

## Total Protons Incident on Booster Dump

E. Bleser

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Collider Accelerator Department  
**Brookhaven National Laboratory**

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<b>AGS Complex Machine Studies</b> <b>(AGS Studies Report No. 301)</b> <b>Total Protons Incident on Booster Dump</b>
<b>Study Period:</b> 2/19/93 - 8/20/93
<b>Participants:</b> E. Bleser, P. Ingrassia, J. Laster
<b>Reported by:</b> E. Bleser

### Purpose

AGS-OPM 2.5 (1/4/93) specifies that the total number of 1.5 GeV equivalent protons deposited on the Booster dump in 1993 shall not exceed  $2.5 \times 10^{19}$ . This note reports the results of an experiment to measure the number of protons deposited on the dump.

### Procedure

Dosimeters were placed at five standard locations near the dump. The five locations were:

1. Downstream end of dump;
2. Upstream end of dump;
3. Upstream end of dump on outer wall of tunnel, 3 feet below the plane of the beam;
4. Five feet upstream of No. 3;
5. Twelve feet upstream of No. 3.

Location No. 1 was normally saturated, so we drop it from further consideration.

Every month the dosimeters were replaced and sent to the Health Physics Group to be read. The results were reported by Roger Thompson in a series of eight memos documented below. On July 22, a special run was carried out wherein we put in a fresh set of dosimeters, ran a known amount of beam into the dump and then removed the dosimeters for reading.

At each location, there were two detectors sensitive to gammas (TLD-700) and two detectors sensitive to gammas and neutrons (TLD-600). They all tracked very well, so in this note for simplicity we report only the TLD-700 results, labeling the two detectors a and b.

## **Results**

Table 1 summarizes the data used in this report. The units are nominally nanoCuries, but we can take them as arbitrary. Figure 1 shows the data as a function of position and Figure 2 shows the data normalized by the calibration run (Run 7). For each run, the ratios should be independent of position and, for our purposes, the lines in Figure 2 are flat enough. For each run we average the ratios over the eight detectors and record the results in Table 2. For the calibration run (Run 7), we put  $1.88 \times 10^{15}$  protons into the dump. Table 2 lists for each run the total protons in the dump, the average protons in the dump per day, and the total protons for 1993. It also gives the OPM limit and a rough estimate of the total number of protons accelerated in the Booster in 1993.

## **Conclusion**

We put the equivalent of  $6 \times 10^{17}$  protons into the Booster dump in 1993, only 2% of our allowed limit of  $250 \times 10^{17}$  and only a small fraction of the protons accelerated in the Booster, which we take to be roughly  $250 \times 10^{17}$ .

TABLE 1

# BOOSTER DUMP MONITORING TLD RESULTS

"Net nC" for TLD - 700 units

RUN NUMBER	1	2	3	4	5	6	7	8	9
INSTALLATION DATE	2/19/93	3/16/93	4/5/93	5/6/93	5/18/93	6/16/93	7/22/93	6/23/93	7/22/93
REMOVAL DATE	3/16/93	4/5/93	5/6/93	5/18/93	6/16/93	6/23/93	7/22/93	7/22/93	8/20/93
DAYS of EXPOSURE	25	20	31	12	29	7	1	29	29
DATE of REPORT	MARCH 29	MAY 6	MAY 26	JUNE 9	JULY 16	JULY 16	JULY 30	AUGUST 1	SEPT 1

DETECTOR	2a	2b	3a	3b	4a	4b	5a	5b
	10369	5993	408	380	200	223	145	132
	19376	18451	874	887	566	507	331	329
	348752	313407	11784	12546	5282	5238	2540	2512
	112651	120800	4548	4443	1890	1979	1000	1078
	335966	407511	9660	9704	4032	4058	2100	2161
	23442	32494	1146	1259	527	584	350	300
	4802.72	4278.2	160.39	134.74	79.26	69.83	43.7	40.35
	479577	415876	19357	19411	8509	8019	3533	3608
	96745	115190	5244	5704	2335	2322	1203	1090

TABLE 2

## SUMMARY of RESULTS

RUN NUMBER	AVERAGE of RATIOS to CALIBRATION RUN	STD	TOTAL PROTONS $10^{15}$	PROTONS per DAY $10^{15}$
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7	1		1.88	1.9
1	2.7	0.6	5	0.2
2	6.3	1.4	12	0.6
3	71.8	9.8	135	4.4
4	26.9	3.2	50	4.2
5	63.5	14.4	119	4.1
6	7.4	1.2	14	2.0
8	106.8	18.6	201	6.9
9	29.9	6.0	56	1.9

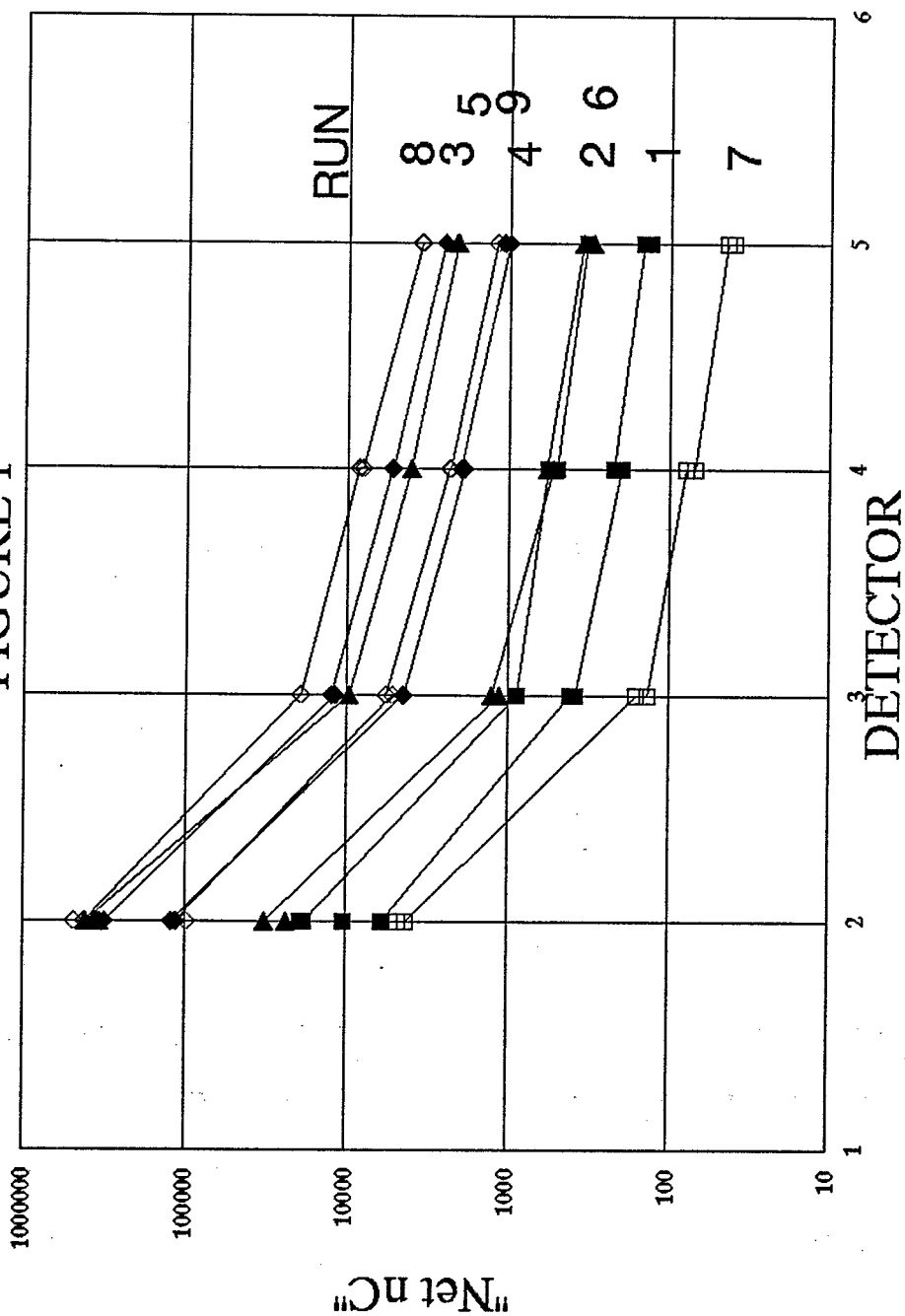
TOTAL 1.5 GeV EQUIVALENT PROTONS on DUMP	595
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OPM LIMIT for DUMP	25000
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TOTAL PROTONS ACCELERATED in BOOSTER ~	25000
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# BOOSTER DUMP MONITORING TLD RESULTS

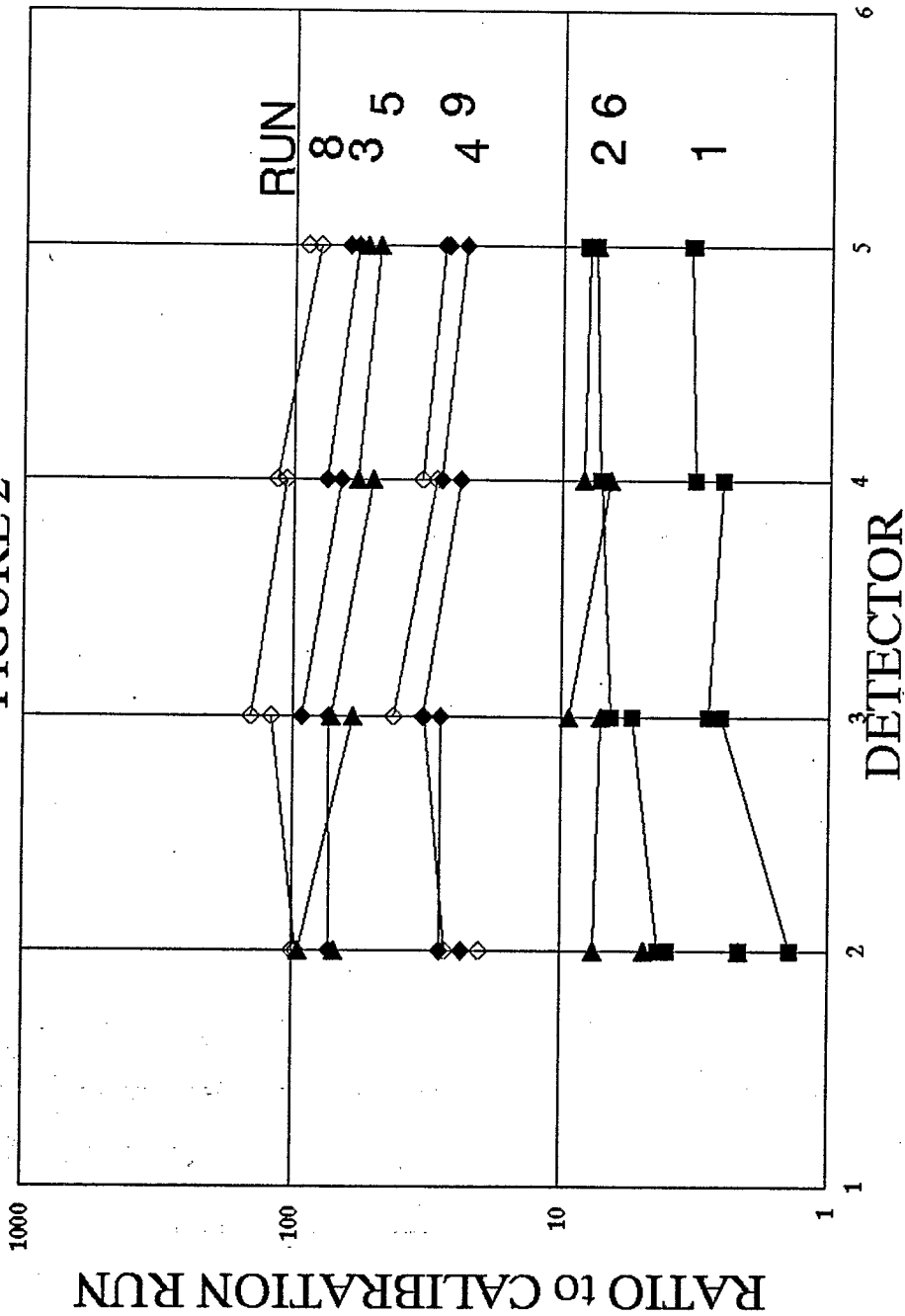
## FIGURE 1



C:\BSTDMP\CALEXP\MAR29.WK3.G1  
14-Sep-93

# BOOSTER DUMP MONITORING TLD RESULTS

FIGURE 2



C:\BSTDMP\CALEXP\MAR29.WK3;G2  
14-Sep-93