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Low energy fast extracted beam in U-line

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Date 1/19/77 Time 0001-0400 Experimenters Gill, Keane, Raka, Soukas, HH Williams

Subject Low Energy Fast Extracted Beam in U-line

OBSERVATIONS AND CONCLUSION

Objective

Obtain a 1.5 GeV/c FEB in U-line up to U-186 beam stop at maximum protons/cycle and rep. rate.

AGS and Extraction Conditions

Initially 3 GeV/c (Gauss Clock = 5700, t extract = 137 ms), no flat top, intensity from 1.5 to 4.7 $\times 10^{12}$ ppp, rep. rate = 1 second (limited pending future tests of Thermal limit for inflector and injection kicker power supplies). Power supplies for C15 kicker and E10 septum scaled by $\sqrt{p/p_{HEP}} \times I_{HEP}$ to 2596 A (9.7 kV) and 973 A respectively. E10 and H10 backleg bumps, H10 ejector magnet, and external supplies scaled by $(p/p_{HEP}) \times I_{HEP}$ to 105 A, 2105 A and .1053 $\times$ HEP values. For 1.5 GeV/c we scaled down as indicated above. The U5 vertical and U12 horizontal collimators were full open.

Results

At 3 GeV/c we made a rough optimization of bumps, septum and kicker magnets, and external UD1-3 (4 1/4° bend) supplies. The observed extraction efficiency using the U15 current tranformer was 61% at CBM $\approx 1.5 \times 10^{12}$ ppp and 55% at 4.7×10^{12} ppp. The later intensity was the maximum circulating beam that could be obtained because the AGS was set up for low intensity operation. The observed spot size on the Al_2O_3 flag at E10 was .7" horz. $\times$ .9" vert., at H10 the spot was $\gtrsim$ .9" horz. $\times$ .7" vertical (at 4.7×10^{12}). At the U15 flag we observed $\gtrsim$ 3.5" horizontal $\times$ .6" vert. Beam was observed at the U165 flag but the spot was not well defined, possibly due to beam scattering from the vacuum pipe in the N3Q36 quad UQ1 which is downstream of the U15 flag. We also observed the internal beam structure using a signal from a ring pick-up electrode and the external beam structure using the U165 external current transformer. We noted an internal loss of $\sim$ 20% during the 3μs prior to extraction and only 9 bunches of various amplitudes externally.

We then attempted extraction at 1.5 GeV/c (Gauss Clock = 2900, t extract = 106 ms). A diffuse beam spot was observed at the E10 and H10 magnets but no external beam was detected.

Conclusions and Recommendations

1. The ringing on the current waveform signal for the C15 kicker should, if possible, be illuminated and observable in the control room.

2. The E15 kicker waveform should be made identical to C15.

3. The problem with the E10 bump supply not firing due to back emf on the backleg windings should be studied.

4. Another run should be scheduled to attempt multi-turn (2 or 3 turn) extraction to overcome the problem of large horizontal size.