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1.5 GeV/c MTX FEB

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AGS STUDIES REPORT NUMBER 92

Date 8/16 → 8/17 Time 0800→0400 Experimenters Blumberg, Egelman, Gill, LoSecco, Soukas, Sulak, Weng, Witkover

Subject 1.5 GeV/c MTX FEB

OBSERVATIONS AND CONCLUSION

Objectives: Measure horizontal and vertical emittance at U168; transport beam through the 8^{o} bend.

AGS Conditions: All in-ring components were the same as July 26 test.

Improvements: A window was inserted at U170 to improve the vacuum to better than 1 micron ($\sim$ 60 microns in normal transport). Two solid thin biases and one ground plane were installed to sweep the residual gas ions away from the single wire SEM.

Results: (1) Extraction efficiency was $\sim$ 60% as in previous (7/26) study. Extracted beam was $\sim 4.5 \times 10^{12}$ ppp at U15. During the emittance measurement the intensity at U167 was $\sim 3 \times 10^{12}$ ppp with efficiency $\sim$ 50%.

(2) Beam profiles were obtained with the single wire SEM at U168 with Q4 and Q5 off and Q3 varied to produce a minimum. The signal was clean and the waists in both planes were clearly defined. The plot of the beam width with respect to Q3 strength is a well shaped parabola. The preliminary fit to the data gives the phase space parameters at Q3 and H13 as shown in the following table.

		ε (cm-mrad)	α	β (cm/mrad)	γ (mrad/cm)
HW = FWHM (93.8% contour)	Q3-H	1.35	-3.22	13.29	0.854
	Q3-V	1.69	-4.90	13.17	1.90
	H13-V	1.35	-2.22	1.27	4.67
	H13-V	1.69	2.49	1.73	4.164
FW at 0.1 of maximum (90% contour)	Q3-H	1.093	-3.46	13.57	0.957
	Q3-V	0.925	-5.33	14.50	2.03
	H13-H	1.093	-1.93	1.079	4.365
	H13-V	0.925	2.56	1.7	4.44
Calculated (95% contour)	H13-H	0.726	-2.55	3.25	2.31
	H13-V	1.063	0.987	0.37	5.3

In general the measured emittances and orientations at 90% contour agrees very well with the calculation, however the emittances at 93.8% contour are much bigger than predicted. This is partly due to the losses upstream of U168 and the incomplete scraping by the J19 target in the ring. The difference between them also indicates that the shape of the profile is not perfectly Gaussian. Using the measured phase space parameters at 90% contour, we found that the loss pattern indicated by the radiation monitor is consistent with the measurement. The fact that it took one and half hours to complete the measurement in one dimension suggests that the measured emittances could be the upper limit.

(3) The newly installed small power supplies in the U-line made the transport possible. The CRT and TV display in the A and B house were very useful for tuning. We consistently transport 90% of the external beam to 8^{o} and 63% through 8^{o}. The loss before 8^{o} was concentrated at UQ4, 5 and 6. The loss in 8^{o} caused the level of liquid helium to drop. The beam was quickly lost after CQ1, 30 ft downstream of 8^{o}. The home built quad, CQ2, performed well and was very effective in focusing as observed on the flag at U618.

Recommendations:

(A) The spill transformer should be restored to record the relationship between the spill and horizontal emittance.

(B) J19 target should be calibrated and used to scrap 20% of the particles before extraction.

(C) Replace the flag at U165 by a bigger one, preferably with effective size 4" X 4", to enable us to see the size and shape of the beam there during transport.

(D) Measurement of the beam intensity by foil exposure in order to calibrate the CT's.

(E) Optimize the vertical position of the beam at extraction by the vertical dipoles at F20 and I10.

(F) Fix LM15 and U500. Replace flags at U667, 772, 797.