fermilab report

Fermi National Accelerator Laboratory Monthly Report

January 1977

Fermi National Accelerator Laboratory

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THE COVER: This tranquil winter scene of Indian Creek from the Giese Road bridge on the Laboratory site does not reflect the miseries of coping with one of the coldest winters of the century. (Photograph by Anthony R. Donaldson)

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CONTENTS JANUARY 1977

THE NEUTRINO AREA IN 1975 AND 1976

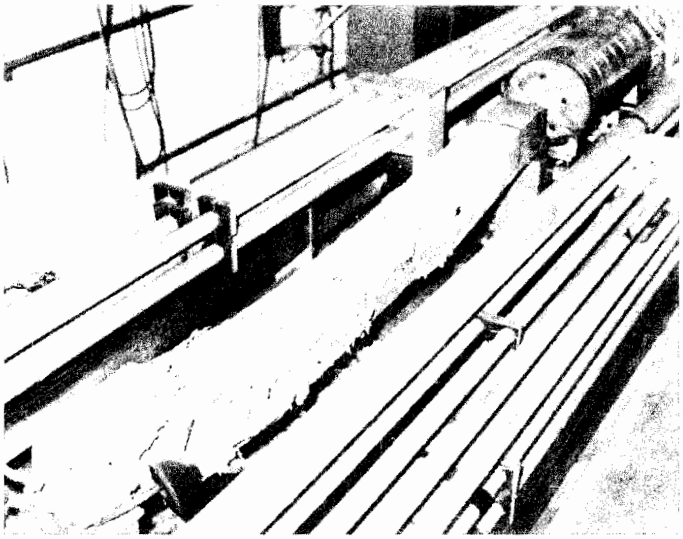
Richard Lundy

In the last few years, the Neutrino Area, like every other part of Fermilab, has been heavily used for physics experiments and, at the same time, modified, improved, and extended in capacity. The purpose of this article is to chronicle the modifications and improvements in 1975 and most of 1976, during my tenure as head of the Neutrino Department. The work reported here is that of many colleagues in the Department, who have made it possible for others to carry out significant physics experiments in both weak and strong interactions.

The last NALREP report on the Neutrino Area was by Russ Huson in April 1975. Since that report, the work in the area has affected the Target Hall, the beam lines and experimental areas, and the bubble chambers. We shall discuss these areas below.

Target Trains

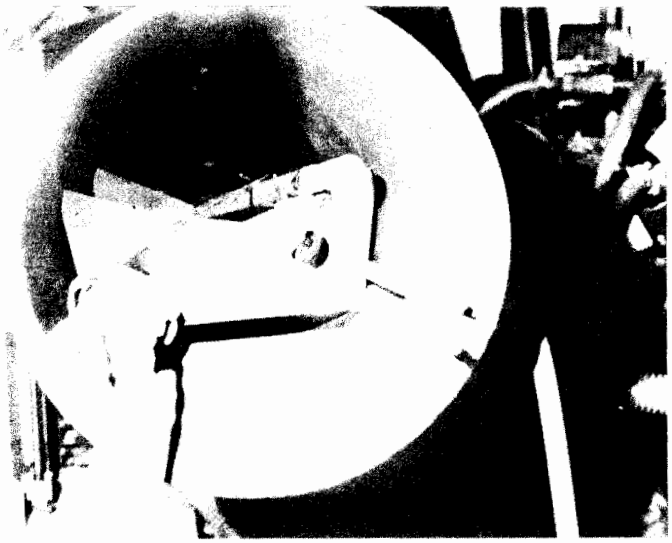
The target trains have had quite different histories in this time. On the one hand, the tried and true quadrupole-triplet train has survived almost intact. It has been upgraded by the addition of more magnets to higher momentum and greater reliability. The figure on page 2 shows a collimator in the triplet train that nobly did its job of protecting the downstream magnet. On the other hand, the old dichromatic train was retired honorably when Experiment #21 left the Wonder Building. A new dichromatic train is now being built; its design was a collaborative effort between the Cal Tech group, the Neutrino Department, and Don Edwards who participates in the experiment



A used collimator on the quadrupole-triplet train. The collimator was made of 2-in. slabs of steel. The shreds are the remains of its cover.

as a Fermilab collaborator. It will reach higher momentum, give higher intensity and more precise neutrino beam properties and have greater reliability.

The conventional two-horn system has been in service for much of this period, with some reliability improvements. Two horn failures were attributed to the higher intensity proton beam. There is also a continuing attempt to operate with a central plug to achieve a more pure antineutrino beam. This plug is shown in the figure at the top of page 3. Construction is proceeding on a separate narrow-band horn train, designed in collaboration with Charles Baltay of Columbia. We are also purchasing new pulse transformers to give a one-millisecond spill time with any of the focusing horn systems. A switching magnet has been added to the horn train to target the bypass proton



Aluminum finger plug in the two-horn system, used to enhance the anti-neutrino flux. The plug has been moved from its mount by beam-induced stresses and heating.

beam onto a new hadron target station a short distance from the end of the neutrino decay pipe.

The entire Target Hall milieu has been enlivened by the acquisition of a surplus mine locomotive, which has been made narrower and modified to operate in Neutrino Hall, but has not yet been christened. The Target Service Building has now been completed. It provides storage space for a number of long trains and for component testing before trains are installed.

Muon Laboratory

The muon beam has been upgraded to 300 GeV/c. Conventional magnets have been used in this improvement. There was work on a superconducting beam line to the Muon Lab, developing magnets and refrigeration. This work

has now moved over to the Proton Area. The conventional muon beam line operates almost exclusively in a ramped mode, both to save energy and to reduce the background for neutrino experiments.

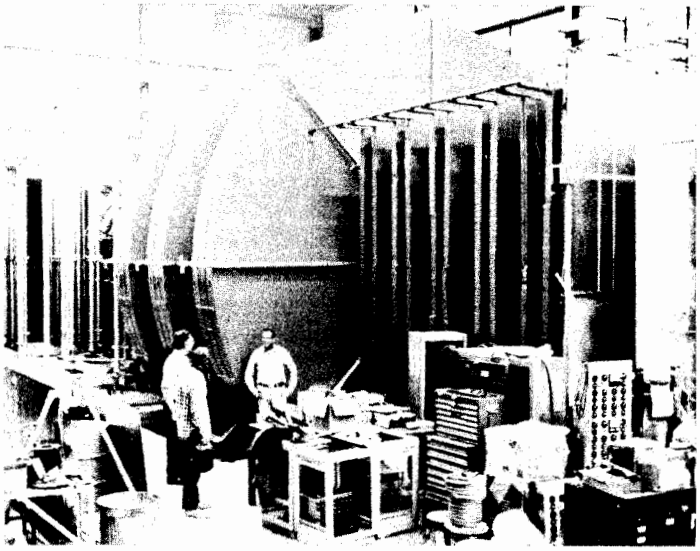
The first generation of muon experiments (for example, E-98) was completed in the Muon Laboratory and the second generation (for example, E-203) is moving in. In addition, the first hadron experiment in the Muon Lab, E-331, has shown that there is a rich future for hadron experiments here, using beams from the new target station at the end of the decay pipe. In addition, Hand and Read carried out some emulsion exposures using tagged muons.

New Construction

Experiment #356, the successor to E-21, has moved to the newly completed Lab E. The Wonder Building has become unsuitable for neutrino experiments because of the enhanced muon background associated with 400-GeV operation. It is planned to install toroidal muon spoilers at the end of the neutrino decay pipe, which should make the Wonder Building suitable for medium-sized neutrino experiments like E-253 (Virginia Polytechnic Institute, University of Maryland, and Oxford University) which is now being installed.

Lab E itself is just upstream of the bubble chamber. It makes use of the N5 hadron beam for high-energy hadron experiments, such as E-379, the Stanford, Cal Tech, Northwestern collaboration. For neutrino experiments, new large (12-ft diameter) magnetic toroids, a Laboratory facility, are now installed and operating. Experiments #356 and #482, the Cal Tech, Northwestern, Fermilab collaboration, are now taking data.

An addition has been completed for Lab C, housing 24-ft toroids for E-310, the Harvard, Fermilab, Pennsylvania, Wisconsin collaboration that is a descendant of E-1A. These toroids are shown in the photograph below. The photograph on the next page shows the detectors of E-310; they are also now taking data.

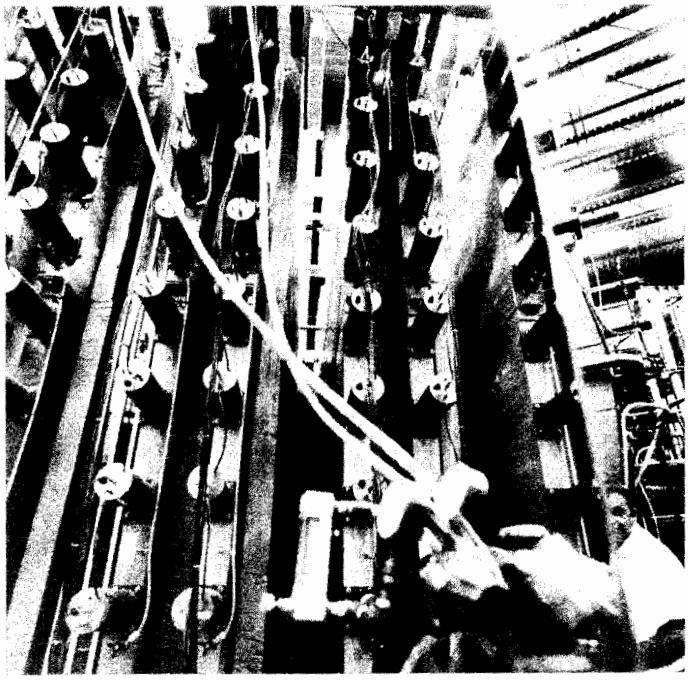


Toroid magnets of E-310.

The unique new N1 cooling system is operating very well. Water is pumped from Swan Lake, used for cooling in heat exchangers at N1, and returned to Swan Lake via the Babbling Brook that wanders along just west of Road A.

Bubble Chambers

The 15-ft chamber has done everything called for in the design except operate with deuterium. This deuterium operation is ready to go whenever deuterium is available.



Detectors of E-310. The iron-plate calorimeters have spark chambers and counters interspersed.

The chamber had operated before 1975 with hydrogen. It has now operated with both light-neon (21% Ne) and heavy-neon (63% Ne) mixtures. For this operation, we have changed from the fiberglass to a metal piston. For hydrogen, eddy currents in the metal had given excessive heat input to the chamber. With neon, the piston stroke is shorter and there is therefore less heat input. There is more confidence in the integrity of the metal system.

Fermilab had a stock of neon. We accumulated more and borrowed some from Argonne and Brookhaven Laboratories. There is now 24,000

liters for the 63%-Ne fill. This is the entire U. S. stock of bubble-chamber neon and is meant to be shared among Argonne, Brookhaven, and Fermilab. The bubble-chamber group has modified a surplus oxygen tanker trailer for use as a neon tanker and the neon has been trucked back and forth between here and the other laboratories. We are also still accumulating neon.

The design of the 15-ft chamber included two sets of cameras, with three cameras in each set. Both sets are now operating, with one set looking into the main body for neutrinos and the other set looking upstream into the nosepiece for hadron identification. We have operated with two expansions per accelerator cycle, one expansion for neutrinos, and one for hadrons. Thus two groups are doing different kinds of physics simultaneously in the same chamber.

The EMI (external muon identifier) has operated without substantial changes. An upgrading is now being carried out with the Berkeley group, to provide increased angular coverage, more planes, and more data capacity.

A tagging system upstream of the chamber has also been completed and operated by Marvin Johnson.

The 30-in. chamber continues to operate steadily. It now has a capability for 8 expansions per flattop. The original hybrid experiment with downstream wide-gap chambers has now been completed. The 30-in. chamber has also been used for the world's only pictures with an enriched high-momentum antiproton beam.

Conclusion

It can be seen from the litany above that the Neutrino Area has played host to many Fermilab experiments, even while improvement and upgrading of its capabilities have been going on.

Studies have been made for even more upgrading. The 1976 Aspen Summer Study was concerned with bringing the Neutrino Area to 1000 GeV. It is a pleasure to acknowledge the dedicated work of many Neutrino Area people who have made a major contribution to Fermilab.

NOTES AND ANNOUNCEMENTS

APPOINTMENTS. . .

As is customary at year's end, there have been a number of rotations of appointments.

Timothy Toohig has become Head of the Meson Laboratory, succeeding Charles Brown, who will become Associate Head.

Peter Koehler has become Head of the Physics Department, succeeding Frank Nezrick. Ed Bleser has been appointed Assistant Head.

Richard Carrigan has become Assistant Head of the Research Division.

Halsey Allen has left Fermilab to join the Tokamak Fusion Test Reactor project at Princeton. James MacLachlan has been named Acting Head of the Operation Section. Halsey Allen's other responsibilities in Plant Support have been put into Technical Services.

MORE ON THE MULTIPARTICLE SPECTROMETER WORKSHOP. . .

Plans are progressing for the Multiparticle Spectrometer Workshop to be held at Fermilab on March 4-5. A tentative agenda has been developed which includes talks on each of the principal features of the multiparticle spectrometer, a critical review of the spectrometer, a discussion of experimental results obtained to date, and a review of related CERN facilities. There will also be provision for contributed talks on ideas for future experiments that would utilize the multiparticle spectrometer.

A mailing is planned for mid-February which will contain an updated version of the agenda as well as descriptive material on the multiparticle

spectrometer. This mailing will be sent to those who indicate by mail or phone that they plan to attend the workshop or who are otherwise interested in receiving the material. Responses should be directed to E. Malamud at Fermilab.

1977 HOLIDAYS. . .

The following Laboratory-wide holidays will be observed this year:

New Year's Day 1977	Friday, December 31, 1976
Memorial Day	Monday, May 30
Independence Day	Monday, July 4
Labor Day	Monday, September 5
Thanksgiving	Thursday, November 24, and Friday, November 25
Christmas	Friday, December 23, and Monday, December 26
New Year's Day 1978	Monday, January 2, 1978

CONFERENCE PROCEEDINGS AVAILABLE. . .

The Proceedings of the 1976 DUMAND Summer Workshop held in Honolulu in September are available from the Physics Department. The Proceedings are about 635 pages and deal with the use of the ocean as a neutrino and muon detector for the purposes of studying extragalactic gravitational stellar collapse, ultra-high energy (above 10 TeV) neutrino and muon interactions, and the abundance of naturally occurring high-energy neutrinos, including both those locally produced and those incident from outside the earth's atmosphere. Prices are postpaid, and payment must be included with order: U. S., $15.50; foreign surface mail, $17.50; Europe by air, $21.00; USSR and Far East by air, $24.00.

RESEARCH ACTIVITIES DURING DECEMBER 1976

James MacLachlan

The accelerator operated for high-energy physics 343 of 595 hours scheduled in the month of December. The principal emphasis for the entire month was on the delivery of high-intensity 2-msec spill to the Neutrino Area for Neutrino #310. The low 58% operating efficiency reflects problems in the experimental areas as well as with the accelerator itself; however, continued progress on accelerator intensity made it possible to achieve important progress in the experimental program. A Booster accelerator intensity of 3×10^{13} p/Main-Ring pulse on Saturday, December 21, was followed by a new Main-Ring mark of 2.47×10^{13} protons/pulse the next day. As in November, the Main-Ring pulsed power feeder system caused the greatest interruption to the program. Once again a feeder fault under a service building was compounded by secondary faults in splices, thereby interrupting operation for $2\frac{1}{2}$ days starting Sunday morning, December 5. Nearly as great a disruption was caused by the loss of a preaccelerator ion source filament on December 13. The pump-down and conditioning of the new filament so limited intensity that scheduled accelerator studies and M&D were moved up a day; by the following weekend, beam intensity was again approaching 2×10^{13} p/pulse. Starting Monday, the 20th, the flattop was reduced to 100 msec to provide for fast extraction of the entire beam to the Neutrino Area. With this ramp it became possible to reduce the cycle time to about 6.8 sec and to average 10^{16} protons/hour. This mode of running was interrupted by a Christmas standby period of Friday through Sunday, December 24 through December 26,

inclusive. Operation was reestablished promptly following the standby. The high average intensity proved too much for a collimator on the Neutrino target train and the special period for neutrino running was curtailed on December 29. The Neutrino Area was turned off for repairs and accelerator studies were carried out while the backup program in the Proton Area was activated. The last day of the month the accelerator switched over to a 200/300 GeV ramp with 2 sec flattops at each energy for the backup program. By the end of the month, spill regulation problems etc. were under control, and the new mode of operation appeared to be successfully established.

The Neutrino Area was the focus of the research program throughout the month. Muon #398 was completed on December 1, and two days later Neutrino #310 was started up with a 2 msec spill. At $\sim 2\times 10^{13}$ p/pulse E310 obtained about 1 trigger per 3 pulses by gating the single triggers to the last part of the spill to enhance the fraction of multimuon triggers. The experiment received over 10^{18} protons on target and recorded somewhat over 30K optical spark-chamber pictures, including several hundred di-muon candidates. The 15-ft bubble chamber was scheduled to run in December for 15' tests of the proposal 15-ft ν/H_2 & Ne #460. The EMI was reconfigured by removing wider angle planes from the chamber and setting them behind the chamber in an outside shelter to provide double planes in the central region. The chamber itself had a varied set of problems, including leaks in recently modified optics ports, helium liquifier and expansion engine difficulties, and pluts in liquid helium lines. The chamber began producing pictures for physics on Wednesday, December 22, and on the next day, set a new record

of 10K pictures in a 24-hour period. The chamber was still operating satisfactorily after the holiday standby, although liquid helium production was marginal. The run for the experiment ended on December 29 with about 22K pictures in the 58% Ne mixture. Neutrino #482 was taking test data in Lab E throughout the month. During the high repetition rate running, an emulsion stack for Emulsions/New Particles #386 was placed in the neutrino beam. This experiment sought evidence for interactions of two energy neutrals in a low background emulsion poured locally and developed promptly. All beam to the Neutrino Area ended during the morning of Wednesday, December 29, when it was found that all three experiments were reporting 80-90% decrease in triggers. A visual examination of the train disclosed that the 8-ft steel collimator immediately downstream of the target had sagged into the beam. The heat resulting from the secondaries during the high-intensity running had heated the collimator to the point where it could no longer support its own weight.

The Proton Area crews worked vigorously in early December to restore Proton-East for Particle Search #325, following the completion of Photon Total Cross Section #25A on November 30. E325 began to run Saturday, December 11, and returned to data taking after a couple of days of startup and used 1.1×10^{17} protons on target at 400 GeV. The Proton Area went into standby December 20 during the high intensity running to the Neutrino Area, but following the train failure, all three lines started to come back up for the 200/300 GeV running which began on December 31. Proton-Central and Proton-West continued this month with Di-Hadron #494 and p-p

Elastic #177A respectively. During the standby period, E177A adjusted their target and recoil arm position to prepare for data taking at 200 GeV. That work was quickly completed for the unexpected reactivation of the area.

The Meson Area also had few changes from the November program. The biggest change was the installation of Multi-Muon #439 in the M2 line for tests of its magnetized beam dump approach to looking for high mass states with multi-muon decays. The experiment calls for $\sim 10^{10}$ protons/pulse, and, therefore, a major part of the test was establishing the feasibility of proper environmental shielding by piecemeal installation of shielding around the experiment. These tests appear successful, and the experiment reportedly works about as proposed, producing a clean, strong ψ signal. Form Factor #456 gathered data steadily in the M1W beam line, and Neutron Elastic #248 ran smoothly to completion in M3. In the M4 beam line, K^{o} Regeneration #226/#486 turned early in the month to data taking on the electron regeneration (E226) part of the experiment. Inclusive Scattering #118A devoted the month to completion of their -175 GeV data. They finished with enough time remaining to permit Di-Lepton #288 to use the single arm spectrometer to measure energy loss of muons in beryllium at 50 GeV. Beam to the Meson Area was turned off on December 20 as scheduled for the neutrino running.

Helium liquifier problems persisted in the Internal Target Area. Partly as a result of bringing in liquid helium, p-N Scattering #381 managed to run about half of the available time in the first two-thirds of the month p-p Polarization #313 also collected some data during the high repetition rate running before Christmas.

FACILITY UTILIZATION SUMMARY -- DECEMBER 1976

I. Summary of Accelerator Operations

		Hours	
A. Accelerator use for physics research			
Accelerator physics research		55.8	
High energy physics research		343.0	
Research during other use		(44.3)	
	Subtotal		398.8
B. Other activities			
Accelerator setup and tuning to experimental areas		11.6	
Program interruption { Scheduled	75.5	130.0	
Program interruption { Adhoc	54.5		
Unscheduled interruption		203.6	
	Subtotal		345.2
C. Unmanned time			-
	Total		744.0

II. Summaries of High Energy Physics Research Use

	# of Expts.	Hours	Results
A. Counter experiments	13	2118.2	2 experiments complete
B. Bubble chamber expts.	-	-	
C. Emulsion experiments	1	-	1 stack; complete
D. Special target expts.	2	-	2 exposures
E. Test experiments	-	-	-
F. Engineering studies & tests	5	241.7	Yields in N3 line et al. & 22K 15-ft pictures
G. Other beam use	-	-	
	21	2359.9	

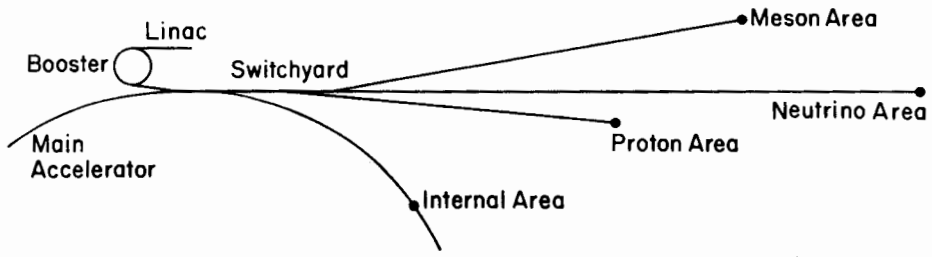
III. Number of Protons Accelerated and Delivered ($\times 10^{18}$)

		200/300 GeV		400 GeV	Total
A. Beam accelerated in Main Ring		0.04		2.05	2.09
B. Beam delivered to expt. areas		200	300	400	
Meson Area		0.00	0.00	0.28	
Neutrino Area					
	Slow Spill	0.00	0.00	0.04	
	Fast Spill	0.00	0.00	1.24	
Proton Area		0.02	0.01	0.13	
	Totals	0.02	0.01	1.69	1.72

IV. Beam Utilization by Experiment

	Hours	Results
A. Meson Area		
Nuclear Chemistry #81A	-	1 exposure
Inclusive Scattering #118A	195.8	Data
K^o Regeneration #226/#486	221.5	Data
n Elastic Scattering #248	209.6	Data
Di-Lepton #288 Tests	12.7	dE/dx for μ in Be
Particle Search #439	167.6	Tests
Form Factor #456	225.1	Data
B. Neutrino Area		
Neutrino #310	241.6	Data
Emulsions/New Particles #386	-	1 stack; complete
Muon #398	6.7	Data; complete
Neutrino #482	173.9	Setup and test data
C. Proton Area		
p-p Elastic #177A	171.6	Data
Particle Search #325	119.0	Data
Nuclear Fragments #466		1 target exposure
Di-Hadron #494	193.9	Data
D. Internal Target Area		
p-p Polarization #313	49.2	Data
p-N Scattering #381	142.7	Data
Total	2130.9	

Fermi National Accelerator Laboratory



Experiments in the Research Areas

JANUARY - APRIL, 1977

Internal Area	Proton Area	Neutrino Area	Meson Area
PROTON-NUCLEON SCATT. #198A	PROTON EAST: PARTICLE SEARCH #325 PHOTOPRODUCTION #401	HADRON BEAM: PARTICLE SEARCH #379	M1 BEAM: POLARIZED SCATTERING #61 INCLUSIVE SCATTERING #324 FORM FACTOR #456
P-P POLARIZATION #313	PROTON CENTER: DI-LEPTON #288 DI-HADRON #494	NEUTRINO BEAM: 15-FT B.C. NEUTRINO #310	M2 BEAM: PARTICLE SEARCH #439 LAMBDA MAGNETIC MOMENT #440 INCLUSIVE NEUTRAL MESON #350
PROTON-NUCLEON SCATT. #381	PROTON WEST: P-P ELASTIC #177A	MUON/HADRON BEAM: PARTICLE SEARCH #369	M3 BEAM: NEUTRON-NUCLEUS INELASTIC #438
NUCLEAR FRAGMENTS #442			M4 BEAM: K^0 CHARGE RADIUS #226
			M6 BEAM: MULTIPARTICLE #110A BACKWARD SCATTERING #290 HADRON DISSOCIATION #396

AREA-BEAM		SPOKESPERSON	EXTENT OF RUN TO DATE	DATE COMPLETED
	LONG-LIVED PARTICLES #239	FRATI	350 HOURS	3 FEB 74
	QUARK #276	VAN GINNEKEN	3 TARGETS EXPOSED	2 NOV 75
	SUPER-HEAVY ELEMENTS #285	LEDERMAN	3 TARGET EXPOSURES	2 AUG 76
	EMULSION/NEW PARTICLES #386	LORD	1 STACK	1 DEC 76
	DETECTOR DEVELOPMENT #34	HUGGETT	50 HOURS	26 JUN 74
	QUARK #297	LEIPUNER	50 HOURS	10 JUL 74
	DETECTOR DEVELOPMENT #327	ALLISON	50 HOURS	7 FEB 75
	PLASTIC DETECTORS #275	ENGE	4 STACKS	20 OCT 73
	EMULSION/PROTONS @ 300 #161	CARY	3 STACKS	20 OCT 73
	EMULSION/PROTONS @ 300 #195	LIM	3 STACKS	10 JUN 75
	EMULSION/PROTONS @ 300 #232	KING	2 STACKS	20 OCT 73
	EMULSION/PROTONS @ 300 #233	HEBERT	8 STACKS	20 OCT 73
	EMULSION/PROTONS @ 300 #237	LORD	5 STACKS	10 JUN 75
	EMULSION/PROTONS @ 300 #242	NIU	2 STACKS	20 OCT 73
	EMULSION/PROTONS @ 300 #244	JAIN	1 STACK	20 OCT 73
	EMULSION/PROTONS @ 300 #250	KUSUMOTO	1 STACK	20 OCT 73
	EMULSION/PROTONS @ 300 #329	TRETJAKOVA	2 STACKS	10 JUN 75
	EMULSION/PROTONS @ 300 #374	DAVIS	1 STACK	10 JUN 75
	EMULSION/PROTONS @ 300 #419	GIACOMELLI	1 STACK	10 JUN 75
	EMULSION/PROTONS @ 300 #421	DZHELEPOV	1 STACK	24 JUN 75
	EMULSION/PROTONS @ 200 #271	GOTTFRIED	10 STACKS	10 JUN 75
	EMULSION/MUONS @ 150 #255	JAIN	1 STACK	16 OCT 73
	EMULSION/MUONS @ 150 #205A	KUSUMOTO	2 STACKS	16 OCT 73
	EMULSION/PI- @ 200 #264	YOUNG	2 STACKS	7 OCT 74
	EMULSION/PI- @ 200 #328	TRETJAKOVA	5 STACKS	7 OCT 74
	EMULSION/PI- @ 200 #339	WOLTER	4 STACKS	9 JUN 75
	EMULSION/PI- @ 200 #362	JAIN	1 STACK	9 JUN 75
	EMULSION/PI- @ 200 #387	WILKES	4 STACKS	9 JUN 75
	EMULSION/PROTONS @ 400 #233	LORD	9 STACKS	9 DEC 75
	EMULSION/PROTONS @ 400 #243	NIU	7 STACKS	9 DEC 75
	EMULSION/PROTONS @ 400 #245	JAIN	1 STACK	9 DEC 75
	EMULSION/PROTONS @ 400 #249	WOLTER	3 STACKS	9 DEC 75
	EMULSION/PROTONS @ 400 #251	KUSUMOTO	3 STACKS	9 DEC 75
	EMULSION/PROTONS @ 400 #265	YOUNG	3 STACKS	9 DEC 75
	EMULSION/PROTONS @ 400 #279	KING	3 STACKS	9 DEC 75
	EMULSION/PROTONS @ 400 #292	GOTTFRIED	12 STACKS	9 DEC 75
	EMULSION/PROTONS @ 400 #336	OGATA	2 STACKS	9 DEC 75
	EMULSION/PROTONS @ 400 #346	EKSPONG	1 STACK	9 DEC 75
	EMULSION/PROTONS @ 400 #395	PRAKASH	1 STACK	9 DEC 75
	EMULSION/PROTONS @ 400 #423	SUGIMOTO	4 STACKS	9 DEC 75
	EMULSION/PROTONS @ 400 #4[illegible]	HEBERT	14 STACKS	9 DEC 75
	EMULSION/PROTONS @ 400 #434	DAKE	3 STACKS	9 DEC 75
	EMULSION/PROTONS @ 400 #461	LORD	6 STACKS	9 DEC 75
	EMULSION/PROTONS @ 400 #452	GIACOMELLI	1 STACK	9 DEC 75
	EMULSION/PROTONS @ 400 #463	TRETJAKOVA	2 STACKS	9 DEC 75
	TACHYON MONOPOLE #202	BARTLETT	COSMIC RAY RUNNING	19 MAY 76
PA -PE	PHOTON TOTAL CROSS SECTION #25A	CALDWELL	1,850 HOURS	30 NOV 76
	PHOTOPRODUCTION #87A	LEE	2,500 HOURS	21 DEC 75
	PARTICLE SEARCH #100A	LIROUE	1,150 HOURS	4 APR 74
	PARTICLE SEARCH #300	CRONIN	750 HOURS	24 APR 75
	EMULSION/ELECTRONS @ HI E #340	DAKE	10 STACKS	5 OCT 76
	DI-MUON #356	LEE	400 HOURS	1 OCT 75
	EMULSION/ELECTRONS @ >100 #399	GOLDEN	6 STACKS	5 OCT 76
	DETECTOR DEVELOPMENT #493	GRUHN	50 HOURS	16 AUG 76
	EMULSION/ELECTRONS @ HI E #510	NIU	6 STACKS	5 OCT 76
-PC	MUON SEARCH #46	ADAIR	500 HOURS	1 DEC 75
	LEPTON #70	LEDERMAN	2,600 HOURS	1 DEC 74
	PARTICLE SEARCH #187	LEDERMAN	200 HOURS	6 NOV 73
	MUON SEARCH #435	ADAIR	250 HOURS	2 JUL 76
	DI-MUON #436	ADAIR	200 HOURS	29 OCT 75
-PW	PARTICLE PRODUCTION #284	WALKER	1,150 HOURS	3 OCT 76
ITA-C-0	PROTON-PROTON SCATTERING #36A	COOL	700 HOURS	24 JUN 73
	PHOTON SEARCH #63A	WALKER	2,600 HOURS	13 MAR 75
	PROTON-PROTON MISSING MASS #67A	SANNES	600 HOURS	3 AUG 73
	TACHYON SEARCH #120	CLINE	1,200 HOURS	29 MAY 73
	PARTICLE SEARCH #184	WANDERER	800 HOURS	29 MAY 74
	PROTON-DEUTERON SCATTERING #186	NIKITAS? / HELISSINOS	450 HOURS	19 AUG 74
	PROTON-NUCLEON INCLUSIVE #198	SANNES	1,050 HOURS	9 MAY 73
	PROTON-PROTON INELASTIC #221	FRANZINI	950 HOURS	5 SEP 74
	PROTON-NUCLEON INELASTIC #317	COOL	1,400 HOURS	1 NOV 75
	PROTON-PROTON INELASTIC #321	LEE-FRANZINI	1,900 HOURS	20 SEP 76
	PARTICLE SEARCH #363	OLSEN	650 HOURS	9 APR 75
	PARTICLE PRODUCTION #418	SANNES	900 HOURS	22 OCT 75

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I. EXPERIMENTS THAT ARE IN PROGRESS (31):

			EXTENT OF RUN TO DATE	DATE OF RECENT RUN
ME -M1	TOTAL CROSS SECTION #104	COOL	1,400 HOURS	1 JAN 75
	INCLUSIVE SCATTERING #324	WEINSTEIN	900 HOURS	1 JAN 77
	HADRON JETS #236A	HOCKETT	1,200 HOURS	1 OCT 76
	POLARIZED SCATTERING #61	CHAMBERLAIN	700 HOURS	1 JUL 76
	FORM FACTOR #456	STORK	650 HOURS	1 JAN 77
-M2	INCLUSIVE NEUTRAL MESON #350	KENNEY	400 HOURS	1 OCT 76
-M4	K ZERO CHARGE RADIUS #226	TELEGDI	300 HOURS	1 JAN 77
	K ZERO CROSS SECTION #486	WINSTEIN	550 HOURS	1 JAN 77
-M6	INCLUSIVE SCATTERING #118A	FRIEDMAN	2,150 HOURS	1 JAN 77
-CHEM	NUCLEAR CHEMISTRY #81A	KAUFMAN	149 BOMBARDMENTS	1 JAN 77
NA -NEUTRINO	15-FOOT NEUTRINO/H2 #45A	PETERSON	162K PIX	1 APR 76
	15-FOOT ANTI-NEUTRINO/H2 #31A	DERRICK	64K PIX	1 APR 76
	15-FOOT ANTI-NEUTRINO/H2,NE #180	MURTHY	76K PIX	1 JUL 75
	15-FOOT NEUTRINO/H2 & NE #53A	SALTAY	64K PIX	1 JUL 76
	NEUTRINO #310	CLINE	1,200 HOURS	1 JAN 77
-MUON/HADRON	TEST MUON IRRADIATION #501	LANDE	2 TARGET EXPOSURES	1 JAN 77
-15-FT	15-FOOT PI- - P @ 100 #83A	KITAGAKI	11K PIX	1 APR 75
	15-FOOT PI- - D,NE @ 200 #89	FRETTER	4K PIX	1 JUL 75
	15-FOOT PI- - P @ 360 #364	HUSON	20K PIX	1 APR 76
-30-IN	30-INCH HYBRID #299	FLESS	431K PIX	1 JAN 77
	30-INCH PBAR - D @ 100 #345	EKSPONG	61K PIX	1 OCT 76
PA -PE	PARTICLE SEARCH #325	CRONIN	800 HOURS	1 JAN 77
	NUCLEAR FRAGMENTS #466	KAUFMAN	4 TARGET EXPOSURES	1 JAN 77
-PC	DI-LEPTON #288	LEDERMAN	2,900 HOURS	1 JAN 77
	DI-HADRON #494	GOOD	1,400 HOURS	1 JAN 77
-PW	PHOTON SEARCH #95A	COX	1,850 HOURS	1 JAN 77
	PROTON-PROTON ELASTIC #177A	CREAR	1,450 HOURS	1 JAN 77
ITA-C-0	PROTON-NUCLEON SCATTERING #198A	OLSEN	1,550 HOURS	1 JAN 77
	PROTON-PROTON POLARIZATION #313	NEAL	1,400 HOURS	1 JAN 77
	PROTON-NUCLEON SCATTERING #381	HALANUD	250 HOURS	1 JAN 77
	NUCLEAR FRAGMENTS #442	TURKOT	200 HOURS	1 JAN 77

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PAGE 3 EXPERIMENTAL PROGRAM SITUATION REPORT (CONT'D)

AREA-BEAM		SPOKESPERSON	EXTENT OF RUN TO DATE	DATE OF RECENT RUN
C. EXPERIMENTS THAT ARE IN TEST STAGE (5):				
MA -M2	MULTI-MUON #439	GARELICK	150 HOURS	1 JAN 77
-M6	HADRON DISSOCIATION #396	GOULIANOS	300 HOURS	1 OCT 76
	MULTIPARTICLE #110A	DZIERBA	50 HOURS	1 OCT 76
NA -NEUTRINO	NEUTRINO #482	BARISH	250 HOURS	1 JAN 77
-15-FT	PARTICLE SEARCH #379	WOJCICKI	450 HOURS	1 JAN 77
D. EXPERIMENTS BEING INSTALLED (5):			EXTENT OF APPROVAL	
MA -M2	LAMBDA MAGNETIC MOMENT #440	BUNCE	160 HOURS	
-M6	BACKWARD SCATTERING #290	BAKER	900 HOURS	
NA -MUON/HADRON	PARTICLE SEARCH #369	KIRK	600 HOURS	
-OTHER	MONOPOLE #502	BARTLETT	COSMIC RAY RUNNING	
EA -PE	PHOTOPRODUCTION #401	GORMLEY	300 HOURS	
E. EXPERIMENTS TO BE SET UP WITHIN A YEAR (20):				
MA -M1	PARTICLE SEARCH #354	COOL	PARASITIC RUNNING	
	HADRON DISSOCIATION #272	FERBEL	600 HOURS	
-M2	HADRON JETS #395	SELOVE	450 HOURS	
	LAMBDA POLARIZATION #441	PONDROM	150 HOURS	
	INCLUSIVE NEUTRON #404	JONES	PARASITIC RUNNING	
	MUON SEARCH #453	FRISCH	600 HOURS	
	PARTICLE SEARCH #411	VON GOELER	250 HOURS	
	PARTICLE SEARCH #413	VON GOELER	150 HOURS	
	PARTICLE SEARCH #468	STEINBERG	300 HOURS	
-M3	NEUTRON-NUCLEUS INELASTIC #438	JONES	200 HOURS	
-M4	INCLUSIVE K-SHORT #383	KOBRAK	500 HOURS	
-M6	ASSOCIATED PRODUCTION #99	DIEBOLD	500 HOURS	
	PARTICLE SEARCH #430	SANDWEISS	TEST RUNNING	
NA -NEUTRINO	NEUTRINO #253	MO	PARASITIC RUNNING	
-MUON/HADRON	DI-MUON #444	SMITH	400 HOURS	
	MUON #20JA	KERTH	500 HOURS	
	MUON #391	KERTH	250 HOURS	
EA -PE	PHOTOPRODUCTION #152B	HEUSCH	350 HOURS	
	PHOTOPRODUCTION #458	LEE	300 HOURS	
ITA-C-O	PROTON-HELIUM SCATTERING #289	MALAMUD	700 HOURS	

NOTES: THE ABILITY TO SET UP THESE EXPERIMENTS DURING THE NEXT YEAR IS CONTINGENT ON THE AVAILABILITY OF FUNDS.

DURING 1977 IT IS PLANNED FOR 30-INCH BUBBLE CHAMBER EXPOSURES TO TOTAL AT LEAST 500K PICTURES.

F. OTHER APPROVED EXPERIMENTS (27):			
MA -M2	LAMBDA-BAR PRODUCTION #495	HELLER	400 HOURS
-M6	INCLUSIVE SCATTERING #451	BARTON	400 HOURS
	FORM FACTOR #446	ECKLUND	500 HOURS
NA -NEUTRINO	15-FOOT NEUTRINO/D2 #151A	SNOW	100K PIX
	15-FOOT NEUTRINO/D2 #227	ENGELMANN	100K PIX
	15-FOOT ANTI-NEUTRINO/D2 #390	GARFINKEL	300K PIX
	NEUTRINO #356	BARISH	1,000 HOURS
	15-FOOT NEUTRINO/H2 & NE #380	BALTAY	200K PIX
	15-FOOT ANTI-NEUTRINO/H2&NE#308	STEVENSON	200K PIX
-15-FT	15-FOOT P - P @ NE @ 400 #291	MANN	25K PIX
-30-IN	30-INCH PI+ & P - P @ 300 #277	BARNES	300K PIX
	30-INCH PBAR - P @ 200 #392	NEALE	100K PIX
	30-INCH PI- - P @ 150 #393	PLESS	400K PIX
	30-INCH PI+ - HI 2 @ 300 #304	WALKER	200K PIX
	30-INCH P - P @ 500 #207	ENGELMANN	50K PIX
-OTHER	DETECTOR DEVELOPMENT #206	YOUH	200 HOURS
	EMULSION/PI- @ 200 #481	TAKAHASHI	EMULSION EXPOSURE
	EMULSION/PI- @ > OR = 200 #503	OGATA	EMULSION EXPOSURE
	EMULSION/PI- @ > OR = 200 #506	DAKE	EMULSION EXPOSURE
	EMULSION/PROTONS @ 400-500 #499	ITAI	EMULSION EXPOSURE
	EMULSION/PROTONS @ 500 #500	WOLTER	EMULSION EXPOSURE
EA -PE	PARTICLE SEARCH #400	PEOPLES	400 HOURS
	PHI PHOTOPRODUCTION #263	CHEN	600 HOURS
-PC	CHARGED HYPERON #497	LACH	400 HOURS
-PW	PION INCLUSIVE #250	PISODE	800 HOURS
	C-TEST #302	CESTER-BEGGE	400 HOURS
	MULTIGAMMA #192	GUIRAGOSSIAN	400 HOURS

PENDING PROPOSALS (40):			EXTENT OF REQUEST
MA -M1	DETECTOR DEVELOPMENT #427	YUAN	200 HOURS
	HIGH ENERGY CHANNELING #507	GIBSON	250 HOURS
	PARTICLE STUDY #515	ROSEN	1,000 HOURS
-M2	LAMBDA BETA DECAY #361	PONDROM	300 HOURS
	PARTICLE SEARCH #477	WEINSTEIN	500 HOURS
	PROTON POLARIZATION #505	YAMIN	100 HOURS
-M3	K STAR PRODUCTION #449	ABOLINS	600 HOURS
	NEUTRON-DEUTRON ELASTIC #479	ROBERTS	300 HOURS
-M6	HADRON DISSOCIATION #312	EDELSTEIN	1,000 HOURS
	PARTICLE SEARCH #409	CUTTS	150 HOURS
	MULTIPARTICLE #523	DZIERBA	
NA -NEUTRINO	NEUTRINO #355	BARISH	1,400 HOURS
	15-FOOT NEUTRINO/H2 & NE #389	TENNER	100K PIX
	15-FOOT NEUTRINO/H2 & NE #455	PETERSON	200K PIX
	NEUTRINO #496	CHEN	1,000 HOURS
	15-FOOT NEUTRINO/D2&HI 2 #521	VANDER VELDE	200K PIX
-MUON/HADRON	PION DISSOCIATION #318	ASCOLI	400 HOURS
	MUON #348	WILSON	800 HOURS
	DI-MUON #443	PILCHER	400 HOURS
	MUON #448	WILSON	300 HOURS
	TEST PARTICLE SEARCH #457	BRANDENBURG	100 HOURS
	MUON #487	SESSOMS	800 HOURS
-15-FT	15-FOOT P - P @ > OR = 300 #208	TAKIBAEV	75K PIX
-30-IN	30-INCH PBAR - P @ 100 #394	WHITMORE	2,000K PIX
	30-INCH HYBRID #488	PLESS	2,500K PIX
	30-INCH PIGP - PGNE @ 100 #504	GULJAMOV	30K PIX
	30-INCH PBAR - D @ 200 #511	FRIDMAN	150K PIX
EA -PE	PHOTOPRODUCTION #450	CALDWELL	600 HOURS
	PHOTOPRODUCTION #516	NASH	1,000 HOURS

PAGE 4 EXPERIMENTAL PROGRAM SITUATION REPORT (CONT'D)

AREA-BEAM		SPOKESPERSON	EXTENT OF REQUEST
-FC	CHARGED HYPERON #353	ECKLUND	600 HOURS
-PK	HADRON JETS #246	SELOVE	600 HOURS
	ELASTIC SCATTERING #301	GETTNER	1,000 HOURS
	DI-MUON #326	PIROUE	400 HOURS
	ELASTIC SCATTERING #347	WALKER	1,200 HOURS
	HADRON-NUCLEON SCATTERING #420	GUIRAGOSSIAN	1,100 HOURS
	ELECTROPRODUCTION #454	GUIRAGOSSIAN	1,500 HOURS
	ELECTRON PRODUCTION #518	TAYLOR	500 HOURS
	HADRON JETS #519	SCHLEIN	900 HOURS
ITA-C-0	PROTON-PROTON SCATTERING #500D	FRANZINI	1,000 HOURS
	PROTON POLARIZATION #522	OGREN	840 HOURS

MANUSCRIPTS AND NOTES PREPARED DURING JANUARY 1977

Copies of preprints with Fermilab publication numbers can be obtained from the Publications Office or Theoretical Physics Department, 3rd floor east, Central Laboratory. Copies of some articles listed are on the reference shelf in the Fermilab Library.

Experimental Physics

B. C. Barish et al. Experiment #21A	Dimuon and Trimuon Production in High Energy Neutrino and Antineutrino Interactions (Talk presented by O. Fackler at the Division of Particles and Fields Meeting, Brookhaven National Laboratory, Oct. 6-8, 1976)
LBL-CERN-Hawaii-Wisconsin Collaboration	Neutrino Interactions with $e^+\mu^-$ and Multiple K^o's (Presented at the XVIII International Conference on High Energy Physics, Tbilisi, USSR, July 15-21, 1976, by M. L. Stevenson)
G. Baroni et al. Experiment #116 and Experiment #233	Energy Dependence of Two Particle Rapidity Correlations in Proton-Nucleus Interactions
J. Erwin et al. Experiment #121A	Extraction of Average Multiplicity of High Energy Off-Mass-Shell $\pi\pi$ and $K\pi$ Scattering
R. Raja Experiment #311	Estimation of the Annihilation Component in $\bar{p}p$ Interactions (FERMILAB-Pub-76/99-EXP; submitted to Phys. Rev. Lett.)
R. Raja and D. Bogert Experiment #311	Maximum Likelihood Analysis of Ionization Data from SAMM (FERMILAB-Pub-77/13-EXP; submitted to Nucl. Instrum. Methods)
R. Raja and C. T. Murphy Experiment #311	A Semi-Automatic Bubble Matching Method for Bubble Chamber Tracks (FERMILAB-Pub-77/14-EXP; submitted to Nucl. Instrum. Methods)
A. J. S. Smith Experiment #331	Production of Dimuons by Pions and Protons at Fermilab (Presented at the International School of Subnuclear Physics, Ettore Majorana, Erice, Sicily, July, 1976)

N. A. Filatova et al. Experiment #456	Study of Drift Chamber System for a K-e Scattering Experiment at the Fermi National Accelerator Laboratory (FERMILAB-Pub-76/97-EXP; submitted to Nucl. Instrum. Methods)
H. I. Amols et al. No Fermilab Experiment #	Physical Characterization of Neutron Beams Produced by Protons and Deuterons of Various Energies Bombarding Beryllium and Lithium Targets of Several Thicknesses (FERMILAB-Pub-76/102-EXP; submitted to Medical Physics)

Theoretical Physics

S. Nussinov and D. P. Sidhu	Loosely Bound States Near the Charm Threshold... Charm Molecules (FERMILAB-Pub-76/70-THY; submitted to Phys. Rev.)
H. J. Lipkin	A Turning Point in the Development of Quantum Mechanics and the Early Years of the Mossbauer Effect (FERMILAB-Conf-76/87-THY; submitted to the Proceedings of the Conference at Erice, Italy, held in August, 1976)

Physics Notes

Z. Guzik Experiment #456	Amplifier-Discriminator for Drift Chambers (FN-301)

DATES TO REMEMBER

February 10-11, 1977	Proposal Presentation Meeting
March 4, 1977	Deadline for receipt of written materials to be considered at the Hadron Jet Experiments Workshop
March 4-5, 1977	Multiparticle Spectrometer Workshop
March 10-11, 1977	Spring meeting of the Fermilab Program Advisory Committee
March 25, 1977	Deadline for receipt of written materials to be considered at the Future Neutrino Experiments Workshop
March 31, 1977	Deadline for request for Fermilab Summer Housing. Please register as soon as possible. More detailed information will be published in February's fermilab report.
March 31-April 1, 1977	Hadron Jet Experiments Workshop
April 21-22, 1977	Future Neutrino Experiments Workshop
May 6, 1977	Deadline for receipt of all new proposals and other written materials to be considered at the Summer meeting of the Program Advisory Committee
May 13-14, 1977	Users Annual Meeting
May 19-20, 1977	Proposal Presentation Meeting
June 18-24, 1977	Summer meeting of the Fermilab Program Advisory Committee

Winter scene taken in Big Woods on site.
(Photograph by Anthony R. Donaldson)

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