

RESEARCH ACTIVITIES DURING APRIL 1977

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In April, the accelerator provided 400-GeV beam for high-energy physics research for 305 hours, or 77% of the 396 hours scheduled. A total of  $1.28 \times 10^{18}$  protons were accelerated. From April 1 to April 13, the Main Ring was ramped with a 2-second flattop with a resultant accelerator cycle of about 15 seconds. From April 13 until April 18, the flattop length was 1 second and the accelerator cycle was about 11 seconds. On April 19, a 23-hour period of accelerator studies at 450 GeV was started. Beam was accelerated for about 13 hours of this period. After careful orbit and tune measurements, both slow and 2-msec spills were set up on a 1/2-second flattop, and nearly 8 hours of beam at more than  $5 \times 10^{12}$  were delivered to the Neutrino Area. The accelerator was shut down the morning of April 20 for the start of a 3-week facility maintenance and development period. The total number of protons accelerated during the month was atypically low, not only because of the shutdown and the long cycle time, but also because extraction losses limited the permissible Main-Ring intensity. The losses that existed at the beginning of the month were slowly reduced, so that average intensity increased from about  $1.3 \times 10^{13}$  protons/pulse up to  $1.6 \times 10^{13}$  protons/pulse after midmonth. No single solution to the problem was found, although the electrostatic septa remain under suspicion and were replaced during the shutdown.

The Accelerator Division started an extensive program of improvements which includes preparation for  $H^-$ -ion injection into the Booster by

moving the present preaccelerator column back over a foot and putting new magnets in the 200-MeV line, changing the Booster control system and modifying several Booster rf cavities to provide higher accelerating voltage, replacing bad 13.8-kV Main-Ring feeders and paralleling of some of the most heavily loaded cables, the start of a 200-MeV cooling ring, and a penetration to the Booster for the "backward" injection line into the Main Ring. The shutdown period has also provided for extensive preventative maintenance of electrical and mechanical systems in both the accelerator and experimental areas. High-energy physics is scheduled to resume Wednesday, May 11.

For the first two weeks in April, the priority experiment was Particle Search #379 in the Neutrino Area. A 400-GeV diffracted proton beam was brought into Lab E by the N5 beam line where the experimenters looked at high-mass states produced in a target calorimeter with a downstream toroidal magnet spectrometer for muons. During the third week of April, they moved the toroids off center to look at the most forward muon production. Neutrino #310 ran with a 2-msec spill and the sign-selected bare target train set for antineutrinos. During the third week of running, this experiment was given the highest priority and the accelerator flattop was cut to 1 second to allow improved repetition rate. The experiment received about  $8 \times 10^{17}$  protons on target at an average intensity of about  $10^{13}$  protons/pulse; they were recording about 1 trigger per 5 to 6 beam pulses. Efforts to increase this rate by raising the accelerator intensity were defeated by the extraction losses mentioned above. During the 450-GeV tests on April 19-20, both Particle Search #379 and Neutrino #310 received beam for about  $7\frac{1}{2}$  hours.

Both experiments recorded some data, although the intensity in the fast spill for Neutrino #310 averaged only a little over  $5 \times 10^{12}$  because there was not adequate time to tune up extraction.

Photoproduction #401 began chamber tests, rate studies, beam tuning, etc. at the beginning of the month in Proton East. In a few days before the shutdown, they took some test and calibration data with all their apparatus working at some level and expect to return after the shutdown in a data-taking condition. Di-Lepton #288 started testing their extensively reworked di-muon setup about April 7, and they also closely approached the data-taking stage by the end of the running period. p-p Elastic #177A ended a run that had extended almost continuously from October 1976. The experiment is now complete; the last two months of the run were devoted to increasing statistics in their highest t-range, -10 to -15 (GeV/c)<sup>2</sup>.

In the Meson Area, Form Factor #456 completed its data taking in the M1 line on April 13, bringing its total data to just over the 4000 high-quality  $K^- e$  scatters at 250 GeV that had been set as a goal. Some of the same equipment and experimenters are involved in High Energy Channeling #507 which set up in the E456 location and took preliminary data for the last week of the April running. n-N Inelastic #438 was also completed in the M3 line and that line has been put in standby status. The experiment measured inelastic cross sections on a variety of nuclear targets. The pion backward-scattering experiment in M6W, E290, reached the data-taking stage during the month after several weeks of setup and PWC tests. The magnetized-iron beam-dump experiment in M2, Multi-Muon #439, worked on their trigger

rates and shielding to increase their intensity capability. The experiment took data easily at approximately  $3 \times 10^9$  diffracted protons/pulse. During a high-intensity test of the M2 line, the targeting angle of the primary proton beam was reduced as many as  $1.5 \times 10^{10}$  protons/pulse were transported down the M2 line without problems for the beam line or surrounding areas. The M4 line was off for the entire month for its conversion to a charged beam line for the benefit of Inclusive K-Short #383.

p-N Scattering #198A was the sole user at the Internal Target Area using the superconducting recoil spectrometer. The experiment completed its running with three weeks of solid data taking.