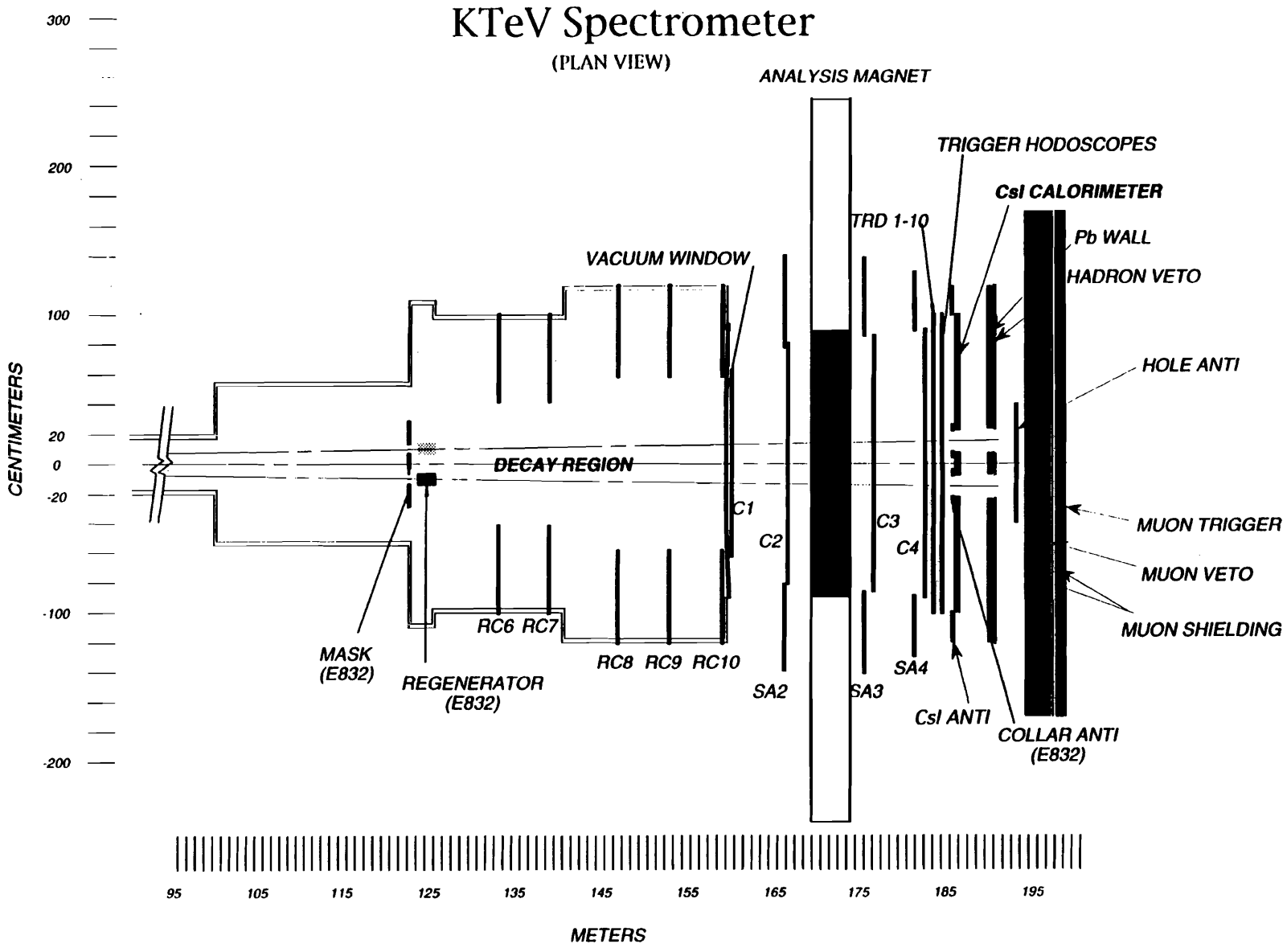
$D^{*\pm}$ Production in 250 GeV $\pi^\pm$N Interactions, G. A. Alves et al., Phys. Rev. D49, R4317 (1994).

E-791 Publications

The E-791 Parallel Architecture Data Acquisition System, S. Amato et al., Nucl. Instr. 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^--Nucleon Interactions as a Function of x_F and p_t^2, E. Aitala et al., accepted for publication in Phys. Lett. B (1996).


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
COLLAR ANTI
(E832)
CENTIMETERS
300
200
100
20
0
-20
-100
-200
95
105
115
125
135
145
155
165
175
185
195
METERS

E-799 (Wah / Yamanaka) A Search for the Rare Decay $K_L \rightarrow \pi^0 l^+ l^-$

UCLA, Chicago, Colorado, Elmhurst, Fermilab, Illinois, Osaka (Japan), Rutgers
(Phase II includes UC/San Diego, Rice, Virginia, Wisconsin)

Status: *Phase I - Data Analysis*
Phase II - No Data Yet

E-799 was proposed to be executed in two phases. Phase I (E-799I) finished data-taking early in 1992 and Phase II (E-799II) will be performed during the next fixed-target run starting in 1996. E-799 focuses upon rare decays, particularly $K_L \rightarrow \pi^0 l^+ l^-$ (where l could be electron, muon, or neutrino) that could have large direct CP violating amplitudes.

E-799I took data in the last Fermilab fixed-target running period from October 1991 until January 1992 using the high intensity MC beamline. About 1000 video cassettes (1 terabyte; 500 million triggers) of data were collected. The data collected has sensitivities approaching 10^{-9} for a variety of rare decays. The important decay modes to be studied are $K_L \rightarrow \pi^0 ee$, $\pi^0 \mu\mu$, $\pi^0 \nu\nu$ (all three have dominant direct CP-violating amplitudes); $K_L \rightarrow \mu\mu\gamma$, eeee, $\mu\mu ee$, $\pi^+\pi^- ee$ (Dalitz and related form factor study); $\pi^0 \rightarrow ee\gamma$, $\pi^0 \rightarrow eeee$ (π^0 Dalitz and related form factor study); $\pi^0 \mu e$, $\pi^0 \rightarrow \mu e$ (lepton number violation); and a few others such as $K_L \rightarrow ee\gamma\gamma$ which is very important for background understanding for $K_L \rightarrow \pi^0 ee$.

We have finished the analysis of $K_L \rightarrow \pi^0 ee$, $K_L \rightarrow \pi^0 \mu\mu$, $\pi^0 \rightarrow ee$, $\pi^0 \rightarrow \mu e$, $K_L \rightarrow eeee$, $K_L \rightarrow \pi^0 \nu\bar{\nu}$, $K_L \rightarrow \pi^0 \pi^0 \gamma$, $K_L \rightarrow ee\gamma\gamma$, $K_L \rightarrow \mu\mu\gamma$, and Λ and $\bar{\Lambda}$ polarization. We have improved the upper limit on the branching ratio for $K_L \rightarrow \pi^0 \mu\mu$ by more than a factor 200, and it is still found to be background-free. We have also observed clean $\pi^0 \rightarrow ee$ events for the first time, by tagging π^0's from $K_L \rightarrow 3\pi^0$ decays.

The table below summarizes our final results.

Decay Mode	Evts seen before E-799	E-799I	E-799I results	Paper
$\pi^0 \rightarrow ee$	(contentious)	8	$(8.0^{+4.1}_{-2.9} \pm 0.5) \times 10^{-8}$	PRL 71, 34 (1993)
$K_L \rightarrow \pi^0 ee$	br<5.5×10^{-9}	-	br<4.3×10^{-9}	PRL 71, 3918 (1993)
$K_L \rightarrow \pi^0 \mu\mu$	br<2.5×10^{-6}	-	br<5.1×10^{-9}	PRL 71, 3914 (1993)
$\pi^0 \rightarrow \mu e$	br<1.6×10^{-8}	-	br<8.6×10^{-9}	PL B320, 407 (1994)
$K_L \rightarrow eeee$	2+6	27	$(3.96 \pm 0.84) \times 10^{-8}$	PRL 72, 3000 (1994)
$K_L \rightarrow \pi^0 \pi^0 \gamma$	none	-	br<2.3×10^{-4}	PR D50, 1874 (1994)
$K_L \rightarrow \pi^0 \nu\bar{\nu}$	br<2.4×10^{-4}	-	br<5.8×10^{-5}	PRL 72, 3758 (1994)
$K_L \rightarrow ee\gamma\gamma$	$(6.6 \pm 3.2) \times 10^{-7}$	58	$(6.5 \pm 1.3) \times 10^{-7}$	PRL 73, 2169 (1994)
$K_L \rightarrow \mu\mu\gamma$	1	199	$(3.23 \pm 0.30) \times 10^{-7}$	PRL 74, 3323 (1995)
Λ, $\bar{\Lambda}$ polarization				PL B338, 403 (1994)

It should be noted that the open geometry of the E-799 detector, the high acceptances for multi-body final states, and the high energy of the decaying kaons, leads to unprecedented sensitivities to numerous rare and not so rare kaon and neutral pion decays. We produced many new physics results from the E-799I data.

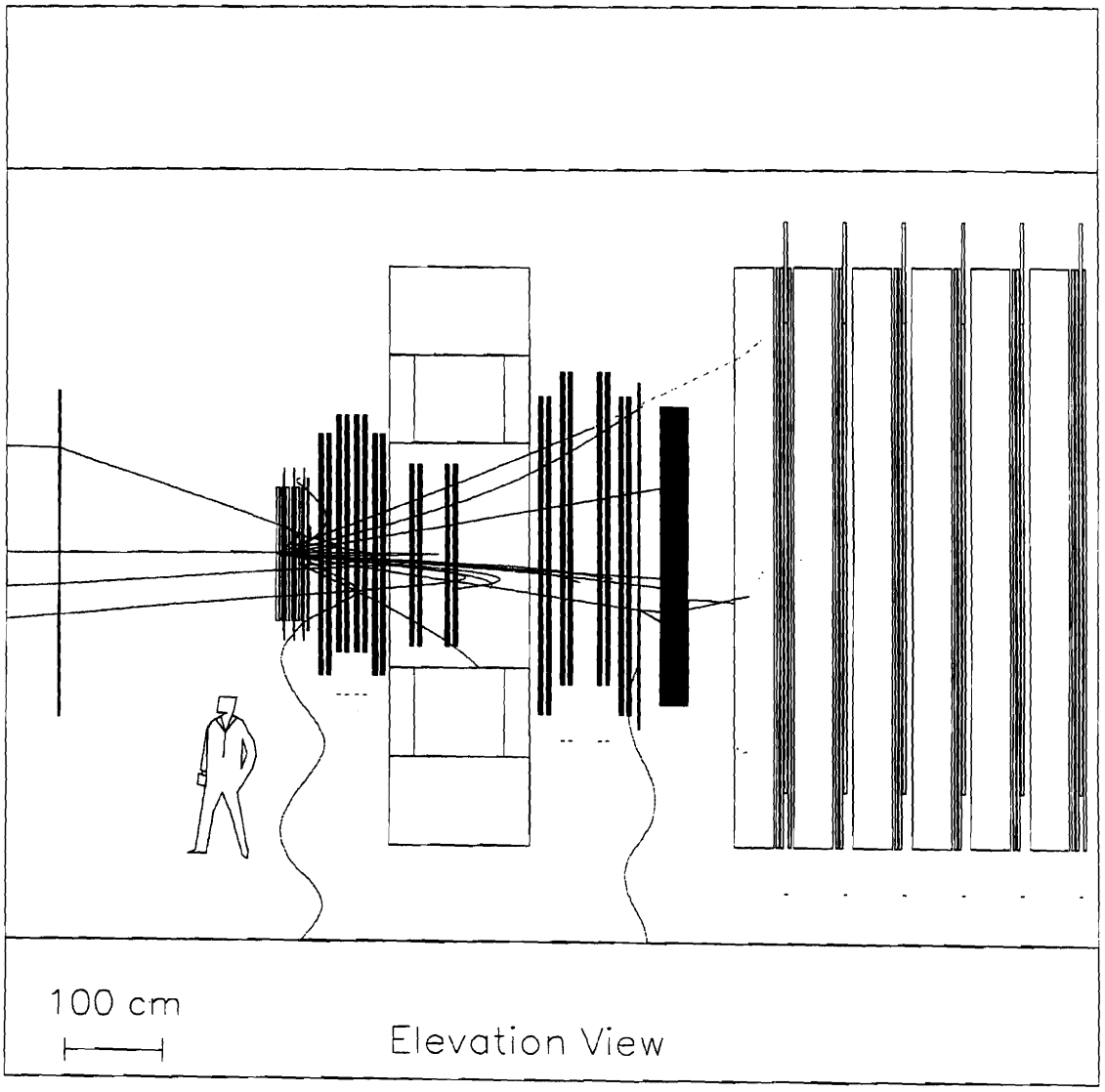
KTeV: E-799-II

We will be using the same technique with a substantially improved detector and new beamline to reach a sensitivity for 4-body decays of 10^{-11}. The same detector will be used for 2π ε'/ε studies (E-832). This program is named 'KTeV' and was approved in February 1992. A comprehensive design report on the KTeV program was produced in April 1992 outlining the physics goals, the beam, the siting, and the detector in much detail. This KTeV report also describes the full details of the calorimeter material tests and thus its justification for various parameters.

The construction of the new experimental hall was completed in 1995, and detectors are being installed. The most important detector upgrade will be the new pure CsI electromagnetic calorimeter. The calorimeter will be digitized every 19ns to achieve an energy resolution of <1% in a high-rate environment. Other major detector elements include a very hermetic scintillation fiber photon veto, a multi-module Transition Radiation Detector for independent pion/electron identification, fast Level 2 trigger logic, and a very high speed, high throughput data acquisition/filtering system.

The experiment is scheduled to start in July 1996. The running time will be shared between E-832 and E-799-II.

E-803



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

Aichi (Japan), Athens (Greece), UC/Davis, UCLA, Chonnam (Korea), Columbia, Fermilab, Gifu (Japan), Gyeongsang (Korea), Hirosaki (Japan), IIT, Indiana, ITEP (Russia), Kansas State, Kinki (Japan), Kobe (Japan), KAIST (Korea), Korea (Korea), Michigan, Minnesota, Nagoya Institute of Tech. (Japan), Nagoya (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*

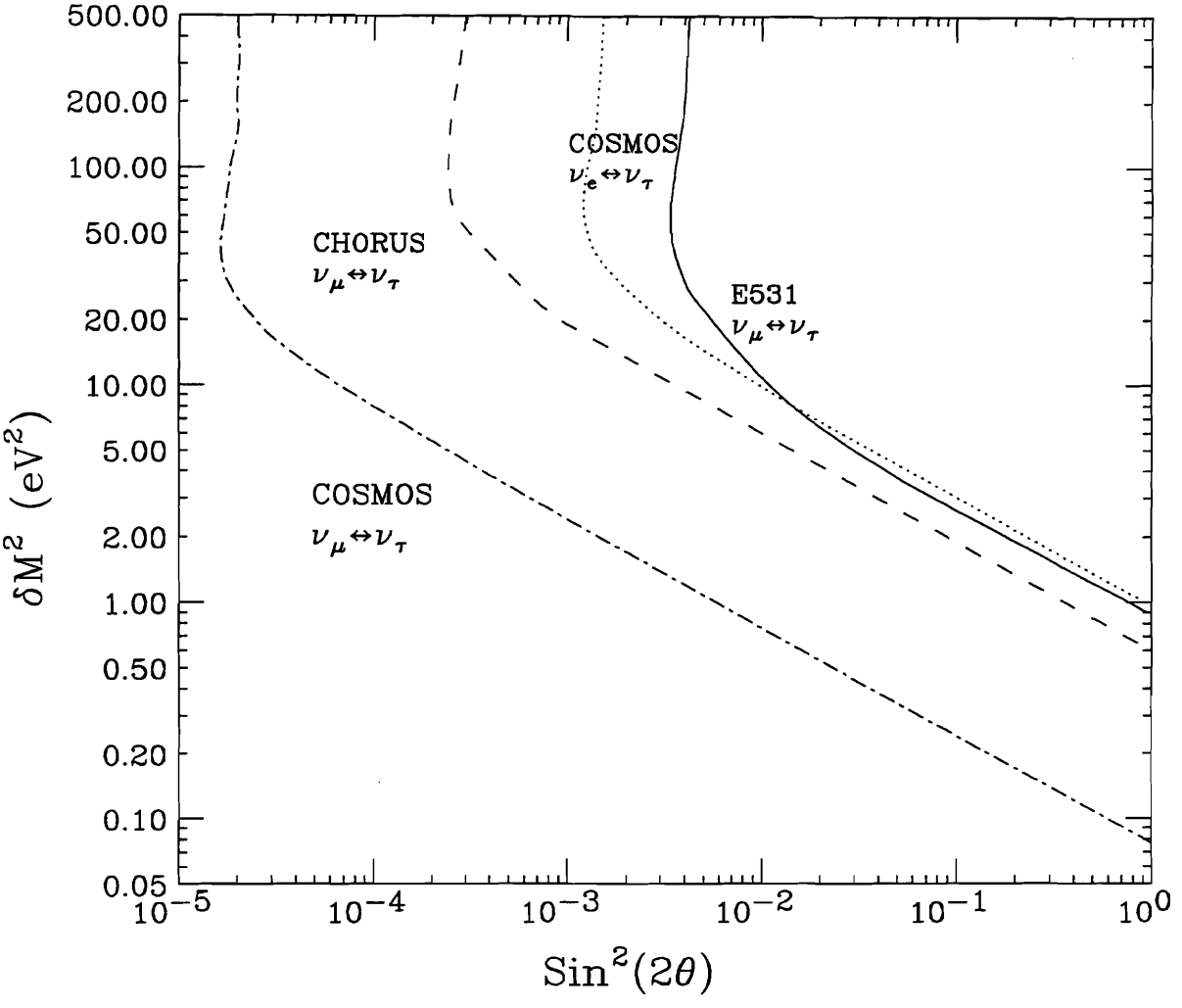
Fermilab E-803 (COSMOS) is a short-baseline neutrino oscillation $\nu_\mu, \nu_e \rightarrow \nu_\tau$ appearance experiment sensitive to ultra-small mixing angles, for neutrino mass differences in the cosmologically interesting range. Interest in oscillations has been stimulated by the apparent deficit 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.

An additional E-803 byproduct will be a measurement of charm and anti-charm production by neutrinos and antineutrinos, providing an engineering input to deep-inelastic neutrino measurements of weak interaction parameters, as well as a 3% determination of the Kobayashi-Maskawa matrix element V_{cd}.

E-803/COSMOS has been endorsed by the HEPAP Subpanel on Accelerator-Based Neutrino Oscillation Experiments as an effort which should be supported in the U.S. program. Progress in the design of the experiment and of the wideband neutrino beam has doubled COSMOS' projected sensitivity over the past year. Pre-production prototyping of the major subsystems will begin in 1996.


500.00
200.00
100.00
50.00
20.00
10.00
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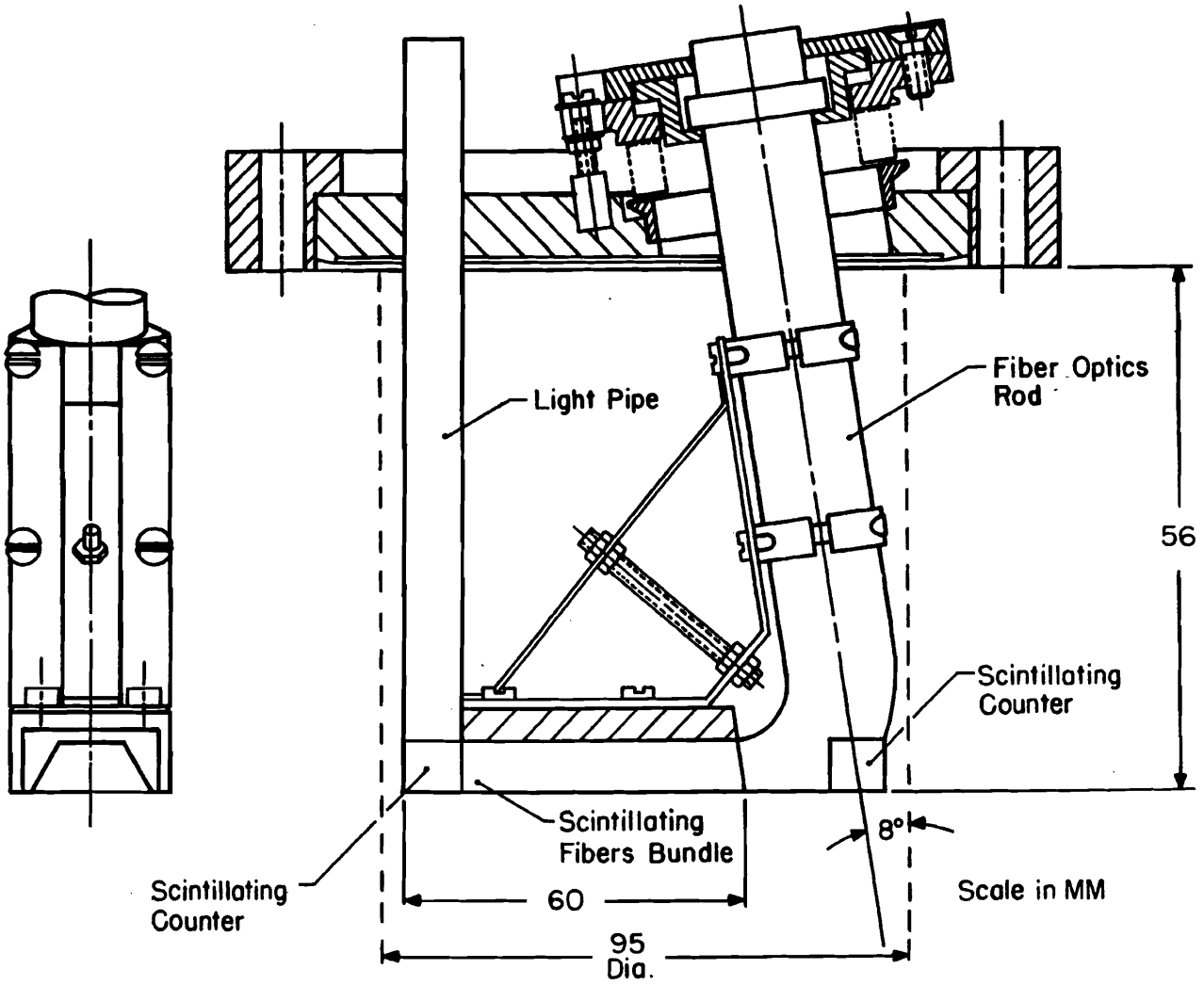
2.00
1.00
0.50
0.20
0.10
0.05
δM^2 (eV^2)
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
10^{0}
Sin$^2(2\theta)$
CHORUS
$\nu_\mu \leftrightarrow \nu_\tau$
COSMOS
$\nu_e \leftrightarrow \nu_\tau$
E531
$\nu_\mu \leftrightarrow \nu_\tau$
COSMOS
$\nu_\mu \leftrightarrow \nu_\tau$


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

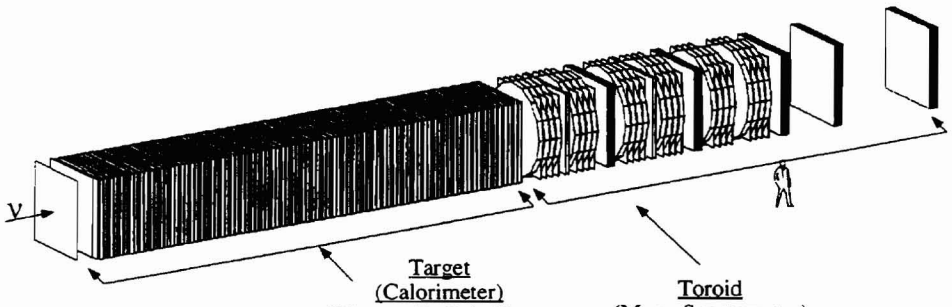
CERN, Cornell, Fermilab

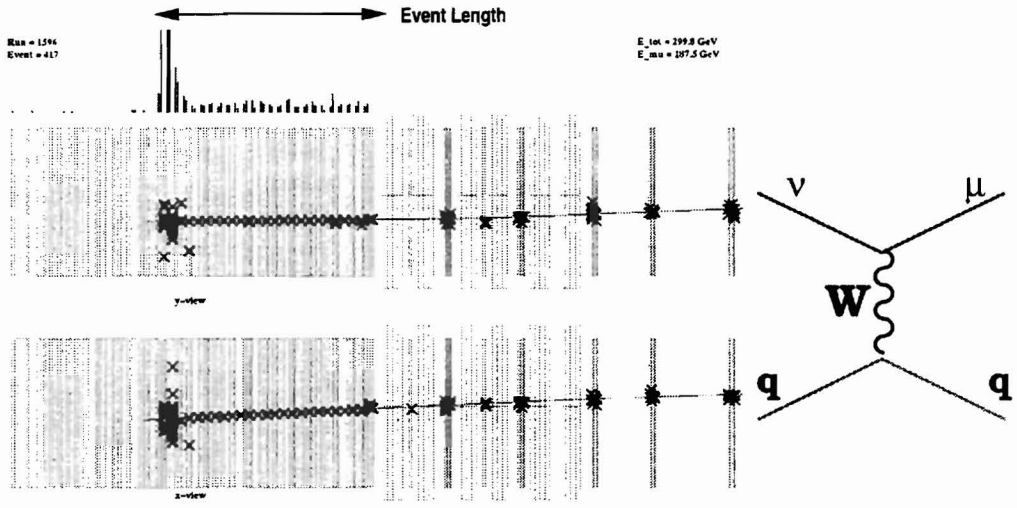
Status: *Data Analysis*

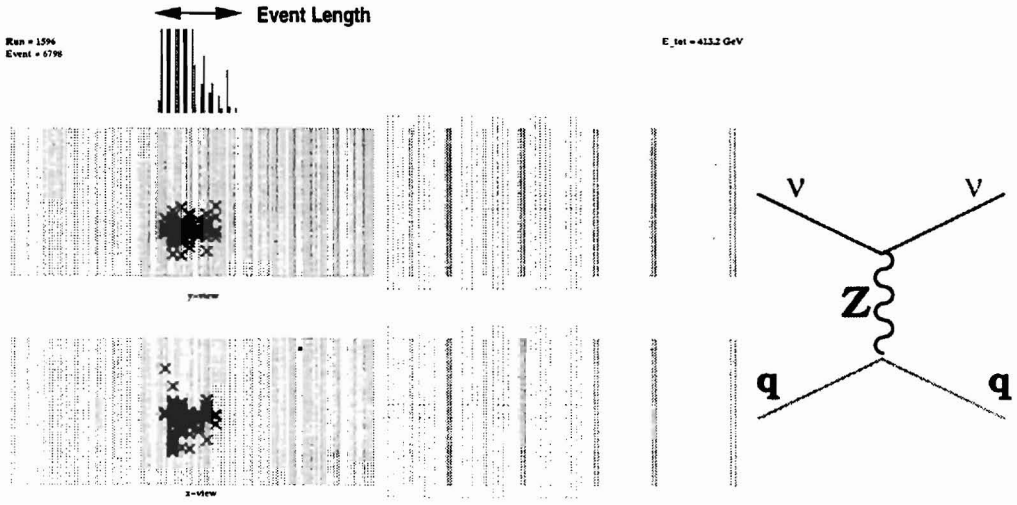
The goals are two-fold: (1) to get new, accurate values of the rho value (ratio of real to imaginary part of the forward scattering amplitude) and total cross section at the full collider energy, and (2) to test out a new detector scheme designed to do the same thing at a higher energy collider. These 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 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.

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 2.5 mm of the beam then the rho value can be obtained to an accuracy of 0.02 and the total cross section to 1.5 mb. This is based on a sample obtained by running for 10 hours at 10 events per second. Most of the running was in the parasitic mode. Data-taking was with separators off and highly scraped beam. After correcting for counting losses and gating off the Main Ring, over 200,000 elastics were obtained. Data analysis is now in progress.

E-815


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


Event Length
ν
μ
W
q
q


Event Length
ν
ν
Z
q
q

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

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

Status: *No Data Yet*

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. Even before the top quark discovery, 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. However, 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) will exploit 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) will enable us to unambiguously distinguish neutrino and anti-neutrino interactions with at least two significant results:

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

(2) The ability to distinguish between neutrino and anti-neutrino interactions will enable 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.

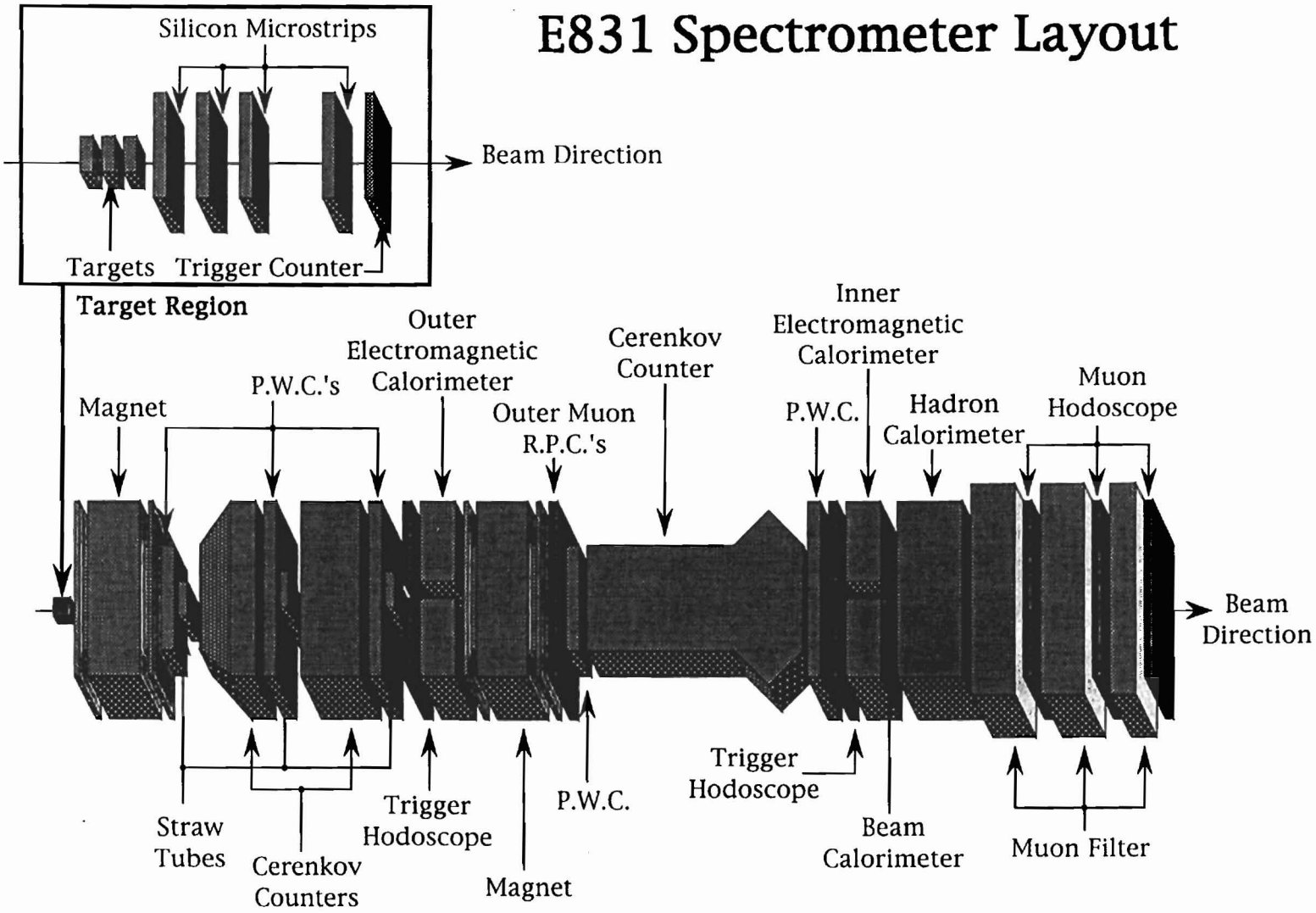
NuTeV will measure $\sin^2\theta_W$ with an expected total error of ± 0.0025, and ρ with an error of ± 0.010. Within the electroweak theory, these measurements can be expressed in terms of equivalent measurements on the top quark and W boson masses; the corresponding error on M_{top} is ± 20 GeV/c^2 ± 17 GeV/c^2 (M_{higgs}) and only ± 120 MeV/c^2 on M_W, competitive with collider measure-

ments. 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 will be 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 $\alpha_s(M_Z)$; NuTeV can reduce that error by nearly a factor of two. In addition, the SSQT will allow increased precision of measurements of the anti-quark distributions, charm and strange sea, and $R_l=\sigma_L/\sigma_T$.

E-815 is making only limited upgrades to the existing detector and is being conducted with only a modest expense to the Laboratory. We regard E-815 as the first experiment in a new generation of high-statistics, precision measurements of neutrino-nucleon scattering continuing into the next millennium.

E831 Spectrometer Layout



E-831 (Cumalat) 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), Lebedev (Russia), INFN/Milano (Italy), Milano (Italy), North Carolina, Notre Dame, INFN/Pavia (Italy), Pavia (Italy), Puebla (Mexico), Puerto Rico/Mayaguez, South Carolina, Tennessee, Vanderbilt, Wisconsin

Status: *No Data Yet*

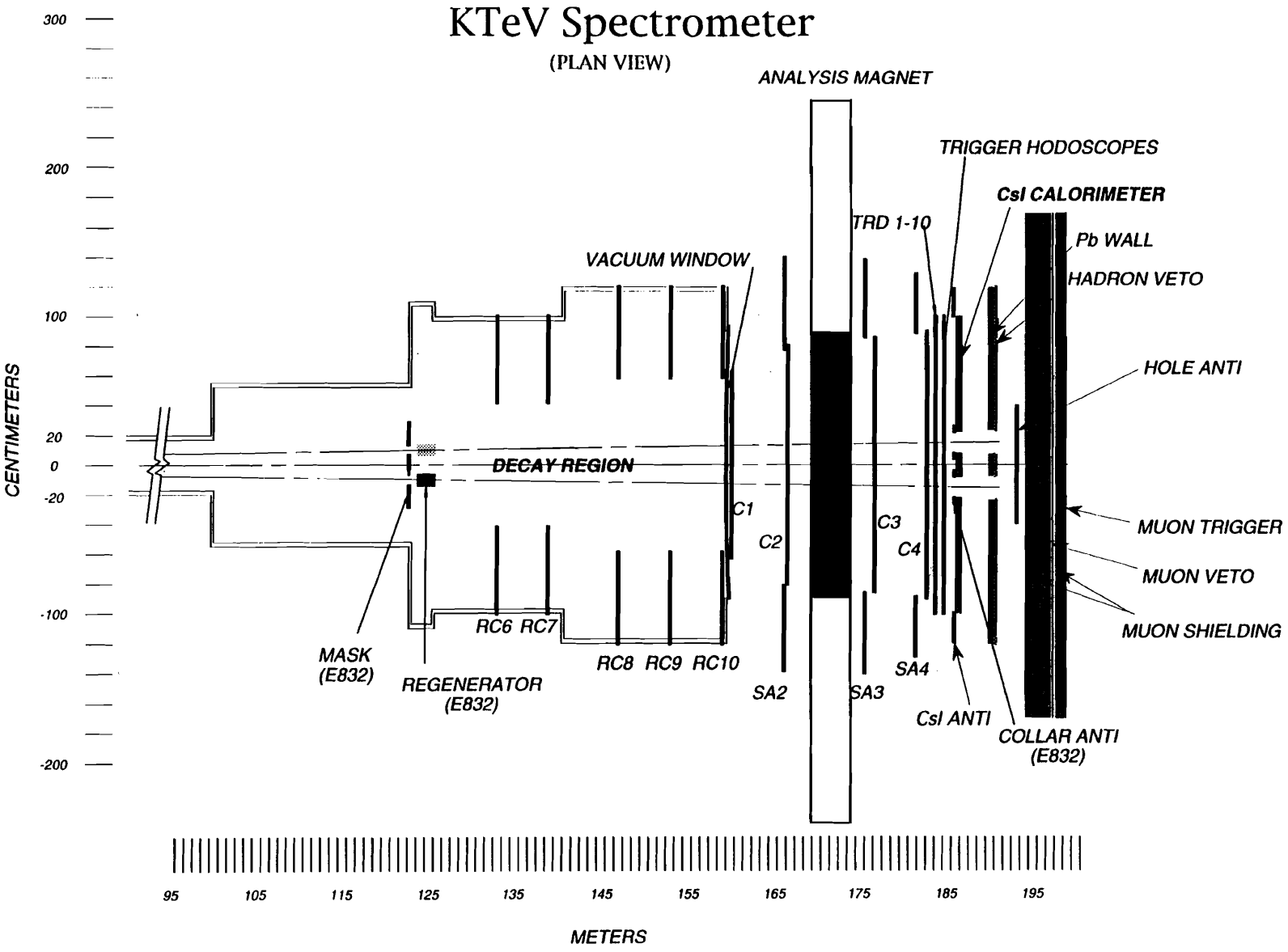
The spectrometer used in Fermilab Experiment 687 to study the photoproduction and decay of charmed particles will be upgraded (FOCUS) to enable it to accumulate 10^6 fully reconstructed charm particles. The physics will involve high precision studies of the D semileptonic decays, QCD studies of Double D events, a measurement of the absolute branching fraction for the D^0 meson, searches for D^0 mixing, CP violation, rare and forbidden decays, fully leptonic decays of the D^+, and a systematic investigation of charm baryons and their lifetimes. The estimates of charm yields are based on reasonable extrapolations from channels we have already studied in E-687.

The increased yield of charm will be obtained by (1) running at over five times the average luminosity of E-687 and (2) increasing the efficiency of the detector by a factor of two. The increased luminosity will be achieved by lowering the beam energy to 250 GeV, using the positron arm of the beam, and running at higher average proton intensity.

The detector must be upgraded to handle the increased luminosity. Major changes are:

1. Speeding up the hadron calorimeter and using it in the First Level Trigger to reduce deadtime;
2. Improving the response time of the silicon vertex microstrip detector;
3. Deadening the PWCs in the beam region and adding straw tube planes to cover the deadened regions. The straw tubes are expected to improve tracking over the entire aperture;
4. Speeding up the front-end electronics by a factor of ten;
5. Speeding up the data acquisition system; and
6. Improving the Second Level Trigger.

Additional changes will be made to the muon detectors and the electromagnetic calorimeters. The target is to be segmented with microstrip planes inserted between target elements. The experiment plans to be able to track a portion of the charged charm particles before they decay.


KTeV Spectrometer
(PLAN VIEW)
ANALYSIS MAGNET
TRIGGER HODOSCOPES
CsI CALORIMETER
TRD 1-10
Pb WALL
VACUUM WINDOW
HADRON VETO
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
COLLAR ANTI
(E832)
CENTIMETERS
300
200
100
20
0
-20
-100
-200
95
105
115
125
135
145
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165
175
185
195
METERS

E-832 (Hsiung / Winstein) A New Tevatron Search for Direct CP Violation in the 2π Decays of the Neutral Kaon

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

Status: *No Data Yet*

The goal of this new experiment 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 in the neutral kaon system 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 $\Delta S = \pm2$ 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 were the "top" discovered in the current Tevatron Collider run.

The 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 1.2×10^7 $K_S \rightarrow 2\pi^0$ "normalizing" events, and at the same time to collect 3×10^7 $K_L \rightarrow \pi^+\pi^-$ events and 6×10^7 $K_S \rightarrow \pi^+\pi^-$ "normalizing" events for the double ratio measurement.

For this effort and Phase II of E-799 (rare K decay experiment), a new KTeV facility will be 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 $\times$ 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 current switcher and a flash ADC right on the base and running at 53 MHz) is used to read out the CsI array for a better understanding of the calorimeter in the higher rate environment. 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, will be 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 gammas 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.

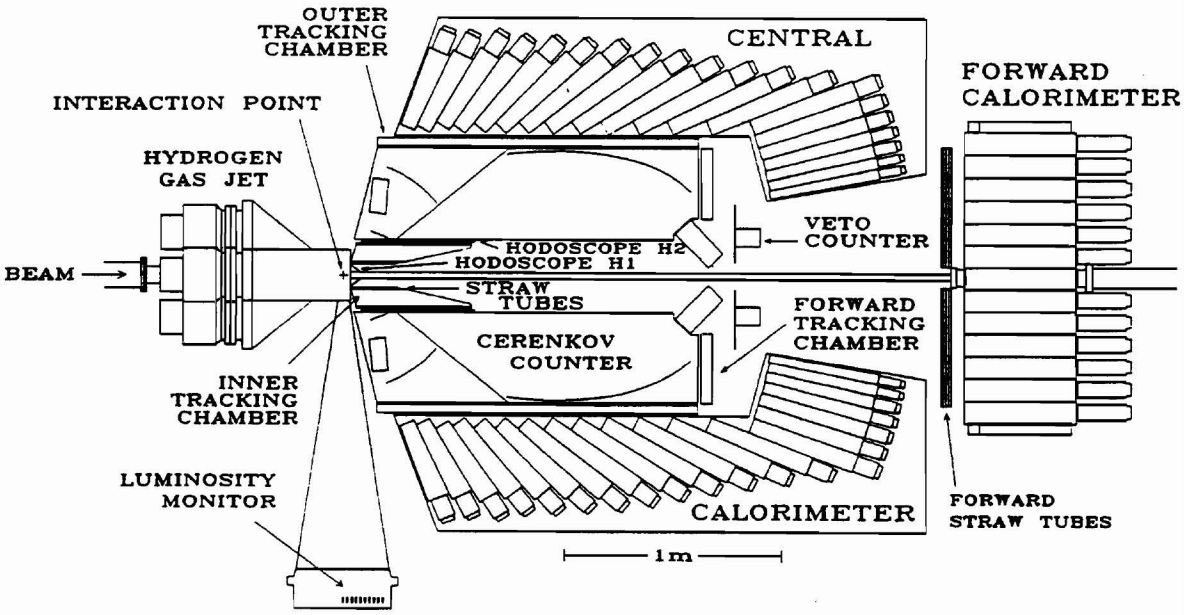
The experiment is now in preparation for the next fixed-target run. A KTeV Design Report (FN-580) has been prepared for the project. A new KTeV experimental hall is now under construction at the NM4 enclosure in the NM beamline for operation in the 1996 fixed-target run at the Tevatron.

Publication

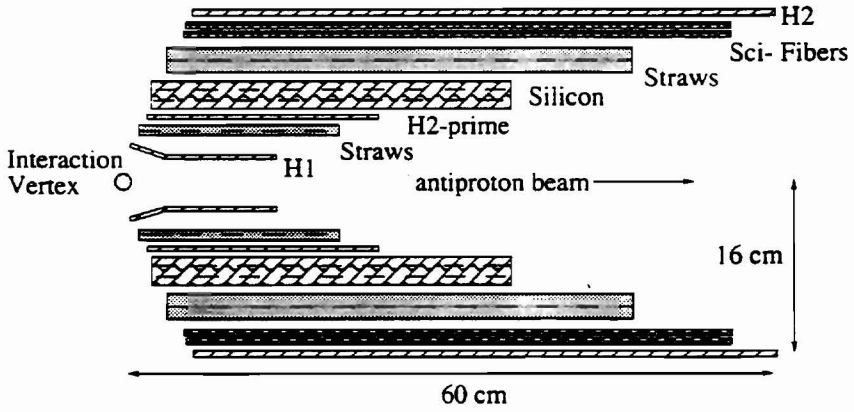
Beam Test of Prototype CsI Calorimeter, R. S. Kessler et al., FERMILAB-PUB-95-108, May 1995. Submitted to NIM.

E-835

Detector Schematic



E-835 Inner Tracking System Schematic



E-835 (Cester) Continued 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, Pennsylvania State, INFN/Torino (Italy), Torino (Italy)

Status: *No Data Yet*

Experiment E-835 is a continuation of the studies of charmonium states formed in $\bar{p}p$ collisions performed in E-760. The experiment will take data during the 1996 fixed-target run. The aims of this run include

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

b) the confirmation of the $^1P_1$ signal and a more precise determination of the $^1P_1$ parameters;

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

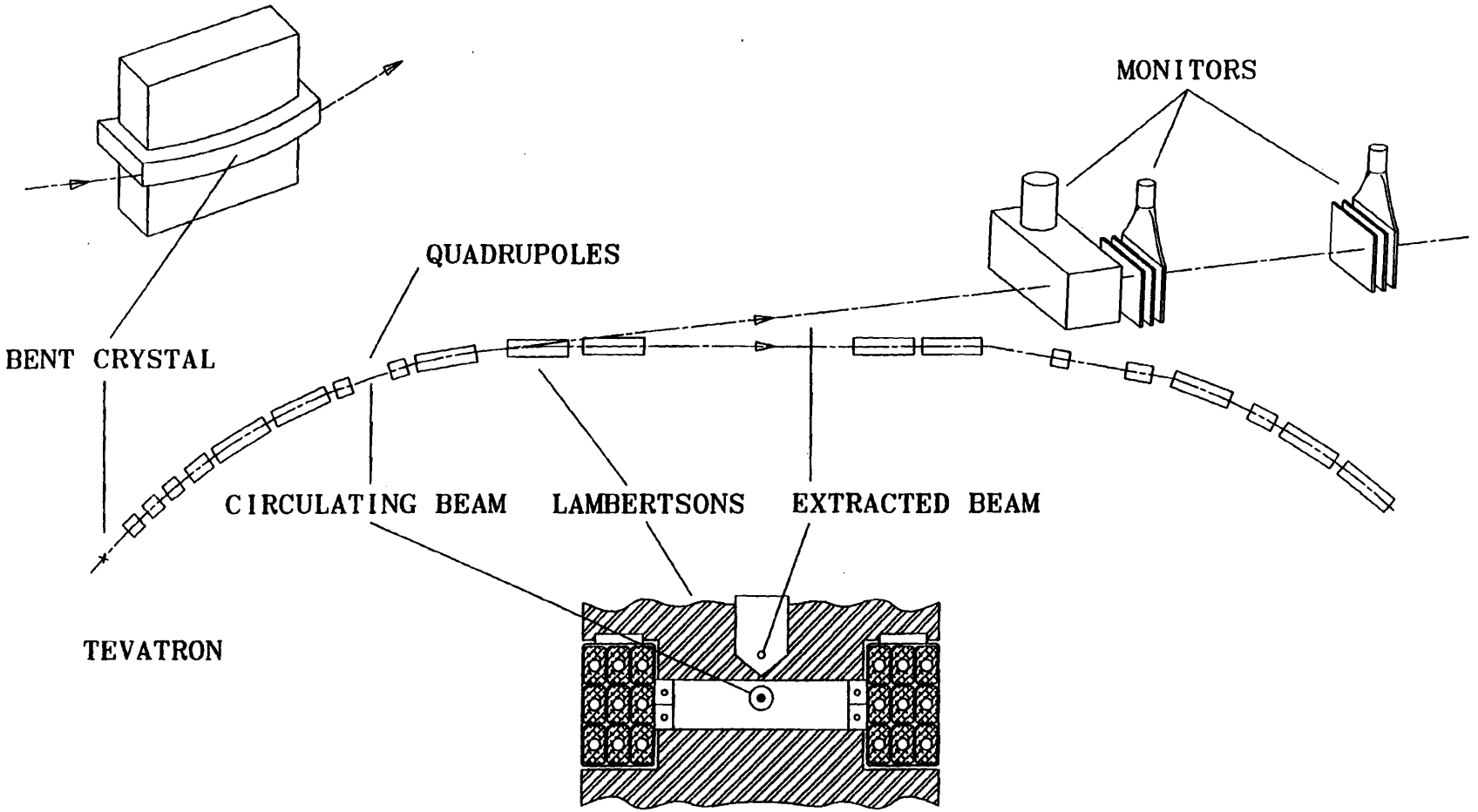
d) the determination of the mass and total width of the χ_0 and of the products of the branching fractions $B(\chi_0 \rightarrow \bar{p}p) \times B(\chi_0 \rightarrow \gamma\gamma)$ and of $B(\chi_0 \rightarrow \bar{p}p) \times B(\chi_0 \rightarrow J/\psi + \gamma)$; and

e) the search for the $^3D_2$ and $^1D_2$ charmonium states.

The experiment will also measure the angular distributions in radiative decays of the χ_1 and χ_2. The studies on the spectroscopy of light-quark states which decay to all photons will continue concurrently with the main charmonium topics.

Based on our experience in E-760, an integrated luminosity of about 200 pb^{-1} is required and several improvements to achieve this are under active development. To produce the required instantaneous luminosity, the density of the gas-jet target is being increased by lowering its operating temperature to ~23° Kelvin. Improvements in the antiproton accumulation rate and in the Antiproton Source itself will allow us to use an antiproton beam of up to 120 mA, a factor of three higher than in E-760. A new set of inner tracking devices is being built. It includes new straw-chambers, a new hodoscope, a silicon system and two planes of scintillating fibers read out with VLPC's. The electromagnetic calorimeters remain but their electronics is being improved to avoid problems from pile-up, and a new data acquisition and online filtering system capable of handling the increased data rate is under development as part of the Fermilab DART project.

FERMILAB E853
CRYSTAL EXTRACTION
C0 LONG STRAIGHT SECTION



E-853 (Murphy) Test of Low Intensity Extraction from the Tevatron Using Channeling in a Bent Crystal

ANL, Boston College, UCLA, Fermilab, IHEP/Protvino (Russia), JINR (Russia), New Mexico, PNPI (Russia), Southwestern Med. Center, SUNY/Albany, Texas/Austin, Vanderbilt, Virginia

Status: *Data Analysis*

E-853 is a test of the feasibility and efficiency of extracting a beam from the halo of the Tevatron using channeling in a bent silicon crystal. It is also testing the effectiveness of bent crystals as halo scrapers for collider experiments. The motivation of the experiment is to apply crystal extraction to TeV-range accelerators.

Characteristically, E-853 removes 10^{-7} of the circulating protons in the accelerator each second (about 10^5 protons/sec). The present luminosity lifetime is approximately 18 hours. The above extraction rate corresponds to a much longer proton beam intensity lifetime so that the luminosity lifetime during these extraction experiments is almost unchanged.

The Tevatron is a good test bed for studies of crystal extraction since it is superconducting, a collider, operates at high energy, and has collider experiments in operation. These features offer a distinct advantage over a related crystal extraction experiment at CERN (RD22).

In 1992 E-853 was approved for 72 hours of dedicated study time during the 1994-96 Collider run. Some experiment setup work such as detector commissioning is done parasitically. Major progress has been made on the experiment in 1995.

E-853 is taking place in the C0 straight section, the normal location of the proton abort line. During collider runs, the abort line is not used at 900 GeV, so one kicker magnet has been replaced by a bent crystal (see the figure). The crystal is positioned to the outside of the beam with an upward curvature of 640 μrad to deflect beam halo into the field-free region of the Lambertson magnets. The crystal is mounted in the B48 straight section at the upstream end of a 1-m beam pipe with articulating bellows which serves as a precision goniometer. Instrumentation in the extracted line is used for diagnostics. Scintillators and silicon micro-strip planes in the line monitor the extracted beam. A CCD camera imaging a fluorescent flag is also mounted in the line. Since the C0 abort line is used for disposing of 150 GeV protons during Tevatron injection, the detectors in the line must retract when the Tevatron is not in a 900 GeV store. There are also monitors at the crystal location to measure the interaction of the circulating protons with the crystal.

In an earlier study, an unbent crystal had been placed at the bent crystal location to study whether halo beam scattered by the crystal created intolerable

backgrounds at the collider experiments. The CDF counting rate was found to be a tolerable 5 KHz for normal circulating beam.

During this running period we have demonstrated extraction at 900 GeV (obviously the highest energy at which channeling has been observed). We are studying channeling efficiency in different situations. Beam has been extracted in a few turns (kick mode) and with natural and noise-driven diffusion (diffusion mode). Multiple crystal pass effects are observed and are significant. The technique is robust and alignment is reproducible. It should be emphasized that significant beam intensities have been extracted. 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 wish to continue these studies to refine the efficiency measurements, investigate luminosity-driven diffusion, and follow some of the interesting accelerator phenomena. We believe the current device could be used as an active scraper right now in the Tevatron to diminish distributed radioactivity. We also note that E-853 offers a concise means for a short 1 TeV demonstration experiment.

Publications

G. Jackson, Proc. 1993 Part. Acc. Conf., p. 402.

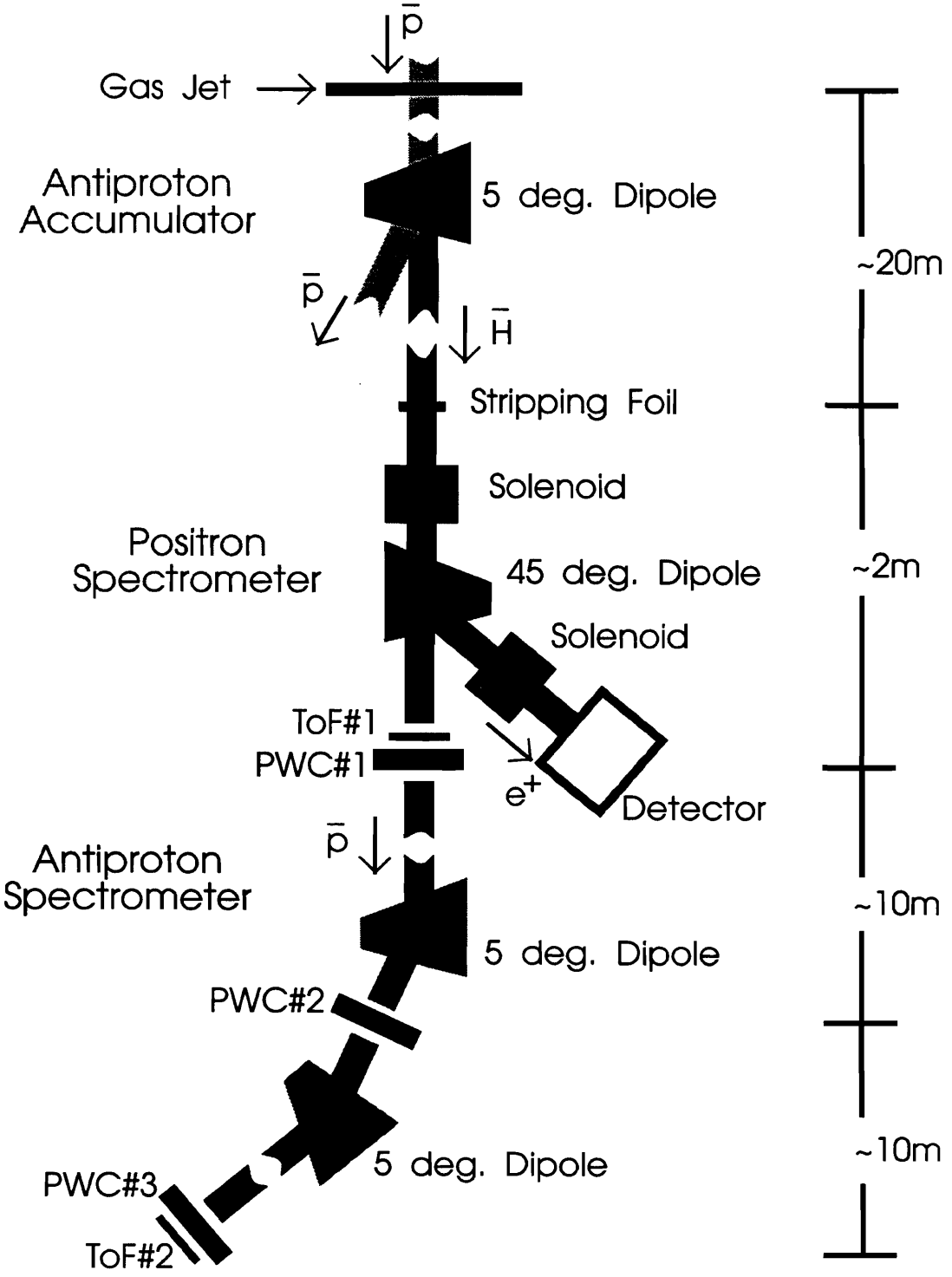
R. Carrigan et al., Proc. Workshop on B Physics at Hadron Colliders, Snowmass, p. 645 (1993).

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

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

T. Murphy et al., First Results from Bent Crystal Extraction at the Fermilab Tevatron, Proc. Relativistic Channeling Workshop, Aarhus (1995), to be published in Nucl. Inst. Meth.

E-862


$\bar{p}$
Gas Jet
Antiproton
Accumulator
5 deg. Dipole
$\bar{p}$
$\bar{H}$
Stripping Foil
Solenoid
Positron
Spectrometer
45 deg. Dipole
Solenoid
ToF#1
PWC#1
e^+
Detector
$\bar{p}$
Antiproton
Spectrometer
5 deg. Dipole
PWC#2
5 deg. Dipole
PWC#3
ToF#2
~20m
~2m
~10m
~10m

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

UC/Irvine, Fermilab, Penn State, SLAC

Status: *No Data Yet*

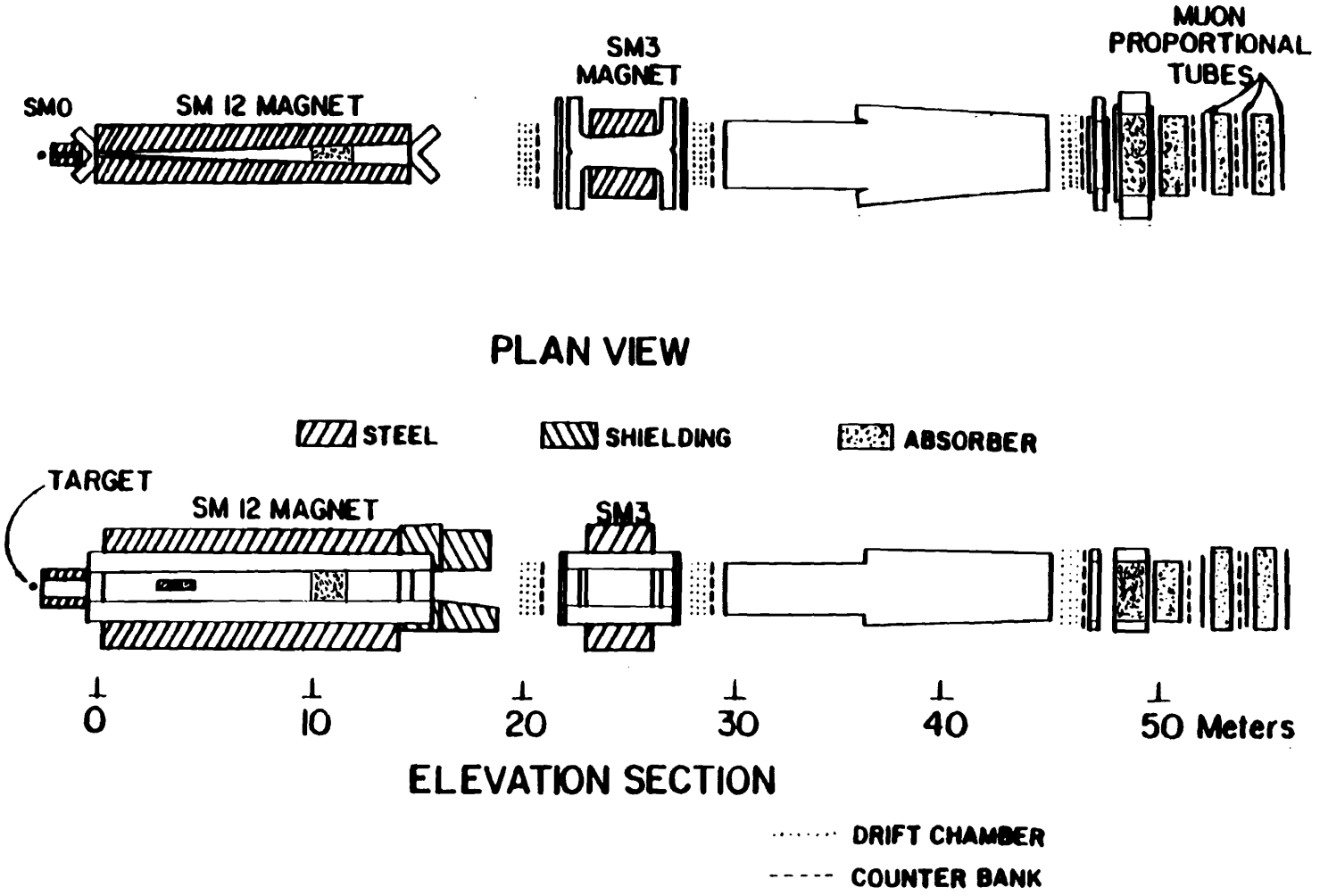
The goal of this experiment is the detection of a sample of antihydrogen atoms – the bound state ($\bar{p}e^+$). This will be the first element ever constructed entirely out of antimatter. A source of antihydrogen atoms is needed to compare antihydrogen with hydrogen spectroscopy, to search for interactions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

A fast antiproton passing by a stationary proton will generate electron-positron pairs; occasionally a positron will be created in a bound instead of a continuum state about the antiproton and form antihydrogen. The cross section for this process is 3.8 pb for an antiproton momentum of 6 GeV/c. Experiment E-682 runs parasitically on experiment E-835, which will integrate a sample of 200 pb^{-1} in a study of $\bar{p}p$ annihilation in a hydrogen gas jet; the integrated luminosity will produce a sample of 700 antihydrogen atoms.

Antihydrogen atoms emerge from the gas jet with the same tiny momentum distribution as the cooled antiproton beam has in the Fermilab Accumulator, $\Delta p/p = 2\times10^{-4}$. Being neutral, the atoms exit the Accumulator at the first dipole magnet, A5B3, 15 m from the gas jet, and enter the E-862 beamline laid between the Accumulator and Debuncher rings in the Accumulator tunnel. At the entrance to the line the atoms strike a known 3 cm^2 spot on a 400 $\mu g/cm^2$ carbon foil, and disassociate into an antiproton and a positron of equal velocities. The momentum vector of the antiproton is known from the tune of the Accumulator ring to 2×10^{-4}, and that of the positron, which is smeared by the momentum distribution of the atomic 1s state, to 10^{-2}. The coincidence between an antiproton and a positron, appearing in such a thin ($10^{-5}\chi_0$) foil, and each with a preset and narrowly defined momentum, defines an antihydrogen event.

A spectrometer, consisting of a pair of weak solenoid lenses and a dipole magnet, separates the positron from the antiproton, filters the positron momentum to 1%, and focuses the positron onto a scintillator 2.5 cm in diameter and 1 cm thick. There the positron stops; the light output of the scintillator gives the positron's time of arrival and a measure of its kinetic energy. The scintillator is surrounded by a 4π NaI detector which detects the photons from the positron's 2γ annihilation. The whole positron spectrometer is just over 2 m long. The antiproton is undeflected by the weak fields of the positron spectrometer. Its momentum and velocity are measured in a separate spectrometer instrumented with proportional wire chambers and time-of-flight counters. The antiproton spectrometer is approximately 25 meters long, and uses two Antiproton Source magnets to provide a 10 degree bend.

This experiment is now in preparation for the next fixed-target run.


SM0
SM 12 MAGNET
SM3
MAGNET
MUON
PROPORTIONAL
TUBES
PLAN VIEW
STEEL
SHIELDING
ABSORBER
TARGET
SM 12 MAGNET
SM3
0
10
20
30
40
50 Meters
ELEVATION SECTION
DRIFT CHAMBER
COUNTER BANK

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

Abilene Christian, Academia Sinica (Taiwan), ANL, Caltech, Fermilab, Georgia State, LANL, Louisiana, New Mexico, Northern Illinois, ORNL, Texas A&M, Valparaiso

Status: *No Data Yet*

E-866 proposes to greatly improve the experimental knowledge of $\bar{d}_p(x)/\bar{u}_p(x)$ via precision measurement of the ratio of Drell-Yan yields from protons on protons to protons on deuterium.

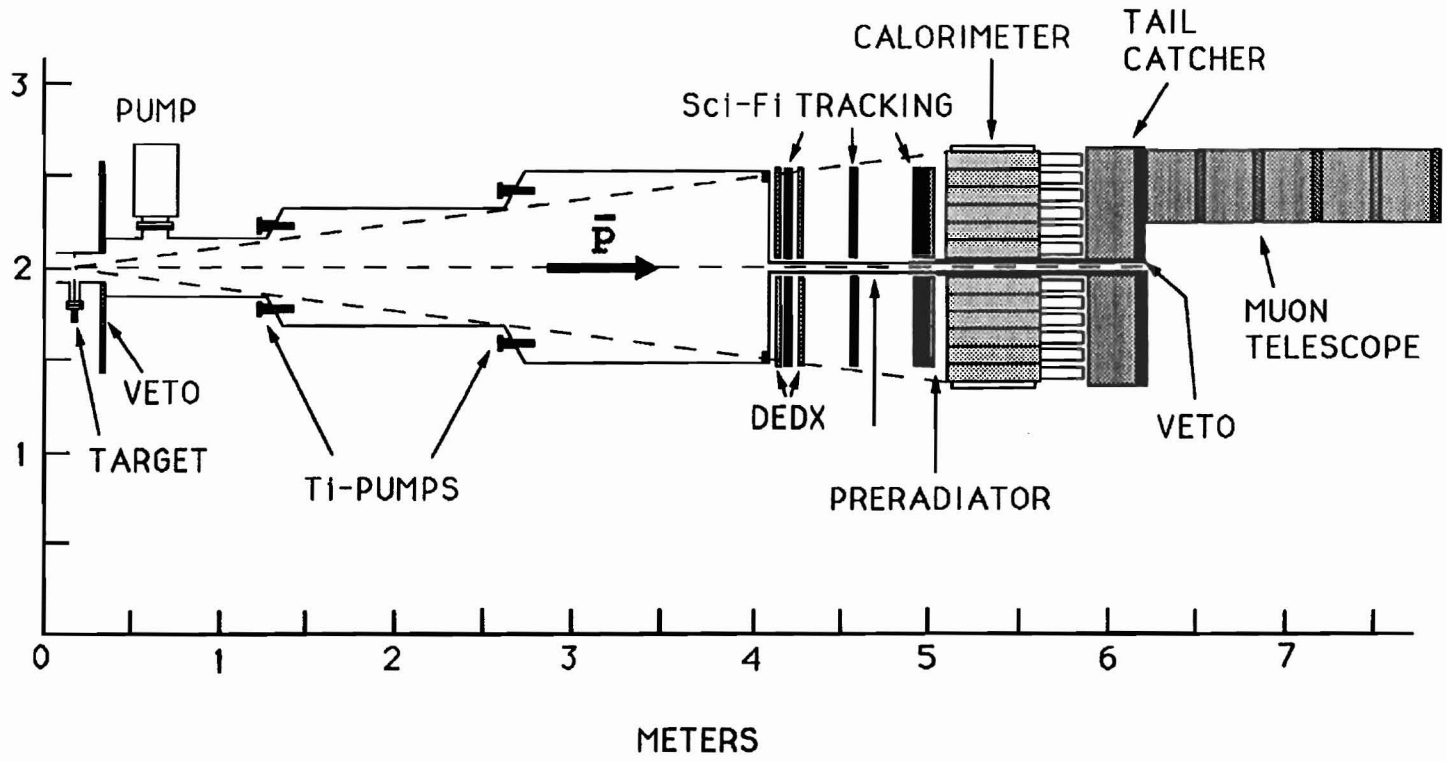
$$\left.\frac{Y_{DY}^{p+p}}{Y_{DY/2}^{p+D}}\right|_{x_f>0.2} \cong 1-\left[\frac{\bar{d}_p(x)-\bar{u}_p(x)}{\bar{d}_p(x)+\bar{u}_p(x)}\right] \qquad (1)$$

In addition to being five times more sensitive than our earlier E-772 measurement on W, it uses the lightest possible nuclei, thereby minimizing any nuclear effects that could obscure extraction of the structure function ratios. The left-hand side of Eq. (1) can be measured as a function of x with experimental systematic errors that will be, at most, ±1.5%. The range in x to be investigated is $0.04 \le x \le 0.3$. The upper limit arises because the sea distribution is a rapidly falling function of x [~ $(1 - x)^8$]. The lower limit arises from the fact that we require the Drell-Yan dilepton pair ($\mu^+\mu^-$) to have a mass appreciably greater (4 GeV) than the mass of the ψ' (3.69 GeV).

The experiment will be carried out using essentially the same equipment as E-772. This setup allowed a high statistics measurement of the ratio of Drell-Yan yields from a variety of nuclear targets. The experimental layout used in E-772 is shown in the figure. The RICH counter will not be used as muons are sufficiently well selected via their range. The three dipoles, SM0, SM12, and SM3, serve as a dimuon spectrometer. The first magnet, SM0, serves to open up the small opening angle of low-mass dimuon pairs, SM12 focuses high p_T muons into the downstream detectors, and both SM12 and SM3 are used to measure the muon momenta. A hadron absorber (e^{-13}) of Cu, C, and CH_2 blocks is placed in the gap of SM12. In this configuration, the apparatus has an energy resolution of 150 MeV at the J/ψ and 200 MeV at the Υ, and z vertex resolution is more than sufficient to reject dimuon pairs created in the beam dump.

In addition to the Drell-Yan data, high-statistics data on J/ψ and ψ' production, as well as a few thousand Υ(1S), Υ(2S) and Υ(3S) events, from H and D targets will also be obtained. The proposed experiment makes use of existing equipment and requires only three months of beam time (one month of setup and checkout, and two months of data-taking).

E-868


CALORIMETER
TAIL CATCHER
Sci-Fi TRACKING
PUMP
$\bar{p}$
MUON TELESCOPE
VETO
DEDX
VETO
TARGET
TI-PUMPS
PRERADIATOR
3
2
1
0
1
2
3
4
5
6
7
METERS

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

UCLA, Fermilab, Michigan, Nebraska, Penn State

Status: *Data Analysis*

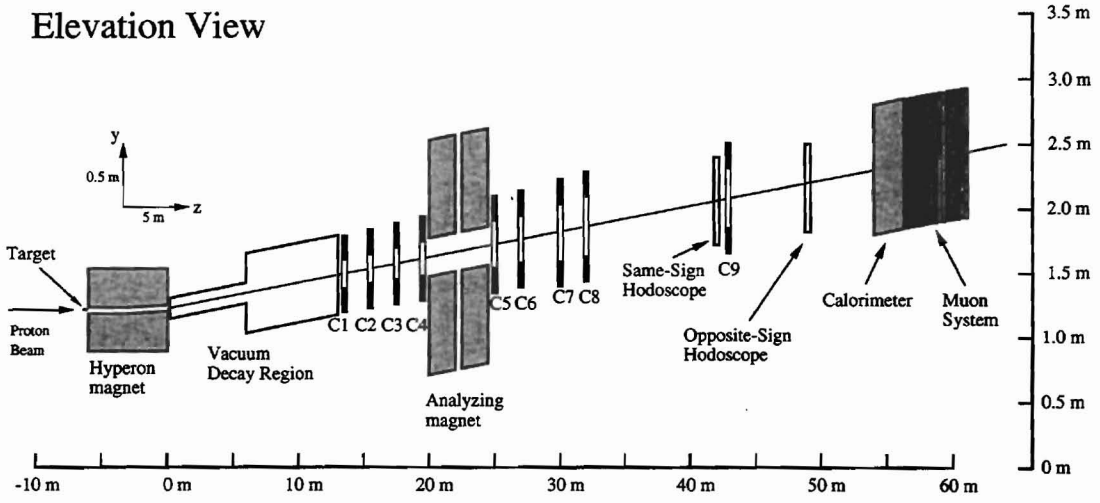
E-868 (APEX) is an experiment designed to search for antiproton decay at the Fermilab Antiproton Accumulator operating at 8.9 GeV. The CPT theorem requires that the antiproton lifetime $\tau_{\bar{p}}$ equals the proton lifetime which we know exceeds 10^{32} years. In practice we can only hope to observe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

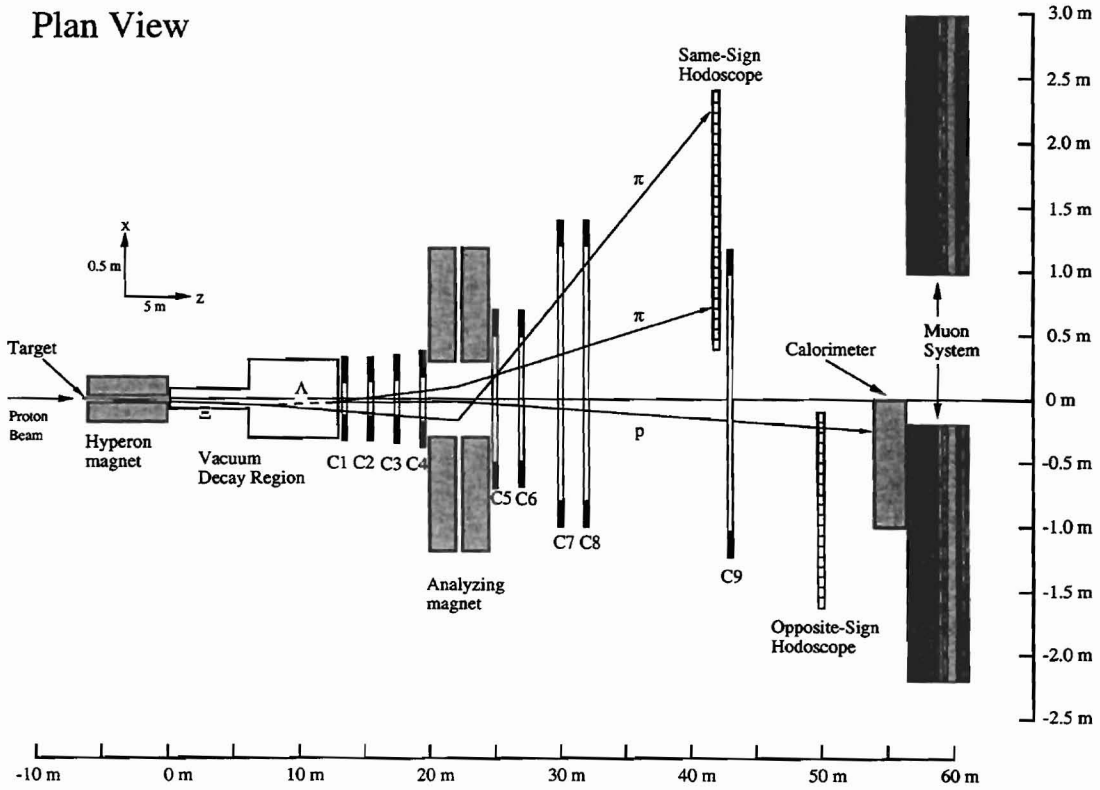
Our present experimental knowledge of the stability of the antiproton is modest. Prior to the recent T-861 test experiment, which was designed to prepare the way for APEX, the best limit on $\tau_{\bar{p}}$ came from observing ~1000 antiprotons in an ion trap for two months, which yielded $\tau_{\bar{p}} > 3$ 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 = $O(10^5\text{-}10^6)$ 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 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 $O(10^{-3}\text{-}10^{-4})$. Analysis of the data sample is in progress.

E-871
The HYPERCP Spectrometer





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, LBL, Michigan, South Alabama, Virginia

Status: *No Data Yet*

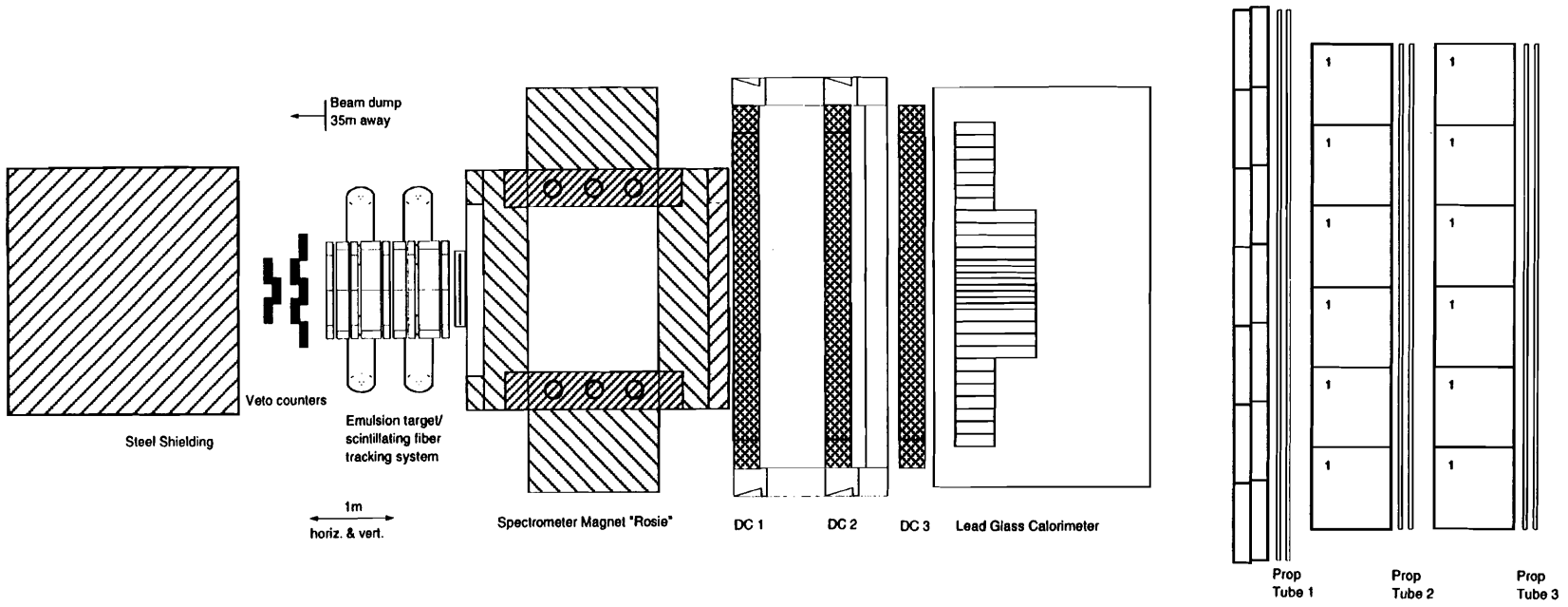
In the thirty years since the discovery of CP violation our understanding of the phenomenon has improved little despite a long series of beautiful experiments. It still remains a small peculiarity found only in the decays of the K_L. Whether CP violation is a property unique to the kaon system and whether 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 nine high-rate narrow pitch (1.0 mm – 2.0 mm) wire chambers separated by a dipole spectrometer magnet. There is a total of 20,000 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 with an anticipated 10% Ξ yield. A hadronic calorimeter on the proton side makes that part of the trigger muon-blind. 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 expect to log approximately 100 billion events. A muon detector at the rear of the spectrometer allows the search for rare and forbidden decays of charged hyperons and kaons.

E-871 is the first dedicated hyperon CP violation experiment. Measurement of a non-zero asymmetry would be the first evidence of CP violation outside of the neutral kaon system and would be unambiguous evidence of direct CP violation.

E-872 Spectrometer Plan View



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

Aichi (Japan), Athens (Greece), UC/Davis, Chonnam Nat'l. (Korea), Fermilab, Gifu (Japan), Gyeongsang (Korea), Hirosaki (Japan), Kinki (Japan), Kobe (Japan), Minnesota, Nagoya (Japan), Okayama (Japan), Osaka City (Japan), Osaka Commerce (Japan), Osaka Sci. Ed. Inst. (Japan), Soai (Japan), South Carolina, Toho (Japan), Tufts, Utsunomiya (Japan)

Status: *No Data Yet*

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, E-803. 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.

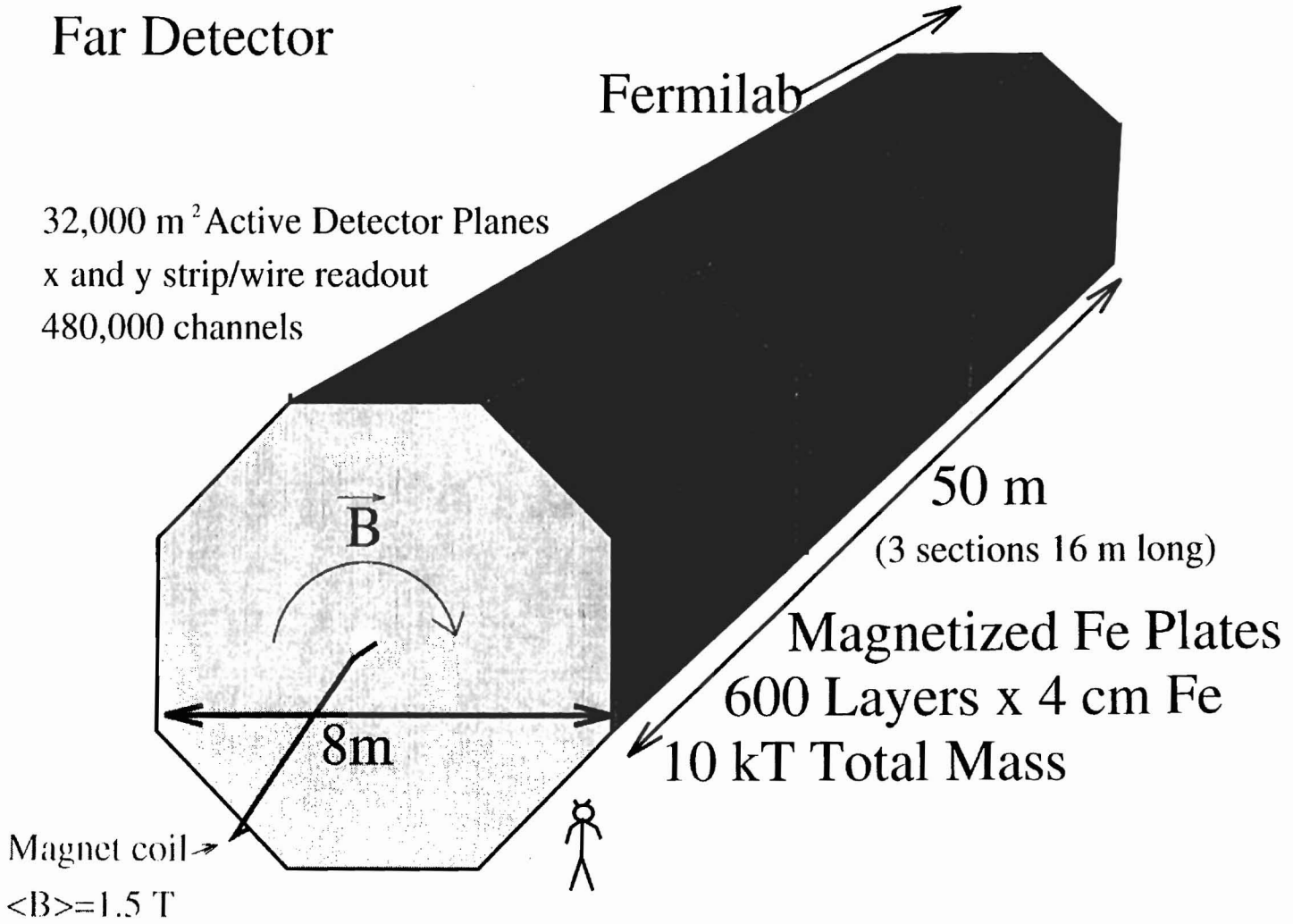
Tau neutrinos are produced predominantly from the leptonic decay of the D_s meson in the decay sequence $D_s \rightarrow \tau + \nu_\tau$, $\tau \rightarrow \nu_\tau$. In this experiment D_s mesons will be produced by 800 GeV protons interacting in a tungsten beam dump. Both the D_s and the daughter 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 1.5×10^{-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 ±9 mr this gives 6.5×10^{-18} ν_τ charged-current interactions per centimeter of emulsion (ρ = 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 7.4×10^{-18} ν_τ charged-current interactions per centimeter of emulsion per proton. Given this interaction rate, we plan to use 24 cm of emulsion and have set as a goal to accumulate 2×10^{18} integrated protons. The latter can be achieved in a 30-week running period, assuming that an intensity of 10^{13} protons per minute can be delivered at a 75% efficiency. Before fiducial volume cuts and efficiency cuts this will yield approximately 310 interactions. We estimate that cuts will reduce the sample by about 15%. Details of these yield calculations are given in the proposal.

E-875

MINOS (Main Injector Neutrino Oscillation Search)

Far Detector



E-875 (Wojcicki) Main Injector Neutrino Oscillation Search

Argonne, Boston College, Caltech, Columbia, Fermilab, Indiana, ITEP (Russia), JINR (Russia), Lebedev (Russia), LLNL, Minnesota, ORNL, Oxford (Great Britain), Rutherford (Great Britain), Stanford, Sussex (Great Britain), Texas A&M, Tufts, 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.

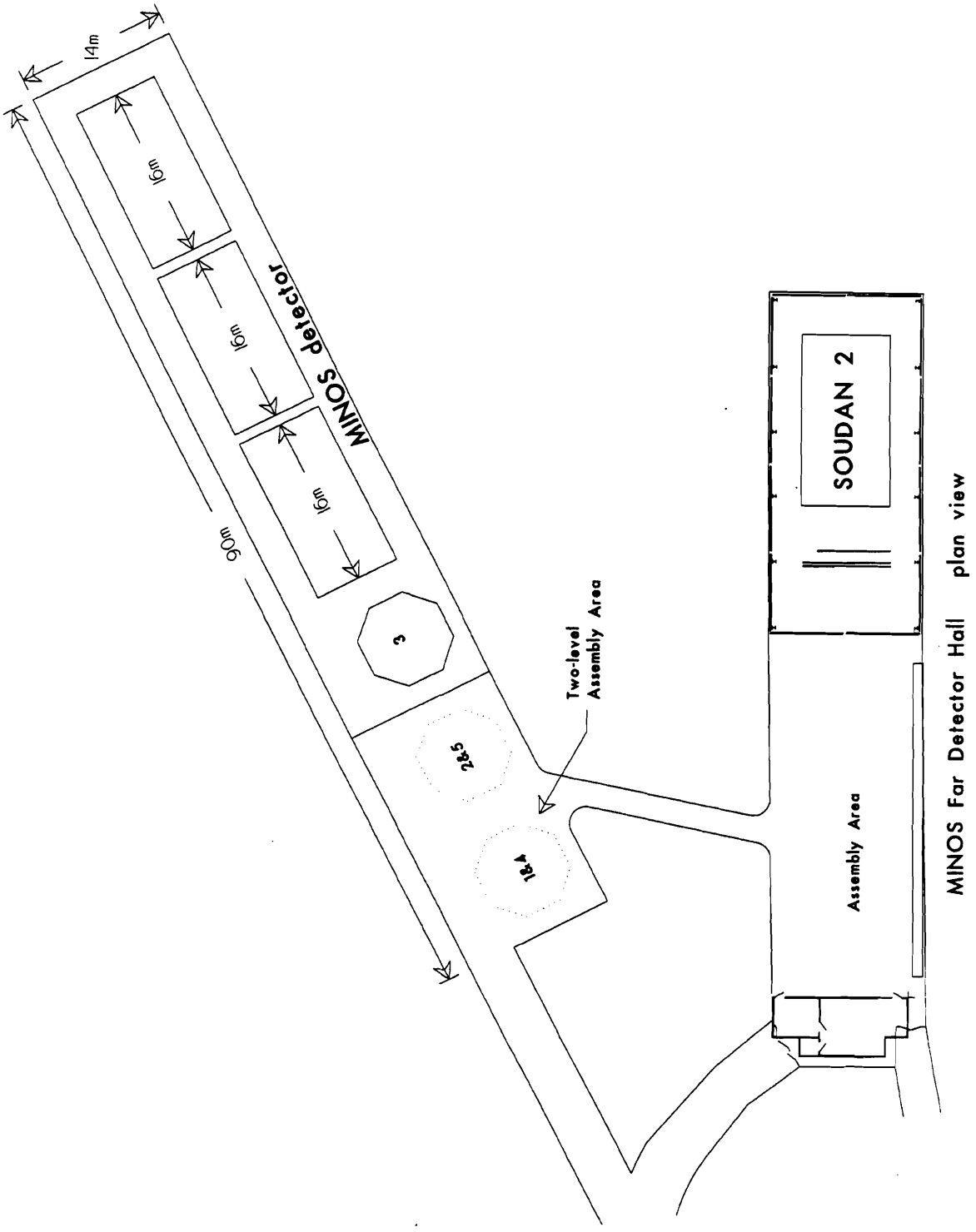
This experiment emphasizes the investigation of neutrino interactions with energies sufficiently above the tau production threshold so that the presence of $\nu_\mu \rightarrow \nu_\tau$ oscillations, if they occur, can be convincingly demonstrated. One of the signals for $\nu_\mu \rightarrow \nu_\tau$ 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. 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 actual features of the far detector are still under discussion. Our goal is to define an optimum detector in the middle of 1997, based on the results of an extensive R&D effort, encompassing both hardware and simulations. The general characteristics of the far detector will be: a total mass of about 10 kT, magnetized iron plates, 8 m in transverse dimensions and 2 to 4 cm thick, with active detector planes between the iron plates. Limited steamer tubes, resistive plate chambers, and liquid scintillator are under consideration for the active detector technology. We estimate that about 20,000 ν_μ interactions (in the absence of oscillations) would be detected in the far detector annually in a wide band beam. In addition, the existing Soudan 2 detector (about 1 kT in mass) will allow us to study neutrino interactions with lower statistics but with finer granularity.

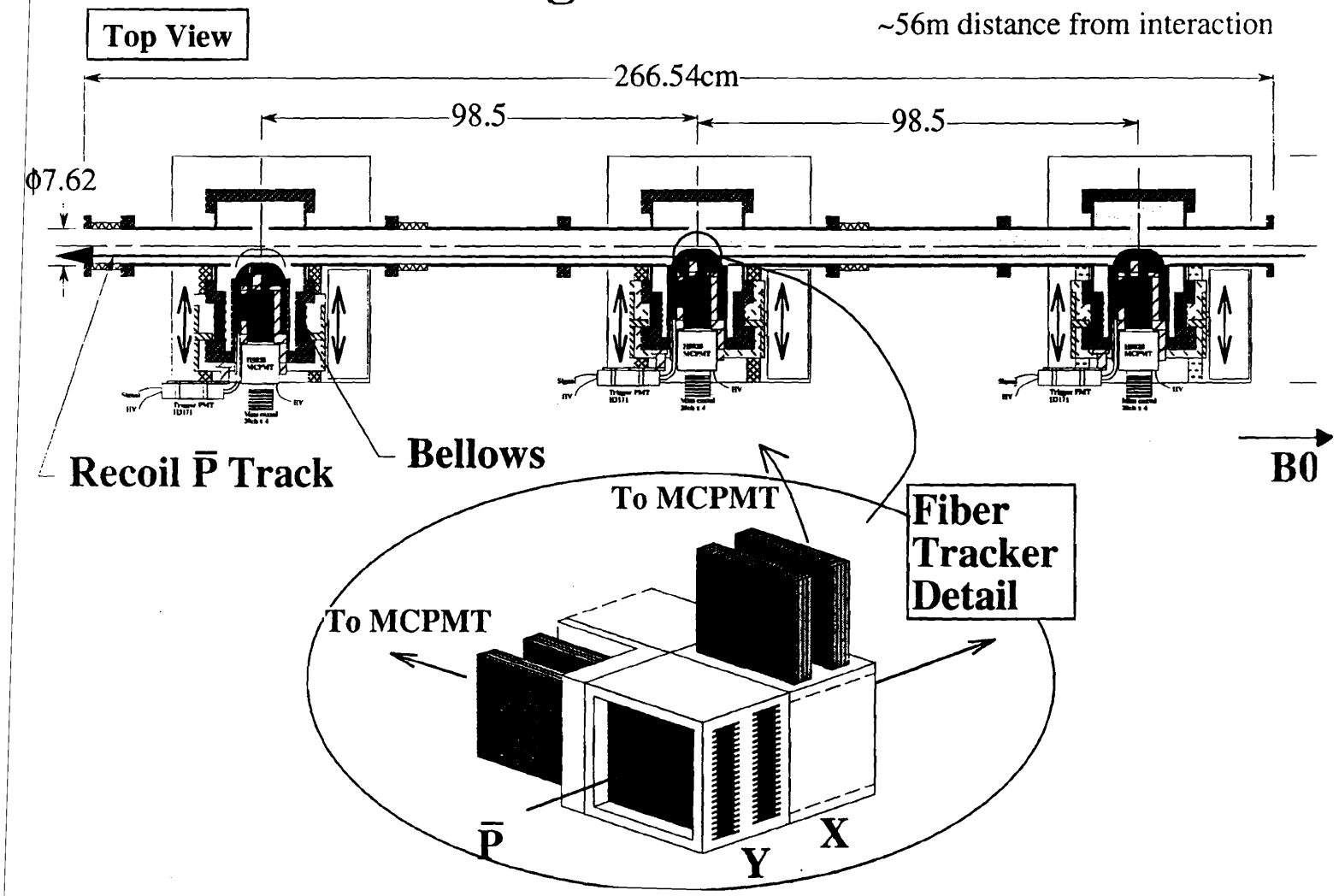
The currently existing laboratory in the Soudan Mine will be expanded to house the new detector, as shown in the following figure. It is estimated that data-taking can commence in the year 2001.



MINOS Far Detector Hall plan view

E-876

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 1m mounted in vacuum pots ("Tokyo 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 have 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 will be used to measure central jets, heavy flavors, Drell Yan and W/Z produced diffractively and also to search for new phenomena.

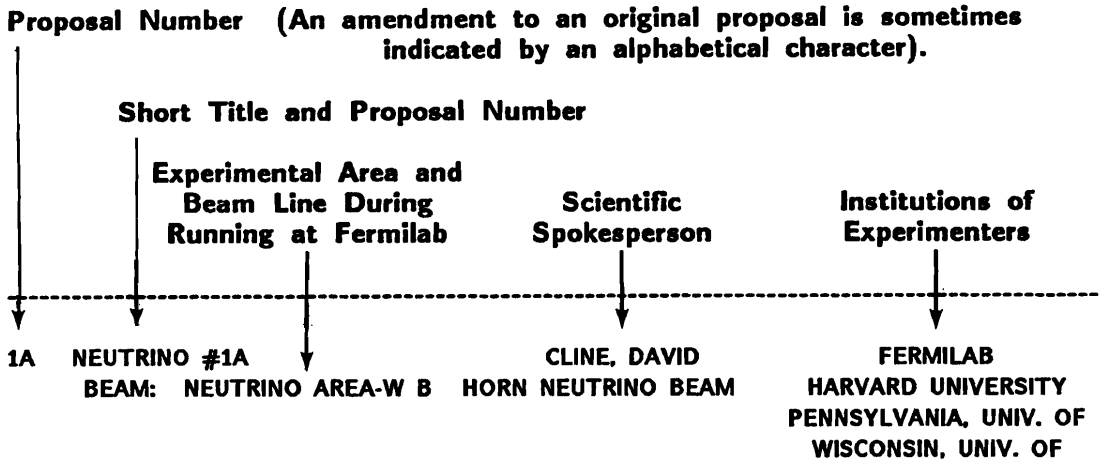
SECTION IX. MASTER LIST OF PROPOSALS

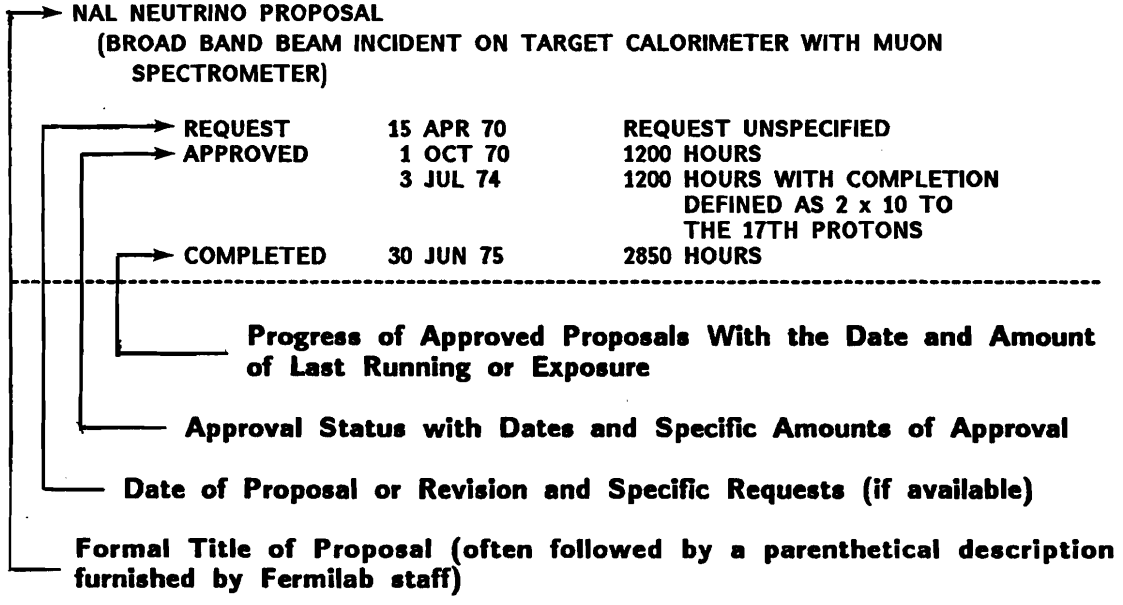
The Master List of proposals contains an entry for each proposal submitted to Fermilab; a typical entry is explained on the next page. In addition to the formal title of the proposal and a brief parenthetical explanation, the name of the spokesperson and a list of participating institutions are included. 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





Fermi National Accelerator Laboratory
Master Listing of Proposals as of February 20, 1996

Note: For proposals having a number below 700 only the approved and pending ones are listed.
Total number of proposals - 882 ... Total number of approved & pending proposals - 431

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	

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

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	

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

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

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	

Fermi National Accelerator Laboratory
Master Listing of Proposals as of February 20, 1996

(continued)

22 MULTIGAMMA #22 — George B. Collins
BROOKHAVEN NATIONAL LABORATORY
VIRGINIA POLYTECHNIC INSTITUTE

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	

Fermi National Accelerator Laboratory
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(continued)

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; COLUMBIA UNIVERSITY

BEAM: Neutrino Area - Wide Band Horn
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	

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(continued)

81A NUCLEAR CHEMISTRY #81A — **Sheldon Kaufman**

BEAM: Meson Area - Miscellaneous
PRELIMINARY SURVEY OF 200 GEV PROTON INTERACTIONS WITH COMPLEX NUCLEI.
(Nuclear chemistry analysis.)

ARGONNE NATIONAL LABORATORY
BROOKHAVEN NATIONAL LABORATORY
CARNEGIE-MELLON UNIVERSITY
UNIVERSITY OF CHICAGO
UNIV. OF ILLINOIS, CHICAGO CIRCLE
PURDUE UNIVERSITY
RBL, ORSAY (FRANCE)

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**

BEAM: Meson Area - M4 Beam
PROPOSAL TO INVESTIGATE REGENERATION OF NEUTRAL K-MESONS AT VERY HIGH ENERGIES.
(See exp #425.)

UNIV. OF CALIFORNIA, SAN DIEGO
UNIVERSITY OF CHICAGO
SLAC
UNIVERSITY OF WISCONSIN - MADISON

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**

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.)

LAL, ORSAY (FRANCE)
UNIVERSITY OF WASHINGTON

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 O'Halloran**

BEAM: Proton Area - East
PROPOSAL TO SEARCH FOR HEAVY LEPTONS AND INTERMEDIATE BOSONS FROM PHOTON-NUCLEON AND PHOTON-NUCLEI COLLISIONS.

COLUMBIA UNIVERSITY
FERMILAB
UNIVERSITY OF HAWAII AT MANOA
UNIVERSITY OF ILLINOIS, CHAMPAIGN

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**

BEAM: Meson Area - Miscellaneous
CRACOW NUCLEAR EMULSION EXPOSURES.

INP, KRAKOW (POLAND)

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**

BEAM: Proton Area - West
PROPOSAL FOR EXAMINATION OF WIDE ANGLE GAMMA RAYS AT NAL.
(Single and digamma production by proton-nucleon collisions.)

FERMILAB
JOHNS HOPKINS UNIVERSITY

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**

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.)

ARGONNE NATIONAL LABORATORY
UNIVERSITY OF BARI (ITALY)
BROWN UNIVERSITY
CERN (SWITZERLAND)
CORNELL UNIVERSITY
FERMILAB
MASSACHUSETTS INST. OF TECHNOLOGY
NORTHEASTERN UNIVERSITY
STANFORD UNIVERSITY

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**

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.)

UNIVERSITY OF CHICAGO
HARVARD UNIVERSITY
UNIVERSITY OF ILLINOIS, CHAMPAIGN
UNIVERSITY OF OXFORD (ENGLAND)

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**

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.)

ARGONNE NATIONAL LABORATORY
FERMILAB
SLAC
STANFORD UNIVERSITY

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**

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.)

UNIVERSITY OF CHICAGO
PRINCETON UNIVERSITY

Request	4 Dec, 70	500 Hours for data taking
Approval	1 Feb, 71	500 Hours
Completed	4 Apr, 74	1,150 Hours

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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; FERMILAB; MAX-PLANCK INSTITUTE (GERMANY); ROCKEFELLER UNIVERSITY; UNIVERSITY OF WASHINGTON

BEAM: Meson Area - M1 Beam
MEASUREMENT OF TOTAL CROSS SECTIONS ON HYDROGEN AND DEUTERIUM.
(Of pi+-, K+-, p, pbar.)

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); PANJAB UNIVERSITY (INDIA); TATA INSTITUTE (INDIA)

BEAM: Meson Area - Miscellaneous
A PROPOSAL TO STUDY SOME CHARACTERISTICS OF PROTON-NUCLEON AND PROTON-NUCLEUS COLLISIONS AT 400 GEV USING NUCLEAR EMULSIONS.

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; UNIV. OF CALIFORNIA, LOS ANGELES; FERMILAB; UNIV. OF ILLINOIS, CHICAGO CIRCLE; INDIANA UNIVERSITY; MAX-PLANCK INSTITUTE (GERMANY)

BEAM: Meson Area - M6 Beam
PROPOSAL TO STUDY MULTIPARTICLE PERIPHERAL PHYSICS AT NAL.
(Using a large wire chamber magnetic spectrometer.)

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; LAWRENCE BERKELEY LABORATORY

BEAM: Meson Area - M2 Beam
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); CRN, STRASBOURG (FRANCE); FERMILAB; UNIVERSITY OF LYON (FRANCE); MCGILL UNIVERSITY (CANADA); UNIVERSITY OF MONTREAL (CANADA); UNIVERSITY OF OTTAWA (CANADA); UNIVERSITY OF VALENCIA (SPAIN)

BEAM: Meson Area - Miscellaneous
INTERACTION OF HIGH ENERGY PROTONS IN NUCLEAR EMULSIONS LOADED WITH B 10 AND LIF.

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); KOBE UNIVERSITY (JAPAN); OSAKA CITY UNIVERSITY (JAPAN); OSAKA SCIENCE EDUC. INST. (JAPAN); WAKAYAMA MEDICAL COLLEGE (JAPAN)

BEAM: Meson Area - Miscellaneous
PHENOMOLOGICAL STUDY OF 200 AND 500 GEV/C PROTON-PROTON COLLISIONS IN EMULSION.

Request	2 Mar, 71	Emulsion Exposure
Approval	1 Apr, 71	Emulsion Exposure
Completed	20 Sep, 72	11 Stack(s)

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118A INCLUSIVE SCATTERING #118A — George W. Brandenburg

UNIVERSITY OF BARI (ITALY)
BROWN UNIVERSITY
FERMILAB
MASSACHUSETTS INST. OF TECHNOLOGY

BEAM: Meson Area - M6 Beam
HADRON SPECTRA FROM HIGH ENERGY INTERACTIONS.
(Single particle inclusive spectra from pions, kaons, and protons using single arm spectrometer.)

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
HARVARD UNIVERSITY
UNIVERSITY OF WISCONSIN - MADISON

BEAM: Internal Target Area (C-0)
EARLY PI ZERO PARTICLE PRODUCTION SURVEY WITH THE GAS JET TARGET.
(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
LAWRENCE BERKELEY LABORATORY

BEAM: Neutrino Area - 30 in. Hadron Beam
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 Russ Huson

UNIV. OF CALIFORNIA, BERKELEY
FERMILAB
LAWRENCE BERKELEY LABORATORY

BEAM: Neutrino Area - 30 in. Hadron Beam
STUDY OF PI- + P INTERACTIONS AT HIGH ENERGY.

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
UNIVERSITY OF ROCHESTER

BEAM: Neutrino Area - 30 in. Hadron Beam
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
FERMILAB
IOWA STATE UNIVERSITY
UNIVERSITY OF MARYLAND
MICHIGAN STATE UNIVERSITY

BEAM: Neutrino Area - 30 in. Hadron Beam
STUDY OF PP INTERACTIONS IN THE ANL 30-INCH HYDROGEN BUBBLE CHAMBER AT NAL.

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
OAK RIDGE NATIONAL LABORATORY

BEAM: Neutrino Area - Miscellaneous
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
CASE WESTERN RESERVE UNIVERSITY

BEAM: Neutrino Area - 30 in. Hadron Beam
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)
UNIVERSITY OF OTTAWA (CANADA)

BEAM: Meson Area - Miscellaneous
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	

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154 30-INCH HYBRID #154 — **Irwin A. Pless**

BEAM: Neutrino Area - 30 in. Hadron Beam
TEST OF PROPORTIONAL WIRE CHAMBERS IN HYBRID SYSTEMS.

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

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
	6 Aug, 73	120 K Pix	Phase II - use of downstream PWC's for feasibility test run of 20K 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**

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.

UNIVERSITY OF HAWAII AT MANOA
LAWRENCE BERKELEY LABORATORY

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**

BEAM: Meson Area - Miscellaneous
STUDY OF SECONDARY PARTICLES PRODUCED BY 200 AND 500 GEV PROTONS IN EMULSION CHAMBERS.

AICHI UNIV. OF EDUCATION (JAPAN)
KWANSEI GAKUIN UNIVERSITY (JAPAN)
NAGOYA UNIVERSITY (JAPAN)
UNIVERSITY OF TOKYO (JAPAN)
YOKOHAMA NATIONAL UNIV. (JAPAN)

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**

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.

UNIVERSITY OF WISCONSIN - MADISON

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**

BEAM: Neutrino Area - 30 in. Hadron Beam
PROPOSAL FOR A STUDY OF THE INTERACTION OF HIGH ENERGY PI- WITH NEON.

DUKE UNIVERSITY
UNIVERSITY OF NORTH CAROLINA

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**

BEAM: Meson Area - Miscellaneous
PROPOSED EMULSION EXPERIMENT SEARCH FOR SHORT LIVED PARTICLES AT HIGH ENERGIES.

UNIVERSITY OF WASHINGTON

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**

BEAM: Neutrino Area - Wide Band Horn
ANTINEUTRINO INTERACTIONS IN THE 15-FOOT H2-NEON BUBBLE CHAMBER.

UNIV. OF CALIFORNIA, BERKELEY
UNIVERSITY OF HAWAII AT MANOA
LAWRENCE BERKELEY LABORATORY
UNIVERSITY OF WASHINGTON

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**

BEAM: Proton Area - West
EARLY MEASUREMENT OF HIGH ENERGY P P LARGE ANGLE ELASTIC SCATTERING.

CORNELL UNIVERSITY
LEBEDEV PHYSICAL INST. (RUSSIA)
MCGILL UNIVERSITY (CANADA)
NORTHEASTERN UNIVERSITY

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**

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.)

CARELTON UNIVERSITY (CANADA)
FERMILAB
MASSACHUSETTS INST. OF TECHNOLOGY

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	

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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
FERMILAB
UNIVERSITY OF MICHIGAN - ANN ARBOR
SUNY AT STONY BROOK

BEAM: Neutrino Area - 30 in. Hadron Beam
PROTON-DEUTERON INTERACTIONS IN THE BARE 30-INCH BUBBLE CHAMBER.

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

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198A PROTON-NUCLEON SCATTERING #198A — **Stephen L. Olsen**

BEAM: Internal Target Area (C-0)
A PROPOSAL FOR A MAGNETIC RECOIL SPECTROMETER FOR THE GAS JET TARGET.
(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.)

IMPERIAL COLLEGE (ENGLAND)
UNIVERSITY OF ROCHESTER
RUTGERS UNIVERSITY

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**

BEAM: Neutrino Area - Miscellaneous
SEARCH FOR WEAKLY PRODUCED MASSIVE LONG LIVED PARTICLES AT NAL.
(Using a threshold Cerenkov counter.)

FERMILAB
UNIVERSITY OF PENNSYLVANIA

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**

BEAM: Neutrino Area - Miscellaneous
SEARCH FOR TACHYON MONOPOLES IN COSMIC RAYS ABOVE 15-FOOT BUBBLE CHAMBER.
(Using magnet fringe field.)

UNIVERSITY OF COLORADO AT BOULDER
PRINCETON UNIVERSITY

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**

BEAM: Neutrino Area - Muon/Hadron Beam
FEASIBLE SEARCH FOR HEAVY NEUTRAL MUONS PREDICTED BY GAUGE THEORIES AND CONCURRENT MEASUREMENT OF DEEP-INELASTIC VIRTUAL COMPTON SCATTERING.

UNIV. OF CALIFORNIA, BERKELEY
FERMILAB
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**

BEAM: Neutrino Area - Miscellaneous
PHENOMENOLOGICAL STUDY OF MUON-NUCLEON COLLISION AT ENERGY MORE THAN 100 GEV IN EMULSION.

KINKI UNIVERSITY (JAPAN)
KOBE UNIVERSITY (JAPAN)
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**

BEAM: Neutrino Area - 30 in. Hadron Beam
A STUDY OF 300 GEV/C P D INTERACTIONS IN THE THIRTY-INCH BUBBLE CHAMBER.

CALIFORNIA INSTITUTE OF TECHNOLOGY
IOWA STATE UNIVERSITY
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**

BEAM: Neutrino Area - Miscellaneous
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.)

CERN (SWITZERLAND)
FERMILAB

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**

BEAM: Meson Area - M1 Beam
A MEASUREMENT OF THE PION FORM FACTOR BY DIRECT PION-ELECTRON SCATTERING.

UNIV. OF CALIFORNIA, LOS ANGELES
FERMILAB
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**

BEAM: Neutrino Area - 30 in. Hadron Beam
A COMPARISON OF 100 GEV AND 200 GEV PI+ - P INTERACTIONS.

UNIV. OF CALIFORNIA, DAVIS
LAWRENCE BERKELEY LABORATORY
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 M. Yager**

BEAM: Neutrino Area - 30 in. Hadron Beam
PION-DEUTERON INTERACTIONS AT 200 GEV/C.

UNIV. OF CALIFORNIA, DAVIS
INP, KRAKOW (POLAND)
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**

BEAM: Internal Target Area (C-0)
P - P INELASTIC SCATTERING IN THE DIFFRACTIVE REGION.
(Continuation of experiment #14A.)

COLUMBIA UNIVERSITY
SUNY AT STONY BROOK

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

Fermi National Accelerator Laboratory
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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 Russ 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

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242 EMULSION/PROTONS @ 300 #242 — Kiyoshi Niu

BEAM: Neutrino Area - Miscellaneous
STUDY OF SECONDARY PARTICLES PRODUCED BY 300 GEV PROTONS IN EMULSION CHAMBERS.

AICHI UNIV. OF EDUCATION (JAPAN)
NAGOYA UNIVERSITY (JAPAN)
YOKOHAMA NATIONAL UNIV. (JAPAN)

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

BEAM: Neutrino Area - Miscellaneous
STUDY OF SECONDARY PARTICLES PRODUCED BY 400 GEV PROTONS IN EMULSION CHAMBERS.

AICHI UNIV. OF EDUCATION (JAPAN)
KONAN UNIVERSITY (JAPAN)
NAGOYA UNIVERSITY (JAPAN)
YOKOHAMA NATIONAL UNIV. (JAPAN)

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

BEAM: Neutrino Area - Miscellaneous
INTERACTION OF 300 GEV PROTONS IN NUCLEAR EMULSION.

SUNY AT BUFFALO

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

BEAM: Neutrino Area - Miscellaneous
INTERACTION OF 400 GEV PROTONS IN NUCLEAR EMULSION.

SUNY AT BUFFALO

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

BEAM: Neutrino Area - Wide Band Horn
A PROPOSED EXPERIMENT TO SEARCH FOR HEAVY LEPTONS.
(Using a hybrid emulsion-spark chamber arrangement.)

UNIV. COLLEGE DUBLIN (IRELAND)
FERMILAB
UNIVERSITY OF LIBRE (BELGIUM)
LONDON UNIVERSITY COLLEGE(ENGLAND)
INFN, ROME (ITALY)
UNIVERSITY OF STRASBOURG (FRANCE)

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

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.)

UNIVERSITY OF MICHIGAN - ANN ARBOR

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

BEAM: Neutrino Area - Miscellaneous
CRACOW EMULSION EXPOSURE TO 400 GEV PROTONS.

INP, KRAKOW (POLAND)

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

BEAM: Neutrino Area - Miscellaneous
PHENOMENOLOGICAL STUDY OF PROTON-NUCLEUS COLLISION AT NAL ENERGIES IN EMULSION (300 GEV).

KINKI UNIVERSITY (JAPAN)
KOBE UNIVERSITY (JAPAN)
OSAKA CITY UNIVERSITY (JAPAN)
OSAKA SCIENCE EDUC. INST. (JAPAN)
WAKAYAMA MEDICAL COLLEGE (JAPAN)

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

BEAM: Neutrino Area - Miscellaneous
PHENOMENOLOGICAL STUDY OF PROTON-NUCLEUS COLLISION AT NAL ENERGIES IN EMULSION (400 GEV).

KINKI UNIVERSITY (JAPAN)
KOBE UNIVERSITY (JAPAN)
OSAKA CITY UNIVERSITY (JAPAN)
OSAKA SCIENCE EDUC. INST. (JAPAN)
WAKAYAMA MEDICAL COLLEGE (JAPAN)

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

BEAM: Neutrino Area - 30 in. Hadron Beam
STUDY OF MULTIPARTICLE PRODUCTION IN A 30-INCH BUBBLE CHAMBER.
(Formerly known as experiment #138I.)

UNIVERSITY OF MICHIGAN - ANN ARBOR
UNIVERSITY OF ROCHESTER

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

BEAM: Neutrino Area - Wide Band Horn
NEUTRINO-ELECTRON SCATTERING AT NAL.

IHEP, BEIJING (PRC)
UNIVERSITY OF MARYLAND
NATIONAL SCIENCE FOUNDATION
UNIVERSITY OF OXFORD (ENGLAND)
VIRGINIA POLYTECHNIC INSTITUTE

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

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254 NEUTRINO #254 — George R. Kalbfleisch

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.)

BROOKHAVEN NATIONAL LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
FERMILAB
PURDUE UNIVERSITY

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

BEAM: Neutrino Area - Miscellaneous
EXPOSURE OF NUCLEAR EMULSIONS TO A BEAM OF 150 GEV MUONS AT THE NATIONAL ACCELERATOR LABORATORY.

SUNY AT BUFFALO

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

BEAM: Proton Area - West
A PROPOSAL TO MEASURE PARTICLES PRODUCED AT HIGH TRANSVERSE MOMENTUM BY PIONS.

UNIVERSITY OF CHICAGO
PRINCETON UNIVERSITY

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

BEAM: Meson Area - M6 Beam
A PROPOSAL TO STUDY HIGH PT PHYSICS WITH A MULTIPARTICLE SPECTROMETER.

CALIFORNIA INSTITUTE OF TECHNOLOGY
UNIV. OF CALIFORNIA, LOS ANGELES
FERMILAB
UNIV. OF ILLINOIS, CHICAGO CIRCLE
INDIANA UNIVERSITY
MAX-PLANCK INSTITUTE (GERMANY)

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

BEAM: Meson Area - M1 Beam
PROPOSAL TO TEST TRANSITION COUNTERS AT NAL.

BROOKHAVEN NATIONAL LABORATORY
FERMILAB

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

BEAM: Neutrino Area - Dichromatic
NEUTRAL CURRENT INVESTIGATION AT NAL.
(Using the Dichromatic beam, target calorimeter, and spectrometer of exp. #21A.)

CALIFORNIA INSTITUTE OF TECHNOLOGY
FERMILAB

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

BEAM: Neutrino Area - Miscellaneous
EXPOSURE OF EMULSIONS TO 200-300 GEV PI- FOR NEW DETERMINATION OF MEAN LIFE OF PI ZERO.

MISSISSIPPI STATE UNIVERSITY
UNIVERSITY OF TENNESSEE, KNOXVILLE

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

BEAM: Neutrino Area - Miscellaneous
EXPOSURE OF EMULSIONS TO 400 GEV PROTONS FOR NEW DETERMINATION OF MEAN LIFE OF PI ZERO.

CRFC, CAMBRIDGE
MISSISSIPPI STATE UNIVERSITY

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

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.)

BROOKHAVEN NATIONAL LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
LAWRENCE BERKELEY LABORATORY

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

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.)

IAP, BUCHAREST (ROMANIA)
CERN (SWITZERLAND)
CORNELL UNIVERSITY
UNIVERSITY OF LUND (SWEDEN)

Request	30 Nov, 73	Emulsion Exposure
Approval	16 Jan, 74	Emulsion Exposure
Completed	10 Jun, 75	10 Stack(s)

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272 HADRON DISSOCIATION #272 — Thomas Ferbel

BEAM: Meson Area - M1 Beam
PROPOSAL TO MEASURE COHERENT DISSOCIATION OF PI-, K-, AND PBAR INTO TWO-BODY SYSTEMS AT FERMILAB ENERGIES.

BROOKHAVEN NATIONAL LABORATORY
FERMILAB
UNIVERSITY OF MINNESOTA
UNIVERSITY OF ROCHESTER

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

BEAM: Neutrino Area - Miscellaneous
EXPOSURE OF PLASTIC-DETECTOR STACKS TO A 300 GEV PROTON BEAM AT NAL.

CHRISTIAN-ALBRECHTS UNIV.(GERMANY)

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

BEAM: Neutrino Area - Miscellaneous
A SEARCH FOR STABLE INTEGRALLY CHARGED MASSIVE PARTICLES (HAN-NAMBU QUARKS).
(Mass spectroscopic analysis of irradiated target.)

ARGONNE NATIONAL LABORATORY
UNIVERSITY OF CHICAGO
FERMILAB

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

BEAM: Neutrino Area - Miscellaneous
THE INTERACTION OF PA=PAE+E- AT 400 GEV.

UNIVERSITY OF TENNESSEE, KNOXVILLE

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

BEAM: Neutrino Area - 30 in. Hadron Beam
PROPOSAL TO STUDY P - D INTERACTIONS AT 205 GEV/C IN THE 30-INCH BUBBLE CHAMBER.

ARGONNE NATIONAL LABORATORY
CIPP (CANADA)
JINR, DUBNA (RUSSIA)
MOSCOW STATE UNIVERSITY (RUSSIA)

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

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.

IOWA STATE UNIVERSITY
UNIVERSITY OF MARYLAND
MICHIGAN STATE UNIVERSITY
NOTRE DAME UNIVERSITY

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

BEAM: Proton Area - West
SURVEY OF PARTICLE PRODUCTION IN PROTON COLLISIONS AT NAL.
(Continuation of work begun in exp #63A.)

FERMILAB
NORTHEASTERN UNIVERSITY
NORTHERN ILLINOIS UNIVERSITY

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

BEAM: Neutrino Area - Miscellaneous
A SEARCH FOR A NEW STATE OF MATTER IN THE ANALYSIS OF AN NAL BEAM DUMP.

COLUMBIA UNIVERSITY
FERMILAB

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

BEAM: Proton Area - Center
A STUDY OF DI-LEPTON PRODUCTION IN PROTON COLLISIONS AT NAL.
(Formerly known as exp #70 III.)

COLUMBIA UNIVERSITY
FERMILAB
SUNY AT STONY BROOK

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

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.)

UNIVERSITY OF ARIZONA
FERMILAB
JINR, DUBNA (RUSSIA)

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

BEAM: Meson Area - M6 Beam
BACKWARD PION-PROTON ELASTIC SCATTERING.
(For u from 0 - 0.8.)

UNIVERSITY OF ARIZONA
FERMILAB

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

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292 EMULSION/PROTONS @ 400 #292 — **Kurt Gottfried**

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; 400 GeV exposure.)

IAP, BUCHAREST (ROMANIA)
CERN (SWITZERLAND)
CORNELL UNIVERSITY
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**

BEAM: Neutrino Area - 30 in. Hadron Beam
A STUDY OF PI+ - D INTERACTIONS AT 200 GEV/C IN THE 30-INCH BUBBLE CHAMBER AT NAL.

CRN, STRASBOURG (FRANCE)
FERMILAB
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**

BEAM: Neutrino Area - 30 in. Hadron Beam
QUARK SEARCH USING 400-500 GEV PROTONS.
(By measuring ionization energy loss.)

BROOKHAVEN NATIONAL LABORATORY

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**

BEAM: Neutrino Area - 30 in. Hadron Beam
PRECISION STUDY OF HIGH ENERGY COLLISIONS INDUCED BY INCIDENT 150 GEV/C PIONS AND PROTONS.
(Using the downstream PWC hybrid system.)

BROWN UNIVERSITY
UNIVERSITY OF CAMBRIDGE (ENGLAND)
FERMILAB
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**

BEAM: Proton Area - East
STUDY OF PARTICLE PRODUCTION AT HIGH TRANSVERSE MOMENTA USING HYDROGEN AND DEUTERIUM TARGETS.

UNIVERSITY OF CHICAGO
PRINCETON UNIVERSITY

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**

BEAM: Meson Area - M3 Beam
PROPOSAL TO STUDY THE COHERENT DISSOCIATION OF NEUTRONS.
(A continuation of work begun in exp #27A.)

FERMILAB
NORTHWESTERN UNIVERSITY
UNIVERSITY OF ROCHESTER
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**

BEAM: Neutrino Area - Wide Band Horn
FURTHER STUDY OF HIGH ENERGY NEUTRINO INTERACTIONS AT FERMILAB.

FERMILAB
HARVARD UNIVERSITY
UNIVERSITY OF PENNSYLVANIA
RUTGERS UNIVERSITY
UNIVERSITY OF WISCONSIN - MADISON

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.

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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 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	

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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

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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 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	

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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# 366
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
FERMILAB
JINR, DUBNA (RUSSIA)
UNIVERSITY OF ROCHESTER

BEAM: Internal Target Area (C-0)
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.)

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
FERMILAB
INP, KRAKOW (POLAND)
MICHIGAN STATE UNIVERSITY
UNIVERSITY OF WASHINGTON

BEAM: Neutrino Area - Muon/Hadron Beam
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.)

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	

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383 INCLUSIVE K-SHORT #383 — **Hans G. E. Kobrak**

BEAM: Meson Area - M4 Beam
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 moments of 20 - 150 GeV/c.)

UNIV. OF CALIFORNIA, DAVIS
UNIV. OF CALIFORNIA, SAN DIEGO
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**

BEAM: Neutrino Area - Miscellaneous
PROPOSAL FOR EXPOSURE OF A STACK OF NUCLEAR EMULSIONS TO PROTONS OF 400 GEV/C.

DELHI UNIVERSITY (INDIA)
JAMMU UNIVERSITY (INDIA)
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**

BEAM: Neutrino Area - Miscellaneous
A SEARCH FOR LOW ENERGY NEUTRAL PARTICLES AND PARTICLE INTERACTIONS INVOLVING SMALL ENERGY EXCHANGES IN THE NEUTRINO BEAM.

UNIVERSITY OF WASHINGTON

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**

BEAM: Neutrino Area - Miscellaneous
100 TO 300 GEV PION INTERACTIONS IN EMULSION AND HEAVY ELEMENT TARGETS.

UNIVERSITY OF WASHINGTON

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**

BEAM: Neutrino Area - Dichromatic
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.

FERMILAB
UNIVERSITY OF HAWAII AT MANOA
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**

BEAM: Neutrino Area - Wide Band Horn
ANTI-NEUTRINO INTERACTIONS IN THE DEUTERIUM-FILLED 15-FOOT BUBBLE CHAMBER.

ARGONNE NATIONAL LABORATORY
CARNEGIE-MELLON UNIVERSITY
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**

BEAM: Neutrino Area - Muon/Hadron Beam
EXPLORATION OF RARE MUON-INDUCED PROCESSES.

UNIV. OF CALIFORNIA, BERKELEY
FERMILAB
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**

BEAM: Meson Area - M2 Beam
CALORIMETER-ARRAY STUDY OF HIGH P-TRANSVERSE EVENTS.

LEHIGH UNIVERSITY
UNIVERSITY OF PENNSYLVANIA
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**

BEAM: Meson Area - M6 Beam
ELASTIC SCATTERING AND DIFFRACTION DISSOCIATION AT SMALL MOMENTUM TRANSFER FOR PI+-, K+-, P, PBAR AND N.

ROCKEFELLER UNIVERSITY

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**

BEAM: Meson Area - M3 Beam
PROPOSAL TO SEARCH FOR HIGH MASS PARTICLES PRODUCED IN ASSOCIATION WITH PROMPT MUONS.
(Using the spectrometer from exps #27A and #305 with additions.)

FERMILAB
NORTHWESTERN UNIVERSITY
UNIVERSITY OF ROCHESTER
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**

BEAM: Neutrino Area - Muon/Hadron Beam
A PROPOSAL FOR A FURTHER STUDY OF MUON NUCLEON INELASTIC SCATTERING AT FERMILAB.
(Using the spectrometer of exp #98.)

UNIVERSITY OF CHICAGO
HARVARD UNIVERSITY
UNIVERSITY OF ILLINOIS, CHAMPAIGN
UNIVERSITY OF OXFORD (ENGLAND)
VIRGINIA POLYTECHNIC INSTITUTE

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	

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399 EMULSION/ELECTRONS @ > 100 #399 — Robert L. Golden

JOHNSON SPACE CENTER (NASA)
KANAGAWA UNIVERSITY (JAPAN)
ISAS, TOKYO UNIVERSITY (JAPAN)
UNIVERSITY OF WASHINGTON

BEAM: Proton Area - Miscellaneous
PRODUCTION OF ELECTROMAGNETIC CASCADE SHOWERS BY SEVERAL HUNDRED GEV ELECTRONS IN EMULSION CHAMBERS.

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)
UNIVERSITY OF COLORADO AT BOULDER
FERMILAB
UNIVERSITY OF ILLINOIS, CHAMPAIGN
INFN, MILANO (ITALY)
UNIVERSITY OF MILANO (ITALY)
UNIVERSITY OF PAVIA (ITALY)
YALE UNIVERSITY

BEAM: Proton Area - East
A SEARCH FOR NEW PARTICLES PRODUCED IN ASSOCIATION WITH THE HADRONIC PRODUCTION OF PSI (3.1) MESONS.
(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.)

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
UNIVERSITY OF ILLINOIS, CHAMPAIGN

BEAM: Proton Area - East
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
RUTGERS UNIVERSITY
UNIVERSITY OF WISCONSIN - MADISON

BEAM: Meson Area - M2 Beam
INCLUSIVE NEUTRON PRODUCTION BY PROTONS ON PROTONS AND NUCLEI.

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
UNIVERSITY OF MICHIGAN - ANN ARBOR
RUTGERS UNIVERSITY
UNIVERSITY OF WISCONSIN - MADISON

BEAM: Meson Area - M2 Beam
MEASUREMENTS OF PI- CU TO K-SHORT, LAMBDA AND NEUTRON INCLUSIVE CROSS SECTIONS.
(For proposal #360 with the apparatus of exp #8 in the M2 beam line.)

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
LAL, ORSAY (FRANCE)
UNIVERSITY OF WASHINGTON

BEAM: Meson Area - M1 Beam
STREAMER CHAMBER SEARCH FOR NEW STATES WHICH DECAY SEMI-LEPTONICALLY.
(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)
UNIVERSITY OF ROCHESTER
RUTGERS UNIVERSITY

BEAM: Internal Target Area (C-D)
NUCLEAR SIZE DEPENDENCE FOR PARTICLE PRODUCTION AT INTERMEDIATE TRANSVERSE MOMENTUM.
(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)

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424 EMULSION/MUONS @ 200 #424 — **Tomonori Wada**

BEAM: Neutrino Area - Miscellaneous
MULTIPLE PION PRODUCTION BY 200 GEV/C MUONS.

ASHIKAGA INST. OF TECH. (JAPAN)
ICRR, UNIVERSITY OF TOKYO (JAPAN)
OKAYAMA UNIVERSITY (JAPAN)
SAITAMA UNIVERSITY (JAPAN)

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**

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.)

UNIV. OF CALIFORNIA, SAN DIEGO
UNIVERSITY OF CHICAGO
LHE, ETH HONGGERBERG (SWITZERLAND)
SLAC
UNIVERSITY OF WISCONSIN - MADISON

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**

BEAM: Meson Area - Miscellaneous
PROPOSAL ON THE STUDY OF FRAGMENTATION PARTICLES CREATED IN A PLASTIC DETECTOR BY 300 GEV PROTONS.

HANSCOM A.F.B. GEOPHYSICS LAB.
UNIVERSITY OF KIEL (GERMANY)

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**

BEAM: Meson Area - M1 Beam
A PROPOSAL FOR TESTING A TRANSITION RADIATION DETECTOR AND A HIGH ENERGY SHOWER DETECTOR FOR COSMIC RAY EXPERIMENTS.

BROOKHAVEN NATIONAL LABORATORY

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**

BEAM: Neutrino Area - Miscellaneous
400 GEV PROTON INTERACTIONS IN NUCLEAR EMULSION.

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)

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**

BEAM: Neutrino Area - Miscellaneous
CASCADE SHOWERS ORIGINATED IN JET SHOWERS.

KOBE UNIVERSITY (JAPAN)
KONAN UNIVERSITY (JAPAN)
SAITAMA UNIVERSITY (JAPAN)
UNIVERSITY OF TOKYO (JAPAN)
UTSUNOMIYA UNIVERSITY (JAPAN)

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**

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.)

BROOKHAVEN NATIONAL LABORATORY
FERMILAB
YALE UNIVERSITY

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**

BEAM: Proton Area - Center
DETERMINATION OF THE POSSIBLE DI-MUON CHARACTER OF THE PROMPT MUON FLUX.

BROOKHAVEN NATIONAL LABORATORY
FERMILAB
YALE UNIVERSITY

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**

BEAM: Meson Area - M3 Beam
INELASTIC CROSS SECTIONS OF NEUTRONS ON NUCLEI.

UNIVERSITY OF MICHIGAN - ANN ARBOR

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**

BEAM: Meson Area - M2 Beam
HIGH SENSITIVITY SEARCH FOR NEW STATES WHICH DECAY INTO MUONS.

UNIVERSITY OF MICHIGAN - ANN ARBOR
NORTHEASTERN UNIVERSITY
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

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440 LAMBDA MAGNETIC MOMENT #440 — Gerry M. Bunce

BEAM: Meson Area - M2 Beam
PROPOSAL FOR A NEW MEASUREMENT OF THE MAGNETIC MOMENT OF THE LAMBDA HYPERON.

UNIVERSITY OF MICHIGAN - ANN ARBOR
RUTGERS UNIVERSITY
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

BEAM: Meson Area - M2 Beam
A PROPOSAL TO STUDY LAMBDA POLARIZATION IN THE INCLUSIVE REACTION PROTON - PROTON TO LAMBDA PLUS ANYTHING WITH LIQUID HYDROGEN TARGET.
(Extension of previous measurements of 300 GeV protons on beryllium to 400 GeV protons on hydrogen.)

UNIVERSITY OF MICHIGAN - ANN ARBOR
RUTGERS UNIVERSITY
UNIVERSITY OF WISCONSIN - MADISON

Request	29 Sep, 75	150 Hours	
Approval	25 Nov, 75	150 Hours	
Completed	2 Jul, 77	400 Hours	

442 NUCLEAR FRAGMENTS #442 — Frank Turkot

BEAM: Internal Target Area (C-0)
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.)

FERMILAB
PURDUE UNIVERSITY

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

BEAM: Neutrino Area - Muon/Hadron Beam
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.)

UNIVERSITY OF CHICAGO
PRINCETON UNIVERSITY

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

BEAM: Neutrino Area - Muon/Hadron Beam
PROPOSAL FOR THE INVESTIGATION OF VIRTUAL PHOTOABSORPTION BY NUCLEAR MATTER.
(Using the cyclotron spectrometer and heavy targets; see proposal #257.)

UNIVERSITY OF CHICAGO
FERMILAB
HARVARD UNIVERSITY
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

BEAM: Meson Area - M6 Beam
STUDY OF THE A-DEPENDENCE OF INCLUSIVE PROCESSES AND ASSOCIATED MULTIPLICITY.
(Using the single arm spectrometer facility.)

UNIVERSITY OF BARI (ITALY)
BROWN UNIVERSITY
FERMILAB
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

BEAM: Meson Area - M1 Beam
MEASUREMENT OF THE KAON FORM FACTOR.
(Continuation of work begun in exp #216.)

UNIV. OF CALIFORNIA, LOS ANGELES
FERMILAB
JINR, DUBNA (RUSSIA)
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

BEAM: Proton Area - East
PHOTOPRODUCTION EXPERIMENT AT FERMILAB.
(Using the broad band photon beam; a continuation of work begun in exp #87A and #401.)

COLUMBIA UNIVERSITY
FERMILAB
UNIVERSITY OF ILLINOIS, CHAMPAIGN

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

BEAM: Neutrino Area - Miscellaneous
SEARCH FOR NEW PARTICLES FROM 400 GEV PROTON COLLISIONS IN EMULSIONS.

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

Request	10 Nov, 75	Emulsion Exposure	
Approval	26 Nov, 75	6 Stack(s)	
Completed	9 Dec, 75	6 Stack(s)	

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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
LHE, ETH HONGGERBERG (SWITZERLAND)
UNIVERSITY OF WISCONSIN - MADISON

BEAM: Meson Area - M4 Beam
PROPOSAL TO STUDY THE ATOMIC NUMBER DEPENDENCE OF THE DIFFERENCE BETWEEN PARTICLE AND ANTI-PARTICLE TOTAL CROSS SECTIONS.
(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
LAWRENCE BERKELEY LABORATORY
YALE UNIVERSITY

BEAM: Meson Area - M1 Beam
SEARCH FOR SHORT LIVED PARTICLES USING A HIGH RESOLUTION STREAMER CHAMBER.

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

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494 DI-HADRON #494 — **Myron L. Good**

COLUMBIA UNIVERSITY
FERMILAB
SUNY AT STONY BROOK

BEAM: Proton Area - Center
A STUDY OF DI-HADRON PRODUCTION IN PROTON COLLISIONS AT FERMILAB.
(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
UNIVERSITY OF MICHIGAN - ANN ARBOR
RUTGERS UNIVERSITY
UNIVERSITY OF WISCONSIN - MADISON

BEAM: Meson Area - M2 Beam
PROPOSAL TO STUDY CASCADE ZERO AND ANTILAMBDA PRODUCTION AND POLARIZATION.
(Experiment would use the spectrometer of E-8.)

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
IOWA STATE UNIVERSITY
YALE UNIVERSITY

BEAM: Proton Area - Center
ELASTIC SCATTERING OF THE HYPERONS.
(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
UNIVERSITY OF PENNSYLVANIA

BEAM: Neutrino Area - Muon/Hadron Beam
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
GENERAL ELECTRIC R&D CENTER

BEAM: Neutrino Area - Miscellaneous
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)
ICRR, UNIVERSITY OF TOKYO (JAPAN)
KONAN UNIVERSITY (JAPAN)
KWANSEI GAKUIN UNIVERSITY (JAPAN)

BEAM: Neutrino Area - Miscellaneous
MULTIPARTICLE PRODUCTION IN HIGH ENERGY PION-NUCLEUS INTERACTIONS.

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)

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507 HIGH ENERGY CHANNELING #507 — Edouard N. Tsyganov

BEAM: Meson Area - M1 Beam
PROPOSAL TO STUDY CHANNELING AT FERMILAB.
(Using the spectrometer of exp #456.)

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)

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

BEAM: Meson Area - Test Beam
STUDY OF THE MECHANISM FOR MULTIPLE PRODUCTION OF PARTICLES AT HIGH ENERGIES.

INP, KRAKOW (POLAND)

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

BEAM: Neutrino Area - Miscellaneous
SEARCH FOR THE LARGE ANGLE SCATTERING OF MUONS.

KANAGAWA UNIVERSITY (JAPAN)
KOBE UNIVERSITY (JAPAN)
UNIVERSITY OF TOKYO (JAPAN)

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

BEAM: Proton Area - Miscellaneous
STUDY OF CASCADE SHOWERS INITIATED BY ELECTRONS.

AICHI UNIV. OF EDUCATION (JAPAN)
NAGOYA UNIVERSITY (JAPAN)
YOKOHAMA NATIONAL UNIV. (JAPAN)

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

BEAM: Meson Area - M1 Beam
PROPOSAL TO STUDY CHARGED PARTICLES PRODUCED IN HADRONIC INTERACTIONS.

CARNEGIE-MELLON UNIVERSITY
FERMILAB
NORTHWESTERN UNIVERSITY
NOTRE DAME UNIVERSITY

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

BEAM: Proton Area - East
A STUDY OF PHOTOPRODUCTION USING A MAGNETIC SPECTROMETER AT THE TAGGED PHOTON LAB.

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)

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

BEAM: Internal Target Area (C-0)
A STUDY OF INCLUSIVE PROTON POLARIZATION.

INDIANA UNIVERSITY

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

BEAM: Meson Area - Test Beam
PROPOSAL TO STUDY INTERACTIONS OF PROTONS OF ENERGY GREATER THAN 500 GEV IN EMULSION AND HEAVY NUCLEI.

UNIVERSITY OF WASHINGTON

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

BEAM: Neutrino Area - Miscellaneous
PROPOSAL TO STUDY PROTON-NUCLEUS INTERACTIONS IN EMULSION PLATES WITH EMBEDDED METAL POWDER GRANULES AT 300 GEV.

UNIVERSITY OF WASHINGTON

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)

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531 NEUTRINO #531 — Neville W. Reay

BEAM: Neutrino Area - Wide Band Horn
A PROPOSAL TO STUDY WEAK DECAY LIFETIMES OF NEUTRINO PRODUCED PARTICLES IN A TAGGED EMULSION SPECTROMETER.

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 POLYTECHNIC INSTITUTE
YOKOHAMA NATIONAL UNIV. (JAPAN)

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

BEAM: Meson Area - M3 Beam
PROPOSAL TO MEASURE THE RATE OF FORMATION OF PI-MU ATOMS IN K-LONG M 3 DECAY.

UNIVERSITY OF CHICAGO
STANFORD UNIVERSITY
UNIVERSITY OF WISCONSIN - MADISON

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

BEAM: Neutrino Area - Wide Band Horn
STUDY OF NEUTRINO INTERACTIONS IN NUCLEAR EMULSIONS.

AICHI UNIV. OF EDUCATION (JAPAN)
NAGOYA UNIVERSITY (JAPAN)
YOKOHAMA NATIONAL UNIV. (JAPAN)

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

BEAM: Proton Area - West
PROPOSAL TO STUDY PBAR-N INTERACTIONS IN THE P-WEST HIGH INTENSITY LABORATORY

UNIVERSITY OF ATHENS (GREECE)
FERMILAB
MCGILL UNIVERSITY (CANADA)
UNIVERSITY OF MICHIGAN - ANN ARBOR
SHANDONG UNIVERSITY (PRC)

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

BEAM: Meson Area - M3 Beam
A SEARCH FOR NEW METASTABLE PARTICLES TRAPPED IN MATTER.

UNIVERSITY OF MICHIGAN - ANN ARBOR

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

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.)

ILLINOIS INSTITUTE OF TECHNOLOGY
UNIVERSITY OF MARYLAND
SUNY AT STONY BROOK
TOHOKU UNIVERSITY (JAPAN)
TUFTS UNIVERSITY

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 Russ Huson

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.

UNIV. OF CALIFORNIA, BERKELEY
FERMILAB
UNIVERSITY OF HAWAII AT MANOA
LAWRENCE BERKELEY LABORATORY
UNIVERSITY OF WASHINGTON
UNIVERSITY OF WISCONSIN - MADISON

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

BEAM: Neutrino Area - Miscellaneous
ANGULAR CORRELATIONS STUDY IN PROTON-NUCLEI JETS AT 400-500 GEV USING EMULSION TELESCOPE TECHNIQUES.

CRN, STRASBOURG (FRANCE)
UNIVERSITY OF LYON (FRANCE)
UNIVERSITY OF SANTANDER (SPAIN)

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)

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549 QUARK #549 — **Michael J. Longo**

BEAM: Neutrino Area - Miscellaneous
A SEARCH FOR FRACTIONAL CHARGES USING ACCELERATOR AND LOW TEMPERATURE TECHNIQUES.

UNIVERSITY OF MICHIGAN - ANN ARBOR
STANFORD UNIVERSITY

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**

BEAM: Internal Target Area (C-0)
A PROPOSAL TO STUDY P - P ELASTIC AND P - D COHERENT SCATTERING.

IMPERIAL COLLEGE (ENGLAND)
UNIVERSITY OF ROCHESTER
RUTGERS UNIVERSITY

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**

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.)

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)

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**

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.)

UNIVERSITY OF MICHIGAN - ANN ARBOR
UNIVERSITY OF MINNESOTA
RUTGERS UNIVERSITY
UNIVERSITY OF WISCONSIN - MADISON

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**

BEAM: Meson Area - Test Beam
PROPOSAL TO STUDY HADRON JETS WITH THE CALORIMETER TRIGGERED MULTIPARTICLE SPECTROMETER.
(Continuation of work begun in exp #260.)

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

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**

BEAM: Neutrino Area - Wide Band Horn
DIRECT DETECTION OF SHORT-LIVED PARTICLES FROM NEUTRINO INTERACTIONS IN NUCLEAR EMULSIONS INSIDE THE 15-FOOT BUBBLE CHAMBER.

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

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

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565 30-INCH HYBRID #565 — **Irwin A. Pless**

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.)

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

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**

BEAM: Proton Area - West
SEARCH FOR CHARM PRODUCTION IN 200 GEV/C HADRON INTERACTIONS.
(Using the spectrometer for exp #302 with additions.)

BROOKHAVEN NATIONAL LABORATORY
CEN-SACLAY (FRANCE)
FERMILAB
PRINCETON UNIVERSITY
UNIVERSITY OF TORINO (ITALY)

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**

BEAM: Neutrino Area - Miscellaneous
300 GEV PION INTERACTIONS IN NUCLEAR EMULSION.

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)

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**

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.)

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

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**

BEAM: Neutrino Area - Miscellaneous
A SEARCH FOR CHARMED PARTICLES PRODUCED BY 300 GEV/C NEGATIVE PIONS IN NUCLEAR EMULSION.

AICHI UNIV. OF EDUCATION (JAPAN)
NAGOYA UNIVERSITY (JAPAN)
YOKOHAMA NATIONAL UNIV. (JAPAN)

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**

BEAM: Neutrino Area - Miscellaneous
A STUDY OF THE MECHANISM FOR MULTIPLE PRODUCTION OF PARTICLES AT OR ABOVE 300 GEV PION INTERACTIONS IN NUCLEAR EMULSION.

INP, KRAKOW (POLAND)

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**

BEAM: Neutrino Area - Miscellaneous
PROPOSAL TO STUDY 400 GEV PROTON INTERACTIONS IN NUCLEAR EMULSION.

UNIVERSITY OF WASHINGTON

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)

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576 EMULSION/PROTONS @ 500 #576 — **Jacques D. Hebert**

BEAM: Neutrino Area - Miscellaneous
500 GEV PROTON INTERACTIONS IN NUCLEAR EMULSION

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)

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**

BEAM: Meson Area - M6 Beam
PROPOSAL TO MEASURE PI P ELASTIC SCATTERING AT LARGE ANGLES.

UNIVERSITY OF ARIZONA
UNIV. OF CALIFORNIA, SAN DIEGO
CORNELL UNIVERSITY
FERMILAB

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**

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.

UNIVERSITY OF ARIZONA
FERMILAB
FLORIDA STATE UNIVERSITY
NOTRE DAME UNIVERSITY
TUFTS UNIVERSITY
VANDERBILT UNIVERSITY
VIRGINIA POLYTECHNIC INSTITUTE

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**

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.)

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)

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**

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.

UNIVERSITY OF CHICAGO
STANFORD UNIVERSITY
UNIVERSITY OF WISCONSIN - MADISON

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**

BEAM: Meson Area - M4 Beam
A PROPOSAL TO STUDY EXCLUSIVE KN CHARGE EXCHANGE AT FERMILAB.
(The spectrometer from experiment #383 would be used.)

UNIV. OF CALIFORNIA, DAVIS
UNIV. OF CALIFORNIA, SAN DIEGO
CARELTON UNIVERSITY (CANADA)
MICHIGAN STATE UNIVERSITY

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**

BEAM: Internal Target Area (C-0)
BROAD SEARCH FOR NEW HADRONIC STATES VIA HIGH RESOLUTION CHARGE AND MASS DETERMINATION OF NUCLEAR FRAGMENTS.

FERMILAB
PURDUE UNIVERSITY

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**

BEAM: Proton Area - West
PROPOSAL FOR EXPERIMENTAL STUDY OF THE RELATIONSHIP BETWEEN HADRONIC AND NUCLEAR SCALING AT VERY HIGH ENERGIES.

ITEP, MOSCOW (RUSSIA)
UNIVERSITY OF PENNSYLVANIA
COLLEGE OF WILLIAM AND MARY

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

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594 NEUTRINO #594 — James K. Walker

BEAM: Neutrino Area - Dichromatic
PROPOSAL FOR A NEW NEUTRINO DETECTOR AT FERMILAB.

FERMILAB
ILLINOIS INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INST. OF TECHNOLOGY
MICHIGAN STATE UNIVERSITY
NORTHERN ILLINOIS UNIVERSITY

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

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.)

CALIFORNIA INSTITUTE OF TECHNOLOGY
UNIVERSITY OF CHICAGO
FERMILAB
UNIVERSITY OF ROCHESTER
STANFORD UNIVERSITY

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

BEAM: Neutrino Area - Muon/Hadron Beam
ON SEARCHING FOR HEAVY STABLE PARTICLES
(A continuation of work begun with exp #187.)

COLUMBIA UNIVERSITY
FERMILAB
SUNY AT STONY BROOK

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 — J. James Whitmore

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.)

UNIVERSITY OF CAMBRIDGE (ENGLAND)
DUKE UNIVERSITY
FERMILAB
UNIVERSITY OF KANSAS
MICHIGAN STATE UNIVERSITY
NOTRE DAME UNIVERSITY

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

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.)

CEN-SACLAY (FRANCE)
CERN (SWITZERLAND)
COLUMBIA UNIVERSITY
FERMILAB
KEK (JAPAN)
KYOTO UNIVERSITY (JAPAN)
SUNY AT STONY BROOK
UNIVERSITY OF WASHINGTON

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

BEAM: Proton Area - Center
A SEARCH FOR THE ETA SUB C IN HADRONIC INTERACTIONS.
(Using the spectrometer from exp #288/496.)

COLUMBIA UNIVERSITY
FERMILAB
SUNY AT STONY BROOK

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

BEAM: Meson Area - M6 Beam
A STUDY OF THE STRUCTURE OF HIGH P TRANSVERSE HADRONIC INTERACTIONS.
(This proposal supersedes P-246.)

ARGONNE NATIONAL LABORATORY
FERMILAB
LEHIGH UNIVERSITY
UNIVERSITY OF PENNSYLVANIA
RICE UNIVERSITY
UNIVERSITY OF WISCONSIN - MADISON

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

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.)

FERMILAB
HOWARD UNIVERSITY
UNIVERSITY OF ILLINOIS, CHAMPAIGN
UNIVERSITY OF PENNSYLVANIA
PURDUE UNIVERSITY
TUFTS UNIVERSITY

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

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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 Sciulli** — CALIFORNIA INSTITUTE OF TECHNOLOGY; COLUMBIA UNIVERSITY; FERMILAB; UNIVERSITY OF ROCHESTER; ROCKEFELLER UNIVERSITY

BEAM: Neutrino Area - Dichromatic
PROPOSAL TO MEASURE NEUTRINO STRUCTURE FUNCTIONS.
(Use of the Lab E neutrino detector to continue work begun in exp #356.)

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); UNIVERSITY OF CHICAGO

BEAM: Meson Area - M3 Beam
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; UNIVERSITY OF MINNESOTA; RUTGERS UNIVERSITY; UNIVERSITY OF WISCONSIN - MADISON

BEAM: Proton Area - Center
A MEASUREMENT OF THE SIGMA-ZERO TO LAMBDA TRANSITION MAGNETIC MOMENT.

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; UNIVERSITY OF MINNESOTA; RUTGERS UNIVERSITY; UNIVERSITY OF WISCONSIN - MADISON

BEAM: Meson Area - M2 Beam
PROPOSAL TO MEASURE THE MAGNETIC MOMENTS OF THE SIGMA +, SIGMA -, XI -, AND OMEGA - HYPERONS USING THE FERMILAB NEUTRAL HYPERON BEAM.

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; UNIVERSITY OF MINNESOTA; RUTGERS UNIVERSITY

BEAM: Proton Area - Center
A MEASUREMENT OF THE CP VIOLATION PARAMETER ETA +-0.
(Use of the neutral hyperon spectrometer is assumed.)

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; FERMILAB; FLORIDA STATE UNIVERSITY; NOTRE DAME UNIVERSITY; TUFTS UNIVERSITY; VANDERBILT UNIVERSITY; VIRGINIA POLYTECHNIC INSTITUTE

BEAM: Meson Area - M6 Beam
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.)

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	

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629 DIRECT PHOTON PRODUCTION #629 — **Charles A. Nelson, Jr.**

BEAM: Meson Area - M1 Beam
DIRECT PHOTON PRODUCTION IN HADRON NUCLEUS COLLISIONS.

FERMILAB
MICHIGAN STATE UNIVERSITY
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**

BEAM: Proton Area - Center
STUDY OF B PARTICLE AND CHARMED PARTICLE PRODUCTION AND DECAY USING A HIGH RESOLUTION STREAMER CHAMBER.

FERMILAB
LAWRENCE BERKELEY LABORATORY
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**

BEAM: Neutrino Area - Miscellaneous
A MEASUREMENT OF NUCLEAR CALIBRATION CROSS SECTIONS FOR PROTONS BETWEEN 100 AND 1000 GEV.

BROOKHAVEN NATIONAL LABORATORY
CERN (SWITZERLAND)
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**

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.

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

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**

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.

FERMILAB
VIRGINIA POLYTECHNIC INSTITUTE

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**

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.

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)

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**

BEAM: Neutrino Area - Prompt Beam
SEARCH FOR THE TAU NEUTRINO AND STUDY OF ELECTRON NEUTRINO AND ELECTRON ANTI-NEUTRINO INTERACTIONS.

UNIV. OF CALIFORNIA, BERKELEY
FERMILAB
UNIVERSITY OF HAWAII AT MANOA
ILLINOIS INSTITUTE OF TECHNOLOGY
RUTGERS UNIVERSITY
STEVENS INSTITUTE OF TECHNOLOGY
TUFTS UNIVERSITY

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**

BEAM: Proton Area - West
REQUEST FOR A CONTINUATION OF E-567.

BROOKHAVEN NATIONAL LABORATORY
CEN-SACLAY (FRANCE)
PRINCETON UNIVERSITY
TEXAS A&M UNIVERSITY
UNIVERSITY OF TORINO (ITALY)

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

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653 PARTICLE SEARCH #653 — **Neville W. Reay**

BEAM: Neutrino Area - East
A PROPOSAL TO MEASURE CHARM AND B DECAYS VIA HADRONIC PRODUCTION IN A HYBRID EMULSION SPECTROMETER.

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)

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**

BEAM: Meson Area - M4 Beam
PROPOSAL TO STUDY THE EFFECT OF BENT CRYSTALS ON CHANNELING NEAR THE CRITICAL RADIUS OF BENDING.

CERN (SWITZERLAND)
CHALK RIVER NUCLEAR LAB. (CANADA)
FERMILAB
JINR, DUBNA (RUSSIA)
UNIVERSITY OF NEW MEXICO
SUNY AT ALBANY
UNIVERSITY OF STRASBOURG (FRANCE)

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**

BEAM: Meson Area - M4 Beam
COMPARISON OF POLARIZATION OF INCLUSIVELY PRODUCED LAMBDAS AND ANTILAMBDAS BY PROTONS, ANTIPROTONS, KAONS AND PIONS ON HYDROGEN.

UNIV. OF CALIFORNIA, DAVIS
UNIV. OF CALIFORNIA, SAN DIEGO
CARELTON UNIVERSITY (CANADA)
FERMILAB
MICHIGAN STATE UNIVERSITY

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**

BEAM: Neutrino Area - Muon Beam
MUON SCATTERING WITH HADRON DETECTION AT THE TEVATRON.

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

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**

BEAM: Proton Area - Center
EMULSION EXPOSURE TO SIGMA MINUS BEAM AT FERMILAB.

INP, KRAKOW (POLAND)
UNIVERSITY OF WASHINGTON

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**

BEAM: Proton Area - East
STUDY OF PION-NUCLEUS INTERACTIONS IN PURE EMULSION STACKS AND EMULSION CHAMBERS AT ENERGY ABOVE 500 GEV.

INP, KRAKOW (POLAND)
LEBEDEV PHYSICAL INST. (RUSSIA)
LOUISIANA STATE UNIVERSITY
TASHKENT, PHY.TEC.INS (UZBEKISTAN)

Request	2 Dec, 80	Emulsion Exposure
Approval	28 Mar, 90	Unspecified
Completed	27 Aug, 90	Unspecified

668 EMULSION/PI- @ 800 #668 — **Wladyslaw Wolter**

BEAM: Unspecified Beam
STUDY OF PION NUCLEUS INTERACTIONS IN PURE EMULSION STACKS AND EMULSION CHAMBERS AT ENERGY ABOVE 800 GEV.

INP, KRAKOW (POLAND)

Request	2 Dec, 80	Emulsion Exposure
Completed	26 Apr, 85	Emulsion Exposure

672A HADRON JETS #672A — **Andrzej Zieminski**

BEAM: Meson Area - West
A STUDY OF HADRONIC FINAL STATES PRODUCED IN ASSOCIATION WITH HIGH-PT JETS AND HIGH-MASS DIMUONS.

FERMILAB
UNIV. OF ILLINOIS, CHICAGO CIRCLE
INDIANA UNIVERSITY
UNIVERSITY OF LOUISVILLE
UNIVERSITY OF MICHIGAN - FLINT
IHEP, PROTVINO (SERPUKHOV)(RUSSIA)

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

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673 CHI MESON #673 — John W. Cooper

BEAM: Neutrino Area - Muon/Hadron Beam
CHI MESON PRODUCTION BY HADRONS.
(E-610 extension.)

FERMILAB
UNIVERSITY OF ILLINOIS, CHAMPAIGN
UNIVERSITY OF PENNSYLVANIA
PURDUE UNIVERSITY
TUFTS UNIVERSITY

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

BEAM: Proton Area - Broad Band
PHOTOPRODUCTION OF HIGH PT JETS.

BALL STATE UNIVERSITY
FERMILAB
UNIVERSITY OF IOWA
UNIVERSITY OF MARYLAND
UNIVERSITY OF MICHIGAN - ANN ARBOR
RICE UNIVERSITY
VANDERBILT UNIVERSITY

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

BEAM: Proton Area - Broad Band
HIGH ENERGY PHOTOPRODUCTION OF STATES CONTAINING HEAVY QUARKS AND OTHER RARE PHENOMENA.

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

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 Knapp

BEAM: Neutrino Area - East
STUDY OF HADRONIC PRODUCTION AND SPECTROSCOPY OF STRANGE, CHARM AND BOTTOM PARTICLES AT THE TEVATRON.

COLUMBIA UNIVERSITY
FERMILAB
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

BEAM: Proton Area - East
PROPOSAL TO DO PHOTON PHYSICS WITH THE TEVATRON AT THE TAGGED PHOTON SPECTROMETER.

UNIV. OF CALIFORNIA, SANTA BARBARA
CARELTON UNIVERSITY (CANADA)
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

BEAM: Neutrino Area - Prompt Beam
STUDY OF NEUTRINO OSCILLATIONS AND SEARCH FOR THE TAU NEUTRINO.

UNIVERSITY OF BARI (ITALY)
ECOLE POLYTECH, PALAISEAU (FRANCE)
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

BEAM: Neutrino Area - Dichromatic
A SEARCH FOR NEUTRINO OSCILLATIONS WITH DELTA-M-SQUARE GREATER THAN 10 EV-SQUARE.

UNIVERSITY OF CHICAGO
COLUMBIA UNIVERSITY
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

BEAM: Internal Target Area (C-0)
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.)

IHEP, BEIJING (PRC)
FERMILAB
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		

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703 ELECTRON TARGET FACILITY #703 — William R. Frisken

BEAM: Collision Area (D-0)
ELECTRON-PROTON COLLISIONS AT FERMILAB
(Electron-proton collisions using the canadian high energy electron ring cheer.)

CIPP (CANADA)
CARELTON UNIVERSITY (CANADA)
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

BEAM: Meson Area - Polarized Proton Beam
INTEGRATED PROPOSAL ON FIRST ROUND EXPERIMENTS WITH THE POLARIZED BEAM FACILITY.

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)

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

BEAM: Proton Area - West
A STUDY OF CHARMONIUM AND DIRECT PHOTON PRODUCTION BY 300 GEV/C ANTIPROTON,PROTON,PI+ AND PI- BEAMS.

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

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

BEAM: Meson Area - West
A Comprehensive Study of Direct Photon Production in Hadron Induced Collisions

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

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

BEAM: Proton Area - Center
MEASUREMENT OF THE ELECTRON ASYMMETRY PARAMETER IN SIGMA MINUS BETA DECAY.

UNIVERSITY OF CHICAGO
FERMILAB
IOWA STATE UNIVERSITY
UNIVERSITY OF IOWA
PNPI, ST. PETERSBURG (RUSSIA)
YALE UNIVERSITY

Request	24 Nov, 81	300 Hours	
Rejected	15 Dec, 81		

708 ELECTRON TARGET FACILITY #708 — Wonyong Lee

BEAM: Collision Area (D-0)
ELECTRON-PROTON INTERACTION EXPERIMENT
(Supercedes proposal #659.)

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

Request	25 Nov, 81	Unspecified	
Inactive	23 Jun, 82		

709 FORWARD DETECTOR #709 — Michael J. Longo

BEAM: Collision Area (D-0)
PROPOSAL FOR A FORWARD DETECTOR FOR THE D0 AREA

UNIV. OF ILLINOIS, CHICAGO CIRCLE
UNIVERSITY OF MICHIGAN - ANN ARBOR

Request	11 Jan, 82	Unspecified	
Rejected	23 Jun, 82		

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710 TOTAL CROSS-SECTION #710 — **Jay Orear and Roy Rubinstein**

BEAM: Collision Area (E-0)
MEASUREMENTS OF ELASTIC SCATTERING AND TOTAL CROSS SECTIONS AT THE FERMILAB PBAR-P COLLIDER.

UNIVERSITY OF BOLOGNA (ITALY)
CORNELL UNIVERSITY
FERMILAB
GEORGE MASON UNIVERSITY
UNIVERSITY OF MARYLAND
NORTHWESTERN UNIVERSITY

Request	1 Feb, 82	Unspecified
Approval	23 Jun, 82	Unspecified
Completed	31 May, 89	Unspecified

711 CONSTITUENT SCATTERING #711 — **David A. Levinthal**

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.

ARGONNE NATIONAL LABORATORY
FERMILAB
FLORIDA STATE UNIVERSITY
UNIVERSITY OF MICHIGAN - ANN ARBOR

Request	28 Aug, 82	Unspecified
Approval	1 Jul, 83	Unspecified
Completed	15 Feb, 88	1,400 Hours

712 MUON PRODUCTON #712 — **Patrick D. Rapp**

BEAM: Collision Area (D-0)
STUDY OF MUONS FROM PBAR-P COLLISIONS UP TO SQUARE ROOT OF S EQUAL TO 2 TEV.

FERMILAB
GEORGE MASON UNIVERSITY

Request	1 Feb, 82	Unspecified
Rejected	23 Jun, 82	

713 HIGHLY IONIZING PARTICLES #713 — **P. Buford Price**

BEAM: Collision Area (D-0)
PROPOSAL FOR A SEARCH FOR HIGHLY IONIZING PARTICLES FOR THE D0 AREA AT FERMILAB.

UNIV. OF CALIFORNIA, BERKELEY
HARVARD UNIVERSITY

Request	29 Jan, 82	Unspecified
Approval	23 Jun, 82	Unspecified
Completed	31 May, 89	Unspecified

714 LARGE ANGLE PARTICLE #714 — **Paul D. Grannis**

BEAM: Collision Area (D-0)
LARGE ANGLE PARTICLE D0 GROUP

BROOKHAVEN NATIONAL LABORATORY
BROWN UNIVERSITY
COLUMBIA UNIVERSITY
FERMILAB
MICHIGAN STATE UNIVERSITY
SUNY AT STONY BROOK

Request	5 Feb, 82	Unspecified
Rejected	1 Jul, 83	

715 SIGMA BETA DECAY #715 — **Peter S. Cooper**

BEAM: Proton Area - Center
PRECISION MEASUREMENT OF THE DECAY SIGMA MINUS TO NEUTRON AND ELECTRON AND NEUTRINO.

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 — **Byron P. Roe**

BEAM: Meson Area - M2 Beam
PROPOSAL FOR FURTHER BEAM DUMP NEUTRINO RUNNING

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 — **Joseph Lach**

BEAM: Collision Area (D-0)
A FORWARD LOOKING DETECTOR FOR THE D0 AREA.

FERMILAB

Request	19 Mar, 82	Unspecified
Rejected	23 Jun, 82	

718 CALORIMETERS AT D-0 #718 — **Albert R. Erwin**

BEAM: Collision Area (D-0)
STUDY OF PBAR-P INTERACTIONS USING CALORIMETERS AT D-0.

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 — **Wonyong Lee**

BEAM: Collision Area (D-0)
ELECTRON-PROTON INTERACTION EXPERIMENT.
(This proposal supercedes proposals #703 and #708.)

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	

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720 FREE QUARK SEARCH #720 — John P. Schiffer

BEAM: Miscellaneous Area
PROPOSAL TO SEARCH FOR +1/3E STABLE PARTICLES USING CRYOGENIC SOURCES.

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 — Jerome L. Rosen

BEAM: Proton Area - West
AN EXPERIMENT TO STUDY CP VIOLATION IN THE DECAY OF K-LONG PRODUCED BY ANTI-PROTONS.

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 — V. Paul Kenney

BEAM: Collision Area (D-0)
STREAMER CHAMBER EXPERIMENT AT THE TEVATRON COLLIDER.

UNIVERSITY OF CAMBRIDGE (ENGLAND)
NOTRE DAME UNIVERSITY

Request	11 Oct, 82	Unspecified
Inactive	18 Feb, 83	

723 GRAVITATIONAL DETECTOR #723 — Adrian Melissinos

BEAM: Collision Area (C-0)
TEST OF A GRAVITATIONAL DETECTOR AT THE TEVATRON COLLIDER.

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 — Michael J. Longo

BEAM: Collision Area (D-0)
COMPLETE CALORIMETRIC DETECTOR FOR THE D-0 AREA.

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 — Konstantin Goulianos

BEAM: Collision Area (D-0)
A PROPOSAL TO MEASURE SINGLE AND DOUBLE DIFFRACTION DISSOCIATION AT THE FERMILAB PBAR-P COLLIDER.

ROCKEFELLER UNIVERSITY

Request	1 Nov, 82	Unspecified
Rejected	1 Jul, 83	

726 CALORIMETRIC DETECTOR #726 — Maris A. Abolins

BEAM: Collision Area (D-0)
PROPOSED CALORIMETRIC DETECTOR FOR THE D-0 AREA.

UNIVERSITY OF ARIZONA
FERMILAB
MICHIGAN STATE UNIVERSITY
UNIVERSITY OF PENNSYLVANIA

Request	1 Nov, 82	Unspecified
Rejected	1 Jul, 83	

727 FORWARD CALORIMETER #727 — Jerome L. Rosen

BEAM: Collision Area (D-0)
SPLIT-FIELD MAGNET SPECTROMETER AND ELECTROMAGNETIC SHOWER DETECTOR FOR D-0.

NORTHWESTERN UNIVERSITY

Request	2 Nov, 82	Unspecified
Withdrawn	16 May, 83	

728 MUON PRODUCTION #728 — Daniel R. Green

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.)

UNIVERSITY OF ARIZONA
FERMILAB
FLORIDA STATE UNIVERSITY
UNIVERSITY OF MARYLAND
VIRGINIA POLYTECHNIC INSTITUTE

Request	1 Nov, 82	Unspecified
Rejected	1 Jul, 83	

729 EMULSION/PROTONS @ 1 TEV #729 — Atul Gurtu

BEAM: Meson Area - Test Beam
PROPOSAL TO STUDY CHARM AND MULTIPARTICLE PRODUCTION IN 1 TEV PROTON-EMULSION COLLISIONS

TATA INSTITUTE (INDIA)

Request	24 Nov, 82	Unspecified
Approval	5 Dec, 83	Emulsion Exposure
Completed	26 Apr, 85	2 Emulsion Stack(s)

730 EMULSION/SIGMA-MINUS @ 250 #730 — Richard J. Wilkes

BEAM: Proton Area - Center
EMULSION EXPOSURE TO 250 GEV SIGMA-MINUS.

INP, KRAKOW (POLAND)
INST.FOR NUCL. RESEARCH (BULGARIA)
UNIVERSITY OF WASHINGTON

Request	5 Jan, 83	Unspecified
Approval	10 Feb, 84	Unspecified
Completed	10 Feb, 84	4 Hours

731 CP VIOLATION #731 — Bruce D. Winstein

BEAM: Meson Area - Center
A MEASUREMENT OF THE MAGNITUDE OF (E'/E) IN THE NEUTRAL KAON SYSTEM TO A PRECISION OF .001.

CEN-SACLAY (FRANCE)
UNIVERSITY OF CHICAGO
ELMHURST COLLEGE
FERMILAB
PRINCETON UNIVERSITY

Request	1 Feb, 83	Unspecified
Approval	1 Jul, 83	Unspecified
Completed	15 Feb, 88	3,100 Hours

732 XI-ZERO DECAY #732 — Marleigh C. Sheaff

BEAM: Proton Area - Center
A SEARCH FOR THE DECAY NEUTRAL CASCADE TO PROTON AND NEGATIVE PION.

UNIVERSITY OF MICHIGAN - ANN ARBOR
UNIVERSITY OF MINNESOTA
RUTGERS UNIVERSITY
UNIVERSITY OF WISCONSIN - MADISON

Request	1 Feb, 83	Unspecified
Rejected	25 Jun, 85	

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733	**NEUTRINO INTERACTIONS #733**	**Raymond L. Brock**	FERMILAB UNIVERSITY OF FLORIDA MASSACHUSETTS INST. OF TECHNOLOGY MICHIGAN STATE UNIVERSITY
	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		
734	**HYPERON PRODUCTION #734**	**Michael V. Hynes**	UNIV. OF CALIFORNIA, LOS ANGELES LOS ALAMOS NATIONAL LABORATORY
	BEAM: Proton Area - Center PRIMAKOFF PRODUCTION OF HYPERON EXCITED STATES.		
	Request 1 Apr, 83 Unspecified Inactive 21 May, 86		
735	**PARTICLE SEARCH #735**	**Laszlo J. Gutay**	DUKE UNIVERSITY FERMILAB IOWA STATE UNIVERSITY NOTRE DAME UNIVERSITY PURDUE UNIVERSITY UNIVERSITY OF WISCONSIN - MADISON
	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		
736	**D-0 QUARK SEARCH #736**	**Robert K. Adair**	BROOKHAVEN NATIONAL LABORATORY YALE UNIVERSITY
	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		
737	**BATISS EXPERIMENT #737**	**Peter Kotzer**	KAZAKH STATE UNIV., (KAZAKHSTAN) MOSCOW STATE UNIVERSITY (RUSSIA) UNIVERSITY OF WASHINGTON WESTERN WASHINGTON UNIVERSITY
	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		
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) FERMILAB LAPP, D'ANNECY-LE-VIEUX (FRANCE) SUNY AT ALBANY
	BEAM: Proton Area - East MEASUREMENTS OF CRYSTAL-ASSISTED ELECTRON-POSITRON PAIR CREATION.		
	Request 9 Sep, 83 Unspecified Rejected 19 Apr, 85		

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740 D-0 DETECTOR #740 — **Paul D. Grannis and Hugh Elliott Montgomery**

BEAM: Collision Area (D-0)

STUDY OF PROTON ANTI-PROTON COLLISIONS USING A LARGE DETECTOR AT D-0.

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)
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**

BEAM: Collision Area (B-0)

STUDY OF PROTON ANTI-PROTON COLLISIONS USING A LARGE DETECTOR AT B-0.

ARGONNE NATIONAL LABORATORY
BRANDEIS UNIVERSITY
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
Data Analysis	31 May, 89	Unspecified

742 STRANGE QUARK #742 — **Joseph Lach**

BEAM: Proton Area - Center

LETTER OF INTENT TO MEASURE OMEGA MINUS POLARIZATION AND MAGNETIC MOMENT.

UNIVERSITY OF CHICAGO
ELMHURST COLLEGE
FERMILAB
IOWA STATE UNIVERSITY
UNIVERSITY OF IOWA
PNPI, ST. PETERSBURG (RUSSIA)
YALE UNIVERSITY

Request	13 Jun, 83	Unspecified
Inactive	15 Jun, 85	

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743 CHARM PRODUCTION #743 — **Stephen Reucroft**

BEAM: Meson Area - Test Beam
PROPOSAL TO MEASURE OPEN CHARM PRODUCTION IN PROTON-PROTON COLLISIONS AT 1 TEV WITH LEBC-EMPS.

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 — **Frank S. Merritt**

BEAM: Neutrino Area - Center
HIGH STATISTICS STUDIES OF CHARGED CURRENT INTERACTIONS USING THE TEVATRON QUAD TRIPLET BEAM.

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 — **Toshio Kitagaki**

BEAM: Neutrino Area - Center
MUON NEUTRINO EXPERIMENT USING THE TOHOKU HIGH RESOLUTION ONE METER BUBBLE CHAMBER.

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 — **James K. Walker**

BEAM: Neutrino Area - Prompt Beam
LETTER OF INTENT TO SEARCH FOR NEW PARTICLES FROM THE PROMPT BEAM FACILITY.

FERMILAB
MASSACHUSETTS INST. OF TECHNOLOGY
MICHIGAN STATE UNIVERSITY

Request	1 Sep, 83	Unspecified
Withdrawn	2 Jun, 86	

747 CHARGED PARTICLES #747 — **Alan A. Hahn**

BEAM: Proton Area - Broad Band
A SEARCH FOR FRACTIONALLY CHARGED PARTICLES AT THE TEVATRON.

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 — **Jack Sandweiss**

BEAM: Unspecified Beam
LETTER OF INTENT TO STUDY BEAUTY AND CHARM AT THE TEVATRON USING HIGH RESOLUTION STEAMER CHAMBER AND A DOWNSTREAM SPECTROMETER.

FERMILAB
NEW YORK UNIVERSITY
UNIVERSITY OF VRIJE (BELGIUM)
YALE UNIVERSITY

Request	7 May, 84	Unspecified
Withdrawn	2 Oct, 84	

749 CHANNELING #749 — **James S. Forster**

BEAM: Meson Area - Bottom
LETTER OF INTENT TO STUDY MATERIAL AND FABRICATION ASPECTS OF CRYSTALS USED FOR CHANNELING.

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 — **Ram K. Shivpuri**

BEAM: Neutrino Area - Miscellaneous
A PROPOSAL TO STUDY MULTIPARTICLE PRODUCTION IN INTERACTIONS OF 1 TEV PROTONS WITH EMULSION NUCLEI.

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 — **Piyare L. Jain**

BEAM: Meson Area - Test Beam
PROPOSAL TO STUDY 1 TEV PROTON INTERACTIONS IN EMULSION.

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 — **James W. Cronin**

BEAM: Unspecified Beam
PROPOSAL TO SEARCH FOR ANOMALOUSLY LARGE HADRON CROSS SECTIONS AT SHORT DISTANCES.

UNIVERSITY OF CHICAGO
TECHNION-ISRAEL INST (ISRAEL)

Request	23 Oct, 84	200 Hours
Withdrawn	8 Dec, 86	

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753 CHANNELING STUDIES #753 — **James S. Forster**

BEAM: Meson Area - Bottom
PROPOSAL TO IMPROVE THE DEFLECTION OF HIGH ENERGY PARTICLE BEAMS BY CHANNELING IN BENT CRYSTALS OF SI AND GE.

BELL NORTHERN RESEARCH LAB(CANADA)
CHALK RIVER NUCLEAR LAB. (CANADA)
FERMILAB
UNIVERSITY OF NEW MEXICO
SUNY AT ALBANY

Request	28 Sep, 84	400 Hours
Approval	20 Nov, 84	Unspecified
Completed	5 Jul, 85	150 Hours

754 CHANNELING TESTS #754 — **Chih-Ree Sun**

BEAM: Meson Area - Bottom
CRYSTAL CHANNELING TESTS IN M-BOTTOM INCLUDING FOCUSING WITH DEFORMED CRYSTALS AND STUDIES OF HIGH Z CRYSTALS.

FERMILAB
GENERAL ELECTRIC R&D CENTER
SUNY AT ALBANY
SANDIA LABORATORIES
SSC LABORATORY

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**

BEAM: Meson Area - Test Beam
A HIGH SENSITIVITY STUDY OF BEAUTY AND CHARM IN HADROPRODUCTION AT THE TEVATRON.

FERMILAB
YALE UNIVERSITY

Request	2 Oct, 84	Unspecified
Approval	25 Nov, 86	Unspecified
Completed	15 Feb, 88	Unspecified

756 MAGNETIC MOMENT #756 — **Kam-Biu Luk**

BEAM: Proton Area - Center
MEASUREMENT OF THE MAGNETIC MOMENT OF THE OMEGA MINUS HYPERON.

UNIVERSITY OF ARIZONA
UNIV. OF CALIFORNIA, BERKELEY
FERMILAB
INDIANA UNIVERSITY
LAWRENCE BERKELEY LABORATORY
UNIVERSITY OF MICHIGAN - ANN ARBOR
UNIVERSITY OF MINNESOTA
RUTGERS UNIVERSITY

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**

BEAM: Neutrino Area - Muon Beam
LETTER OF INTENT FOR A PROPOSAL TO STUDY MOMENTUM RESOLUTION FOR MUONS ABOVE 300 GEV IN MAGNETIZED IRON.

FERMILAB
UNIVERSITY OF ILLINOIS, CHAMPAIGN
UNIVERSITY OF WASHINGTON
UNIVERSITY OF WISCONSIN - MADISON

Request	12 Dec, 84	Test Running
Rejected	14 Dec, 85	

758 EMULSION EXPOSURE #758 — **Mitsuko Kazuno and Hiroshi Shibuya**

BEAM: Meson Area - Test Beam
STUDY OF THE MECHANISM OF MULTIPARTICLE PRODUCTION IN EMULSION NUCLEI @ 800 GEV PROTONS.

NAGOYA UNIVERSITY (JAPAN)
TOHO UNIVERSITY (JAPAN)

Request	11 Mar, 85	Unspecified
Approval	11 Mar, 85	Unspecified
Completed	26 Apr, 85	2 Emulsion Stack(s)

759 EMULSION EXPOSURE #759 — **Yoshihiro Tsuzuki**

BEAM: Meson Area - Test Beam
A STUDY OF NUCLEAR INTERACTIONS OF 800 GEV PROTONS IN EMULSION.

KOBE UNIVERSITY (JAPAN)
OSAKA CITY UNIVERSITY (JAPAN)
OSAKA SCIENCE EDUC. INST. (JAPAN)

Request	11 Mar, 85	Unspecified
Approval	11 Mar, 85	Unspecified
Completed	26 Apr, 85	2 Emulsion Stack(s)

760 CHARMONIUM STATES #760 — **Rosanna Cester**

BEAM: Accumulator Ring
A PROPOSAL TO INVESTIGATE THE FORMATION OF CHARMONIUM STATES USING THE PBAR ACCUMULATOR RING.

UNIV. OF CALIFORNIA, IRVINE
FERMILAB
UNIVERSITY OF FERRARA (ITALY)
INFN, GENOVA (ITALY)
NORTHWESTERN UNIVERSITY
PENNSYLVANIA STATE UNIVERSITY
UNIVERSITY OF TORINO (ITALY)

Request	29 Mar, 85	Unspecified
Approval	25 Jun, 85	Unspecified
Data Analysis	10 Jan, 92	Unspecified

761 HYPERON RADIATIVE DECAY #761 — **Alexei A. Vorobyov**

BEAM: Proton Area - Center
PROPOSAL TO STUDY HYPERON RADIATIVE DECAY.

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

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**

BEAM: Meson Area - Test Beam
CASCADE SHOWERS ORIGINATING IN PROTON-NUCLEUS COLLISIONS.

AOYAMA GAKUIN UNIVERSITY (JAPAN)
ICRR, UNIVERSITY OF TOKYO (JAPAN)
KOBE UNIVERSITY (JAPAN)
OKAYAMA UNIVERSITY (JAPAN)
OSAKA SCIENCE EDUC. INST. (JAPAN)

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**

BEAM: Meson Area - Test Beam
PROTON-NUCLEUS INTERACTIONS AT TEVATRON ENERGY.

ICRR, UNIVERSITY OF TOKYO (JAPAN)
KOBE UNIVERSITY (JAPAN)
OKAYAMA UNIVERSITY (JAPAN)
OSAKA SCIENCE EDUC. INST. (JAPAN)

Request	11 Jun, 85	Unspecified
Approval	21 Jun, 85	Unspecified
Completed	11 Jul, 85	2 Emulsion Stack(s)

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764 EMULSION EXPOSURE #764 — Hirotada Nanjo

BEAM: Meson Area - Test Beam
EXCLUSIVE INVESTIGATION OF MULTIPLE PRODUCTION IN RAPIDITY SPACE.

HIROSAKI UNIVERSITY (JAPAN)

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

BEAM: Meson Area - Test Beam
TRANSVERSE MOMENTUM MEASUREMENT OF SECONDARY PARTICLES IN PROTON-EMULSION COLLISIONS AT 800 GEV.

OKAYAMA UNIVERSITY (JAPAN)

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

BEAM: Collision Area (Miscellaneous)
MEASUREMENTS OF THE NEUTRON SPECTRUM IN THE TEVATRON TUNNEL WITH APPLICATION TO THE SSC.

FERMILAB
LAWRENCE BERKELEY LABORATORY

Request	11 Jul. 85	Unspecified
Approval	17 Jul. 85	Unspecified
Completed	13 Oct. 85	Unspecified

767 MUON CALORIMETRY #767 — Yasushi Muraki

BEAM: Neutrino Area - Muon Beam
MEASUREMENT OF DIRECT ELECTRON PAIR PRODUCTION CROSS-SECTION IN THE TEVATRON MUON BEAM.

CHUO UNIVERSITY (JAPAN)
ICRR, UNIVERSITY OF TOKYO (JAPAN)
KEK (JAPAN)
NAGOYA UNIVERSITY (JAPAN)

Request	29 Aug. 85	Unspecified
Rejected	1 Jul. 86	

768 POLARIZED SCATTERING #768 — Alan D. Krisch

BEAM: Proton Area - West
PROTON - PROTON ELASTIC SCATTERING WITH A POLARIZED TARGET.

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

Request	12 Nov. 85	Unspecified
Rejected	30 Jun. 87	

769 PION & KAON CHARM PROD. #769 — Jeffrey A. Appel

BEAM: Proton Area - East
PION AND KAON PRODUCTION OF CHARM AND CHARM-STRANGE STATE.

CBPF (BRAZIL)
FERMILAB
UNIVERSITY OF MISSISSIPPI
NORTHEASTERN UNIVERSITY
UNIVERSITY OF TORONTO (CANADA)
TUFTS UNIVERSITY
UNIVERSITY OF WISCONSIN - MADISON
YALE UNIVERSITY

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

BEAM: Neutrino Area - Center
HIGH STATISTICS STUDIES OF CHARGED CURRENT INTERACTIONS USING THE TEVATRON QUAD TRIPLET BEAM.

UNIVERSITY OF CHICAGO
COLUMBIA UNIVERSITY
FERMILAB
UNIVERSITY OF ROCHESTER
UNIVERSITY OF WISCONSIN - MADISON

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

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.

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

Request	10 Dec. 86	Unspecified
Approval	4 Apr. 87	Unspecified
Data Analysis	8 Jan. 92	Unspecified

772 DIMUONS #772 — Joel M. Moss

BEAM: Meson Area - East
STUDY OF THE NUCLEAR ANTIQUARK SEA VIA P+N -> DIMUONS.

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

Request	11 Mar. 86	Unspecified
Approval	1 Jul. 86	Unspecified
Completed	15 Feb. 88	1,700 Hours

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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. Data Analysis 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 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 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		

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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	
Being Installed	1 Oct, 95		

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 (CO 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		

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788 NEUTRINO OSCILLATIONS #788 — **Robert H. Bernstein**

BEAM: Neutrino Area - Center
NEUTRINO OSCILLATIONS AND CROSS-SECTIONS IN A TAGGED NEUTRINO LINE.

FERMILAB
UNIV. OF PARIS VI, LPG (FRANCE)

Request	11 Aug, 87	Unspecified
Inactive	23 Dec, 92	

789 B-QUARK MESONS & BARYONS #789 — **Daniel M. Kaplan and Jen-Chieh Peng**

BEAM: Meson Area - East
MEASUREMENT OF THE PRODUCTION AND DECAY INTO TWO-BODY MODES OF B-QUARK MESONS AND BARYONS.

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 — **Frank Sciulli**

BEAM: Neutrino Area - Test Beam
CALORIMETER MODULE CALIBRATION FOR ZEUS DETECTOR.

ARGONNE NATIONAL LABORATORY
COLUMBIA UNIVERSITY
UNIVERSITY OF IOWA
LOUISIANA STATE UNIVERSITY
OHIO STATE UNIVERSITY
PENNSYLVANIA STATE UNIVERSITY
VIRGINIA POLYTECHNIC INSTITUTE
UNIVERSITY OF WISCONSIN - MADISON

Request	5 Jun, 87	Unspecified
Approval	17 Dec, 87	Unspecified
Completed	27 Aug, 90	Unspecified

791 HADROPRODUCTION HEAVY FLAVORS #791 — **Jeffrey A. Appel and Milind Vasant Purohit**

BEAM: Proton Area - East
Search for the Flavor-Changing Neutral-Current Decays

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 — **Kjell Aleklett and Lembit Sihver**

BEAM: Meson Area - East
STUDY OF FRAGMENTATION PRODUCTS FROM THE REACTION 800 GEV P + 197 AU.

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 — **Jere J. Lord**

BEAM: Proton Area - Miscellaneous
Emulsion Exposure to 1000 GeV, or highest energy protons.

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 — **Karl Van Bibber**

BEAM: Unspecified Beam
CONSTRUCTION AND OPERATION OF AN AXION HELIOSCOPE.

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 — **Morris Pripstein**

BEAM: Meson Area - Test Beam
TEST OF ELECTRON/HADRON COMPENSATION FOR WARM LIQUID CALORIMETRY.

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 — **Gordon B. Thomson**

BEAM: Proton Area - Center
A MEASUREMENT OF THE CP VIOLATION PARAMETER N+-0 THE SON OF E621.

UNIVERSITY OF MINNESOTA
RUTGERS UNIVERSITY

Request	1 Jun, 88	Unspecified
Withdrawn	4 Jan, 94	

797 FINE-GRAINED ELECTROMAG. CAL. #T797 — **H. Richard Gustafson and Rudolf P. Thun**

BEAM: Proton Area - East
FINE-GRAINED ELECTROMAGNETIC CALORIMETRY.

UNIVERSITY OF MICHIGAN - ANN ARBOR

Request	31 Aug, 88	Unspecified
Approval	1 Apr, 90	Unspecified
Completed	20 May, 90	Unspecified

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798 SSC DETECTOR TEST #T798 — **Priscilla Cushman and Roger W. Rusack**

ROCKEFELLER UNIVERSITY
YALE UNIVERSITY

BEAM: Proton Area - East
PROPOSAL TO BUILD A SYNCHROTRON-RADIATION DETECTOR FOR TAGGING ELECTRONS AT THE SSC.

Request	20 Jul, 88	Unspecified
Approval	30 Jan, 89	Unspecified Stage I approval.
Completed	2 May, 90	Unspecified

799 CP VIOLATION #799 — **Yau Wai Wah and Taku Yamanaka**

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

BEAM: Neutrino Area - Muon Beam
PROPOSAL TO SEARCH FOR RARE KAON DECAY.

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 — **Kenneth A. Johns and Regina A. Rameika**

UNIVERSITY OF ARIZONA
DEPAUW UNIVERSITY
FERMILAB
UNIVERSITY OF MICHIGAN - ANN ARBOR
UNIVERSITY OF MINNESOTA

BEAM: Proton Area - Center
MEASUREMENT OF THE MAGNETIC MOMENT OF THE OMEGA MINUS HYPERON.

Request	1 Mar, 88	Unspecified
Approval	5 Oct, 88	Unspecified
Completed	8 Jan, 92	Unspecified

801 PHOTON TOTAL XSECTION-URANIUM #801 — **G. L. Bayatian**

YEREVAN PHYSICS INST. (ARMENIA)

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.

Request	10 Oct, 88	Unspecified
Rejected	26 Dec, 89	

802 MUONS IN EMULSION #802 — **Lali Chatterjee and Dipak Ghosh**

FERMILAB
JADAVPUR UNIVERSITY (INDIA)

BEAM: Neutrino Area - Muon Beam
DEEP INELASTIC MUON INTERACTION WITH NUCLEAR TARGETS USING EMULSION TELESCOPE TECHNIQUE.

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 — **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)
COLUMBIA UNIVERSITY
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
UNIVERSITY OF MINNESOTA
ITEP, MOSCOW (RUSSIA)
NAGOYA INST. OF TECHNOLOGY (JAPAN)
NAGOYA UNIVERSITY (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)

Muon Neutrino to Tau Neutrino Oscillations

Request	6 Apr, 89	Unspecified
Unscheduled	24 Nov, 93	

804 KAON PHYSICS AT MAIN INJECTOR #804 — **Bruce D. Winstein**

UNIV. OF CALIFORNIA, IRVINE
CEN-SACLAY (FRANCE)
UNIVERSITY OF CHICAGO
FERMILAB
UNIVERSITY OF ILLINOIS, CHAMPAIGN
RUTGERS UNIVERSITY
YALE UNIVERSITY

BEAM: Main Injector Area
HIGH PRECISION, HIGH SENSITIVITY KAON PHYSICS AT THE MAIN INJECTOR

Request	14 Jun, 88	Unspecified
Unconsidered	14 Jun, 88	

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805 IMB NEUTRINO OSCILLATIONS #805 — **Wojciech Gajewski**

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

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)

Request	24 Aug, 89	Unspecified
Inactive	23 Dec, 92	

806 MP BEAMLINE UPGRADE #806 — **Akihiko Yokosawa**

BEAM: Meson Area - Polarized Proton Beam
ENERGY UPGRADE OF THE MP BEAMLINE AND PROPOSED EXPERIMENTS

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)

Request	28 Sep, 89	Unspecified
Withdrawn	7 Mar, 90	

807 WARM HEAVY LIQUID CALORIMETRY #T807 — **Scott Teige**

BEAM: Proton Area - East
WARM HEAVY LIQUID CALORIMETRY: A PROPOSAL TO MEASURE PERFORMANCE OF CANDIDATE MATERIALS

RUTGERS UNIVERSITY

Request	26 Dec, 89	Unspecified
Approval	9 Feb, 90	Unspecified
Completed	1 May, 90	Unspecified

808 B-PHYSICS #T808 — **Howard S. Goldberg**

BEAM: Meson Area - West
B-MESON HADROPRODUCTION, INCLUDING MEASUREMENTS OF CROSS-SECTIONS, LIFETIMES, AND MIXING.

UNIV. OF ILLINOIS, CHICAGO CIRCLE
UNIVERSITY OF LOUISVILLE
UNIVERSITY OF MICHIGAN - ANN ARBOR
UNIVERSITY OF PITTSBURGH
IHEP, PROTVINO (SERPUKHOV)(RUSSIA)

Request	1 Mar, 90	Unspecified
Inactive	23 Dec, 92	

809 DIRECT PHOTON SPIN DEPENDENCE #809 — **Akira Masaike and Sandibek B. Nurushev**

BEAM: Meson Area - Polarized Proton Beam
STUDY OF THE SPIN DEPENDENCE OF DIRECT-GAMMA PRODUCTION AT HIGH P

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)

Request	7 Mar, 90	Unspecified
Inactive	23 Dec, 92	

810 STRUCTURE FUNCTIONS #810 — **Richard Wilson**

BEAM: Neutrino Area - Muon Beam
MEASUREMENT OF NUCLEON STRUCTURE FUNCTIONS WITH HIGH STATISTICAL ACCURACY AND LOW SYSTEMATIC ERRORS, USING MUON BEAMS FROM THE TEVATRON.

UNIV. OF CALIFORNIA, SAN DIEGO
FERMILAB
HARVARD UNIVERSITY
UNIV. OF ILLINOIS, CHICAGO CIRCLE
UNIVERSITY OF WUPPERTAL (GERMANY)

Request	5 Mar, 90	Unspecified
Inactive	23 Dec, 92	

811 PBAR P ELASTIC SCATTERING #811 — **Jay Orear**

BEAM: Collision Area (E-0)
PBAR P ELASTIC SCATTERING.

CERN (SWITZERLAND)
CORNELL UNIVERSITY
FERMILAB

Request	14 Mar, 90	Unspecified
Approval	9 Jul, 92	Unspecified
Data Analysis	20 Feb, 96	

812 CPT AND GRAVITY TESTS #812 — **Gerald A. Smith**

BEAM: Accumulator Ring
PRECISION TESTS OF CPT AND GRAVITY USING LOW ENERGY ANTIMATTER AT FERMILAB.

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)

Request	19 Feb, 90	Unspecified
Inactive	30 Jun, 94	

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Master Listing of Proposals as of February 20, 1996

(continued)

813	**SMALL PHYSICS #813**	**Lawrence W. Jones**	UNIVERSITY OF HAWAII AT MANOA LODZ UNIVERSITY UNIVERSITY OF MICHIGAN - ANN ARBOR UNIVERSITY OF WASHINGTON
	BEAM: Unspecified Beam I. A QUANTITATIVE TEST OF THE LANDAU-MIGDAL-POMMERANCHUK EFFECT; II. HADRON INCLUSIVE DISTRIBUTIONS AT HIGH X; III. NEUTRON POLARIZATION		
	Request 2 Mar, 90 Unspecified Rejected 5 May, 93		
814	**PRIMAKOFF PRODUCTION #814**	**Vladimir Chaloupka**	UNIVERSITY OF ROCHESTER UNIVERSITY OF WASHINGTON
	BEAM: Proton Area - Center SEARCH FOR PRIMAKOFF PRODUCTION OF HYBRID MESONS.		
	Request 28 Feb, 90 Unspecified Inactive 23 Dec, 92		
815	**NEUTRINO #815**	**Michael H. Shaevitz and Robert Bernstein**	ADELPHI UNIVERSITY UNIVERSITY OF CINCINNATI COLUMBIA UNIVERSITY FERMILAB KANSAS STATE UNIVERSITY NORTHWESTERN UNIVERSITY UNIVERSITY OF OREGON UNIVERSITY OF ROCHESTER XAVIER UNIVERSITY
	BEAM: Neutrino Area - Center Precision Measurements of Neutrino Neutral Current Interactions Using a Sign-Selected Beam		
	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 Being Installed 1 Oct, 95		
816	**SDC DETECTOR MUON BEAM TESTS #T816**	**Henry J. Lubatti**	UNIVERSITY OF COLORADO AT BOULDER FERMILAB 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
	BEAM: Neutrino Area - Muon Beam SSC Detector Muon Sub-System Beam Tests		
	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 CORNELL UNIVERSITY
	BEAM: Neutrino Area - Muon Beam 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 UNIVERSITY OF LOUISVILLE MOSCOW STATE UNIVERSITY (RUSSIA) IHEP, PROTVINO (SERPUKHOV)(RUSSIA)
	BEAM: Unspecified Beam Proposal to use the NWA Electron Test Beam at Fermilab for Tests of a Lead Glass Calorimeter Prototype		
	Request 26 Jun, 90 Unspecified Withdrawn 30 Apr, 91		
819	**EMPACT DETECTOR TEST FOR SSC #819**	**Louis S. Osborne**	UNIVERSITY OF HOUSTON INDIANA UNIVERSITY JINR, DUBNA (RUSSIA) MASSACHUSETTS INST. OF TECHNOLOGY
	BEAM: Neutrino Area - Muon Beam EMPACT Muon Telescope Evaluation at Fermilab		
	Request 28 Jun, 90 Unspecified Approval 15 Aug, 91 Unspecified Completed 15 Oct, 91 Unspecified		
820	**MUON NEUTRINO MAGNETIC MOMENT #820**	**Nikos Giokaris**	FERMILAB UNIVERSITY OF MARYLAND NORTHEASTERN UNIVERSITY NORTHERN ILLINOIS UNIVERSITY UNIVERSITY OF ROCHESTER ROCKEFELLER UNIVERSITY
	BEAM: Miscellaneous Area Search for the muon neutrino magnetic moment at the 10 to the -10 Bohr magneton level using the Booster at Fermilab		
	Request 13 Jul, 90 Unspecified Inactive 30 Jun, 94		
821	**NEUTRON MEASUREMENTS AT NWA #T821**	**Kenneth A. Johns**	UNIVERSITY OF ARIZONA BALL STATE UNIVERSITY FERMILAB UNIVERSITY OF MICHIGAN - ANN ARBOR UNIVERSITY OF MINNESOTA NORTHERN ILLINOIS UNIVERSITY RICE UNIVERSITY
	BEAM: Neutrino Area - West Neutron Measurements at NWA		
	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 FERMILAB 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
	BEAM: Main Injector Area A Long-Baseline Neutrino Oscillation Experiment from Fermilab to Soudan		
	Request 24 Aug, 90 Unspecified Withdrawn 24 Oct, 95		

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823 D-0 DETECTOR UPGRADE #823 — **Paul D. Grannis and Hugh Elliott Montgomery**

BEAM: Collision Area (D-0)
D0 Detector Upgrade

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)
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	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 — **Medford Webster**

BEAM: Main Injector Area
Neutrino Beam from the Proposed Main Injector to the DUMAND Detector

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	

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825 SDC PROTOTYPE DETECTORS #825 — **J. 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 POLYTECHNIC INSTITUTE
WAKAYAMA MEDICAL COLLEGE (JAPAN)
UNIVERSITY OF WASHINGTON
UNIVERSITY OF WISCONSIN - MADISON
YEREVAN PHYSICS INST. (ARMENIA)

Request 1 Oct. 90 Unspecified
Inactive 23 Dec. 92

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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

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827 MICRO-BCD #827 — Nigel S. Lockyer

BEAM: Collision Area (C-0)
B Physics at the TEV I; Micro-BCD

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 — Sheldon L. Stone

BEAM: Collision Area (Miscellaneous)
Letter of Intent to Measure CP Violation in B Meson Decay at the Fermilab Collider

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 — David C. Christian and Michael D. Sokoloff

BEAM: Proton Area - East
Study of Heavy Flavors at TPL, Continuation of E-791

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 — William C. Carithers, Jr. and Giorgio Bellettini

BEAM: Collision Area (B-0)
Proposal for an Upgraded CDF Detector

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 9 Oct, 90 Unspecified
Unscheduled 11 Jul, 91

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831 HEAVY QUARK PHOTOPRODUCTION #831 — **John P. Cumalat**

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)
LEBEDEV PHYSICAL INST. (RUSSIA)
INFN, MILANO (ITALY)
UNIVERSITY OF MILANO (ITALY)
UNIVERSITY OF NORTH CAROLINA
NOTRE DAME UNIVERSITY
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

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	
Being Installed	1 Oct, 95		

832 CP VIOLATION #832 — **Yee Bob Hsiung and Bruce D. Winstein**

BEAM: Neutrino Area - Muon Beam
Proposal for a New Tevatron Search for Direct CP Violation in the 2pi decays of the Neutral Kaon

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	
Being Installed	1 Oct, 95		

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**

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
PENNSYLVANIA STATE UNIVERSITY
UNIVERSITY OF TORINO (ITALY)

Request	16 Oct, 90	Unspecified	
Approval	7 Dec, 92	Unspecified	
Being Installed	1 Oct, 95		

836 SUPERCONDUCTING DETECTOR TEST #836 — **Robert G. Wagner**

BEAM: Unspecified Beam
Proposal for a Beam Test of a Superconducting Thin Film Strip Particle Detector

ARGONNE NATIONAL LABORATORY

Request	3 Oct, 90	24 Hours in three 8 hour shifts	
Withdrawn	8 Jan, 92		

837 EMPACT/TEXAS TEST #837 — **Michael D. Marx**

BEAM: Unspecified Beam
EMPACT/TEXAS Beam Test(s)

SUNY AT STONY BROOK

Request	12 Oct, 90	Unspecified	
Inactive	23 Dec, 92		

Fermi National Accelerator Laboratory
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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**

BEAM: Neutrino Area - Muon Beam
Scintillating Fiber Tracker - Beam Test

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)

Request	25 Sep, 90	Unspecified
Approval	15 Apr, 91	Unspecified
Completed	8 Jan, 92	Unspecified

840 SPAGHETTI CALORIMETRY TEST #840 — **Adam Para**

BEAM: Meson Area - Polarized Proton Beam
Spaghetti calorimetry in '91 test beam cycle

FERMILAB

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**

BEAM: Meson Area - Test Beam
Proposal for Beam Test of Scintillator Calorimeter Prototypes at Fermilab during FY 1991

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 POLYTECHNIC INSTITUTE
WESTINGHOUSE ELECTRIC CORPORATION
UNIVERSITY OF WISCONSIN - MADISON
YALE UNIVERSITY

Request	8 Oct, 90	Unspecified
Approval	28 Mar, 91	Unspecified
Completed	8 Jan, 92	Unspecified

842 RADIATION EXPOSURE #842 — **David G. Underwood**

BEAM: Proton Area - Broad Band
Proposed Radiation Measurement in the Wideband Neutral Dump Area

ARGONNE NATIONAL LABORATORY

Request	6 Nov, 90	Unspecified
Approval	15 Aug, 91	Unspecified
Completed	8 Jan, 92	Unspecified

843 EMULSION EXPOSURE 600 GeV #843 — **C. O. Kim**

BEAM: Neutrino Area - Muon Beam
Interactions of 600 Gev Muons with Emulsion Nuclei

CHONNAM NATIONAL UNIVERSITY(KOREA)
KOREA UNIVERSITY, SEOUL (KOREA)

Request	24 Oct, 90	Unspecified
Approval	1 Jul, 91	Unspecified
Completed	13 Jul, 91	Unspecified

844 TRD/SHOWER COUNTER TEST #844 — **Simon P. Swordy**

BEAM: Meson Area - Polarized Proton Beam
Transition Radiation Detector/EM Shower Counter Calibration

ENRICO FERMI INSTITUTE

Request	28 Nov, 90	40 Hours
Approval	11 Oct, 91	Unspecified
Completed	26 Dec, 91	Unspecified

845 TEVATRON BEAUTY #845 — **Peter E. Schlein**

BEAM: Unspecified Beam
A Dedicated Beauty Experiment for the Tevatron Collider

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

Request	7 Jan, 91	Unspecified
Rejected	10 Jul, 91	

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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 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 — BROOKHAVEN NATIONAL LABORATORY; CALIFORNIA INSTITUTE OF TECHNOLOGY; UNIV. OF CALIFORNIA, SAN DIEGO; CARNEGIE-MELLON UNIVERSITY; OAK RIDGE NATIONAL LABORATORY; PRINCETON UNIVERSITY; TATA INSTITUTE (INDIA)

BEAM: Neutrino Area - Test Beam
Request for Test Beam Time for Barium Fluoride Calorimeter Development

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 — 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

BEAM: Meson Area - Test Beam
Fermilab Test Beam Time of Diamond Radiation Detectors

Request	1 May, 91	Unspecified	
Approval	8 Jan, 92	Unspecified	
Withdrawn	8 Jan, 92	Unspecified	

851 FIBER IRRADIATION STUDIES #851 — Seymour Margulies and Jadwiga Piekarz — 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)

BEAM: Collision Area (C-0)
Fiber Irradiation Studies in the C0 Region

Request	1 May, 91	Unspecified	
Approval	14 Aug, 91	Unspecified	
Completed	8 Jan, 92	Unspecified	

852 PIXEL DETECTOR TEST #T852 — Eric Arens — FERMILAB; LAWRENCE BERKELEY LABORATORY

BEAM: Neutrino Area - Muon Beam
Pixel Detector Test at NM

Request	8 May, 91	Unspecified	
Approval	9 Sep, 91	Unspecified	
Completed	23 Dec, 91	Unspecified	

853 TEVATRON CRYSTAL EXTRACTION #853 — C. Thornton Murphy — ARGONNE NATIONAL LABORATORY; BOSTON COLLEGE; UNIV. OF CALIFORNIA, LOS ANGELES; 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

BEAM: Collision Area (C-0)
A Test of Low Intensity Extraction from the Tevatron Using Channeling in a Bent Crystal

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 — COLUMBIA UNIVERSITY; FERMILAB

BEAM: Debuncher Ring
Proposal to Measure the Flux of Ciculating Muons in the Debuncher.

Request	11 Jul, 91	Unspecified	
Approval	8 Jan, 92	Unspecified	
Completed	8 Jan, 92	Unspecified	

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855	**dE/dx MUONS #855**	**George R. Kalbfleisch**	UNIVERSITY OF OKLAHOMA SSC LABORATORY
	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		
	Request 3 Aug, 91 Unspecified Approval 18 Nov, 91 Unspecified Completed 8 Jan, 92 Unspecified		
856	**INTEGRATED PIXEL DETECTOR TEST#856**	**Sherwood I. Parker**	UNIVERSITY OF HAWAII AT MANOA LAWRENCE BERKELEY LABORATORY STANFORD UNIVERSITY
	BEAM: Neutrino Area - Muon Beam An Integrated Pixel Detector - Test Beam Request		
	Request 4 Oct, 91 Unspecified Approval 11 Oct, 91 Unspecified Completed 8 Jan, 92 Unspecified		
857	**SPIN-TENSOR #857**	**L. I. Sarycheva**	MOSCOW STATE UNIVERSITY (RUSSIA)
	BEAM: Unspecified Beam Proposal to measure all components of the depolarization tensor.		
	Request 10 Dec, 91 Unspecified Inactive 23 Dec, 92		
858	**ELASTIC SCATTERING SPIN EFFECTS #858**	**Alan D. Krisch**	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)
	BEAM: Unspecified Beam Spin Effects in High Proton-Proton Elastic Scattering		
	Request 6 Jan, 92 Unspecified Rejected 30 Jul, 92		
859	**CP VIOLATION IN HYPERON DECAY #859**	**Shao Yuan Hsueh**	FERMILAB
	BEAM: Unspecified Beam CP Violations in Hyperon Decay		
	Request 2 Jan, 92 Unspecified Withdrawn 13 Jan, 94		
860	**SEARCH FOR NEUTRINO OSCILLATIONS#860**	**Wonyong Lee**	BROOKHAVEN NATIONAL LABORATORY COLUMBIA UNIVERSITY FERMILAB KANGNUNG NATIONAL UNIV. (KOREA) KOREA UNIVERSITY, SEOUL (KOREA) SEOUL NATIONAL UNIVERSITY (KOREA)
	BEAM: Debuncher Ring A Search for Neutrino Oscillations using the Fermilab Debuncher.		
	Request 14 Jan, 92 Unspecified Withdrawn 17 Jan, 96		
861	**ANTIPROTON DECAY #T861**	**Steve Geer**	UNIV. OF CALIFORNIA, LOS ANGELES FERMILAB PENNSYLVANIA STATE UNIVERSITY
	BEAM: Accumulator Ring Test of Backgrounds for an Antiproton Decay Search Experiment at the Antiproton Accumulator		
	Request 10 Feb, 92 24 Hours Completed 29 Oct, 92		
862	**ANTI-HYDROGEN DETECTION #862**	**David C. Christian**	UNIV. OF CALIFORNIA, IRVINE FERMILAB PENNSYLVANIA STATE UNIVERSITY SLAC
	BEAM: Accumulator Ring Detection of Relativistic Anti-Hydrogen Atoms produced by Pair Production with Positron Capture		
	Request 27 Aug, 92 Unspecified Being Installed 1 Oct, 95		
863	**NUCLEON SPIN #863**	**Aldo Penzo**	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)
	BEAM: Meson Area - Polarized Proton Beam Nucleon Spin Structure Studies with Polarized Proton and Antiproton Beams		
	Request 31 Aug, 92 7 Months Rejected 7 Dec, 92		
864	**MAXIMUM ACCEPTANCE DETECTOR #T864**	**James D. Bjorken and Cyrus C. Taylor**	CASE WESTERN RESERVE UNIVERSITY DUKE UNIVERSITY FERMILAB LOS ALAMOS NATIONAL LABORATORY UNIVERSITY OF MICHIGAN - ANN ARBOR SLAC VIRGINIA POLYTECHNIC INSTITUTE
	BEAM: Collision Area (C-0) Maximum Acceptance Detector for the Fermilab Collider (MAX)		
	Request 1 Sep, 92 Unspecified Approval 24 May, 93 Unspecified Completed 20 Feb, 96		

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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 — **Patrick L. McGaughey**

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
IHEP, ACADEMIA SINICA (TAIWAN)
ARGONNE NATIONAL LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
FERMILAB
GEORGIA STATE UNIVERSITY
LOS ALAMOS NATIONAL LABORATORY
LOUISIANA STATE UNIVERSITY
NEW MEXICO STATE UNIVERSITY
NORTHERN ILLINOIS UNIVERSITY
OAK RIDGE NATIONAL LABORATORY
TEXAS A&M UNIVERSITY
VALPARAISO UNIVERSITY

Request	2 Sep, 92	Unspecified
Approval	7 Dec, 92	Unspecified
Being Installed	1 Oct, 95	

867 HIDDEN CHARM AND BEAUTY #867 — **Bradley B. Cox**

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

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 SCL 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 — **Steve Geer**

BEAM: Accumulator Ring
Proposal to Search for Antiproton Decay at the Fermilab Antiproton Accumulator

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 — **Barry C. Barish and Bill Willis**

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

FERMILAB
SSC LABORATORY

Request	11 Nov, 92	Unspecified
Withdrawn	4 Jan, 94	

870 PROTOTYPE DETECTORS FOR THE SDC #870 — **George H. Trilling**

BEAM: Meson Area - Polarized Proton Beam
PROTOTYPE DETECTORS FOR THE SDC #870

FERMILAB
LAWRENCE BERKELEY LABORATORY
SSC LABORATORY

Request	1 Jan, 93	Unspecified
Withdrawn	4 Jan, 94	

871 CP VIOLATION #871 — **Kam-Biu Luk and Edmond C. Dukes**

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

IHEP, ACADEMIA SINICA (TAIWAN)
UNIVERSITY OF SOUTH ALABAMA
UNIV. OF CALIFORNIA, BERKELEY
FERMILAB
UNIVERSITY OF GUANAJUATO (MEXICO)
ILLINOIS INSTITUTE OF TECHNOLOGY
LAWRENCE BERKELEY LABORATORY
UNIVERSITY OF MICHIGAN - ANN ARBOR
UNIVERSITY OF VIRGINIA

Request	21 Mar, 93	Unspecified
Approval	29 Jun, 94	Unspecified Stage I approval.
Being Installed	1 Oct, 95	

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872 TAU NEUTRINO #872 — **Byron Lundberg and Vittorio Paolone**

BEAM: Proton Area - West
BEAM DUMP #872

AICHI UNIV. OF EDUCATION (JAPAN)
UNIVERSITY OF ATHENS (GREECE)
UNIV. OF CALIFORNIA, DAVIS
CHONNAM NATIONAL UNIVERSITY(KOREA)
FERMILAB
GIFU UNIVERSITY (JAPAN)
GYEONGSANG NATIONAL UNIV. (KOREA)
HIROSAKI UNIVERSITY (JAPAN)
KINKI UNIVERSITY (JAPAN)
KOBE UNIVERSITY (JAPAN)
UNIVERSITY OF MINNESOTA
NAGOYA UNIVERSITY (JAPAN)
OKAYAMA UNIVERSITY (JAPAN)
OSAKA CITY UNIVERSITY (JAPAN)
OSAKA SCIENCE EDUC. INST. (JAPAN)
OSAKA UNIV. OF COMMERCE (JAPAN)
SOAI UNIVERSITY (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.
Being Installed	1 Oct, 95	

873 BOOSTER NEUTRINOS #873 — **F. Federspiel and H. White**

BEAM: Booster Accelerator
Letter of Intent to Perform a Neutrino Experiment using the Fermilab 8 GEV Booster

LOS ALAMOS NATIONAL LABORATORY

Request	21 Oct, 94	Unspecified
Unconsidered	21 Oct, 94	

874 CHARGED PION LIFETIME #874 — **Steve Geer**

BEAM: Meson Area - West
Precision Measurement of the Lifetime of Charged Pions

DUKE UNIVERSITY
FERMILAB
UNIVERSITY OF NEBRASKA
ROCKEFELLER UNIVERSITY

Request	9 Nov, 94	Unspecified
Unconsidered	9 Nov, 94	

875 NEUTRINO OSCILLATIONS #875 — **Stanley G. Wojcicki**

BEAM: Main Injector Area
A Long-baseline Neutrino Oscillation Experiment at Fermilab

ARGONNE NATIONAL LABORATORY
BOSTON COLLEGE
CALIFORNIA INSTITUTE OF TECHNOLOGY
COLUMBIA UNIVERSITY
FERMILAB
INDIANA UNIVERSITY
JINR, DUBNA (RUSSIA)
LAWRENCE LIVERMORE LABORATORY
LEBEDEV PHYSICAL INST. (RUSSIA)
UNIVERSITY OF MINNESOTA
ITEP, MOSCOW (RUSSIA)
OAK RIDGE NATIONAL LABORATORY
UNIVERSITY OF OXFORD (ENGLAND)
RUTHERFORD-APPLETON LABS.(ENGLAND)
STANFORD UNIVERSITY
SUSSEX UNIVERSITY (ENGLAND)
TEXAS A&M UNIVERSITY
TUFTS UNIVERSITY
WESTERN WASHINGTON UNIVERSITY

Request	9 Feb, 95	Unspecified
Unscheduled	2 May, 95	

876 CDF HARD DIFFRACTION STUDIES #876 — **Mike G. Albrow**

BEAM: Collision Area (B-0)
Proposal for Hard Diffraction Studies in CDF

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	

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877	**AXION SEARCH #877**	**Siu Au Lee**	COLORADO STATE UNIVERSITY FERMILAB JOINT INST. FOR LAB. ASTROPHYSICS SSC LABORATORY
	BEAM: Beam Not Applicable Measurement of the Magnetically-Induced QED Birefringence of the Vacuum and an Improved Laboratory Search for Axions		
	Request 28 Mar, 95 Unspecified Unconsidered 28 Mar, 95		
878	**SPIN STRUCTURE FUNCTION PHYSICS #878**	**Joel Moss**	LOS ALAMOS NATIONAL LABORATORY
	BEAM: Main Injector Area Spin Structure Function Physics at Fermilab.		
	Request 7 Nov, 95 Unspecified Unconsidered 7 Nov, 95		
879	**B PHYSICS TEST BEAM PROGRAM #879**	**Joel N. Butler and Walter Selove**	CARNEGIE-MELLON UNIVERSITY FERMILAB UNIVERSITY OF PENNSYLVANIA SYRACUSE UNIVERSITY
	BEAM: Meson Area - Test Beam A Test Beam Program for Future B Physics Experiments at Fermilab		
	Request 16 Mar, 95 Unspecified Unconsidered 16 Mar, 95		
880	**B PHYSICS TEST BEAM PROGRAM #880**	**Joel N. Butler and Sheldon L. Stone**	CARNEGIE-MELLON UNIVERSITY FERMILAB UNIVERSITY OF MINNESOTA SYRACUSE UNIVERSITY WAYNE STATE UNIVERSITY
	BEAM: Meson Area - Test Beam Proposal for Test Beam Running of the CLEO III RICH Detector		
	Request 16 Mar, 95 Unspecified Unconsidered 16 Mar, 95		
881	**AUGER PROJECT R&D #881**	**Paul M. Mantsch**	FERMILAB
	BEAM: Beam Not Applicable A Request for Fermilab R&D Support for the Pierre Auger Project.		
	Request 6 Nov, 95 Unspecified Unconsidered 6 Nov, 95		
882	**SEARCH FOR LOW MASS MONOPOLES #882**	**George R. Kalbfleisch**	UNIVERSITY OF OKLAHOMA
	BEAM: Beam Not Applicable A Search for Low Mass Monopoles		
	Request 15 Aug, 95 Unspecified Unconsidered 15 Aug, 95		