RESEARCH ACTIVITIES DURING JANUARY 1977

James MacLachlan

The accelerator began the month running with a 10-second cycle providing a 2-second spill on a 200-GeV front porch and a 2-second spill at the 300-GeV flattop. This mode of operation was highly successful; typically 10^{13} protons were extracted at each energy. A total of 1.9×10^{18} protons were accelerated at 200/300 GeV before returning to 400 GeV on January 20. Main-Ring intensity was limited to about 1.6×10^{13} ppp during the 400-GeV running because the Neutrino Area was not ready for high-intensity fast spill. The Main Ring was run with a 1-second flattop with the intention of maintaining a steady set of running conditions for several weeks which would allow a reasonable repetition rate for the 15-ft bubble chamber. A total of 0.52×10^{18} protons were accelerated to 400 GeV. The accelerator provided beam for the experimental program for 441 hours, 64% of 696 hours scheduled for January. Thus, beam averaged 100 hours per week despite four separate failures in the 13.8 kV Main-Ring pulsed power feeder system. Operation was interrupted by feeder troubles two days starting January 2, a day each January 15 and 25, and two days starting January 31. An additional day was lost January 17 because of an electrical power reduction caused by unusual demand and power-company equipment failures resulting from severe weather followed by a Main-Ring magnet replacement; yet another day was lost January 28 because of a sequence of failures including a shorted pulsed bump magnet for the Main-Ring abort system, a shorted electrostatic extraction septum, and vacuum leaks in D-sector of the Main Ring. This

degree of unscheduled interruption substantially reduced the operating efficiency of the experiments, particularly during the 400-GeV running.

The 200/300 GeV running was scheduled principally for the benefit of the Proton Area where Particle Search #325 collected data on the energy dependence of the production of high-mass dimuons. Polarized Scattering #61 in the Meson Area was also a major beneficiary of the 300-GeV operation because it proved possible to tune the east branch of the M1 line to 300 GeV and achieve about 9×10^{6} protons for 10^{12} on target. The secondary flux of about 5×10^{7}/pulse achieved near the end of their 300-GeV running enabled them to get a good start on a measurement of polarization in elastic scattering near the dip at $t \approx 1.4\ (\mathrm{GeV}/c)^{2}$. The Neutrino Area was off during this period while the triplet train was being removed from the target tube, Neuhall was cleared of the contamination resulting from the collimator failure in late December, and the two-horn focusing system was installed for use with the 15-ft bubble chamber. The chamber was in standby much of the time during the horn installation, but shortly before the resumption of 400-GeV running, the main chamber vent valve became plugged. A partial emptying of the chamber was required. The Internal Target Area continued to have helium liquefier problems. On January 10, installation of a second liquefier system borrowed from the Switchyard Group began. When this installation was completed about January 20, a new era of abundance began; even the original liquefier system began to perform in exemplary fashion.

For the last third of the month the accelerator operated at 400 GeV. The Meson Area received 400-GeV beam early on Friday, January 21, and

was joined in less than 24 hours by the Proton and Neutrino Areas. The Meson Area and Proton Area continued with nearly unchanged programs. The Neutrino Area got off to a slow start with the newly installed horn train because the 15-ft bubble chamber could not be made operational. The first attempt at refilling after the relief valve plug was unsuccessful because the chamber level gauge read incorrectly, thus leading to an insufficient transfer. The warmup from the second attempt was underway at the end of the month. Neutrino #310 received some bare target calibration running just after the area resumed operation, but was unable to serve as a backup program for $\bar{\nu}$ running because their toroidal muon spectrometer magnet had severe water flow problems. The Internal Target Area ran as steadily as the intermittent accelerator operation would allow and produced adequate liquid helium to keep the spectrometer going full time for p-p Polarization #313.

FACILITY UTILIZATION SUMMARY -- JANUARY 1977

I. Summary of Accelerator Operations

			Hours	
A. Accelerator use for physics research				
Accelerator physics research			31.9	
High energy physics research			441.1	
Research during other use			(62.3)	
		Subtotal		473.0
B. Other activities				
Accelerator setup and tuning to experimental areas			5.0	
Program interruption { Scheduled	12.0		24.7	
Program interruption { Adhoc	12.7			
Unscheduled interruption			241.3	
		Subtotal		271.0
C. Unmanned time				-
		Total		744.0

II. Summaries of High Energy Physics Research Use

		# of Expts.	Hours	Results
A.	Counter experiments	13	2401.5	
B.	Bubble chamber experiments	1	2.0	tests
C.	Emulsion experiments	-	-	
D.	Special target experiments	2	-	1 exp.; 1 in progress
E.	Test experiments	-	-	
F.	Engineering studies and tests	2	22.2	N0, N5 beam tests
G.	Other beam use	-	-	
		18	2425.7	

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

	200/300 GeV	400 GeV	Total
A. Beam accelerated in Main Ring	1.93	0.52	2.45

B. Beam delivered to expt. areas	@200	@300	@400	
Meson Area	0.00	0.24	0.18	
Neutrino Area				
Slow Spill	0.00	0.00	0.01	
Fast Spill	0.00	0.00	0.05	
Proton Area	0.92	0.72	0.26	
Totals	0.92	0.96	0.50	2.38

BEAM UTILIZATION BY

	Beam	Run Dates	Hours
MESON AREA			
Polarized Scattering #61	M1E	1/1-1/31	329.5
Nuclear Chemistry #81A	M0		
K^o Charge Radius #226/#486	M4	1/4-1/31	345.7
Backward Scattering #290	M6W	1/27-1/31	2.0
Inclusive π^o #350	M2	1/27-1/31	200.2
Hadron Dissociation #396	M6W	1/4-1/27	253.5
NEUTRINO AREA			
15' $\bar{\nu}/H_2$ & Ne #180	N0	1/26	2.0
Neutrino #310	N0	1/22-1/23	22.1
Neutrino #482	N0	1/23-1/29	41.8
PROTON AREA			
p-p Elastic #177A	PW	1/1-1/31	269.3
Particle Search #325	P1	1/1-1/31	371.8
Nuclear Fragments #466	PE	1/21-1/31	
Di-Hadron #494	PC	1/1-1/31	333.0
INTERNAL TARGET AREA			
p-N Scattering #198A		1/4-1/9	96.7
p-p Polarization #313		1/18-1/20	98.5
Nuclear Fragments #442		1/21-1/31	37.4
Total for experiments			2403.5
Beam line tests and engineering studies			22.2
		Total	2425.7

EXPERIMENT -- JANUARY 1977

Activities

data: elastic scattering of protons at 300 GeV from polarized proton target

data: 1 target exposure in primary beam

data: K_S^o regeneration from a lead regenerator

tests: counter timing, Cerenkov counter & PWC system checkout

tests & data: inclusive π^o in triple Regge region

tests & data: target dissociation at ±100 GeV/c

test: checkout of the external muon identifier

calibration: straight-through muons for alignment and calibration

calibration and tests: muon calibration of calorimeters

data: p-p elastic scattering at very high transverse momentum at 200 & 400 GeV

data: production of high mass di-muon states at 200, 300, & 400 GeV

data: 1 target in progress

data: production of various high mass di-hadron combinations

data: p-p elastic and inelastic scattering

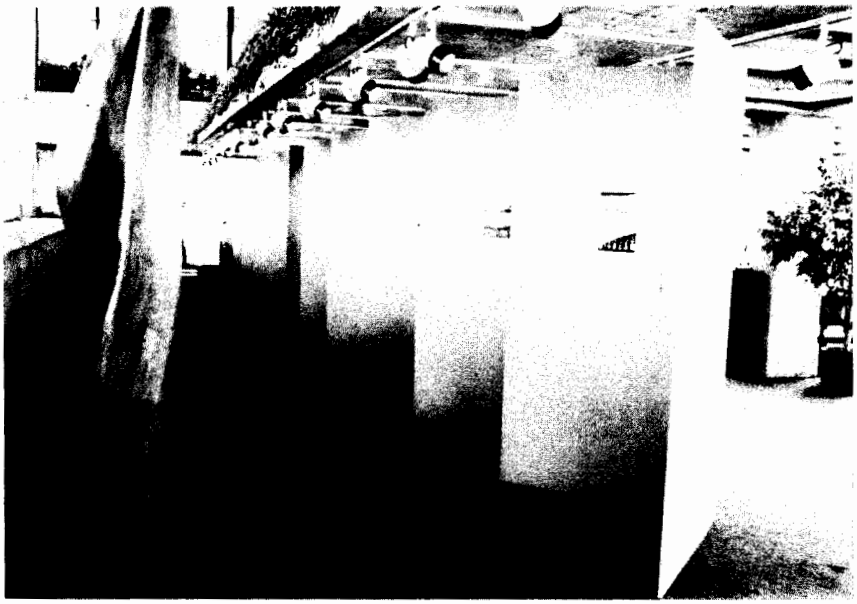
data: rescattering analysis of target protons mostly at t = 0.8

setup and tests

The annual President's meeting of URA was held at the Laboratory on February 4. This photograph was taken during their visit to the Accelerator Control Room.

PROPOSALS RECEIVED DURING JANUARY AND FEBRUARY 1977

No.	Title	Submitted By
523	A Proposal to Study Multiparticle Peripheral Hadron Reactions Yielding Forward π^0 and η^0 Mesons	A. Dzierba
524	Proposal to Study Proton-Nucleus Interactions in Emulsion Plates with Embedded Metal Powder Granules at Highest Available Energy (> 400 GeV)	R. Wilkes
525	Proposal to Study Pion-Nucleus Interactions in Emulsion Plates with Embedded Metal Powder Granules at Highest Available Energy > 300 GeV	R. Wilkes
526	Proposal for Anti-Proton Proton Studies in the Fermilab 15-Foot Hydrogen Bubble Chamber at 100 GeV	R. Lander
527	Proposal to Study Annihilation and Non-Annihilation Processes in $\bar{p}d$ Collisions in the 15-Foot Bubble Chamber	R. Lander
528	Proposal for a Detector Development Study of Acoustic Calorimetry at Fermilab Energies	A. Roberts
529	Reactions of Complex Nuclei with Pions in the Hundred GeV Range	A. Turkevich
530	Search for Charm Production in 400 GeV/c Proton Interactions	V. Fitch
531	A Proposal to Study Weak Decay Lifetimes of Neutrino Produced Particles in a Tagged Emulsion Spectrometer	N. Reay
532	A Critical Test of the Quark Confinement Model	C. Brown
533	Proposal to Measure the Rate of Formation of π-μ Atoms in $K_L^0 \rightarrow \pi\mu\nu$ Decay	S. Aronson
534	Hybrid Nuclear Emulsion - 15-Ft Bubble Chamber Experiment to Study Neutrino Produced Short Lived Particles	H. Lubatti
535	Proposal to Study the Interactions of K_L^0 Mesons in the Momentum Region Above 50 GeV/c Using a Pion Induced K_L^0 Beam	U. Nauenberg



The exhibit, "Selected Landscape Prints from One Hundred Views of Famous Places of Edo" by Hiroshige I (1797-1858) attracted hundreds of viewers during its three-month stay on the second-floor lounge. The prints, famous as the last extensive series by Hiroshige, depicted everyday life in Edo (Tokyo) and its suburbs. On loan from the Art Institute of Chicago, the prints added another dimension to the rotating exhibits frequently seen at Fermilab.

DATES TO REMEMBER

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	Future Colliding-Beam Experiments Workshop
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. For more detailed information, see page 16.
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