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Vertical Bump at E-20

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U.S. Department of Energy

USDOE Office of Science (SC)

DISCLAIMER

AGS Complex Machine Studies (AGS Studies Report No. 326) Vertical Bump at E-20
Study Period: March 11 and 12, 1995
Participants: MCR, R. DiFranco, J. Funaro, R. Zapasek
Reported by: E. Gill and A. Soukas
Machine: AGS Proton Complex
Aim: To Dump Beam on E-20 Catcher (vertically)

SUMMARY

By using a set of overpowered AGS injection dipoles, the beam was deflected vertically in the vicinity of the catcher, resulting in placing the beam loss into the E-20 catcher.

INTRODUCTION

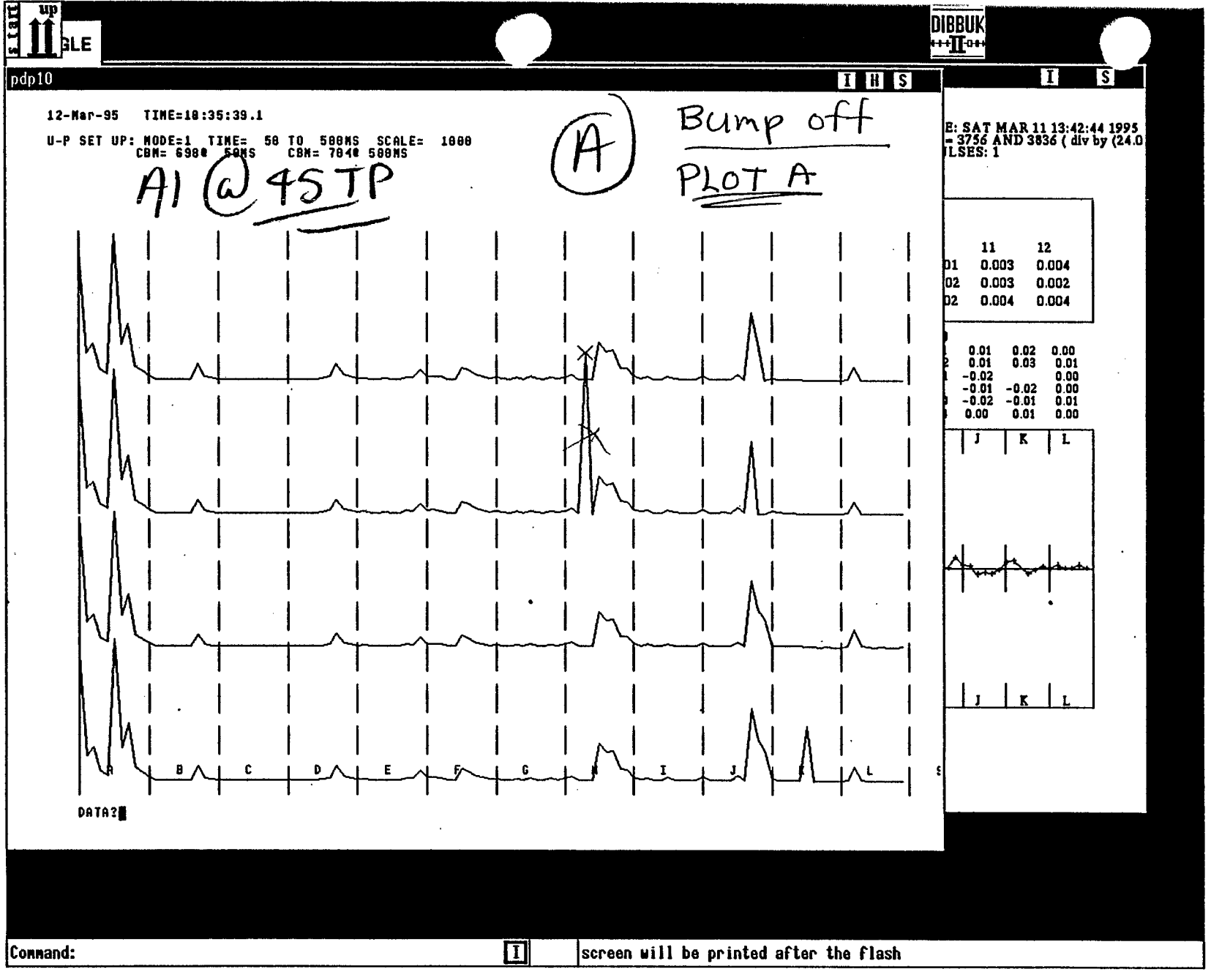
Localized injected beam losses have been noted especially in three AGS locations; namely, H12, J15, and K12. These are thought to be due to vertical beam apertures. The normal orbit correction dipole system does not provide enough deflection to minimize these losses at all locations. They can be moved from one spot to another. The desire is to place as much of the loss as possible into the E-20 catcher.

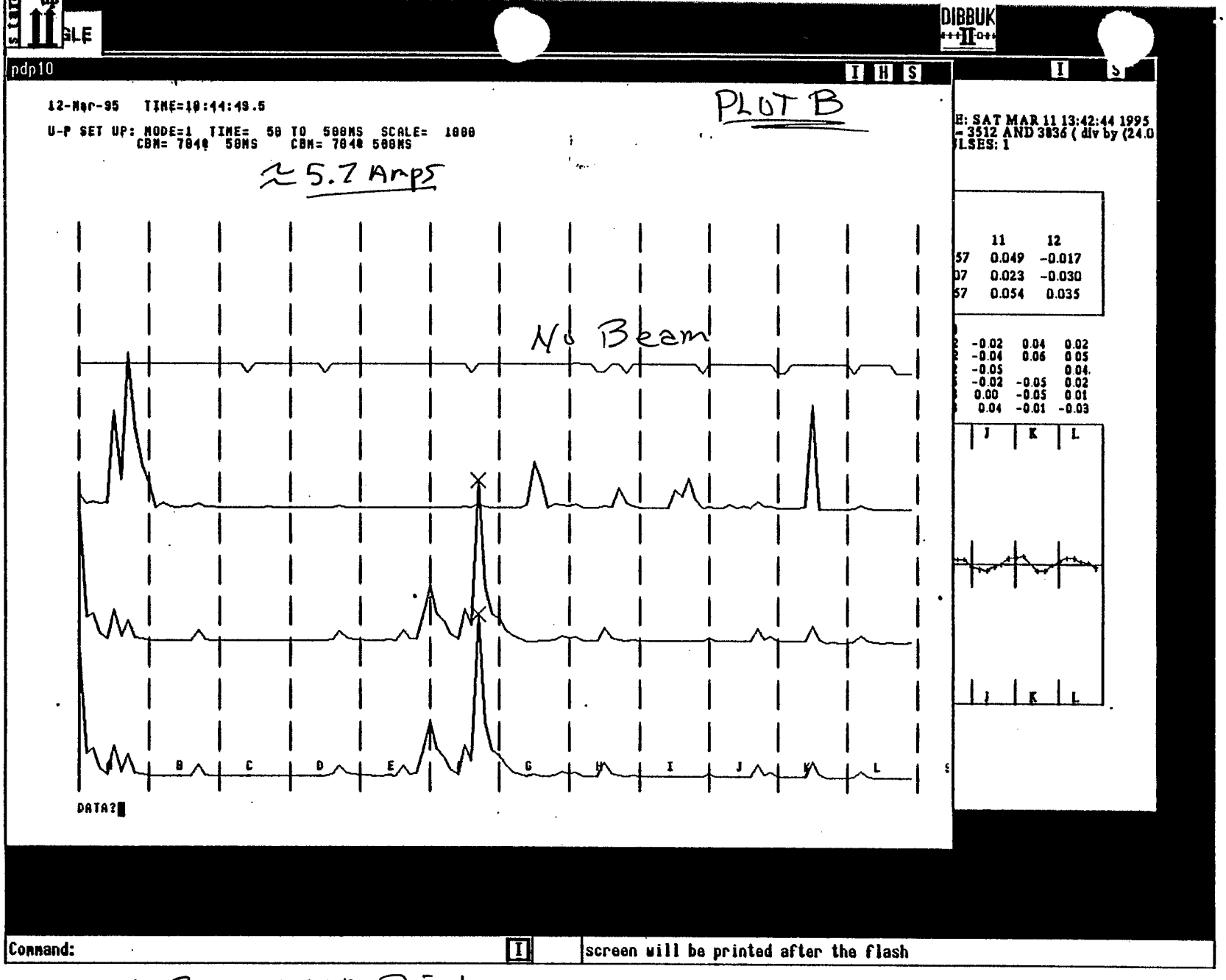
STUDY

The beam loss pattern with a normal machine, i.e., the orbit bump off, is shown in Plot A. Large losses are seen to occur in H and J, and Table A at an intensity of 45 TP.

As part of our test, a special 3/2 lambda vertical bump was created around the AGS E-20 straight section using two sets of the regular low field dipole magnets but by pulsing them up to approximately 6 Amperes. Their normal maximum currents are approximately 2 Amperes. Several of the old beta quadrupole power supplies were used since thy are rated for higher voltage and current. The resulting orbit is shown in Plot C. The loss pattern as measured by the AGS RLM system is shown in Plot B and Table B.

It appears that to place a large fraction of the beam loss on the E-20 catcher, a vertical 1.0 lambda or 3/2 lambda bump should be created by moving several magnets vertically. This can be augmented by using the normal low field dipoles for trimming purposes.


start up
GLE
DIBBUK
II
pdp10
I H S
12-Mar-95 TIME=18:35:39.1
U-P SET UP: MODE=1 TIME= 50 TO 500MS SCALE= 1000
CBM= 6980 50MS CBM= 7040 500MS
A1 @ 45 TP
A
Bump off
PLOT A
A B C D E F G H I J K L
DATA?
I S
E: SAT MAR 11 13:42:44 1995
= 3756 AND 3836 (div by (24.0
LSES: 1
11 12
01 0.003 0.004
02 0.003 0.002
02 0.004 0.004
0.01 0.02 0.00
0.01 0.03 0.01
-0.02 0.00
-0.01 -0.02 0.00
-0.02 -0.01 0.01
0.00 0.01 0.00
J K L
J K L
Command:
I
screen will be printed after the flash



(c)

X BAD DATA Point

up

TOGGLE

DIBBUK II

pdp10

I H S

U-P SET UP: MODE=1 50 TO 500MS PLOT NUMBER 1 DISPLAYED
12-MAR-95 TIME=18:22 56.4

A	B	C	D	E	F	G	H	I	J	K	L	S
1111	21	3	3	8	16	13	16	25	38	7	-5	-4
198	3	3	3	10	23	7	32	8	3	3	3	-5
214	3	3	3	3	15	3	3	17	3	3	85	620
65	3	3	3	3	3	13	3	3	5	3	3	634
34	3	3	3	7	3	3	3	3	3	3	3	660
971	3	3	5	3	82	19	245	14	31	345	53	654
238	3	3	17	3	64	5	189	3	3	151	-4	-4
375	81	3	85	13	29	3	196	3	492	120	-5	-5
88	13	3	25	12	21	14	77	3	275	48	-5	
53	7	3	17	64	8	6	78	3	206	-5	-4	

TOTAL = 6926 CBN AT 50NS = 780 CBN AT 500NS = 784
TOTAL COUNTS

1843*	25	6	6	334	742	836	75	340	53	16	-5	-4
220	6	6	6	92	182	168	111	31	6	18	6	-5
258	6	6	16	57	2817	19	56	67	6	6	127	4352
88	6	6	16	22	381	16	6	6	7	6	11	4452
41	6	6	6	48	634	6	6	6	6	6	6	4639
1886	6	6	27	6	5160	38	281	28	39	375	65	4595
267	6	6	38	12	1414	9	218	8	68	173	-4	-4
415	93	6	185	16	1315	6	231	6	688	141	-5	-5
97	19	14	47	68	537	129	136	35	363	59	-5	
65	11	6	71	339	548	52	134	6	284	-5	-4	

TOTAL = 24267
DATA?

(A)

Table A

Bump off

up

BLE

DIBBUK II

pdp10

I H S

(B)

Table B

BumpoN

U-P SET UP: MODE=1 50 TO 500MS PLOT NUMBER 1 DISPLAYED
12-MAR-95 TIME=18:44 48.5

A	B	C	D	E	F	G	H	I	J	K	L	S
968	3	3	3	10	419	162	26	3	28	3	-5	-4
175	3	3	3	9	208	87	33	3	3	3	3	-5
289	3	3	3	3	144	35	3	6	3	3	49	620
63	3	3	3	3	53	10	3	3	3	3	3	634
28	3	3	3	15	19	3	3	3	3	3	-4	-5
234	3	3	3	3	235	22	108	3	3	119	-5	-4
42	3	3	17	84	128	5	25	3	3	23	-4	-4
166	98	3	88	28	1203	3	13	3	95	-5	-5	-5
26	14	3	25	25	399	10	3	3	19	-4	-5	
22	6	3	17	219	285	44	13	3	48	-5	-4	

TOTAL = 6735 CBN AT 50NS = 784 CBN AT 500NS = 784
TOTAL COUNTS

1053	6	6	6	225	574	762	70	267	49	6	-5	-4
212	6	6	6	64	268	215	109	13	6	6	6	-5
219	6	6	14	35	2489	52	37	44	6	6	71	4352
82	6	6	13	12	267	25	6	6	6	6	6	4453
22	6	6	6	49	497	6	6	6	6	6	-4	-5
228*	6	6	18	6	4150	33	127	8	6	122	-5	-4
43	6	6	38	94	1114	18	27	6	38	24	-4	-4
173	88*	6	83	22	2384	6	15	6	104	-5	-5	-5
28	16	6	35	28	863	85	23	6	23	-4	-5	
25	8	6	51	277	685	84	43	6	51	-5	-4	

TOTAL = 19282
DATA?

I S

E: SAT MAR 11 13:42:44 1995
= 3512 AND 3836 (div by (24.0
LSES: 1

	11	12
57	0.049	-0.017
07	0.023	-0.030
57	0.054	0.035

	-0.02	0.04	0.02
	-0.04	0.06	0.05
	-0.05		0.04
	-0.02	-0.05	0.02
	0.00	-0.05	0.01
	0.04	-0.01	-0.03

J K L

C C

PLOT C

VERTICAL

CURRENT DATE: SUN MAR 12 18:46:55 1995 FILE DATE: SAT MAR 11 13:
INPUT DATA: ORBIT – FILE std400a NORM: F15 = 3512 AND 3P[illegible] (
GAIN: LOW REAL TIME: 400 MS. NUMBER OF PULSES: 1

HARMONIC ANALYSIS:

N	5	6	7	8	9	10	11	12
SIN	-0.034	0.025	0.004	-0.037	0.047	-0.057	0.049	-0.017
COS	-0.040	0.058	-0.056	0.048	-0.067	0.007	0.023	-0.030
AMP	0.053	0.063	0.057	0.061	0.082	0.057	0.054	0.035

AVERAGE POSITION: -0.005 AVERAGE SIGMA: 0.000

0.02	-0.01	0.05	0.00	-0.03	-0.64	0.11		-0.02	-0.02	0.04	0.0
-0.03	-0.01	0.04	0.02	0.01	-0.55	0.04		-0.02	-0.04	0.06	0.0
0.02	-0.04	0.00	0.06	0.28		-0.01	0.01	0.02	-0.05		0.0
0.05	-0.04		0.06	0.25	0.15			0.05	-0.02	-0.05	0.0
0.02	-0.02	-0.05	0.02	0.10		-0.02	-0.05	0.03	0.00	-0.05	0.0
0.02	0.00	-0.01	-0.03	-0.39	0.24	-0.04	-0.05	0.03	0.04	-0.01	-0.0