AGS Complex Machine Studies

(AGS Studies Report No. 364)

Protons Incident on the Booster Dump in 1997

Study Period: December 23, 1996 to September 10, 1997

Participants: E. Bleser, and P. Ingrassia

Reported by: E. Bleser

Machine: Booster

Beam: Normal Protons

Tools: Thermoluminescent detectors mounted in Booster tunnel

Aim: AGS - OPM 2.5 (1/4/93) specifies that the total number of 1.5 GeV equivalent protons deposited on the Booster dump in a year shall not exceed 2.5×10^{19}. This note reports the results of the monitoring program for 1997.

PROCEDURES

The procedures are detailed in AGS Studies Report No. 301.

RESULTS

Table 1 summarizes the data used in this report. The calibration run in 1993 put 1.88×10^{15} protons into the dump. Using this number we calculate in Table 2 that in the 9 months ending September 10, 1997 we had put 5.5×10^{18} protons into the dump, well below the allowed level of 2.5×10^{19} per year.

TABLE 1
BOOSTER DUMP MONITORING TLD RESULTS
RESULTS FOR FY 1997
"Net nC" for TLD-700 Units

RUN NUMBER	1	2	3	CALIBRATION
INSTALLATION DATE	11/15/95	2/9/96	5/30/96	7/22/93
REMOVAL DATE	2/9/96	5/30/96	8/14/96	7/22/93
DATE OF REPORT	9/24/96	9/24/96	11/15/96	7/30/93
DETECTOR				
3A	33	331,320	137,368	160
3B	32	370,731	131,003	135
4A	16	147,661	57,745	79
4B	14	149,942	55,013	70
5A	25	82,938	28,361	44
5B	25	88,309	28,233	40

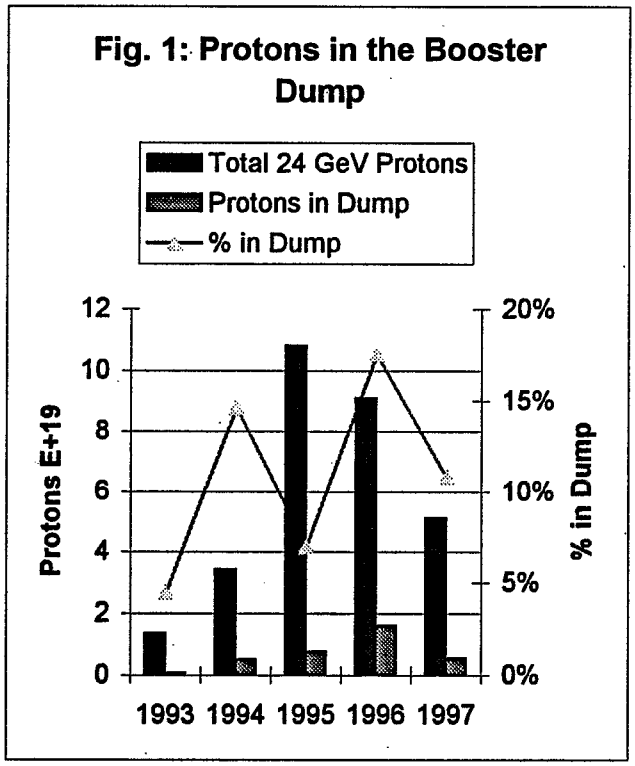
TABLE 2
SUMMARY of RESULTS
RESULTS FOR FY 1997

RUN NUMBER	1	2	3	CALIBRATION
AVERAGE OF MEAS/CALIB	0.3	2145.1	782.3	1.0
STD	0.2	358.7	117.6	0.0
TOTAL PROTONS	6.4E+14	4.0E+18	1.5E+18	1.9E+15
TOTAL 1.5 GEV EQUIVALENT				
PROTONS ON DUMP				5.5E+18
OPM LIMIT FOR DUMP				2.50E+19

5 YEAR SUMMARY

Proton Totals

Figure 1 shows the total protons extracted from the AGS at 24 GeV for each of the past 5 years (from Ingrassia in Performance Reports on the AGS Intranet). It also shows the total protons incident on the Booster Dump for each of the past five years (from AGS SR 301, 336, 337, 363). The ratio of these numbers is also plotted. This ratio shows considerable variation from year to year, which we might guess is significant rather than, just statistical. Thus the ratio for 1996 might be 16% plus or minus 2%. As yet we have no correlation between these results and remembered operating conditions, but experienced people feel that the machines are set up differently from year to year. In 1996 there were high losses in the dump. The question (for which we have no answers) might be does this represent a general high level of losses in the Booster (undesirable) or does this represent an efficient collection of losses in the dump with a concomitant reduction of losses elsewhere in the accelerator complex (desirable).



Accumulated Activity

The baseline calculation of the activity induced around the dump assumes 10^{13} protons per second incident on the dump for 25 years. The most critical product for us is sodium 22, which has a half life of 2.6 years, which means that it will reach its effective peak concentrations in about 5 years of steady state operations. Figure 2 shows a compilation of the sodium 22 activity produced by the protons lost in each of the past 5 years, the subsequent decay of that activity, and the total accumulated activity as a fraction of the baseline calculation. We are at about 2.5% of the activity calculated in the baseline calculation. This is a useful empirical number, since in designing shielding we are

always required to project the future beam intensity, the fraction of that beam lost, and the annual running periods. Using this number we can reevaluate the present Booster dump and the future Booster dump following the construction of the Booster Applications Facility.

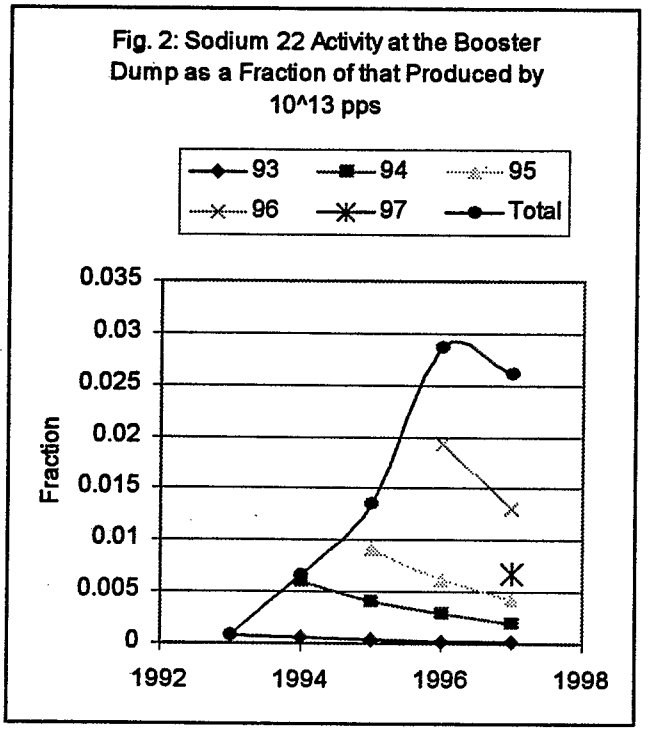


Fig. 2: Sodium 22 Activity at the Booster Dump as a Fraction of that Produced by 10^13 pps