BNL-105263-2014-TECH

Booster Technical Note No. 221;BNL-105263-2014-IR

SURVEY COORDINATES OF THE BOOSTER-TO-AGS TRANSPORT LINE

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February 1993

Collider Accelerator Department

Brookhaven National Laboratory

U.S. Department of Energy

USDOE Office of Science (SC)

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BOOSTER TECHNICAL NOTE
NO. 221

F. X. Karl and M. A. Goldman

February 17, 1993

ALTERNATING GRADIENT SYNCHROTRON DEPARTMENT
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F.X. Karl, M.A. Goldman

January 27, 1993

The Booster to AGS transport line [BTA line], used to inject protons and heavy ions from the Booster into the AGS, was surveyed and aligned during October and December 1990. The surveyors were F. Karl, D. Kazmark, Jr. and J. Roecklein, of the BNL/AGS Survey Group.

Survey reference data is stored in File BTA7390.300 of the BNL/AGS Survey Group. Drawings describing locations of reference points of beam components are also available on file.

The transport line is described in section 5 of the AGS Booster project's Booster Design Manual, Revision 1, October 1988. The layout of the transfer line magnets is given in AGS Booster drawing D37-M-0413-5H. [Booster To AGS Transfer Line, Component Stand Locations, J. A. Scheblein; June 14, 1990]. The drawing numbers of individual magnet components of the transfer line are listed in that drawing, together with a plan view layout of the line, showing defining dimensions of the line. The line components were aligned to the positions and spacings called out in that drawing, during the survey of 1990.

The survey was referenced to the survey pillar monuments "L" and "LA" in the AGS ring. These monument stations were used as fixed control references for the BTA line survey. Their horizontal coordinates were measured in the 1987 horizontal survey of the AGS ring [1], and are:

	AGS Inch Coordinates	
	EAST	NORTH
AGS Pillar Monument " L " (Survey Point 100)	2469.198	14582.679
AGS Pillar Monument " LA " (Survey Point 99)	1953.146	13336.891

[The AGS machine center has AGS Inch Coordinates:
EAST 6942.600, NORTH 12000.000].

The AGS Inch Coordinates of transport line components, coordinate increments between successive components, and distances between successive components are listed in Table 1. The transport line starts at the AGS Injection Point, Survey Point 24, with coordinates: EAST 2381.8431, NORTH 15685.661 .

The vertical focus quadrupole magnet QV1 was placed 2" downstream from the position specified in the Booster Design Manual, to avoid mechanical interferences. For the front end septa and magnets QH1 through DH4 the magnet placements are the same in the Booster Design Manual and drawing D37-M-0413-5H. Magnets QV9 through QV15 were installed at the locations called out in that drawing, and differ from those in the Design Manual.

Elevation views, showing layout of the line components are given in AGS Booster drawings: D37-M-0391-5C, D37-M-0392-5B , D37-M-0393-5A, Booster To AGS Transfer Line, J.A. Scheblein, January 15, 1991.

AGS drawings relating to the Booster ejection septa are: D14-1510-M-5A, Building 914 Booster Ejection Septum Shielding Assembly, April 1, 1991; D37-M-0391-5A, Booster To AGS Transfer Line Ejection Septum to Q7 Assembly, January 15,1991; Booster To AGS Transfer Line Q12 to AGS Injection Septum Assembly, January 15, 1991.

AGS drawings relating to the transfer line pickup electrodes are: D37-M-0265-4C, Pickup Electrode Assembly End Plate, July 26, 1989; D37-M-0501-4A, Booster To AGS Transfer Line Q5 & Q14 PUE Chamber Weldment Assembly, September 4, 1990; D36-M-1242-5E, AGS Booster QUAD/PUE Vacuum Shell WeldmentFebruary 15, 1989; D37-M-0586-4A, Booster-AGS Transfer Line PUE Chamber Rework Q11, Q12 & Q13 Assembly, November 7, 1990.

The PUE center for quadrupole magnet QV5 is located 14.473" downstream of the center point of that magnet. The center of the PUE for each of the quadrupole magnets: QV11, QH12, QV13, QH14 is located 14.473" upstream of the center of the corresponding magnet.

Table 1. BTA Line Coordinates

BTA LINE COMPONENTS		AGS Inch Coordinates		Coordinate Increment [Inches]		Distance Increment [Inches]
SURVEY POINT	NAME	EAST	NORTH	DELTA E	DELTA N	S DIFF
24	I.P. (AGS Injection Point)	2381.8431	15685.661			
	SEPTUM	2379.9487	15711.5102			
	SEPTUM	2404.7712	15616.0374	24.8225	-95.4728	98.6469
	QV1	2436.8441	15518.641	32.0729	-97.3964	102.5414
2	DH1	2448.5336	15483.1451	11.6895	-35.4959	37.3712
3	QH2A	2458.386	15449.1082	09.8524	-34.0369	35.4342
	QH2B	2466.0487	15422.6358	07.6627	-26.4724	27.5591
4	QV3	2480.7655	15371.794	14.7168	-50.8418	52.9289
5	STRIPPER	2487.8809	15347.2126	07.1154	-24.5814	25.5905
6	QH4	2501.5644	15299.9406	13.6835	-47.272	49.2126
7	DH2	2523.0049	15225.8703	21.4405	-74.0703	77.1110
8	QV5	2523.4486	15152.6977	00.4437	-73.1726	73.1740
9	DH3	2524.0535	15052.9457	00.6049	-99.752	99.7538
10	QH6	2503.5128	14978.6209	-20.5407	-74.3248	77.1109
11	QV7	2483.5868	14906.5205	-19.926	-72.1004	74.8032
12	QH8	2389.2008	14564.9922	-94.386	-341.528	354.3308
13	DH4	2376.0916	14517.5578	-13.1092	-47.4344	49.2125
14	QV9	2350.2192	14429.8063	-25.8724	-87.7515	91.4861

15	QH10	2317.0444	14317.2874	-33.1748	-112.519	117.3076
16	QV11	2243.363	14067.3826	-73.6814	-249.905	260.5405
17	QH12	2192.141	13893.6531	-51.222	-173.729	181.1233
18	QV13	2132.3759	13690.9478	-59.7651	-202.705	211.3322
	QH14	2108.0537	13608.4544	-24.3222	-82.4935	86.0043
20	DH5	2092.6908	13556.3479	-15.0976	-51.2067	53.38599
21	QV15	2078.3562	13458.813	-14.3346	-97.5349	98.58264
	SEPTB1	2062.6363	13351.8517	-15.7199	-106.961	108.1103

BTA LINE

DIAGNOSTIC AND TRIM COMPONENTS

PUE_V.046 (Pickup Electrode)	2523.5364	15138.2250	0.0878 (From QV5)	-14.4727	14.473 (From QV5)
XF059 (Beam Current Monitor, Transformer)	2495.9543	14951.2712	-7.5585 (From QH6)	-27.3498	28.375 (From QH6)
MW060 (Profile Monitor, Multiwire)	2491.0263	14933.4396	-12.4865 (From QH6)	-45.1813	46.875 (From QH6)
MW125 (Profile Monitor, Multiwire)	2258.2638	14117.9215	-58.7806 (From QH10)	-199.3659	207.8505 (From QH10)
DH127 (Trim Dipole)	2252.1129	14097.0594	-64.9315 (From QH10)	-220.2280	229.6005 (From QH10)
PUE_V.129	2247.4560	14081.2647	4.0930 (From QV11)	13.8821	-14.473 (From QV11)
DV141 (Trim Dipole)	2200.8909	13923.3306	-42.4721 (From QV11)	-144.0520	150.1832 (From QV11)

PUE_H.143	2196.2340	13907.5353	4.0930 (From QH12)	13.8822	-14.473 (From QH12)
DH158	2141.1258	13720.6248	8.7499 (From QV13)	29.6770	-30.9400 (From QV13)
PUE_V.160	2136.4689	13704.8300	4.090 (From QV13)	13.8822	-14.473 (From QV13)
MW166 (Profile Monitor, Multiwire)	2122.9545	13658.9935	-9.42136 (From QV13)	-31.9544	33.3143 (From QV13)
DV168	2116.8036	13638.1313	-15.5723 (From QV13)	-52.8165	55.0643 (From QV13)
PUE_H.170	2112.1467	13622.3366	4.0930 (From QH14)	13.8822	-14.473 (From QH14)
DV181	2086.0256	13510.9971	-6.6652 (From DH5)	-45.3509	45.838 (From DH5)
XF183 (Beam Current Monitor, Transformer)	2083.1538	13491.4569	-9.5370 (From DH5)	-64.8910	65.588 (From DH5)

In this table: listed quadrupole magnet coordinates are those of the quadrupole center; the dipole magnet coordinates are those of the dipole magnet apex; the PUE coordinates are those of the PUE center.

When BTA transport line components are listed as elements in the modular accelerator design (MAD) beam-optical transport accelerator code, their designation nomenclature is that of the present note, prefaced by " ABI." . For example, the horizontally focusing dipole magnet DH3 would be listed as ABI.DH3 .

Table 1A.

BTA LINE COMPONENTS		AGS Meter Coordinates		Coordinate Increment [Meters]		Distance Increment [Meters]
SURVEY POINT	NAME	EAST	NORTH	DELTA E	DELTA N	S DIFF
24	I.P. (AGS Injection Point)	60.49881	398.41579			
	SEPTUM	60.45070	399.07236			
	SEPTUM	61.08119	396.64735	0.63049	-2.42501	2.50563
	QV1	61.87996	394.22173	0.79877	-2.42562	2.55375
2	DH1	62.19275	393.27189	0.31279	-0.94985	1.00003
3	QH2A	62.44300	392.40735	0.25025	-0.86454	0.90003
	QH2B	62.63764	391.73495	0.19463	-0.67240	0.70000
4	QV3	63.01144	390.44357	0.37381	-1.29138	1.34439
5	STRIPPER	63.19217	389.81920	0.18073	-0.62437	0.65000
6	QH4	63.53974	388.61849	0.34756	-1.20071	1.25000
7	DH2	64.08432	386.73711	0.54459	-1.88139	1.95862
8	QV5	64.09559	384.87852	0.01127	-1.85858	1.85862
9	DH3	64.11096	382.34482	0.01536	-2.53370	2.53375
10	QH6	63.58923	380.45697	-0.52173	-1.88785	1.95862
11	QV7	63.08310	378.62562	-0.50612	-1.83135	1.90000
12	QH8	60.68570	369.95080	-2.39740	-8.67481	9.00000
13	DH4	60.35273	368.74597	-0.33297	-1.20483	1.25000
14	QV9	59.69557	366.51708	-0.65716	-2.22889	2.32375
15	QH10	58.85293	363.65910	-0.84264	-2.85798	2.97961

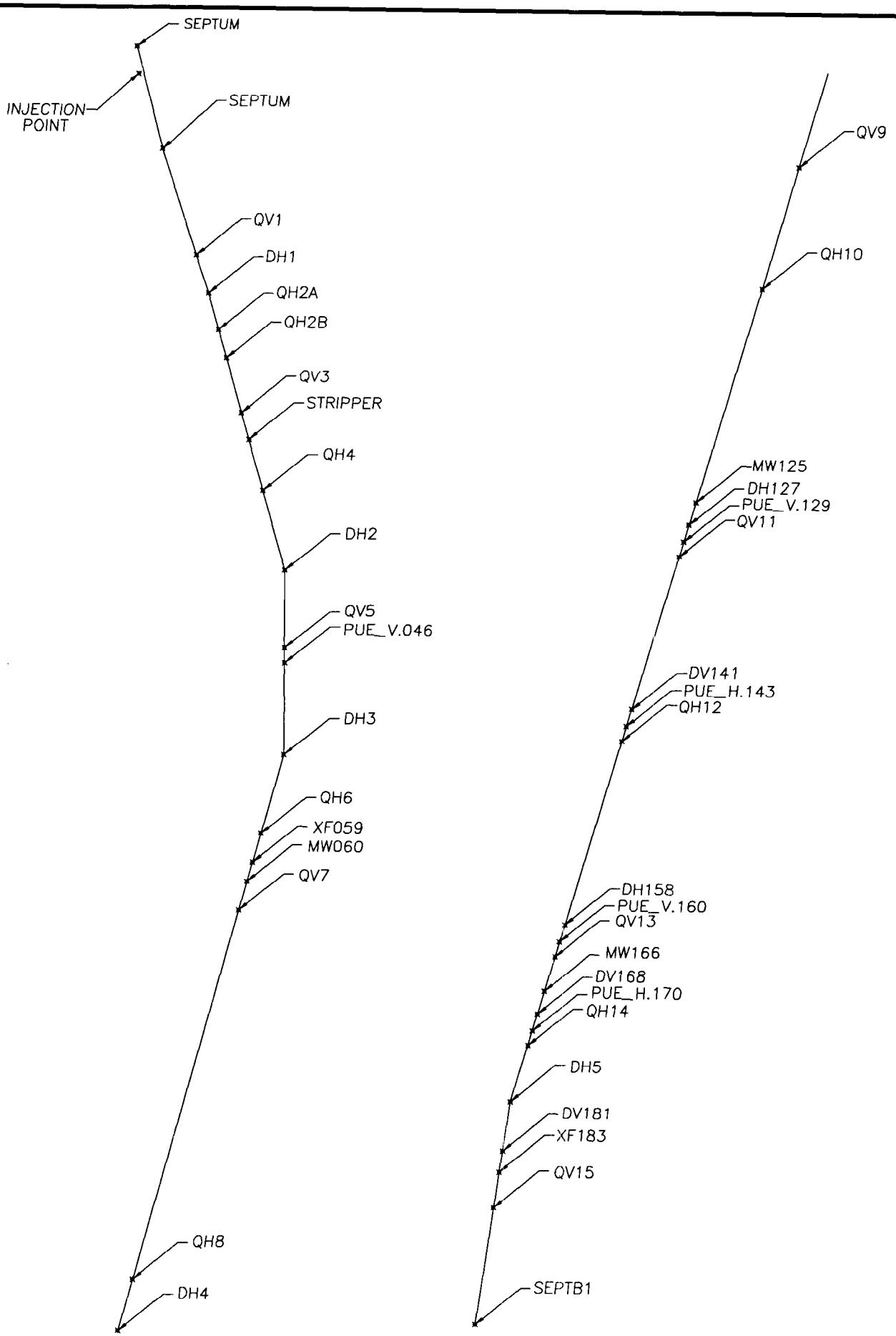
16	QV11	56.98142	357.31152	-1.87151	-6.34759	6.61773
17	QH12	55.68038	352.89879	-1.30104	-4.41272	4.60053
18	QV13	54.16235	347.75007	-1.51803	-5.14871	5.36784
	QH14	53.54456	345.65474	-0.61778	-2.09533	2.18451
20	DH5	53.15435	344.33124	-0.39021	-1.32351	1.37983
21	QV15	52.79025	341.85385	-0.36410	-2.47739	2.50400
	SEPTB1	52.39096	339.13703	-0.39929	-2.71681	2.74600
	PUE_V.046	64.09782	384.51092	0.00223 (From QV5)	-0.36761	0.36761 (From QV5)
	XF059	63.39724	379.76229	-0.19199 (From QH6)	-0.69468	0.72073 (From QH6)
	MW060	63. 27207	379.30937	-0.31716 (From QH6)	-1.14761	1.19063 (From QH6)
	MW125	57.35990	358.59521	-1.49303 (From QH10)	-5.06389	5.27940 (From QH10)
	DH127	57.20367	358.06531	-1.64926 (From QH10)	-5.59379	5.83185 (From QH10)
	PUE_V.129	57.08538	357.66412	0.10396 (From QV11)	0.35261	-0.36761 (From QV11)
	DV141	55.90263	353.65260	-1.07879 (From QV11)	-3.65892	3.81465 (From QV11)
	PUE_H.143	55.78434	353.25140	0.10396 (From QH12)	0.35261	-0.36761 (From QH12)

DH158	54.38460	348.50385	0.22225 (From QV13)	0.75380	-0.78588 (From QV13)
PUE_V.160	54.26631	348.10268	0.10389 (From QV13)	0.35261	-0.36761 (From QV13)
MW166	53.92304	346.93843	-0.23930 (From QV13)	-0.81164	0.84618 (From QV13)
DV168	53.76681	346.40854	-0.39554 (From QV13)	-1.34154	1.39863 (From QV13)
PUE_H.170	53.64853	346.00735	0.10396 (From QH14)	0.35261	-0.36761 (From QH14)
DV181	52.98505	343.17933	-0.16930 (From DH5)	-1.15191	1.16429 (From DH5)
XF183	52.91211	342.68301	-0.24224 (From DH5)	-1.64823	1.66594 (From DH5)

This table is a reproduction of Table 1, with all distances and coordinates converted to meters, by multiplying each value in Table 1 by 0.0254 .

Reference:

1. R. Thern, E. Auerbach, E. Bleser, M. Tanaka, 1985-1987 Horizontal Survey And Alignment, AGS/AD/Tech. Note No. 289, Brookhaven National Laboratory, Upton NY,



THE B.T.A. TRANSPORT LINE

ASchebein Jan. 27,1993