RESEARCH ACTIVITIES DURING SEPTEMBER 1976

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The September operating schedule for high energy physics research was once again greatly curtailed by the tight operating budget which limited the scheduled beam time to less than 400 hours during the month. For the first 14 days, the experimental research program and accelerator operating mode were essentially a continuation of August's running, using a two-second slow-extracted beam along with "pinged" beam for the 30-inch bubble chamber during part of the time and, in addition, some periods when a fast slow-spill pulse of one-millisecond duration was delivered at the end of the flattop for tests in the Neutrino Area. Throughout this two-week period, the accelerator continued the spotty performance (62% reliability) that had characterized the August operating record, with linac, booster, and main-ring component and vacuum failures all contributing to the major periods of unscheduled down time. A significant milestone was achieved on September 7, however, when the first patient received treatment in the neutron beam of the Cancer Therapy Facility.

At mid-month there was a one-day period of accelerator studies and repairs when the operating cycle was changed to a 200-GeV flattop with a 100-GeV front porch, both of two-seconds duration. Slow spill at 100 GeV was delivered to the Proton Laboratory only, while 200-GeV slow-spilled beam was sent to all three external experimental areas. This mode of running occurred during four days at the end of the running period, proceeding smoothly and with essentially no downtime. Although it was short, the

period provided an opportunity to complete several commitments to user groups for data-taking with lower energy incident beam and at the same time allowed continued facility operation at reduced power demand levels, thereby conserving both energy and financial resources.

Early on September 20 the accelerator and experimental areas were shut down for the remainder of the month in order to conserve funds and meet the Transition Quarter operating budget. During the first week of the shutdown, major cleaning and maintenance work was performed on almost all of the 345 and 13.8 kV equipment in the main site master substation, including a long delayed repainting of poles and support structures. Basic power needs for the site including the Cancer Therapy Facility were provided at reduced levels from the backup system except on September 25, when a 12-hour sitewide outage was necessary for switchgear maintenance. Maintenance and development work proceeded in the accelerator and experimental areas at a reduced pace, consistent with the budgetary limitations. Noteworthy accomplishments included replacement and testing of the one-turn fast extraction kicker in the Main Ring, the upgrading of the M1 beam line to 400 GeV and preliminary work on conversion of the M4 line to a charged particle beam capability in the Meson Area, the installation and debugging of a new interlock system and beam monitoring and instrumentation in the bypass hadron beam lines in the Neutrino Area and the installation of a new helium transfer line for cryogenic magnets in the P-West Area. By the end of the month startup of the injector was well underway in preparation for what is hoped will be an extended period of running for high

energy physics, with no planned major interruptions for several months.

The primary high-energy physics emphasis, with 400-GeV beam, continued to be on the Muon #319 experiment in the Neutrino Area. The group completed data-taking work in the N1 muon beam line by mid-September and then used available 200-GeV beam time for calibration studies and tests. It had also been hoped to complete the commitment of 100K pictures in the deuterium-filled 30-inch bubble chamber for 30" $\bar{p}$-d @ 100 GeV #345 but the effort was thwarted on September 7 when a piston rod in the chamber failed about 40K pictures short of the goal. Repairs could not be completed before the start of the facility shutdown. Other Neutrino-Area accomplishments included some startup and testing work by Neutrino #310 in Lab C, using muons from the slow spill that leaked through the earth shield, and, later, neutrinos produced by a one-millisecond fast spill pulse on the target train. Particle Search #379 used slow spill in the bypass beam to do tests and take preliminary data with their Lab E apparatus after the bubble-chamber failure occurred. Both groups made use of the beam at both 400 and at 200 GeV. The Neutrino Department also carried out several "beam plug" tests for a future antineutrino run.

The same three main experiments continued to work in the Proton Area during September as had been the case in August. Photon Total Cross Section #25A took data at the Tagged Photon Laboratory in the Proton-East line, working on their run plan with a 135-GeV incident electron beam and subsequently collecting data with the electron beam tuned at 40 GeV when 200-GeV beam was available from the accelerator. Di-Hadron #494 used

the 400- and later 200-GeV incident proton beam in Proton-Center for their data-taking activities on di-hadron and di-electron production in high mass regions. In the Proton-West Area, Particle Production #284 completed their experiment except for some short SEM calibration runs. Data were collected over a broad range of momenta, first with 400-GeV protons incident on their liquid hydrogen target and later using both 100- and 200-GeV incident beam in order to investigate the dependence of energy on their results. Nuclear Fragments #466 also parasitically exposed one foil to the pre-target beam in Proton-East during the month.

The Meson Area program was carried out by six primary user groups. Inclusive Scattering #324 finished collecting data at ±75 and ±30 GeV in the M1 West beam, making good use of the 200-GeV run to get data for the low energy point. In the M2 and M3 beams, Particle Search #472 and Neutron Elastic Scattering #248 were both in a steady data-taking mode during 400-GeV operation while only the particle search experiment continued to run at 200 GeV. K^o Regeneration #'s 226/486 continued to perform tuneup, equipment testing and preliminary data collection work in the M4 beam when 400-GeV protons were available on target but only did rough tuning with the 200-GeV incident beam. Hadron Jets #260, using the multiparticle spectrometer in the M6 West line, completed the data-taking phase of their experiment before mid-September and then spent the rest of the available running time during both 400- and 200-GeV operation doing calibration checks and tests related to planned future running for a future Multiparticle #110A experiment. During the period that 400-GeV beam was being delivered on the Meson

Area target train, Hadron Dissociation #396 also used the M6 beam line parasitically to take data for their experiment. The M5 test beam was also used by several experimenters under the usual informal arrangements.

Internal Target Area research activities were centered around three major user groups. p-p Inelastic #321 was able to run whenever the accelerator was operational and used their upstream 3-mil warm gas jet to collect data at various circulating beam energies between 8 and 400 GeV. By the start of the facility shutdown, the group's data-taking work for this experiment except for possible future 500-GeV running, had been completed. p-N Scattering #198A was the prime user of the spectrometer facility during the period of 400-GeV accelerator operation, but the accumulated number of hours of data taking was relatively small because of non-concurrent failures of the accelerator and the helium liquifier for the spectrometer magnets. p-p Polarization #313 had control of the spectrometer during the four-day 100/200 GeV running interval and was able to take data during more than half of that time.