

RESEARCH ACTIVITIES DURING MARCH 1977

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The accelerator was run at 400 GeV for the entire month of March. Beam was delivered for high-energy physics for 447 hours or 72% of the scheduled 618 hours. An average of 100 hours of beam per week was available, but accelerator performance was not steady. Several Main-Ring magnet failures made major contributions to unscheduled interruption. A total of four bending magnets failed in service, on three separate occasions. The failure mode was different each time; two magnets failed when an electrical transient caused power supplies to misbehave, a beam-induced vacuum leak was probably caused by power-supply regulations problems, and one of the oldest magnets apparently expired with a turn-to-turn short.

For the first half of the month, the accelerator was easily delivering a total of approximately 1.8×10^{13} p/pulse, providing both a slow spill required by the program and approximately 1.2×10^{13} p/pulse 20- μ sec fast spill for the focusing horn, with an 11-sec cycle period. An eight-hour test was made of extracting two 10- μ sec pulses separated by one second to provide for double pulsing of the 15-ft bubble chamber. Two cleanly extracted pulses were provided, but it did not prove possible to obtain useful slow spill between the pulses during this initial test. Because of difficulties in the Neutrino Area, on March 15 the flattop length was changed to 2 seconds with about a 15-sec cycle to improve the duty factor for the counter program. For the next week, however, only approximately 10^{13} p/pulse were required. When the high-intensity program resumed March 24 with a request for

2-msec spill, the accelerator could not deliver because of high extraction losses. Although a ragged transition period must be expected when such a pronounced change is made in accelerator operating mode, problems persisted longer than usual. Despite intensive efforts by accelerator operators and system specialists, the accelerator ended the month averaging about 1.3×10^{13} protons/pulse.

The Neutrino Area started the month with the 15-ft chamber in steady production (5-6K pictures/day) for 15 ft ν/H_2 &Ne #180. This run ended March 3 with a total of 93K pictures taken since February 3. A run for 15 ft ν/H_2 & Ne #53A started with the test of double pulsing of the chamber on March 3. Although the pictures taken during the second pulse on this test were somewhat obscured by unrecompressed bubbles from the first pulse, measurements of fiducials showed the pictures to be generally satisfactory. A later test run by the bubble chamber produced second-pulse pictures that were indistinguishable from those taken on the first pulse. A separation as short as 700 msec between expansions appears possible in the Ne/ H_2 mixture. E-53A ran until the first focusing horn failed March 15, accumulating 47K pictures. The failure appears to have been caused by fatigue in a weld on the inner conductor of the upstream horn. On March 16, it was discovered that the 15-ft chamber piston shaft seals were not working correctly. Further inspection revealed that serious galling of the shaft had torn the seals. Major reconditioning is required for the metal piston shaft and the chamber is being prepared to run in May with the plastic piston. During the time the sign-selected bare target was being readied to replace the horn

train, Particle Search #379 ran in the N5 line. The train replacement was complete by March 24, and Neutrino #310 was completing its startup tests by the end of the month with the polarity set for antineutrinos.

March saw the completion of K^0 -Charge Radius #226 in the M4 line, which brought to a close a long-standing program of K^0 physics. The M4 beam is now being converted for charged particles. The neutral-hyperon experimenters began and completed an 0(1%) measurement of the magnetic moment of the Λ in the M2 beam line by exploiting their previous observation of substantial polarization in Λ production and the spin precession produced by their sweeping magnet. The K form-factor experiment, E-456, ran steadily all month in M1 as the area's top priority. The change to 2-sec flattop has brought this work nearly to its goal of 4000 clean K^-e scatters. The multiparticle spectrometer in M6W had some very fruitful setup and test time. The Multiparticle #110A experimenters commissioned a number of new proportional chambers employing a current division measurement to give a two-dimensional readout, including a cylindrical chamber around the target with wires along the beam direction.

The program in the Proton Area was very simple; p-p Elastic Scattering #177A ran all month at an intermediate-high setting of their spectrometer for $|t|$ in the range of 10 to 15 $(\text{GeV}/c)^2$. In Proton-Central and Proton-East, installation was underway for Di-Lepton #288 and Photoproduction #401 respectively. P-East saw a few hours of test beam at the end of the month.

The Internal-Target Area started with p-N Scattering #198A using the superconducting spectrometer. p-N Scattering #381 started taking data a

week later and continued throughout the month when adequate liquid helium was being produced. p-p Polarization #313 took over March 10, but was seriously slowed down during most of their run because the accelerator intensity was far below their expectations. They also suffered a setback when a conical Mylar baffle shielding the buffer volume was damaged during a pumpdown after a diffusion-pump repair. Experiment #381 was completed on March 30.