RESEARCH ACTIVITIES DURING FEBRUARY 1978

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The accelerator operated from February 3 to February 22 at 400 GeV with a 1.25-sec flattop. There were 333.2 hours of beam for high-energy physics out of the 452 hours scheduled during this period; 1.6×10^{18} protons were accelerated at an average intensity of 1.5×10^{13} per pulse and an average repetition rate of 11.9 seconds. For a week starting February 8 a 30-40 msec spill of about 3×10^{12} p/pulse was provided for further tests of the νe scattering experiment Neutrino #253. There has been at least a respite in the recent rash of failures of Main-Ring pulsed power transformers; the last two failures were February 3 and February 8.

In the middle of the month the Laboratory was notified by the Department of Energy of its intention to suspend operations to conserve power during the coal strike. Over a week of uncertainty followed during which the Laboratory appealed for a reconsideration. However, a notice of indefinite suspension was received February 22 during a two-day maintenance and development period. The Laboratory continued in a standby state for the rest of the month with activities limited to low energy accelerator studies and those maintenance and development projects which could be finished or interrupted on one-day notice so that high-energy physics running could resume quickly in the event of favorable action on the continuing appeal.

Among the accelerator activities during the suspension were the running in of the H^- injection into the Booster and the installation of three rebuilt Main-Ring pulse power transformers. In addition, two transformers

were moved from less critical positions to replace failed transformers so that the Main Ring's capability for < 9 sec cycling has been restored.

Muon #203A running in the N1 beam downstream of the cyclotron spectrometer was the top priority on the experimental program in February, and the experiment received an average of 10^{13} p/pulse. The μ/p ratio averaged $\gtrsim 2\times10^{-7}$. During some brief periods of higher intensity the experimenters discovered that they suffered some significant loss of drift-chamber efficiency in the hottest part of the beam. Partial blockage of the cooling circuits in the large-aperture quads in Enclosure 103 made it impossible to move the beam focus far enough upstream to spread the beam at the position of the critical drift chamber. Several remedies were tried. The installation of a 4Q120 quadrupole at the upstream end of the Muon Lab proved inadequate. Toward the end of the month it was found that it was possible to ramp the quads to the desired 1200 A, even though they are not laminated, by ramping only from 500 A, rather than from zero current. In this mode the experimenters achieved about a fourfold increase in beam size with little loss in yield and apparently were able to run with satisfactory efficiency up to something like 4×10^{6} μ/sec.

Multi-Muon #439 running in the Meson Area's M2 line was off during the first half of the month while repairs were made on two coils for their magnetized beam dump and further improvements were made in the M2 shielding. Additional steel shielding was added under the mezzanine during the power pause with the hope of permitting secondary intensity $\gtrsim 10^{11}$ p/pulse during day as well as night and weekend running. Inclusive K_S^0 #383 was the

top-priority experiment in the Meson Area after the first week of running because it became clear that the ~ 3×10^{12} p/pulse intensity required for finishing its program in a reasonable time was a problem for the switchyard. The work done in response to their increased priority made it possible to provide > 3×10^{12} p/pulse most of the time and allowed E-383 to complete the 125-GeV portion of their program before the power pause.

The good news in the Proton Area is the lack of specific information to report. Both Photoproduction #87A in Proton-East and Di-Lepton #288 in Proton-Central used most of the available beam for routine data-taking. Improvements in their trigger allowed E-87A to raise their primary beam rate from 3×10^{11} to 7×10^{11} p/pulse during the month. Running in the Internal Target Area was almost mostly routine, and p-N Scattering #522 which ran for the entire period made good progress in steady data-taking.

FACILITY UTILIZATION SUMMARY--FEBRUARY 1978

I. Summary of Accelerator Operations

			Hours	
A. Accelerator use for physics research				
Accelerator physics research			16.0	
High energy physics research			333.2	
Research during other use			-	
		Subtotal		349.2
B. Other activities				
Accelerator setup and tuning to experimental areas			5.8	
Program interruption	Scheduled	74.0	198.0	
	Ad hoc*	124.0		
Unscheduled interruption			119.0	
		Subtotal		322.9
C. Unmanned time				-
				672.0

II. Summaries of High Energy Physics Research Use

	# of Expts.	Hours	Results
A. Counter experiments	14	2328.0	-
B. Bubble chamber experiments	-	-	-
C. Emulsion experiments	-	-	-
D. Special target experiments	1	-	1 target exposed
E. Test experiments	1	79.9	e^- calorimeter calib.
F. Engineering studies and tests	(1)	184.6	N3 yield studies
G. Other beam use			
	16	2592.5	

III. Number of Protons Accelerated and Delivered @ 400 GeV ($\times 10^{18}$)

A. Beam accelerated in Main Ring				1.63
B. Beam delivered to experimental areas				
Meson Area			0.19	
Neutrino Area				
	Slow Spill	1.04		
	Fast Spill	0.14		
Proton Area			0.10	1.47

*Suspension of program for power conservation

BEAM UTILIZATION BY

	Beam	Hours
MESON AREA		
Multiparticle #110 A	M6W	258.6
Hadron Dissociation #272	M1E	231.8
Inclusive K_S^0 #383	M4	208.5
Multimuon #439	M2	161.8
NEUTRINO AREA		
Muon #203A/391	N1	247.9
Neutrino #253	N0	99.1
Neutrino #310	N0	1.5
Neutrino #356 Calib.	N5	69.2
Muon #448 Tests	N1	273.6
Nuclear Fragments #466	N0	-
PROTON AREA		
Photoproduction #87A	P1	262.4
Di-Lepton #288	PC	275.0
P #519 Tests	PW	79.9
INTERNAL TARGET AREA		
p-N Scattering #552	C0	292.6
Hours for Experiments		2407.9
Engineering tests (N3 yield meas.)		184.6
TOTAL HOURS FOR HIGH ENERGY PHYSICS		2592.5

EXPERIMENT -- FEBRUARY 1978

Activities

tuneup & data: -100 and -175 GeV on LH_2 target looking at 12 exclusive channel triggers with emphasis on the $\pi\pi n$ channel

tuneup: 50 and 100 GeV e^- calibration of liquid argon calorimeter, drift-chamber tests, counter timing, trigger studies, etc.

data: 125 GeV/c K^- on an LH_2 target to look for $K^- + p \rightarrow K_S^o + X$ in a pair spectrometer

data: $\sim 10^{11}$ p/pulse into a magnetized beam dump using di-μ and multi-μ triggers

data: deep inelastic μ scattering, multi-μ production, etc. with 225 GeV μ^+ into a distributed target calorimeter

test: test of μ background at 400-GeV proton energy using a 30 msec spill

data: single-μ and multi-μ data with an iron-scintillator calorimeter and toroidal μ spectrometer

tests: calibration of the target calorimeter with hadrons and muons

setup: trigger tests, etc.

data: three-week bombardment of an uranium foil by the N0 primary proton beam

data: photoproduction of high mass hadron states using the broadband photon beam

data: high mass di-μ data in a high rate configuration

test: electron beam calibration of multi-cell calorimeter

data: pp scattering at beam energies of 20-400 GeV at t = -1 to -3 using an H_2 jet target and proton recoil spectrometer