AGS Complex Machine Studies

(AGS Studies Report Number 345)

Calibration of Target SEC's Based on Single Beam Transports

Study Period: May 15, 1996
Participants : Kevin Brown, Woody Glenn
Reported By : Kevin Brown
Machine/Beam : AGS, 25.3 GeV/c protons
Tools : GPM and seb Loss monitors
Aim : Determine Transport Efficiencies and Calibrate Target SEC's

1 Introduction

In order to check the calibration of the target SEC's, unsplit beam is transported down individual beam lines as cleanly as possible and documented. While the beam is down individual lines some scans are made to check various apertures. The data set includes all SEB loss monitors and the intensity monitors. The extracted beam spiral pitch was reduced to give an extracted beam size of about 1/2 the normal beam size.

2 Results

Various Observations.

1. Flags which were Not working:
   DF146, DF215, CF039, AF124, BF328,
2. C10 SEC reads a 2.3 TP offset with no beam.
3. AB1 Skew operates near the inner limit (???).
4. DSEC increases when moved off target by 19 %.
5. Vertical incompatability in AD/BC setups at beginning of Switchyard. Minimum losses in Entrance of DD4 corresponded to a different value

in CP020 than a value needed to minimize losses of B/C beam into AD2. Perhaps AP1 and CP1 are not at correct currents.

6. Horizontal Aperture is very 'tight' entering DD4&5.
7. Vertical Aperture is very 'tight' in BD4 CD4 area with beam to C-only.
8. Losses appeared in BB3/AP1 area with beam to C/B only which were much greater than for beam to A/D only, and were not reducable.
9. Beam was not on normal spot for beam to C-only, but found no noticable change in SEC response when beam was moved around using steering (table controls were not working). Beam was move about 1/4 inch both horizontal and vertical.
10. When move beam over to B-only a loss appeared on DD4&5, which could be reduced with horizontal steering. Explainable from effect of change in direction of field in BB3, but a concern in that it suggests a limited aperture.
11. Horizontal Aperture very 'tight' at entrance of BD5 (50 cnts range on BD4).
12. Known/expected losses at D240, A240, CD4, CQ5-8, DQ10.

Tables 1 and 2 summarize the SEC data and results. T/I is a number calculated by CLYDE which represents the ratio of the measured target intensity to the AGS CBM late intensity. 1st SEC and 2nd SEC reflect the fact that in B and C lines there are two SEC's, one at each target station.

Table 1: Summary of Transport Data for Each Beam Line

Beam Line	*LCBM*	*XINEFF*	*T/I*	*LLS*	*1st SEC*	*2nd SEC*
A ONLY	4.33	2.8	102.3	3.6	4.37	NA
B/B5 ONLY	6.17	2.3	98.8	5.4	6.01	5.6
C/C3 ONLY	5.50	2.6	88.8	3.6	4.87	5.35
D ONLY	6.50	1.9	82.4	3.2	5.31	NA

Table 2: SEC Calibrations for Each Beam Line

Beam Line	*LCBM*	*Corrected SEC*	*1st Ratio*	*2nd Ratio*
A ONLY	4.33	4.06	1.08	NA
B/B5 ONLY	6.17	5.70	1.05	0.98
C/C3 ONLY	5.50	5.16	0.94	1.04
D ONLY	6.50	6.17	0.86	NA

3 Conclusions

The mean SEC calibration is 0.98 $\pm$ 0.1. The SEC calibrations are good to within 10 % and so the intensities reported for normal running are probably fairly close to reality, although the D SEC reads very low and the C SEC reads low.

There were two suprises which we need to address again. The first was the increased losses in BB3/AP1 that occured by just shifting beam over from D line to C line. Since we are using unsplit beam for these tests there should be no loss in these two areas. The second suprise was the amount of skew needed for AB1 losses to be minimized.

A Data Sets

The following sets of data were collected, as well as printouts of CLYDE.

1. With beam to D-only two GPM log files were made:
   SEB_DATA_Collection.96May15-1105.log == raw long losses.
   SEBshorts_DATA_Collect.96May15-1110.log == raw short losses.

2. With beam to C-only two GPM log files were made:
   SEB_DATA_Collection.96May15-1201.log == raw long losses.
   SEBshorts_DATA_Collect.96May15-1201.log == raw short losses.

3. With beam to B-only two GPM log files were made:
   SEB_DATA_Collection.96May15-1427.log == raw long losses.
   SEBshorts_DATA_Collect.96May15-1427.log == raw short losses.

4. With beam to A-only two GPM log files were made:
   SEB_DATA_Collection.96May15-1535.log == raw long losses.
   SEBshorts_DATA_Collect.96May15-1536.log == raw short losses.

5. Archives of each setup were saved:
   jwg_sty_a1b_b5 == beam to B5.
   jwg_sty_a1la1 == beam to A.
   jwg_study_d2a == beam to D.
   jwg_sty_a1c2 == beam to C.
   jwg_sty_a1lc_c3 == beam to C3.

6. While beam was to D-only data was taken of losses with various flags inserted.
   TimeStamp ..... Condition
   9640 - 50 ..... CF011 in
   9660 - 70 ..... CF039 in
   9670 - 80 ..... CF100 in
   9695 - 05 ..... AF124 in
   9710 - 20 ..... DF146 in
   9725 - 35 ..... DF215 in
   9745 - 55 ..... DF332 in
   9760 - 70 ..... DF364 in