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Booster Technical Note No. 27;BNL-105074-2014-IR

Booster Coordiantes with 1,2,4,7 Sextupoles

Z. Parsa

April 1986

Collider Accelerator Department

Brookhaven National Laboratory

U.S. Department of Energy

USDOE Office of Science (SC)

DISCLAIMER

BOOSTER COORDINATES

WITH

1, 2, 4, 7 SEXTUPOLES

Booster Technical Note

No. 27

Z. PARSA

APRIL 23, 1986

HIGH ENERGY FACILITIES

Brookhaven National Laboratory

Upton, N.Y. 11973

ABSTRACT

THIS NOTE UPDATES THE AGS-BOOSTER COORDINATES, [BST/TN 6], BY INCLUDING THE 1,2,4,7 SEXTUPOLES. IT DESCRIBES THE COORDINATES OF THE AGS - BOOSTER IN THE BOOSTER CENTERED FRAME OF REFERENCE WITH AXES IN THE NORTH (X) AND EAST (Y) DIRECTIONS. TRANSFORMATION FROM THE BOOSTER CENTERED FRAME TO THE AGS AND BNL GRIDS ARE DISCUSSED, AND THE COORDINATES OF THE MACHINE WITH RESPECT TO THESE FRAMES ARE GIVEN.

I. INTRODUCTION

This note updates the AGS-Booster [1] coordinates, by including the 1,2,4,7 sextupole configuration [2]. In sec. II we describe the Booster centered reference frame with axes in the North (X) and East (Y) directions, with the unit of length expressed in meters. In section III, the transformation from the Booster centered reference frame to the AGS and BNL grids are discussed, and the coordinates of the Booster with respect to these frames are tabulated.

Layout of the Booster lattice [3] showing relative position of magnets and the labling convention of the lattice and its superperiods are also included (see Figures 1-3).

II. BOOSTER CENTERED COORDINATE SYSTEM

The coordinates of the Booster lattice in the Booster centered coordinate system (with East (X) and North (Y) axes where the length is measured in meters) using Tape 5 of program SYNCH, were generated assuming that:

1. The magnets have sharp edges where the field becomes zero.

2. The values listed in Table I correspond to the coordinates of an on-axis point of the downstream end of that element when viewed in a clockwise direction.

We note that, the effect of the earth's curvature for the Booster is negligable.

III. TRANSFER OF COORDINATES TO AGS AND BNL GRID

We can use the following transformation from the Booster centered frame of reference to that of AGS and BNL grids asuuming that the axes of the Booster centered coordinate system are parallel to those of 1) AGS and 2) BNL grids. Here X and Y are the x and y distances expressed in the Booster coodinate system, with E and N as the East and North coordinates and E0 and N0 are the the coordinates of the Booster in the 1) AGS [E(inch),N(inch)] and 2) BNL [E(feet),N(feet)] grids respectively:

1. AGS GRID

$$E(\text{inch}) = E0_{\text{AGS}}\ (\text{inch}) + X_{\text{BST}}\ (\text{inch})$$

$$N(\text{inch}) = N0_{\text{AGS}}\ (\text{inch}) + Y_{\text{BST}}\ (\text{inch})$$

$$E0_{\text{AGS}}\ (\text{inch}) = 1{,}148.88$$

$$N0_{\text{AGS}}\ (\text{inch}) = 15{,}459.36$$

2. BNL GRID

$$E(\text{feet}) = E0_{\text{BNL}}\ (\text{feet}) + X_{\text{BST}}\ (\text{feet})$$

$$N(\text{feet}) = N0_{\text{BNL}}\ (\text{feet}) + Y_{\text{BST}}\ (\text{feet})$$

$$E0_{\text{BNL}}\ (\text{feet}) = 98{,}517.19 \text{ feet, and}$$

$$N0_{\text{BNL}}\ (\text{feet}) = 102{,}438.28 \text{ feet .}$$

where the values for E0 and N0 were obtained from [4], (using the conversion factor of 2.54 cm/inch).
Note that the origins of the two systems are different.

REFERENCES:
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1. Booster Coordinates Update, Booster Tech Note No. 6, Z. Parsa, (January 28, 1986).

2. Booster Parameters with Enlarged Q5, Booster Tech. Note No. 25, Z. Parsa, (April 17, 1986).

3. Booster Lattice with Enlarged Q5 and 1,2,4,7 Sextupole Configuration. Booster Tech. Note No.26, E. Courant and Z. Parsa, (April 21,1986).

4. M. Schhaeffer, January 27, 1986.

5. The coordinates of the Booster Injection, Ejection, etc. will be given in a subsequent note.

Table 1

	ELEMENT	X(M)	Y(M)	E-AGS(IN)	N-AGS(IN)	ANGLE	S(ORBIT)
Ø		31.86Ø63	-5.55399	24Ø3.23542	1524Ø.69914	99.89	Ø.ØØØ
1	QD	31.82ØØ6	-5.8Ø257	2401.63829	1523Ø.91226	1ØØ.33	.252
2	S3Ø	31.77174	-6.Ø9866	2399.736Ø1	15219.25543	1ØØ.87	.552
3	SEXV	31.77174	-6.Ø9866	2399.736Ø1	15219.25543	1ØØ.87	.552
4	BEND	31.18Ø98	-8.42167	2376.47750	15127.79823	1Ø5.11	2.952
5	SEXV	31.18Ø98	-8.42167	2376.47750	15127.79823	1Ø5.11	2.952
6	S7Ø	3Ø.94998	-9.Ø8246	2367.38316	15101.78296	1Ø6.35	3.652
7	SXF	3Ø.94998	-9.Ø8246	2367.38316	15101.78296	1Ø6.35	3.652
8	S3Ø	3Ø.85Ø98	-9.36565	2363.48559	15Ø9Ø.63356	1Ø6.89	3.952
9	QF	3Ø.76786	-9.6Ø342	2360.21325	15Ø81.27270	1Ø7.33	4.2Ø4
1Ø	QF	3Ø.68475	-9.84118	2356.94Ø91	15Ø71.91185	1Ø7.78	4.456
11	S3Ø	3Ø.58575	-1Ø.12438	2353.Ø4334	15Ø6Ø.76245	1Ø8.32	4.756
12	SEXV	3Ø.58575	-1Ø.12438	2353.Ø4334	15Ø6Ø.76245	1Ø8.32	4.756
13	BEND	29.6ØØ57	-12.3Ø951	2314.25678	14974.73350	112.58	7.156
14	SEXV	29.6ØØ57	-12.3Ø951	2314.25678	14974.73350	112.58	7.156
15	S7Ø	29.25834	-12.92Ø15	2300.78309	14950.69267	113.83	7.856
16	SXD	29.25934	-12.92Ø15	2300.78309	14950.69267	113.83	7.856
17	S3Ø	29.11167	-13.18185	2295.ØØ866	14940.38946	114.36	8.156
18	QD	28.98853	-13.4Ø157	2290.16Ø53	14931.73906	114.81	8.4Ø8
19	QD	28.86538	-13.62129	2285.31241	14923.ØØ865	115.26	8.659
2Ø	S37Ø	27.Ø5644	-16.84894	2214.Ø9435	14796.Ø1572	121.91	12.359
21	QF	26.93330	-17.Ø6866	2209.24623	14787.36532	122.36	12.611
22	QF	26.81Ø16	-17.28839	2204.39811	14778.71491	122.82	12.863
23	S3Ø	26.66349	-17.55ØØ9	2198.62367	14768.41170	123.35	13.163
24	SEXV	26.66349	-17.55ØØ9	2198.62367	14768.41170	123.35	13.163
25	BEND	25.31383	-19.53Ø95	2145.48758	14690.42495	127.65	15.563
26	SEXV	25.31383	-19.53Ø95	2145.48758	14690.42495	127.65	15.563
27	S7Ø	24.87Ø76	-2Ø.Ø7288	2128.Ø4394	14669.Ø89Ø5	128.91	16.263
28	SXD	24.87Ø76	-2Ø.Ø7288	2128.Ø4394	14669.Ø89Ø5	128.91	16.263
29	S3Ø	24.68Ø88	-2Ø.3Ø514	2120.56809	14659.94509	129.44	16.563
3Ø	QD	24.52145	-2Ø.5ØØ14	2114.29149	14652.26797	129.9Ø	16.815
31	QD	24.36203	-2Ø.69514	2108.Ø1490	14644.59Ø86	13Ø.35	17.Ø67
32	S3Ø	24.17214	-2Ø.92739	21ØØ.53905	14635.44690	13Ø.88	17.367
33	SEXV	24.17214	-2Ø.92739	21ØØ.53905	14635.44690	13Ø.88	17.367
34	BEND	22.49901	-22.6438Ø	2034.66794	14567.87194	135.18	19.767
35	SEXV	22.49901	-22.6438Ø	2034.66794	14567.87194	135.18	19.767
36	S1ØØ	21.74124	-23.29631	2ØØ4.83426	14542.18237	136.98	2Ø.767
37	QF	21.55Ø37	-23.46Ø66	1997.31990	14535.71181	137.43	21.Ø19
38	QF	21.35951	-23.625Ø2	1989.8Ø554	14529.24124	137.88	21.271
39	S37Ø	18.55574	-26.Ø3932	1879.42Ø9Ø	14434.18981	144.53	24.971
4Ø	QD	18.36487	-26.2Ø368	1871.9Ø654	14427.71925	144.98	25.223
41	QD	18.174Ø1	-26.36803	1864.39218	14421.24869	145.42	25.474
42	S3Ø	17.94668	-26.56378	1855.44208	14413.54182	145.96	25.774
43	SEXV	17.94668	-26.56378	1855.44208	14413.54182	145.96	25.774
44	BEND	16.ØØØ92	-27.96357	1778.83742	14358.43189	15Ø.22	28.174
45	SEXV	16.ØØØ92	-27.96357	1778.83742	14358.43189	15Ø.22	28.174
46	S7Ø	15.39922	-28.32128	1755.14844	14344.34879	151.47	28.874
47	SXF	15.39922	-28.32128	1755.14844	14344.34879	151.47	28.874
48	S3Ø	15.14135	-28.47459	1744.99602	14338.31318	152.ØØ	29.174
49	QF	14.92484	-28.6Ø33Ø	1736.47222	14333.24577	152.45	29.426
5Ø	QF	14.7Ø834	-28.73201	1727.94842	14328.17837	152.89	29.678
51	S3Ø	14.45Ø47	-28.88532	1717.79600	14322.14275	153.42	29.978
52	SEXV	14.45Ø47	-28.88532	1717.79600	14322.14275	153.42	29.978
53	BEND	12.29120	-29.92597	1632.78539	14281.17236	157.67	32.378
54	SEXV	12.29120	-29.92597	1632.78539	14281.17236	157.67	32.378
55	S1ØØ	11.35595	-3Ø.27995	1595.96453	14267.23579	159.44	33.378
56	QD	11.12Ø38	-3Ø.36912	1586.69Ø28	14263.72552	159.89	33.63Ø

Table 1

	ELEMENT	X(M)	Y(M)	E-AGS(IN)	N-AGS(IN)	ANGLE	S(ORBIT)
57	QD	10.88482	-30.45828	1577.41603	14260.21523	160.33	33.882
58	S30	10.60424	-30.56447	1566.36978	14256.03425	160.87	34.182
59	SEXV	10.60424	-30.56447	1566.36978	14256.03425	160.87	34.182
60	BEND	8.29707	-31.21436	1475.53627	14230.44811	165.11	36.582
61	SEXV	8.29707	-31.21436	1475.53627	14230.44811	165.11	36.582
62	S70	7.60931	-31.34471	1448.45922	14225.31640	166.35	37.282
63	SXF	7.60931	-31.34471	1448.45922	14225.31640	166.35	37.282
64	S30	7.31456	-31.40057	1436.85476	14223.11710	166.89	37.582
65	QF	7.06709	-31.44747	1427.11186	14221.27060	167.33	37.834
66	QF	6.81962	-31.49437	1417.36895	14219.42410	167.78	38.086
67	S30	6.52487	-31.55023	1405.76450	14217.22480	168.32	38.386
68	SEXV	6.52487	-31.55023	1405.76450	14217.22480	168.32	38.386
69	BEND	4.13989	-31.78961	1311.86796	14207.80046	172.58	40.786
70	SEXV	4.13989	-31.78961	1311.86796	14207.80046	172.58	40.786
71	S70	3.43995	-31.79855	1284.31115	14207.44861	173.83	41.486
72	SXD	3.43995	-31.79855	1284.31115	14207.44861	173.83	41.486
73	S30	3.13998	-31.80238	1272.50109	14207.29781	174.36	41.786
74	QD	2.88812	-31.80560	1262.58556	14207.17120	174.81	42.037
75	QD	2.63627	-31.80881	1252.67003	14207.04460	175.26	42.289
76	S370	-1.06343	-31.85605	1107.01261	14205.18478	181.91	45.989
77	QF	-1.31529	-31.85927	1097.09708	14205.05818	182.36	46.241
78	QF	-1.56714	-31.86248	1087.18155	14204.93157	182.82	46.493
79	S30	-1.86712	-31.86631	1075.37149	14204.78078	183.35	46.793
80	SEXV	-1.86712	-31.86631	1075.37149	14204.78078	183.35	46.793
81	BEND	-4.25742	-31.68791	981.26494	14211.80461	187.65	49.193
82	SEXV	-4.25742	-31.68791	981.26494	14211.80461	187.65	49.193
83	S70	-4.94828	-31.57516	954.06568	14216.24329	188.91	49.893
84	SXD	-4.94828	-31.57516	954.06568	14216.24329	188.91	49.893
85	S30	-5.24437	-31.52685	942.40886	14218.14558	189.44	50.193
86	QD	-5.49295	-31.48628	932.62198	14219.74272	189.90	50.445
87	QD	-5.74154	-31.44571	922.83511	14221.33985	190.35	50.697
88	S30	-6.03762	-31.39739	911.17828	14223.24215	190.88	50.997
89	SEXV	-6.03762	-31.39739	911.17828	14223.24215	190.88	50.997
90	BEND	-8.36064	-30.80663	819.72110	14246.50072	195.18	53.397
91	SEXV	-8.36064	-30.80663	819.72110	14246.50072	195.18	53.397
92	S100	-9.30462	-30.47663	782.55643	14259.49266	196.98	54.397
93	QF	-9.54238	-30.39351	773.19558	14262.76501	197.43	54.649
94	QF	-9.78015	-30.31040	763.83473	14266.03735	197.88	54.901
95	S370	-13.27289	-29.08941	626.32546	14314.10754	204.53	58.601
96	QD	-13.51065	-29.00629	616.96461	14317.37988	204.98	58.852
97	QD	-13.74842	-28.92318	607.60376	14320.65223	205.42	59.104
98	S30	-14.03161	-28.82418	596.45436	14324.54981	205.96	59.404
99	SEXV	-14.03161	-28.82418	596.45436	14324.54981	205.96	59.404
100	BEND	-16.21675	-27.83900	510.42544	14363.33643	210.22	61.804
101	SEXV	-16.21675	-27.83900	510.42544	14363.33643	210.22	61.804
102	S70	-16.82738	-27.49677	486.38462	14376.81014	211.47	62.504
103	SXF	-16.82738	-27.49677	486.38462	14376.81014	211.47	62.504
104	S30	-17.08908	-27.35010	476.08142	14382.58458	212.08	62.804
105	QF	-17.30880	-27.22695	467.43102	14387.43271	212.45	63.056
106	QF	-17.52852	-27.10381	458.78062	14392.28084	212.89	63.308
107	S30	-17.79023	-26.95714	448.47741	14398.05528	213.42	63.608
108	SEXV	-17.79023	-26.95714	448.47741	14398.05528	213.42	63.608
109	BEND	-19.77109	-25.60748	370.49070	14451.19143	217.67	66.008
110	SEXV	-19.77109	-25.60748	370.49070	14451.19143	217.67	66.008
111	S100	-20.54528	-24.97453	340.01085	14476.11094	219.44	67.008
112	QD	-20.74027	-24.81510	332.33374	14482.38754	219.89	67.260

Table 1

	ELEMENT	X(M)	Y(M)	E-AGS(IN)	N-AGS(IN)	ANGLE	S(ORBIT)
113	QD	-20.93527	-24.65567	324.65662	14488.66414	220.33	67.512
114	S30	-21.16753	-24.46579	315.51266	14496.13998	220.87	67.812
115	SEXV	-21.16753	-24.46579	315.51266	14496.13998	220.87	67.812
116	BEND	-22.88394	-22.79266	247.93765	14562.01103	225.11	70.212
117	SEXV	-22.88394	-22.79266	247.93765	14562.01103	225.11	70.212
118	S70	-23.34070	-22.26222	229.95493	14582.89460	226.35	70.912
119	SXF	-23.34070	-22.26222	229.95493	14582.89460	226.35	70.912
120	S30	-23.53645	-22.03489	222.24806	14591.84470	226.89	71.212
121	QF	-23.70080	-21.84402	215.77749	14599.35905	227.33	71.464
122	QF	-23.86516	-21.65316	209.30692	14606.87341	227.78	71.716
123	S30	-24.06091	-21.42583	201.60004	14615.82351	228.32	72.016
124	SEXV	-24.06091	-21.42583	201.60004	14615.82351	228.32	72.016
125	BEND	-25.46070	-19.48007	146.49006	14692.42813	232.58	74.416
126	SEXV	-25.46070	-19.48007	146.49006	14692.42813	232.58	74.416
127	S70	-25.81842	-18.87837	132.40694	14716.11709	233.83	75.116
128	SXD	-25.81842	-18.87837	132.40694	14716.11709	233.83	75.116
129	S30	-25.97172	-18.62055	126.37132	14726.26051	234.36	75.416
130	QD	-26.10043	-18.40399	121.30391	14734.79331	234.81	75.667
131	QD	-26.22914	-18.18749	116.23650	14743.31711	235.26	75.919
132	S370	-28.11990	-15.00708	41.79714	14868.53022	241.91	79.619
133	QF	-28.24862	-14.79057	36.72973	14877.05402	242.36	79.871
134	QF	-28.37733	-14.57407	31.66233	14885.57782	242.82	80.123
135	S30	-28.53063	-14.31620	25.62670	14895.73023	243.35	80.423
136	SEXV	-28.53063	-14.31620	25.62670	14895.73023	243.35	80.423
137	BEND	-29.57128	-12.15693	-15.34376	14980.74081	247.65	82.823
138	SEXV	-29.57128	-12.15693	-15.34376	14980.74081	247.65	82.823
139	S70	-29.81908	-11.50225	-25.09937	15006.51540	248.91	83.523
140	SXD	-29.81908	-11.50225	-25.09937	15006.51540	248.91	83.523
141	S30	-29.92527	-11.22168	-29.28035	15017.56166	249.44	83.823
142	QD	-30.01443	-10.98611	-32.79063	15026.83591	249.90	84.075
143	QD	-30.10360	-10.75055	-36.30091	15036.11016	250.35	84.327
144	S30	-30.20979	-10.46997	-40.48189	15047.15641	250.88	84.627
145	SEXV	-30.20979	-10.46997	-40.48189	15047.15641	250.88	84.627
146	BEND	-30.85968	-8.16280	-66.06796	15137.98994	255.18	87.027
147	SEXV	-30.85968	-8.16280	-66.06796	15137.98994	255.18	87.027
148	S100	-31.04589	-7.18029	-73.39894	15176.67146	256.98	88.027
149	QF	-31.09279	-6.93282	-75.24543	15186.41436	257.43	88.279
150	QF	-31.13969	-6.68535	-77.09193	15196.15727	257.88	88.531
151	S370	-31.82865	-3.05006	-104.21656	15339.27889	264.53	92.231
152	QD	-31.87555	-2.80259	-106.06305	15349.02179	264.98	92.482
153	QD	-31.92245	-2.55512	-107.90954	15358.76470	265.42	92.734
154	S30	-31.97832	-2.26037	-110.10884	15370.36916	265.96	93.034
155	SEXV	-31.97832	-2.26037	-110.10884	15370.36916	265.96	93.034
156	BEND	-32.21769	.12460	-119.53310	15464.26570	270.22	95.434
157	SEXV	-32.21769	.12460	-119.53310	15464.26570	270.22	95.434
158	S70	-32.22663	.82455	-119.88494	15491.82251	271.47	96.134
159	SXF	-32.22663	.82455	-119.88494	15491.82251	271.47	96.134
160	S30	-32.23046	1.12452	-120.03572	15503.63257	272.00	96.434
161	QF	-32.23367	1.37638	-120.16232	15513.54810	272.45	96.686
162	QF	-32.23689	1.62823	-120.28892	15523.46363	272.89	96.938
163	S30	-32.24072	1.92821	-120.43971	15535.27369	273.42	97.238
164	SEXV	-32.24072	1.92821	-120.43971	15535.27369	273.42	97.238
165	BEND	-32.06231	4.31851	-113.41581	15629.38023	277.67	99.638
166	SEXV	-32.06231	4.31851	-113.41581	15629.38023	277.67	99.638
167	S100	-31.90125	5.30546	-107.07480	15668.23631	279.44	100.638
168	QD	-31.86068	5.55404	-105.47766	15678.02319	279.89	100.890

Table 1

	ELEMENT	X(M)	Y(M)	E-AGS(IN)	N-AGS(IN)	ANGLE	S(ORBIT)
169	QD	-31.82Ø12	5.8Ø263	-1Ø3.88Ø53	15687.81ØØ6	28Ø.33	1Ø1.142
17Ø	S3Ø	-31.77188Ø	6.Ø9871	-1Ø1.97825	15699.46689	28Ø.87	1Ø1.442
171	SEXV	-31.77188Ø	6.Ø9871	-1Ø1.97825	15699.46689	28Ø.87	1Ø1.442
172	BEND	-31.18103	8.42173	-78 71974	15798.92409	285.11	1Ø3.842
173	SEXV	-31.18103	8.42173	-78 71974	15798.92409	285.11	1Ø3.842
174	S7Ø	-3Ø.95ØØ4	9.Ø8252	-69.62548Ø	15816.93936	286.35	1Ø4.542
175	SXF	-3Ø.95ØØ4	9.Ø8252	-69.62548Ø	15816.93936	286.35	1Ø4.542
176	S3Ø	-3Ø.85184	9.36571	-65.72783	15828.Ø8876	286.89	1Ø4.842
177	QF	-3Ø.76792	9.6Ø348	-62.45549	15837.44962	287.33	1Ø5.Ø94
178	QF	-3Ø.68488Ø	9.84124	-59.18315	15846.81Ø47	287.78	1Ø5.346
179	S3Ø	-3Ø.58581	1Ø.12444	-55.28557	15857.95987	288.32	1Ø5.646
18Ø	SEXV	-3Ø.58581	1Ø.12444	-55.28557	15857.95987	288.32	1Ø5.646
181	BEND	-29.6ØØ63	12.3Ø957	-16.49ØØ2	15943.99882	292.58	1Ø8.Ø46
182	SEXV	-29.6ØØ63	12.3Ø957	-16.49ØØ2	15943.98882	292.58	1Ø8.Ø46
183	S7Ø	-29.2584Ø	12.92Ø21	-3.Ø2533	15968.Ø2965	293.83	1Ø8.746
184	SXD	-29.2584Ø	12.92Ø21	-3.Ø2533	15968.Ø2965	293.83	1Ø8.746
185	S3Ø	-29.11172	13.18191	2.74911	15978.33286	294.36	1Ø9.Ø46
186	QD	-28.98858	13.4Ø163	7.59723	15986.98326	294.81	1Ø9.297
187	QD	-28.86544	13.62135	12.44535	15995.63367	295.26	1Ø9.549
188	S37Ø	-27.Ø5658Ø	16.84988Ø	83.66341	16122.7Ø66Ø	3Ø1.91	113.249
189	QF	-26.93336	17.Ø6872	88.51153	16131.35788Ø	3Ø2.36	113.5Ø1
19Ø	QF	-26.81Ø22	17.28844	93.35965	1614Ø.ØØ741	3Ø2.82	113.753
191	S3Ø	-26.66355	17.55Ø15	99.13489	16158Ø.31Ø62	3Ø3.35	114.Ø53
192	SEXV	-26.66355	17.55Ø15	99.13489	16158Ø.31Ø62	3Ø3.35	114.Ø53
193	BEND	-25.31389	19.53181	152.27Ø18	16228.29737	3Ø7.65	116.453
194	SEXV	-25.31389	19.53181	152.27Ø18	16228.29737	3Ø7.65	116.453
195	S7Ø	-24.87Ø82	2Ø.Ø7294	169.71382	16249.63327	3Ø8.91	117.153
196	SXD	-24.87Ø82	2Ø.Ø7294	169.71382	16249.63327	3Ø8.91	117.153
197	S3Ø	-24.68Ø93	2Ø.3Ø52Ø	177.18967	16258.77723	3Ø9.44	117.453
198	OD	-24.52151	2Ø.5ØØ2Ø	183.46627	16266.45435	3Ø9.9Ø	117.7Ø5
199	QD	-24.36288	2Ø.69528Ø	189.74286	16274.13147	31Ø.35	117.957
2ØØ	S3Ø	-24.17228	2Ø.92745	197.21871	16283.27542	31Ø.88	118.257
2Ø1	SEXV	-24.17228	2Ø.92745	197.21871	16283.27542	31Ø.88	118.257
2Ø2	BEND	-22.49987	22.64386	263.Ø8982	16358.85Ø38	315.18	12Ø.657
2Ø3	SEXV	-22.49987	22.64386	263.Ø8982	16358.85Ø38	315.18	12Ø.657
2Ø4	S1ØØ	-21.74138Ø	23.29637	292.92358Ø	16376.53995	316.98	121.657
2Ø5	QF	-21.55Ø43	23.46Ø72	3ØØ.43786	16383.Ø1Ø52	317.43	121.9Ø9
2Ø6	QF	-21.35957	23.62588	3Ø7.95222	16389.48188	317.88	122.161
2Ø7	S37Ø	-18.55588Ø	26.Ø3938	418.33686	16484.53251	324.53	125.861
2Ø8	OD	-18.36493	26.2Ø373	425.85122	16491.ØØ3Ø7	324.98	126.112
2Ø9	OD	-18.17487	26.36889	433.36558	16497.47363	325.42	126.364
21Ø	S3Ø	-17.94673	26.56384	442.31568	16585.18Ø51	325.96	126.664
211	SEXV	-17.94673	26.56384	442.31568	16585.18Ø51	325.96	126.664
212	BEND	-16.ØØØ98	27.96363	518.92Ø34	16568Ø.29Ø43	33Ø.22	129.Ø64
213	SEXV	-16.ØØØ98	27.96363	518.92Ø34	16568Ø.29Ø43	33Ø.22	129.Ø64
214	S7Ø	-15.39928	28.32134	542.6Ø932	16574.37353	331.47	129.764
215	SXF	-15.39928	28.32134	542.6Ø932	16574.37353	331.47	129.764
216	S3Ø	-15.14148	28.47465	552.76174	16588Ø.4Ø915	332.ØØ	13Ø.Ø64
217	QF	-14.92498	28.6Ø336	561.28554	16585.47655	332.44	13Ø.316
218	QF	-14.7Ø839	28.73207	569.8Ø934	16598.54395	332.89	13Ø.568
219	S3Ø	-14.45852	28.88538	579.96176	16596.57957	333.42	13Ø.868
22Ø	SEXV	-14.45852	28.88538	579.96176	16596.57957	333.42	13Ø.868
221	BEND	-12.29125	29.92603	664.97237	16637.54997	337.67	133.268
222	SEXV	-12.29125	29.92603	664.97237	16637.54997	337.67	133.268
223	S1ØØ	-11.356ØØ	3Ø.28ØØ1	7Ø1.79323	16651.48653	339.44	134.268
224	QD	-11.12Ø44	3Ø.36917	711.Ø6748	16654.99688Ø	339.89	134.52Ø

Table 1

	ELEMENT	X(M)	Y(M)	E-AGS(IN)	N-AGS(IN)	ANGLE	S(ORBIT)
225	QD	-10.88487	30.45834	720.34173	16658.50709	340.33	134.772
226	S30	-10.60430	30.56453	731.38798	16662.68807	340.87	135.072
227	SEXV	-10.60430	30.56453	731.38798	16662.68807	340.87	135.072
228	BEND	-8.29713	31.21442	822.22149	16688.27422	345.11	137.472
229	SEXV	-8.29713	31.21442	822.22149	16688.27422	345.11	137.472
230	S70	-7.60937	31.34477	849.29855	16693.40592	346.35	138.172
231	SXF	-7.60937	31.34477	849.29855	16693.40592	346.35	138.172
232	S30	-7.31462	31.40063	860.90300	16695.60523	346.89	138.472
233	QF	-7.06715	31.44753	870.64591	16697.45172	347.33	138.724
234	QF	-6.81968	31.49443	880.38881	16699.29822	347.78	138.976
235	S30	-6.52492	31.55029	891.99326	16701.49753	348.32	139.276
236	SEXV	-6.52492	31.55029	891.99326	16701.49753	348.32	139.276
237	BEND	-4.13995	31.78967	985.88980	16710.92186	352.58	141.676
238	SEXV	-4.13995	31.78967	985.88980	16710.92186	352.58	141.676
239	S70	-3.44001	31.79861	1013.44661	16711.27372	353.83	142.376
240	SXD	-3.44001	31.79861	1013.44661	16711.27372	353.83	142.376
241	S30	-3.14003	31.80244	1025.25667	16711.42451	354.36	142.676
242	QD	-2.88818	31.80565	1035.17220	16711.55112	354.81	142.927
243	QD	-2.63632	31.80887	1045.08773	16711.67772	355.26	143.179
244	S370	1.06337	31.85611	1190.74515	16713.53754	1.91	146.879
245	QF	1.31523	31.85933	1200.66068	16713.66414	2.36	147.131
246	QF	1.56708	31.86254	1210.57621	16713.79075	2.82	147.383
247	S30	1.86706	31.86637	1222.38627	16713.94155	3.35	147.683
248	SEXV	1.86706	31.86637	1222.38627	16713.94155	3.35	147.683
249	BEND	4.25737	31.68797	1316.49282	16706.91772	7.65	150.083
250	SEXV	4.25737	31.68797	1316.49282	16706.91772	7.65	150.083
251	S70	4.94823	31.57522	1343.69208	16702.47903	8.91	150.783
252	SXD	4.94823	31.57522	1343.69208	16702.47903	8.91	150.783
253	S30	5.24431	31.52691	1355.34890	16700.57674	9.44	151.083
254	QD	5.49290	31.48634	1365.13578	16698.97960	9.90	151.335
255	QD	5.74148	31.44577	1374.92265	16697.38247	10.35	151.587
256	S30	6.03757	31.39745	1386.57948	16695.48018	10.88	151.887
257	SEXV	6.03757	31.39745	1386.57948	16695.48018	10.88	151.887
258	BEND	8.36058	30.80668	1478.03666	16672.22160	15.18	154.287
259	SEXV	8.36058	30.80668	1478.03666	16672.22160	15.18	154.287
260	S100	9.30456	30.47669	1515.20133	16659.22966	16.98	155.287
261	QF	9.54233	30.39357	1524.56218	16655.95731	17.43	155.539
262	QF	9.78009	30.31045	1533.92303	16652.68497	17.88	155.791
263	S370	13.27283	29.08947	1671.43230	16604.61478	24.53	159.491
264	QD	13.51059	29.00635	1680.79315	16601.34244	24.98	159.742
265	QD	13.74836	28.92324	1690.15400	16598.07009	25.42	159.994
266	S30	14.03155	28.82424	1701.30340	16594.17251	25.96	160.294
267	SEXV	14.03155	28.82424	1701.30340	16594.17251	25.96	160.294
268	BEND	16.21669	27.83906	1787.33232	16555.38589	30.22	162.694
269	SEXV	16.21669	27.83906	1787.33232	16555.38589	30.22	162.694
270	S70	16.82733	27.49683	1811.37314	16541.91219	31.47	163.394
271	SXF	16.82733	27.49683	1811.37314	16541.91219	31.47	163.394
272	S30	17.08903	27.35015	1821.67635	16536.13774	32.00	163.694
273	QF	17.30875	27.22701	1830.32675	16531.28961	32.44	163.946
274	QF	17.52847	27.10387	1838.97715	16526.44148	32.89	164.198
275	S30	17.79017	26.95720	1849.28035	16520.66704	33.42	164.498
276	SEXV	17.79017	26.95720	1849.28035	16520.66704	33.42	164.498
277	BEND	19.77103	25.60754	1927.26706	16467.53089	37.67	166.898
278	SEXV	19.77103	25.60754	1927.26706	16467.53089	37.67	166.898
279	S100	20.54522	24.97459	1957.74691	16442.61138	39.44	167.898
280	QD	20.74022	24.81516	1965.42402	16436.33478	39.89	168.150

Table 1

	ELEMENT	X(M)	Y(M)	E-AGS(IN)	N-AGS(IN)	ANGLE	S(ORBIT)
281	QD	20.93522	24.65573	1973.10114	16430.05819	40.33	168.402
282	S30	21.16747	24.46585	1982.24511	16422.58235	40.87	168.702
283	SEXV	21.16747	24.46585	1982.24511	16422.58235	40.87	168.702
284	BEND	22.88388	22.79272	2049.82011	16356.71129	45.11	171.102
285	SEXV	22.88388	22.79272	2049.82011	16356.71129	45.11	171.102
286	S70	23.34064	22.26228	2067.80283	16335.82772	46.35	171.802
287	SXF	23.34064	22.26228	2067.80283	16335.82772	46.35	171.802
288	S30	23.53639	22.03495	2075.59971	16326.87762	46.89	172.102
289	QF	23.70075	21.84408	2081.96027	16319.36327	47.33	172.354
290	QF	23.86510	21.65322	2088.45084	16311.84891	47.78	172.606
291	S30	24.06085	21.42589	2096.15772	16302.89881	48.32	172.906
292	SEXV	24.06085	21.42589	2096.15772	16302.89881	48.32	172.906
293	BEND	25.46065	19.48013	2151.26770	16226.29420	52.58	175.306
294	SEXV	25.46065	19.48013	2151.26770	16226.29420	52.58	175.306
295	S70	25.81836	18.87643	2165.35082	16202.60523	53.83	176.006
296	SXD	25.81836	18.87643	2165.35082	16202.60523	53.83	176.006
297	S30	25.97166	18.62056	2171.38644	16192.45281	54.36	176.306
298	QD	26.10038	18.40405	2176.45385	16183.92901	54.81	176.557
299	QD	26.22909	18.18755	2181.52126	16175.40522	55.26	176.809
300	S370	28.11985	15.00714	2255.96062	16050.19210	61.91	180.509
301	QF	28.24856	14.79063	2261.02803	16041.66830	62.36	180.761
302	QF	28.37727	14.57413	2266.09544	16033.14450	62.82	181.013
303	S30	28.53058	14.31626	2272.13106	16022.99209	63.35	181.313
304	SEXV	28.53058	14.31626	2272.13106	16022.99209	63.35	181.313
305	BEND	29.57123	12.15699	2313.10152	15937.98151	67.65	183.713
306	SEXV	29.57123	12.15699	2313.10152	15937.98151	67.65	183.713
307	S70	29.81902	11.50231	2322.85714	15912.20692	68.91	184.413
308	SXD	29.81902	11.50231	2322.85714	15912.20692	68.91	184.413
309	S30	29.92522	11.22174	2327.03011	15901.16067	69.44	184.713
310	QD	30.01438	10.98617	2330.54839	15891.88642	69.90	184.965
311	QD	30.10354	10.75061	2334.05867	15882.61217	70.35	185.217
312	S30	30.20974	10.47003	2338.23965	15871.56591	70.88	185.517
313	SEXV	30.20974	10.47003	2338.23965	15871.56591	70.88	185.517
314	BEND	30.85962	8.16286	2363.82572	15780.73238	75.18	187.917
315	SEXV	30.85962	8.16286	2363.82572	15780.73238	75.18	187.917
316	S100	31.04583	7.18035	2371.15670	15742.05087	76.98	188.917
317	QF	31.09273	6.93288	2373.00320	15732.30796	77.43	189.169
318	QF	31.13963	6.68541	2374.84969	15722.56505	77.88	189.421
319	S370	31.82860	3.05012	2401.97432	15579.44344	84.53	193.121
320	QD	31.87550	2.80265	2403.82081	15569.70053	84.98	193.372
321	QD	31.92240	2.55518	2405.66730	15559.95762	85.42	193.624
322	S30	31.97826	2.26043	2407.86660	15548.35317	85.96	193.924
323	SEXV	31.97826	2.26043	2407.86660	15548.35317	85.96	193.924
324	BEND	32.21764	-.12455	2417.29086	15454.45663	90.22	196.324
325	SEXV	32.21764	-.12455	2417.29086	15454.45663	90.22	196.324
326	S70	32.22657	-.82449	2417.64270	15426.89982	91.47	197.024
327	SXF	32.22657	-.82449	2417.64270	15426.89982	91.47	197.024
328	S30	32.23040	-1.12446	2417.79349	15415.08975	92.00	197.324
329	QF	32.23362	-1.37632	2417.92008	15405.17422	92.44	197.576
330	QF	32.23683	-1.62817	2418.04668	15395.25869	92.89	197.828
331	S30	32.24066	-1.92815	2418.19747	15383.44863	93.42	198.128
332	SEXV	32.24066	-1.92815	2418.19747	15383.44863	93.42	198.128
333	BEND	32.06226	-4.31845	2411.17357	15289.34209	97.67	200.528
334	SEXV	32.06226	-4.31845	2411.17357	15289.34209	97.67	200.528
335	S100	31.90120	-5.30540	2404.83256	15250.48601	99.44	201.528
336	QD	31.86063	-5.55399	2403.23542	15240.69914	99.89	201.780

Tabe 2

	APEX	N(IN)	E(IN)	X(M)	Y(M)
1	A1	15172.5Ø94Ø	2392.1Ø75Ø	31.57798	-7.286Ø1
2	A2	15Ø16.Ø5128	2337.41334	3Ø.18875	-11.26ØØ4
3	A4	14727.Ø9392	2175.46711	26.Ø7531	-18.59956
4	A5	14598.77793	2Ø7Ø.55952	23.41Ø66	-21.85878
5	A7	14382.63583	1819.55Ø5Ø	17.Ø35Ø3	-27.34879
6	A8	14297.93882	1677.Ø8292	13.41635	-29.5ØØ1Ø
7	B1	14239.26782	1522.Ø7224	9.479Ø8	-3Ø.99Ø34
8	B2	14208.4Ø552	1359.22841	5.34285	-31.77424
9	B4	14204.17689	1Ø28.Ø1Ø87	-3.Ø7ØØ8	-31.88165
1Ø	B5	14230.87177	864.43221	-7.22497	-31.2Ø36Ø
11	B7	14340.18138	551.74332	-15.16727	-28.42714
12	B8	14421.21363	4Ø7.15988	-18.83969	-26.36892
13	C1	14526.1215Ø	278.84412	-22.ØØ891	-23.7Ø426
14	C2	14651.71741	17Ø.69486	-24.8459Ø	-2Ø.51412
15	C4	14936.44615	1.42441	-29.14537	-13.282Ø1
16	C5	15Ø91.45695	-57.24624	-3Ø.63561	-9.34474
17	C7	15416.9Ø838	-118.92531	-32.2Ø225	-1.Ø7827
18	C8	15582.63744	-121.Ø4Ø79	-32.25599	3.13125
19	D1	15746.216Ø4	-94.34554	-31.57793	7.28614
2Ø	D2	15902.67392	-39.65Ø69	-3Ø.18868	11.26Ø17
21	D4	16191.63Ø55	122.29683	-26.Ø7521	18.59967
22	D5	16319.946Ø8	227.2Ø499	-23.41Ø55	21.85889
23	D7	16536.Ø87Ø5	478.21498	-17.Ø3489	27.34887
24	D8	16628.78343	62Ø.68294	-13.41621	29.5ØØ16
25	E1	16679.45374	775.69388	-9.47893	3Ø.99Ø38
26	E2	16719.31531	938.53785	-5.34269	31.77426
27	E4	16714.54246	1269.7554Ø	3.Ø7Ø24	31.88163
28	E5	16687.84685	1433.33395	7.22513	31.2Ø357
29	E7	16578.53585	1746.Ø2235	15.16742	28.427Ø7
3Ø	E8	16497.5Ø295	1890.6Ø543	18.83983	26.36883
31	F1	16392.59450	2Ø18.92Ø72	22.Ø99Ø3	23.7Ø416
32	F2	16266.99811	2127.Ø6942	24.846Ø1	2Ø.514Ø1
33	F4	15982.26862	2296.33859	29.14545	13.28188
34	F5	15827.25755	2355.ØØ856	3Ø.63567	9.3446Ø
35	F7	15501.8Ø585	2416.68617	32.2Ø228	1.Ø7812
36	F8	15336.Ø7678	2418.8ØØ91	32.25599	-3.13139

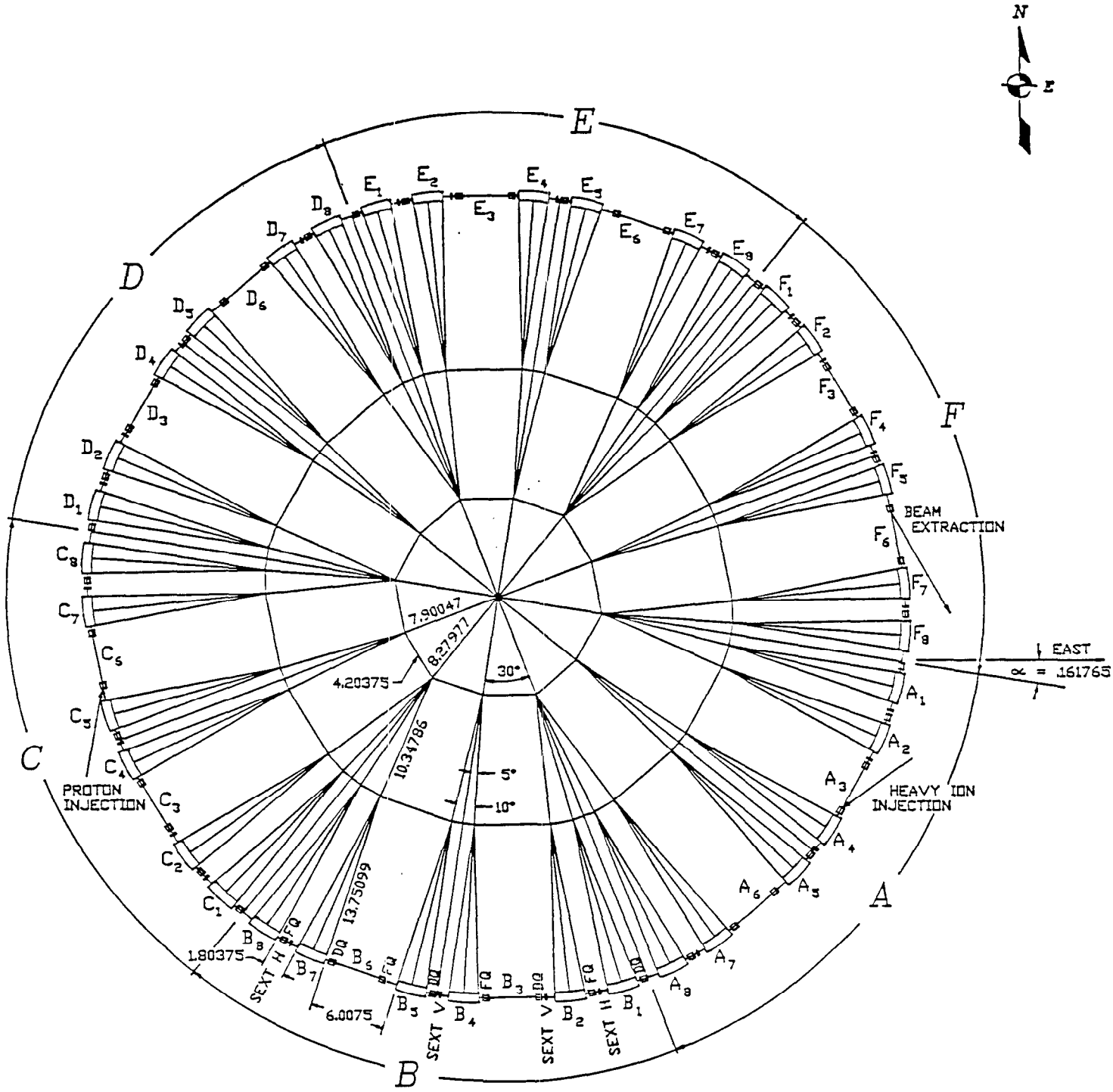

FIG. 1 Overall Layout of the AGS Booster

0 5
METERS

NOTE: ALL DIMENSIONS ARE IN METERS

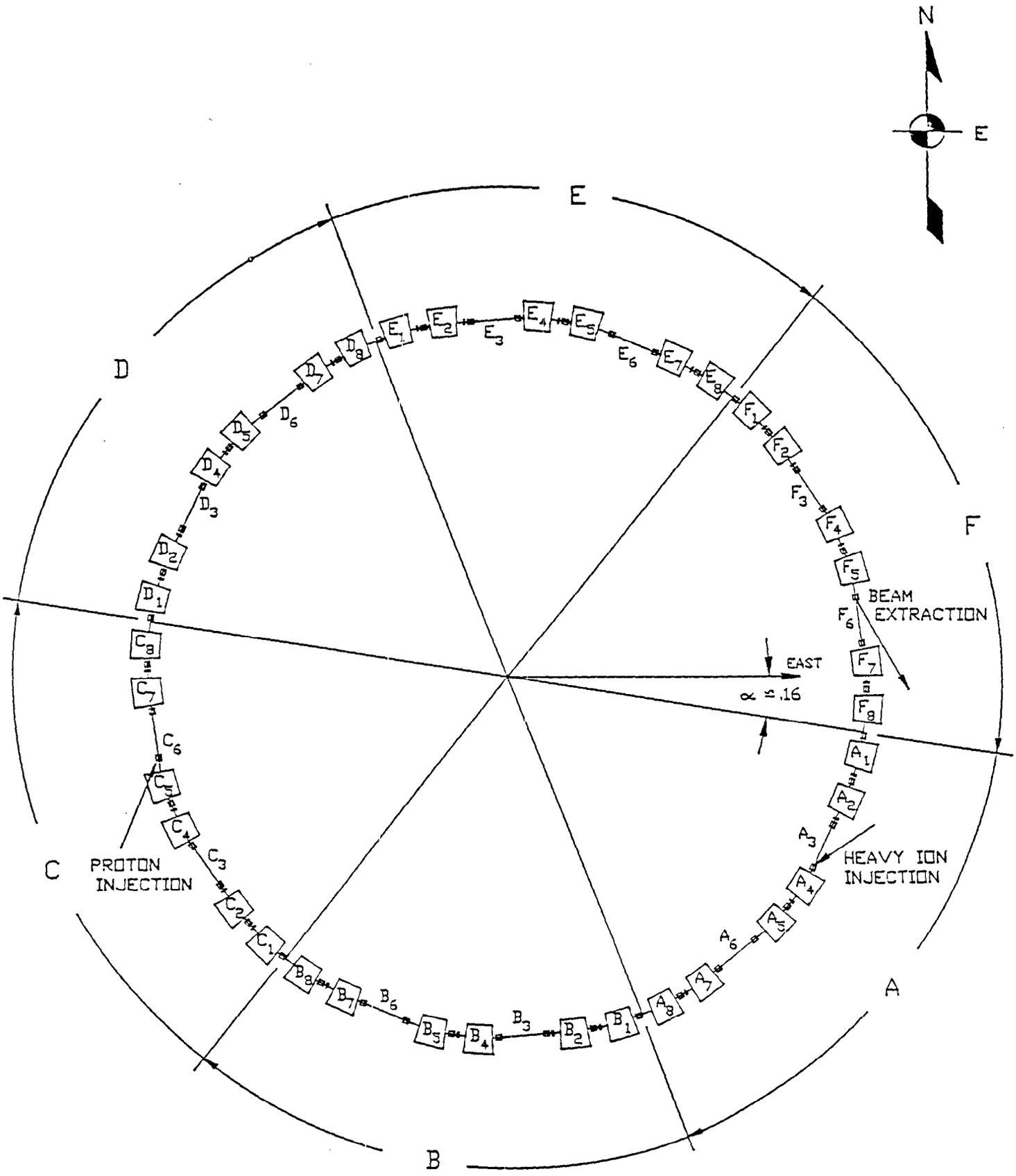

Fig.2 Layout of the AGS Booster showing the relative position of magnets (e.g. Dipole Apex locations) and labling convention of the Booster Superperiods. (A to F, with the Beam in the Clockwise direction).

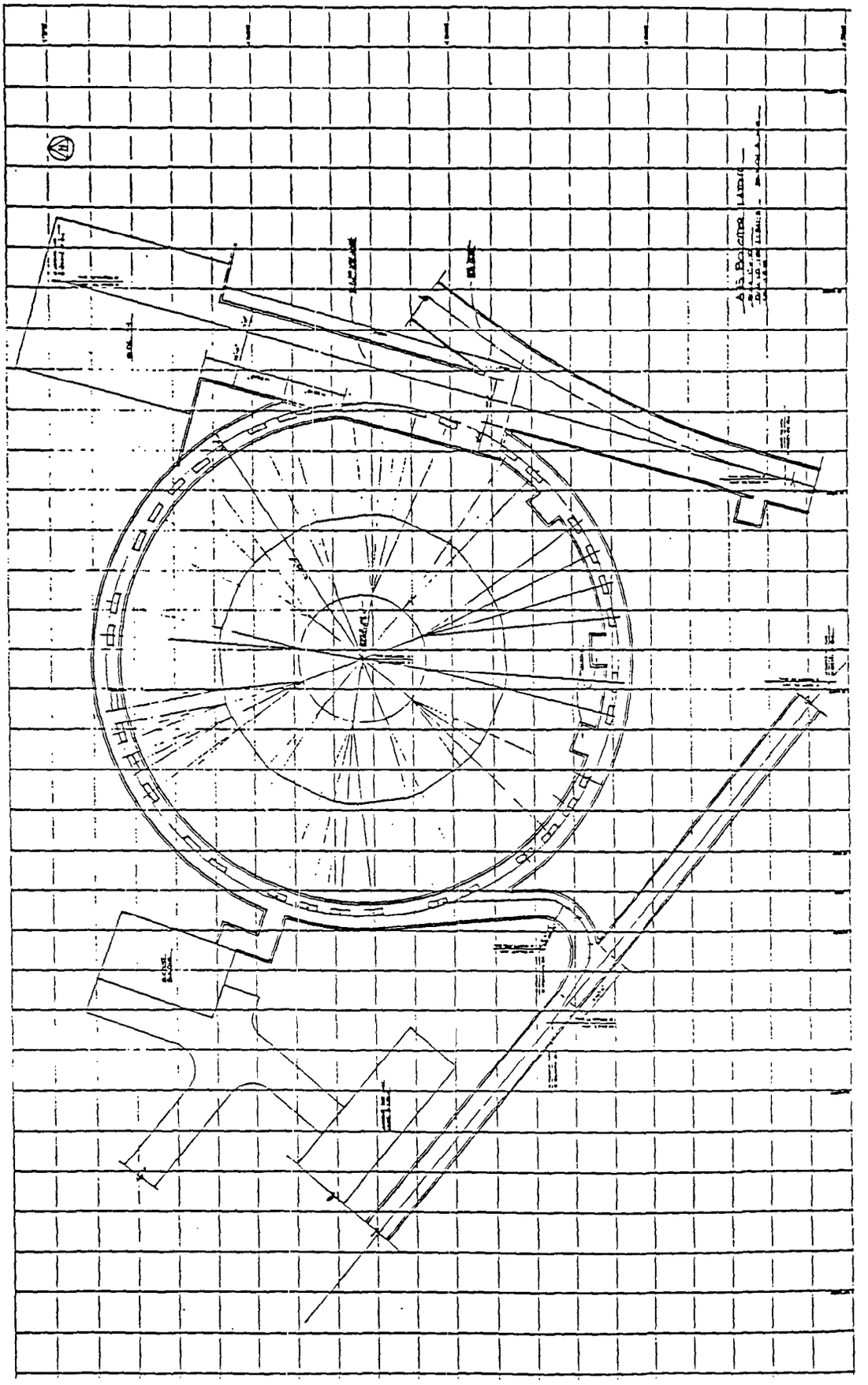

Fig. 3 Construction map of AGS Booster