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THE J-10 DUMP BUMP

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Technical Note

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I. SUMMARY

This note documents the design of the 3/2 lambda bump that will be installed to bump the AGS beam into the new dump at J-10.

II. THE J-10 BUMP

The new bump will be very similar to the existing 3/2 lambda bumps. It will use backleg windings on the main AGS magnets. Table 1 specifies its construction. Column 1 lists the magnets involved, column 2 specifies the magnet type, column 3 indicates whether the bump dipole field adds or subtracts from the main dipole field, column 4 gives the hook-up polarity in the standard AGS nomenclature, column 5 gives the number of turns on the backleg (6 on a short magnet, 5 on a long magnet), column 6 gives the magnet specification for running the standard version of the AGS MAD modeling program, and column 7 gives the phase advance from the exit of magnet I-10 to the exits of the other magnets. The cable on the magnets is 4/0 flex with a resistance of about 5.4 milliohms per magnet. At 400 amperes DC this cable will reach a temperature of about 100 degrees C.

III. THE MODELING RESULTS

Figure 1 shows the closed orbit in the AGS when the 15 GeV MAD model[1] is run with a dipole field error of 1% in the magnets of Table 1. Figure 2 is a detail of Figure 1. Table 2 tabulates for reference the data plotted in Figure 2. The markers show the beam positions at the PUE's (The actual PUE readings are at present in error by +4mm). Elaborate modeling studies have been done and the details may be reported elsewhere.

IV. OPERATIONS

Figure 3 shows the current[2] needed in the bump to produce a displacement of 20 mm at the exit of the main magnet J-10. The bump performance can be summarized by the equation:

$$\mathbf{I = X * P * [\ .2653 + 0.001 * P]}$$

where: I = bump current in Amperes:

X = Inward displacement of the closed orbit at the exit of Main Magnet J-10 in millimeters;

P = momentum in GeV/c.

Displacements at other points in the orbit can be scaled from Table 2.

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[1]Standard models of our machine are maintained by E. Auerbach on the Apollo System in directory "users/Models". Current versions of the MAD program are maintained by J. Niederer.

[2]Field vs current data for the AGS main magnets is available from R. Thern.

TABLE 1. THE J-10 BUMP

MAGNET	TYPE	CHANGE IN BEND	HOOKUP POLARITY	BACKLEG TURNS	MAD SEQUENCE	dMUX 2*PI
I-10	BF	-	B	6	BF[36]	0.000
I-11	BD	-	B	6	BD[33]	0.072
J-4	CD	+	A	5	CD[38]	0.534
J-5	AF	+	A	5	AF[19]	0.620
J-18	CF	+	A	5	CF[40]	1.027
J-19	BD	+	A	6	BD[39]	1.059
K-12	BD	-	B	6	BD[42]	1.551
K-13	CF	-	B	5	CF[41]	1.575

Qx=8.720

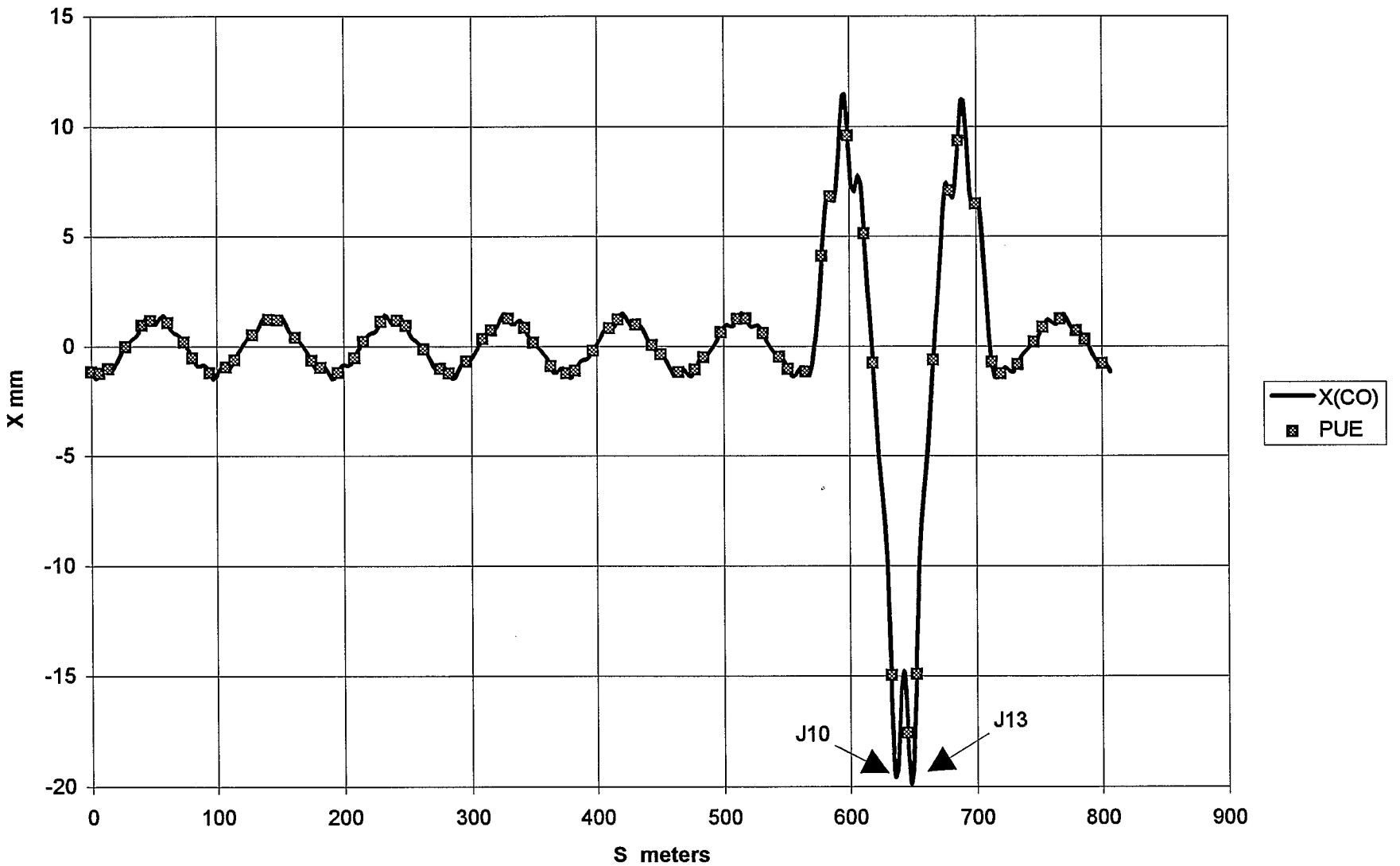
TABLE 2. THE J_10 BUMP CLOSED ORBIT

EXIT of MAGNET	S meters	X mm
I10	570.155	-0.9
I11	575.209	1.5
I12	577.825	3.8
PUE I12	578.112	4.1
I13	580.822	6.2
I14	584.734	6.9
PUE I14	585.021	6.8
I15	587.731	6.6
I16	591.642	9.1
I17	594.639	11.4
I18	598.551	9.9
PUE I18	598.838	9.6
I19	601.167	7.5
I20	603.783	7.0

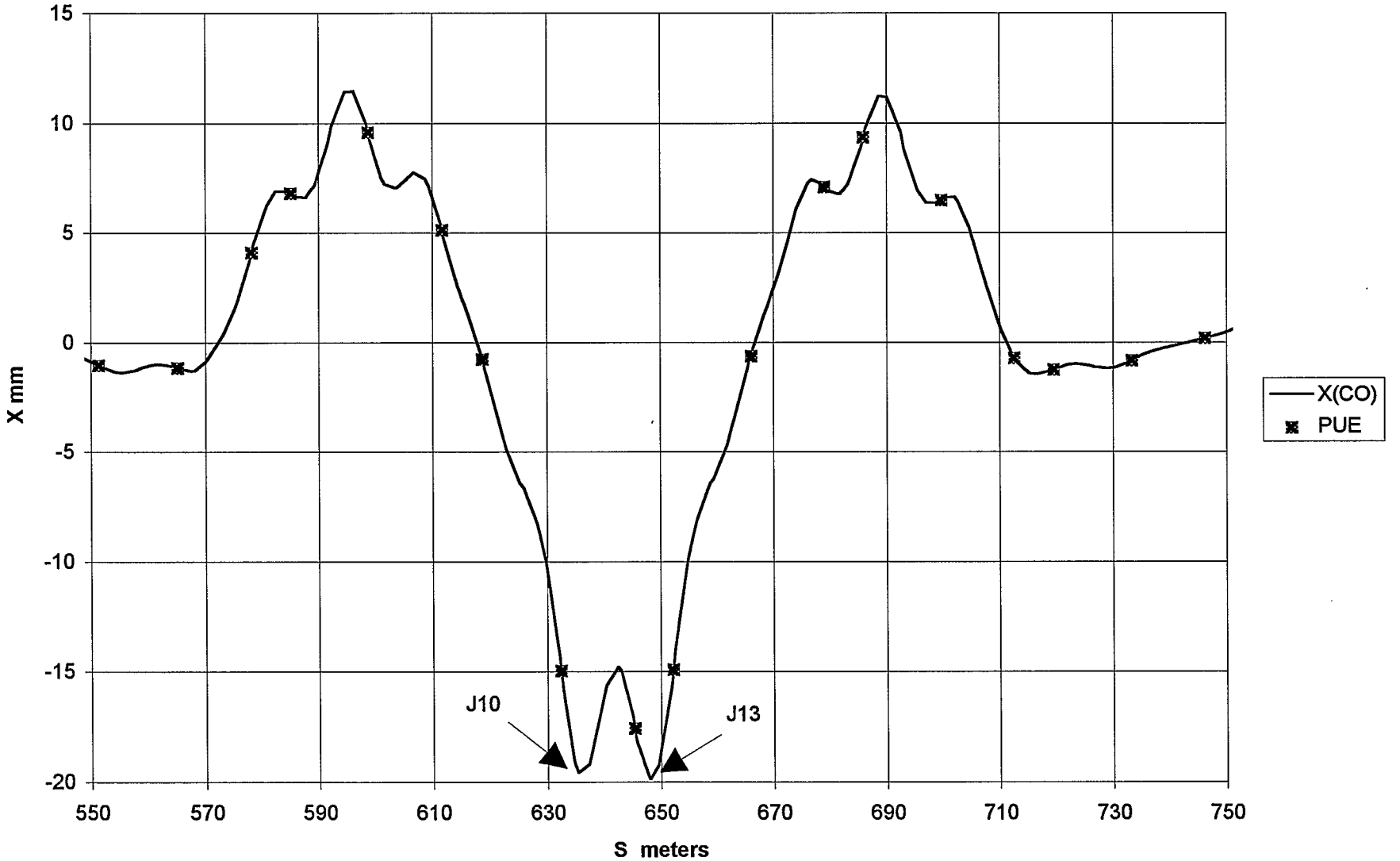
EXIT of MAGNET	S meters	X mm
J1	608.837	7.5
J2	611.453	5.4
PUE J2	611.74	5.1
J3	614.45	2.6
J4	618.362	-0.5
PUE J4	618.649	-0.8
J5	621.359	-3.4
J6	625.27	-6.4
J7	628.267	-8.3
J8	632.179	-14.3
PUE J8	632.466	-15.0
J9	634.795	-19.1
J10	637.411	-19.2
J10 SS MP	638.935	-17.4
J11 ENT	640.459	-15.6
J11	642.465	-14.8
J12	645.081	-17.1
PUE J12	645.368	-17.6
J13	648.079	-19.9
J14	651.99	-15.6
PUE J14	652.277	-14.9
J15	654.987	-9.9
J16	658.898	-6.4
J17	661.896	-4.7
J18	665.807	-0.9
PUE J18	666.094	-0.6
J19	668.423	1.3
J20	671.039	3.3

EXIT of MAGNET	S meters	X mm
K1	676.093	7.3
K2	678.71	7.2
PUE K2	678.997	7.1
K3	681.707	6.7
K4	685.618	9.0
PUE K4	685.905	9.3
K5	688.615	11.2
K6	692.527	9.6
K7	695.524	6.9
K8	699.435	6.4
PUE K8	699.722	6.5
K9	702.051	6.6
K10	704.667	5.2
K11	709.722	1.0

J10 BUMP, CLOSED ORBIT



J10 BUMP, CLOSED ORBIT



J-10 BUMP CURRENT for 20 mm BUMP