AGS STUDIES REPORT NUMBER 90

Date 7/21/77 Time 0830-1600 Experimenters A. Carroll, J.W. Glenn, A. Soukas

Subject 5 GeV/c Slow Spill for Experiment #703

OBSERVATIONS AND CONCLUSION

Objectives

To achieve a 5 GeV/c slow spill of $\sim 5 \times 10^8$ protons/second through B line SEB transport and B1 secondary beam to Experiment 703.

Technique

Small angle proton scattering from internal targets.

AGS Conditions

1.6 second cycle, 1.0 second flat top, SEB sextupoles off. H-20 septum retracted. F-5 and F-10 extraction magnets and SEB beam transport of 5 GeV/c values. C12 SEC calibration 1 count/10^9 protons and B target SEC 1 count/10^8 protons. Circulating beam intensity $\sim 2.5 \times 10^{12}$.

Results

Using the F-5 flag we extracted $\sim 4 \times 10^{10}$ protons ($\sim$ 2% extraction) into the SEB channel. The boron carbide target at F-7 was also tried but the extraction efficiency was down by a factor of 2 or 3, and there was not noticeable improvement in image quality at the C-10 flag.

When we attempted to extend the flat top beyond 1.0 seconds, it was found that a timing multivibrator did not allow the flat top to extend beyond 1.3 seconds.

With all the quads in the SEB transport off except Q6, Q7-8, and Q9, $\sim 1 \times 10^9$ (2%) of the extracted beam was transported from C-10 flag to the B target as calculated. The time taken to tune the beam from the AGS to the B target was longer than in the previous study of June 23 and pointed out the need for more sensitive flags for the 5 GeV/c running.

With some tuning $\sim$ 50% of the beam at the B target was transported to the 703 experiment as measured on an ion chamber, and monitor telescopes. Most of the beam loss was at a 1.5" diameter circular collimator just upstream of the liquid hydrogen target because the beam was found to be low with respect to the normal B1 transport by $\sim$.75". The beam losses on the collimator caused radiation levels of $\sim$ 20 mr/hour in the experimental trailer.

The beam spot upstream of the collimator as measured by a Polaroid film was 2" wide by 1" high. Further tuning of the SEB and B1 line will be required. The beam momentum as determined from the B1 line dipoles was 5% higher than the 5.0 GeV/c given by the AGS gauss clock.

Obtaining a sufficiently smooth spill from the AGS is the remaining major difficulty. For short periods of time, spills of $\sim$ 600 m sec were achieved, but this spill was not stable and had $\sim$ 100% modulation at 60 cycles and at other multiples of 60 cycles. Accidental rates between the two spectrometers of Experiment 703 were $\sim$ 50 times higher than compared to running with similar beam intensities during normal SEB running. Subsequent to the studies it was found that a capacitor had been put across the servo input, which severely limited its high frequency response. Also some 60 cycle noise was found on the output of the spill counter.

Improvements Required Before Next Study Period

1. Measure gain of bump servo as function of frequency.
2. Provide more sensitive flag and/or SWIC at B target so that beam size and position can be determined.
3. Provide better shielding near collimators in B line.
4. Provide $\geq$ 2 second flat top.

Conclusion

The extraction and beam transport from the AGS to Experiment 703 now provides sufficient intensity and a nearly good enough beam spot. Further work is required