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Booster Coordinates with 1,2,4,7 Sextupoles

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BOOSTER COORDINATES

WITH
1, 2, 4, 7 SEXTUPOLES

Booster Technical Note
No. 27

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APRIL 23, 1986

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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 negligible.

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 assuming 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 coordinate 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

$$E(\text{inch}) = E_0 \underset{\text{AGS}}{(\text{inch})} + X \underset{\text{BST}}{(\text{inch})}$$

$$N(\text{inch}) = N_0 \underset{\text{AGS}}{(\text{inch})} + Y \underset{\text{BST}}{(\text{inch})}$$

$$E_0 \underset{\text{AGS}}{(\text{inch})} = 1,148.88$$

$$N_0 \underset{\text{AGS}}{(\text{inch})} = 15,459.36$$

2. BNL GRID

$$E(\text{feet}) = E_0 \underset{\text{BNL}}{(\text{feet})} + X \underset{\text{BST}}{(\text{feet})}$$

$$N(\text{feet}) = N_0 \underset{\text{BNL}}{(\text{feet})} + Y \underset{\text{BST}}{(\text{feet})}$$

$$E_0 \underset{\text{BNL}}{(\text{feet})} = 98,517.19 \text{ feet, and}$$

$$N_0 \underset{\text{BNL}}{(\text{feet})} = 102,438.28 \text{ feet .}$$

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:

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. Schhaeffe, 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)	Z(M)	E-AGS(IN)	N-AGS(IN)	ANGLE	S(ORBIT)
0	QD	31.86063	-5.55399	2403.23542	15240.69914	99.89	g.agg	.252
1	S30	31.82006	-5.58257	2481.3829	15238.91226	100.33		.552
2	SEXY	31.77174	-6.09866	2399.3601	15219.6543	100.87		.552
3	BEND	31.1898	-6.09866	2399.3601	15219.25543	100.87		.552
4	SEXV	30.76786	-6.42167	2376.77750	15127.79823	105.11		2.952
5	S70	30.18098	-8.42167	2376.77750	15127.79823	105.11		2.952
6	SXV	30.94998	-9.08246	2367.38316	15101.78296	106.35		3.652
7	SXF	30.94998	-9.08246	2367.38316	15101.78296	106.35		3.652
8	S30	30.85098	-9.36565	2368.18559	15090.63356	106.89		3.952
9	QF	30.76786	-9.60342	2368.21325	15081.27270	107.33		4.204
10	QF	30.68475	-9.84118	2356.94091	15071.91185	107.78		4.456
11	S30	30.56575	-10.12438	2353.64334	15060.76245	108.32		4.756
12	SEXY	30.58575	-10.12438	2353.64334	15060.76245	108.32		4.756
13	BEND	29.60057	-12.30951	2314.25678	14974.73350	112.58		7.156
14	SEXY	29.60057	-12.30951	2314.25678	14974.73350	112.58		7.156
15	S70	29.25834	-12.92015	2306.88309	14950.61267	113.83		7.856
16	SXO	29.25834	-12.92015	2306.78309	14950.69267	113.83		7.856
17	S30	29.11167	-13.18167	2295.08066	14940.38946	114.36		8.156
18	QD	28.98853	-13.40157	2299.6053	14931.35986	114.81		8.498
19	QD	28.86538	-13.62129	2285.31241	14923.08865	115.26		8.659
20	S370	27.05634	-16.84894	2221.490435	14796.01572	121.91		12.359
21	QF	26.93339	-17.86866	2209.21623	14787.35532	122.36		12.611
22	QF	26.81016	-17.28839	2198.9811	14778.71491	122.82		12.863
23	S30	26.66349	-17.50059	2198.62367	14768.411170	123.35		13.163
24	SEXY	26.66349	-17.50059	2198.62367	14768.411170	123.35		13.163
25	BEND	25.31383	-19.53095	2145.48558	14690.42495	127.65		15.563
26	SEXY	25.31383	-19.53095	2145.48558	14690.42495	127.65		15.563
27	S70	24.87076	-20.07288	2128.003394	14669.08905	128.91		16.263
28	SXO	24.87076	-20.07288	2128.003394	14669.08905	128.91		16.263
29	S30	24.68088	-20.30514	2120.55809	14659.91509	129.44		16.553
30	QD	24.52145	-20.50014	2114.2949	14652.26797	129.90		16.815
31	QD	24.36203	-20.69514	2108.61950	1464.52086	130.35		17.667
32	S30	24.17214	-20.92739	2100.53305	14635.44698	130.88		17.667
33	SEXY	24.17214	-20.92739	2100.53305	14635.44698	130.88		17.667
34	BEND	22.49901	-22.64388	2034.66194	14567.87194	135.18		19.767
35	SEXY	22.49901	-22.64388	2034.66194	14567.87194	135.18		19.767
36	S100	21.74124	-23.29631	2004.83126	14542.18237	136.98		20.076
37	QF	21.36203	-23.46066	1997.31290	14535.15182	137.43		21.819
38	QF	21.35951	-23.62502	1989.80554	14529.24124	137.88		21.211
39	S370	18.55574	-26.03932	1879.43590	14434.18881	144.53		24.593
40	QD	18.36387	-26.32128	1871.90654	14427.71925	144.98		25.223
41	QD	18.17401	-26.36803	1864.39218	14421.24619	145.42		25.474
42	S30	17.94668	-26.5378	1855.44208	14413.54182	145.96		25.744
43	SEXY	17.94668	-26.5378	1855.44208	14413.54182	145.96		25.744
44	BEND	16.00092	-27.96357	1778.83142	14358.43389	150.22		28.174
45	SEXY	16.00092	-27.96357	1778.83142	14358.43389	150.22		28.174
46	S70	15.39922	-28.32128	1755.14444	14344.34879	151.47		28.874
47	SXF	15.39922	-28.32128	1755.14844	14344.34879	151.47		28.874
48	S30	15.14135	-28.47459	1744.39642	14338.31318	152.08		29.426
49	QF	14.92484	-28.60330	1736.47722	14333.24577	152.45		29.426
50	QF	14.00634	-28.73201	1727.94842	14328.17837	152.89		29.678
51	S30	14.5047	-28.88532	1717.79680	14322.14275	153.42		29.978
52	SEXY	14.45047	-28.88532	1717.79680	14322.14275	153.42		29.978
53	BEND	12.29120	-29.92597	1632.78539	14281.17236	157.67		32.378
54	SEXY	12.29120	-29.92597	1632.78539	14281.17236	157.67		32.378
55	S100	11.35595	-30.27995	1595.96453	14267.23579	159.44		33.378
56	QD	11.12038	-30.36912	1586.69828	14263.72552	159.89		33.632

Table 1

ELEMENT	X(M)	Y(M)	Z(M)	E-AGS(IN)	N-AGS(IN)	ANGLE	S(ORBIT)
57	0.0	18.88482	-3.045828	1577.11603	1426.0721523	160.33	33.882
58	5.0	18.60424	-3.0556447	1566.36978	1425.603425	160.87	34.182
59	5.0	18.60424	-3.0556447	1566.36978	1425.603425	160.87	34.182
6.0	BEND	8.29707	-3.1.21436	1475.53627	1423.044811	165.11	36.582
61	SEXV	8.29707	-3.1.21436	1475.53627	1423.044811	165.11	36.582
62	S70	7.60931	-3.1.34471	1448.4.922	1422.531640	166.35	37.282
63	SXF	7.60931	-3.1.34471	1448.4.922	1422.531640	166.35	37.282
64	S30	7.31456	-3.1.40057	1436.5476	1422.311710	166.89	37.582
65	QF	7.06709	-3.1.44747	1422.11186	1422.127060	167.33	37.834
66	QF	6.91962	-3.1.44747	1417.38895	1421.9410	167.8	38.086
67	S30	6.52487	-3.1.55023	1405.6450	1421.722480	168.32	38.386
68	SEXV	6.52487	-3.1.55023	1405.76450	1421.722480	168.32	38.386
69	BEND	4.13989	-3.1.788961	1311.85796	1420.780046	172.58	40.786
70	SEFXV	4.13989	-3.1.788961	1311.85796	1420.780046	172.58	40.786
71	S70	3.43995	-3.1.79855	1284.31115	1420.714861	173.83	41.486
72	SXD	3.43995	-3.1.79855	1284.31115	1420.714861	173.83	41.486
73	S30	3.13998	-3.1.80238	1272.51019	1420.72981	174.36	41.786
74	QD	2.88812	-3.1.80560	1262.08556	1420.717120	174.81	42.037
75	QD	2.63627	-3.1.80881	1252.67003	1420.704460	175.26	42.289
76	S370	-1.06343	-3.1.85665	1107.01261	1420.518478	181.91	45.989
77	QF	-1.31529	-3.1.85927	1097.01978	1420.518518	182.36	46.441
78	QF	-1.56714	-3.1.86248	1087.18155	1420.493157	182.82	46.493
79	S30	-1.86712	-3.1.86631	1075.37149	1420.478078	183.35	46.793
80	SEXV	-1.86712	-3.1.86631	1075.37149	1420.478078	183.35	46.793
81	BEND	-4.25742	-3.1.68791	981.6494	1421.180461	187.65	49.193
82	SEXV	-4.25742	-3.1.68791	981.6494	1421.180461	187.65	49.193
83	S70	-4.94828	-3.1.57516	954.06568	1421.62329	188.91	49.893
84	SXD	-4.94828	-3.1.57516	954.06568	1421.62329	188.91	49.893
85	S30	-5.2437	-3.1.52685	942.08886	1421.845558	189.44	50.193
86	QD	-5.49295	-3.1.48628	932.62198	1421.974272	189.90	50.445
87	QD	-5.74154	-3.1.44571	922.83511	1422.139985	190.35	50.697
88	S30	-6.03762	-3.1.39739	911.17828	1422.324215	190.88	50.997
89	SEXV	-6.03762	-3.1.39739	911.17828	1422.324215	190.88	50.997
90	BEND	-8.36664	-3.0.80663	819.72110	1424.654072	195.18	53.397
91	SEXV	-8.36664	-3.0.80663	819.72110	1424.654072	195.18	53.397
92	S100	-9.30462	-3.0.47663	782.55643	1425.949266	196.98	54.397
93	QF	-9.54238	-3.0.39251	773.19558	1426.276501	197.43	54.649
94	QF	-9.78015	-3.0.31040	763.83473	1426.603735	198.88	54.981
95	S370	-13.21675	-2.9.08941	626.31546	1431.41.0754	204.53	58.601
96	QD	-13.51065	-2.9.08629	616.9.6461	1431.7.37988	204.93	58.852
97	QD	-13.74064	-2.7.92318	607.6.0376	1432.0.65223	205.42	59.104
98	S30	-14.03161	-2.8.82418	596.5.436	1432.4.54981	205.96	59.404
99	SEXV	-14.03161	-2.8.82418	596.5.436	1432.4.54981	205.96	59.404
100	BEND	-16.21675	-2.7.83900	510.4.254	1436.3.33643	210.22	61.804
101	SEXV	-16.21675	-2.7.83900	510.4.254	1436.3.33643	210.22	61.804
102	S70	-16.82738	-2.7.49677	486.38462	1437.6.81014	211.47	62.504
103	SXF	-16.82738	-2.7.49677	486.38462	1437.6.81014	211.47	62.504
104	S30	-17.06908	-2.7.35010	476.81142	1438.2.9458	212.08	62.604
105	QF	-17.30880	-2.7.22695	467.3102	1438.7.43271	212.45	63.056
106	QF	-17.52852	-2.7.10381	458.78062	1439.2.28084	212.89	63.308
107	S30	-17.79023	-2.6.95714	48.47741	1439.8.65528	213.42	63.608
108	SEXV	-17.79023	-2.6.95714	448.47741	1439.8.65528	213.42	63.608
109	BEND	-19.77109	-2.5.60748	370.4.5070	1445.1.19143	217.67	66.008
110	SEXV	-19.77109	-2.5.60748	370.4.5070	1445.1.19143	217.67	66.008
111	S100	-20.54528	-2.4.97453	340.0.085	1447.6.1094	215.44	67.008
112	QD	-20.74027	-2.4.81518	332.33374	1448.2.38754	219.89	67.260

Table 1

ELEMENT	X(M)	Y(M)	Z(M)	E-AGS(IN)	N-AGS(IN)	ANGLE	S(ORBIT)
113 QD	-20.93527	-24.65779	324.65662	14496.66414	220.33	67.512	
114 S3@	-21.16753	-24.46579	315.51266	14496.13998	220.87	67.812	
115 SEXY	-21.16753	-24.45779	315.51266	14496.13998	220.87	67.812	
116 BEND	-22.88394	-22.9266	14562.01103	14562.01103	225.11	70.212	
117 SEXY	-22.88394	-22.9266	14562.01103	14562.01103	225.11	70.212	
118 S7@	-23.34870	-22.26222	229.95493	14582.89460	226.35	70.912	
119 SXF	-23.34870	-22.26222	229.95493	14582.89460	226.35	70.912	
120 S3@	-23.53645	-22.03489	212.24806	14591.84470	226.89	71.212	
121 QF	-23.70080	-21.84402	217.7749	14599.35905	227.33	71.464	
122 OF	-23.86516	-21.65316	209.36692	14606.89731	227.78	71.716	
123 S3@	-24.06091	-21.2583	201.60004	14615.82351	228.32	72.016	
124 SEXY	-24.06091	-21.42583	14615.82351	14615.82351	228.32	72.016	
125 BEND	-25.46870	-19.46807	1462.42813	14692.42813	232.58	74.416	
126 SEXY	-25.46870	-19.08007	1464.49006	14692.42813	232.58	74.416	
127 S7@	-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 S3@	-25.95717	-18.62555	126.37132	14726.26551	234.36	75.416	
130 QD	-26.10043	-18.0399	121.30391	14734.79331	234.81	75.667	
131 OD	-26.22914	-18.18749	116.23650	14743.31711	235.26	75.919	
132 S3@	-28.11990	-15.90708	141.79714	14868.53022	241.51	79.619	
133 QF	-28.24862	-14.59057	36.72973	14877.05402	242.36	79.871	
134 OF	-28.37733	-14.57407	31.66233	14885.57782	242.82	80.123	
135 S3@	-28.53063	-14.31620	25.62670	14895.73023	243.35	80.423	
136 SEXY	-28.53063	-14.31620	25.62670	14895.73023	243.35	80.423	
137 BEND	-29.57128	-12.15693	-15.34376	14895.74081	247.65	82.823	
138 SEXY	-29.57128	-12.15693	-15.34376	14895.74081	247.65	82.823	
139 S7@	-29.81908	-11.50225	-25.09937	15006.15150	248.91	83.523	
140 SXD	-29.81908	-11.50225	-25.09937	15006.15150	248.91	83.523	
141 S3@	-29.92527	-11.21618	-29.28035	150217.56165	249.44	83.823	
142 OD	-30.98611	-10.98611	-32.79063	15026.83591	249.90	84.075	
143 QD	-30.10360	-10.15055	-36.30091	15036.11016	250.35	84.327	
144 S3@	-30.20979	-10.16997	-42.57128	15047.15641	247.65	82.823	
145 SEXY	-30.20979	-10.16997	-42.57128	15047.15641	247.65	82.823	
146 BEND	-30.85968	-8.16280	-66.06796	15137.58994	255.18	87.027	
147 SEXY	-30.85968	-8.16280	-66.06796	15137.58994	255.18	87.027	
148 S1@	-31.04589	-7.18029	-73.39894	15176.67146	256.98	88.027	
149 OF	-31.19279	-6.93282	-75.24643	15186.41436	257.43	88.279	
150 QF	-31.19279	-6.93282	-77.09193	15196.15727	258.88	88.531	
151 S3@	-31.182865	-3.05006	-104.21656	15339.27889	264.98	92.482	
152 OD	-31.182865	-3.05006	-106.06305	15349.02179	264.98	92.482	
153 S3@	-31.192245	-2.55512	-107.90954	15358.778	265.42	92.734	
154 S3@	-31.197832	-2.66037	-110.10864	15370.36916	265.46	93.034	
155 SEXY	-31.197832	-2.66037	-110.10884	15370.36916	265.46	93.034	
156 BEND	-32.21769	-1.12460	-119.5310	15464.26570	270.22	95.434	
157 SEXY	-32.21769	-1.12460	-119.5310	15464.26570	270.22	95.434	
158 S7@	-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 S3@	-32.23046	1.12452	-120.03572	15503.46325	272.09	96.434	
161 OF	-32.23367	1.37638	-120.16232	15513.54810	272.45	96.686	
162 QD	-32.23689	1.62823	-120.28892	15523.46363	272.89	96.938	
163 S3@	-32.24072	1.92821	-120.43971	15535.27369	273.42	97.238	
164 SEXY	-32.24072	1.92821	-120.43971	15535.27369	273.42	97.238	
165 BEND	-32.06231	4.31851	-113.41581	155629.38023	277.67	99.638	
166 SEXY	-32.06231	4.31851	-113.41581	155629.38023	277.67	99.638	
167 S1@	-31.90125	5.39546	-107.07480	15668.43631	279.14	100.638	
168 QD	-31.86068	5.55404	-105.47766	15678.02231	279.89	100.890	

Table 1

ELEMENT	X(M)	Y(M)	Z(M)	E-AGS(IN)	N-AGS(IN)	ANGLE	S(ORBIT)
169 QD	-31.82612	5.80263	-103.88063	15687.81005	280.33	101.142	
170 S3@	-31.7780	6.09871	-101.9725	15699.46689	280.87	101.442	
171 SEXV	-31.77180	6.09871	-101.9725	15699.46689	280.87	101.442	
172 BEND	-31.18103	8.42173	-78.71374	15790.92409	285.11	103.842	
173 SEXV	-31.18103	8.42173	-78.71374	15790.92409	285.11	103.842	
174 S7@	-30.95004	9.08252	-69.62510	15816.93936	286.35	104.542	
175 SXF	-30.95004	9.08252	-69.62510	15816.93936	286.35	104.542	
176 S3@	-30.85104	9.36571	-65.7273	15828.08876	286.89	104.842	
177 QF	-30.76592	9.60248	-62.4559	15837.44962	287.33	105.094	
178 QF	-30.68480	9.84124	-59.18315	15846.81047	287.78	105.346	
179 S3@	-30.58181	10.12444	-55.28557	15857.95987	288.32	105.646	
180 SEXV	-30.58181	10.12444	-55.28557	15857.95987	288.32	105.646	
181 BEND	-25.60563	12.30957	-16.42932	15942.98992	292.58	108.046	
182 SEXV	-29.60063	12.30957	-16.42932	15943.98882	292.58	108.046	
183 S7@	-29.25640	12.92021	-3.0253	15958.02965	293.83	108.746	
184 SXD	-29.25640	12.92021	-3.0253	15968.02965	293.83	108.746	
185 S3@	-29.11172	13.40163	2.74911	15978.93286	294.36	109.046	
186 QD	-28.98858	13.40163	7.59723	15986.98326	294.81	109.297	
187 QD	-28.85544	13.52125	12.44555	15995.63367	295.26	109.549	
188 S37@	-27.85550	16.84908	83.66341	16122.70660	301.91	113.249	
189 QF	-27.69336	17.06872	88.51153	16131.35700	302.36	113.501	
190 QF	-26.81822	17.28844	93.35955	16140.00741	302.82	113.753	
191 S3@	-26.66555	17.55015	99.13469	16150.31062	303.35	114.053	
192 SEXV	-26.66555	17.55015	99.13469	16150.31062	303.35	114.053	
193 BEND	-25.31389	19.53101	152.27018	16228.29737	307.65	116.453	
194 SEXV	-25.31389	19.53101	152.27018	16228.29737	307.65	116.453	
195 S7@	-24.87082	20.07294	169.71382	16249.63327	308.91	117.153	
196 SXD	-24.87082	20.07294	169.71382	16249.63327	308.91	117.153	
197 S3@	-24.68193	20.30520	177.18957	16258.77723	309.44	117.453	
198 QD	-24.52151	20.50020	183.46622	16266.45435	309.90	117.785	
199 QD	-24.36008	20.69520	189.74246	16274.13147	310.35	117.957	
200 S3@	-24.17220	20.92745	197.21871	16283.27542	310.88	118.257	
201 SEXV	-24.17220	20.92745	197.21871	16283.27542	310.88	118.257	
202 BEND	-24.14967	20.92745	197.21871	16283.27542	310.88	118.257	
203 SEXV	-22.49197	22.64386	263.08982	16350.85038	315.18	120.657	
204 S10@	-21.4130	23.29637	292.92310	16376.53995	316.98	121.657	
205 OF	-21.56043	23.46072	300.43286	16383.01052	317.43	121.909	
206 QF	-21.35557	23.62508	307.95222	16389.48108	317.88	122.161	
207 S37@	-18.53580	26.03938	418.33666	16484.53261	324.53	125.861	
208 QD	-18.36493	26.20373	425.85122	16491.00307	324.98	126.112	
209 QD	-18.17487	26.36809	433.36555	16497.47333	325.42	126.364	
210 S3@	-17.94673	28.47465	442.31568	16505.18051	325.96	126.664	
211 SEXV	-17.94673	28.60336	561.28554	16585.47655	332.44	130.316	
212 BEND	-16.00098	27.95363	518.92084	16560.29043	330.22	129.064	
213 SEXV	-16.00098	27.95363	518.92084	16560.29043	330.22	129.064	
214 S7@	-15.39128	28.32134	542.60992	16574.37353	331.47	129.764	
215 SXF	-15.39128	28.32134	542.60992	16574.37353	331.47	129.764	
216 S3@	-15.14440	28.47465	552.7614	16580.40915	332.00	130.064	
217 QF	-14.92490	28.60336	561.28554	16585.47655	332.44	130.316	
218 CF	-14.70839	28.73207	569.80914	16590.54395	332.89	130.568	
219 S3@	-14.45052	28.88538	579.96116	16596.57957	333.42	130.868	
220 SEXV	-12.29125	29.92603	664.97337	16637.54997	337.67	133.268	
221 BEND	-12.29125	29.92603	664.97337	16637.54997	337.67	133.268	
222 SEXV	-11.33600	30.28001	701.79333	16651.48663	339.44	134.268	
223 S10@	-11.12044	30.36917	711.06748	16654.99688	339.89	134.520	

Table 1

ELEMENT	X(M)	Y(M)	Z(M)	E-AGS(IN)	N-AGS(IN)	ANGLE	S(ORBIT)
OD	-10.88487	30.45834	720.34173	16658.50709	340.33	134.772	
S30	-10.60420	30.56453	731.38798	16662.68807	340.87	135.072	
SEXV	-10.60430	30.56453	731.38798	16662.68807	340.87	135.072	
BEND	-8.29713	31.21442	822.22149	16688.27422	345.11	137.472	
SEXV	-8.29713	31.21442	822.22149	16688.27422	345.11	137.472	
S70	-7.60937	31.34477	849.29855	16693.40592	346.35	138.172	
SXF	-7.60937	31.34477	849.29855	16693.40592	346.35	138.172	
S30	-7.31462	31.40063	860.90300	16695.60523	346.89	138.472	
QF	-7.06715	31.44753	870.64591	16697.45172	347.33	138.724	
QF	-6.81968	31.49443	880.38881	16699.29822	347.38	138.976	
S30	-6.52492	31.55029	891.99326	16701.49753	348.32	139.276	
SEXV	-6.52492	31.55029	891.99326	16701.49753	348.32	139.276	
BEND	-4.13995	31.78967	985.88980	16710.92186	352.58	141.676	
SEXV	-4.13995	31.78967	985.88980	16710.92186	352.58	141.676	
S70	-3.44001	31.79861	1013.44661	16711.27372	353.83	142.376	
SXD	-3.44001	31.79861	1013.44661	16711.27372	353.83	142.376	
S30	-3.14003	31.80244	1025.25667	16711.42451	354.36	142.676	
QD	-2.88818	31.80565	1035.17220	16711.5512	354.81	142.927	
OD	-2.63632	31.80887	1045.08773	16711.67772	355.26	143.179	
S30	-1.86337	31.85611	1190.74515	16713.5375	1.91	146.879	
QF	-1.31523	31.86933	1289.66068	16713.66414	2.36	147.131	
QF	-1.56708	31.86925	1210.57621	16713.79075	2.82	147.383	
S30	-1.86706	31.86637	1222.38627	16713.94155	3.25	147.683	
SEXV	-1.86706	31.86637	1222.38627	16713.94155	3.25	147.683	
BEND	4.25737	31.68797	1316.49282	16706.91772	7.65	150.083	
SEXV	4.25737	31.68797	1316.49282	16706.91772	7.65	150.083	
S70	4.94823	31.57522	1343.69208	16702.47903	8.91	150.783	
SXD	4.94823	31.57522	1343.69208	16702.47903	8.91	150.783	
S30	5.24430	31.52691	1355.34890	16700.57674	9.4	151.083	
QD	5.49290	31.48634	1365.13578	16698.97968	9.98	151.335	
OD	5.74148	31.44577	1374.52265	16697.38247	10.35	151.587	
S30	9.50375	30.39745	1386.57948	16695.48018	10.88	151.887	
SEXV	6.93757	31.39745	1386.57948	16695.48018	10.88	151.887	
BEND	8.36058	30.80668	1470.93666	16672.22160	15.18	154.287	
SEXV	9.30456	30.80668	1470.93666	16672.22160	15.18	154.287	
S10	9.30456	30.47669	1515.20133	16559.22966	16.38	155.287	
QF	9.54233	30.39357	1524.56218	16655.95731	17.13	155.539	
OD	9.78089	30.1045	1533.92303	16652.68498	17.88	155.791	
S30	13.27283	29.08947	1671.43230	16604.61478	24.53	159.491	
QD	13.51059	29.00635	1680.79315	16601.34244	24.98	159.742	
S30	13.74836	28.9234	1690.15000	16598.07009	25.42	159.994	
QD	14.03155	28.82424	1701.30340	16594.17251	25.96	160.294	
S30	14.03155	28.82424	1701.30340	16594.17251	25.96	160.294	
SEXV	14.03155	27.35015	1787.33232	16555.38589	30.22	162.694	
BEND	16.21669	27.83906	1787.33232	16555.38589	30.22	162.694	
SEXV	16.21669	27.83906	1787.33232	16555.38589	30.22	162.694	
S70	16.82733	27.49683	1811.37314	16541.91219	31.47	163.394	
SXF	16.82733	27.49683	1811.37314	16541.91219	31.47	163.394	
S30	17.08993	27.35015	1821.67635	16536.13774	32.00	163.694	
QF	17.308875	27.22701	1830.32675	16531.28961	32.44	163.946	
OD	17.52847	27.10387	1838.97715	16526.44148	32.89	164.198	
S30	17.79017	26.95720	1849.28035	16520.66704	33.42	164.498	
SEXV	17.79017	26.95720	1849.28035	16520.66704	33.42	164.498	
BEND	19.77103	25.60754	1927.26706	16467.53089	37.67	166.898	
SEXV	19.77103	25.60754	1927.26706	16467.53089	37.67	166.898	
S10	20.54522	24.97459	1957.7691	16442.61138	39.44	167.098	
QD	20.74822	24.81516	1965.42492	16436.33478	39.89	168.150	

Table 1

ELEMENT	X(M)	Y(M)	E-AGS(1N)	N-AGS(1N)	ANGLE	S(ORBIT)
281	QD	24.65573	1973.10114	16430.05819	40.33	168.402
282	S30	21.1747	1982.24511	16422.58235	40.87	168.702
283	SEXY	21.16747	1982.24511	16422.58235	40.87	168.702
284	BEND	22.88388	22.79272	16356.71129	45.11	171.102
285	SEXY	22.88388	22.79272	16356.71129	45.11	171.102
286	S70	23.30664	22.26228	16335.82772	46.35	171.802
287	SXF	23.30664	22.26228	16335.82772	46.35	171.802
288	S30	23.56395	2067.8223	16336.87762	46.89	172.102
289	QF	23.70079	2075.5971	16319.36327	47.33	172.354
290	OF	23.70079	2081.96027	16311.84881	47.78	172.606
291	S30	24.9610	2088.45084	16302.89881	48.32	172.905
292	SEXY	24.9610	2096.15772	16302.89881	48.32	172.905
293	BEND	25.40665	2151.26770	16226.29420	52.58	175.306
294	SEXY	25.40665	2151.26770	16226.29420	52.58	175.306
295	S70	25.8036	2165.35092	16202.60523	53.83	176.006
296	SXD	25.8036	2165.35092	16202.60523	53.83	176.006
297	S30	25.9166	2165.35092	16202.60523	53.83	176.006
298	QD	26.16038	2171.38644	16192.45281	54.36	176.306
299	QD	26.2909	2176.45385	16183.92901	54.81	176.557
300	S370	28.1985	2181.52126	16175.40522	55.26	176.809
301	QF	28.24856	2255.96062	16050.19210	61.91	180.509
302	QF	28.37727	2261.022803	16041.66830	62.36	180.761
303	S30	28.50558	2266.079544	16033.14450	62.82	181.013
304	SEXY	28.50558	2272.13106	16022.99209	63.35	181.313
305	BEND	29.5723	2313.16152	16022.99209	63.35	181.313
306	SEXY	29.5723	2313.16152	16022.99209	63.35	181.313
307	S70	29.8902	2322.85714	15981.16087	69.44	184.713
308	SXD	29.8902	2322.85714	15981.16087	69.44	184.713
309	S30	29.9522	2327.053011	15981.16087	69.44	184.713
310	QD	30.0438	2330.54839	15830.88642	69.90	184.965
311	QD	30.1354	10.75061	2334.05867	16815.91	67.65
312	S30	30.20914	10.47003	2338.23965	15813.10152	67.65
313	SEXY	30.20914	10.47003	2338.23965	15813.10152	67.65
314	BEND	30.85982	8.16286	2363.82572	15709.73238	75.18
315	SEXY	30.85982	8.16286	2363.82572	15709.73238	75.18
316	S100	31.04983	7.18035	2371.15670	15709.80587	76.98
317	QF	31.09273	6.93288	2373.00320	15733.30796	77.43
318	QF	31.13953	6.68541	2374.84969	15722.56505	77.88
319	S370	31.8280	3.05012	2401.97432	15579.44344	84.53
320	QD	31.8755	8.0265	2403.2081	15566.70053	84.98
321	QD	31.9224	2.55218	2405.65730	15556.70562	85.12
322	S30	31.9782	2.26043	2407.86660	15548.35317	85.96
323	SEXY	31.9782	2.26043	2407.86660	15548.35317	85.96
324	BEND	32.2164	-1.12455	2417.29086	15455.45663	90.22
325	SEXY	32.2164	-1.12455	2417.29086	15455.45663	90.22
326	S70	32.22657	-82449	2417.64270	15425.89982	91.47
327	SXF	32.22657	-82449	2417.64270	15425.89982	91.47
328	S30	32.23040	-1.12446	2417.79349	15411.08975	92.08
329	OF	32.23362	-1.37632	2417.92008	15407.17422	92.44
330	QF	32.23683	-1.62817	2418.06668	15395.25869	92.99
331	S30	32.24066	-1.92815	2418.19747	15388.44863	93.12
332	SEXY	32.24066	-1.92815	2418.19747	15388.44863	93.12
333	BEND	32.05226	-4.31845	2411.17357	15289.34209	97.67
334	SEXY	32.05226	-4.31845	2411.17357	15289.34209	97.67
335	S100	31.90120	-5.30540	2408.83256	15256.48601	99.49
336	QD	31.85863	-5.55399	2403.23542	15240.69914	99.89
						201.780

Table 2

APEX	N (IN)	E (IN)	X (M)	Y (M)
1 A1	15172.50940	2392.10750	31.5798	-7.28601
2 A2	15016.05128	2337.41334	30.1885	-11.26804
3 A4	14227.09392	2175.46711	26.07531	-18.59956
4 A5	14598.77793	2070.55952	23.41066	-21.85878
5 A7	14582.63583	1819.55050	17.03963	-27.34879
6 A8	14277.93884	1677.08294	13.41635	-25.58813
7 B1	14239.26782	1522.07224	9.4798	-30.99034
8 B2	14299.40552	1359.22841	5.3495	-21.77424
9 B4	14204.17689	1022.01087	-3.07098	-31.88165
10 B5	14230.87177	864.43221	-15.22497	-31.20360
11 B7	14340.18138	551.74332	-15.16727	-28.42714
12 B8	14421.21363	407.15988	-18.83969	-26.36892
13 C1	14526.12150	278.84412	-23.70426	
14 C2	14551.71741	170.69486	-24.84598	-20.51412
15 C4	14536.46115	1.42441	-29.14537	-13.28201
16 C5	15001.45695	-57.24624	-9.34474	
17 C7	15410.92828	-110.92253	-32.28215	-1.87927
18 C8	15582.63744	-121.04079	-32.25599	3.13125
19 D1	15746.21604	-94.34554	-31.57793	7.28614
20 D2	15902.67392	-39.65069	-30.18866	11.26017
21 D4	16191.63055	122.29683	-26.07521	18.59967
22 D5	16319.94608	227.20499	-23.41055	21.58889
23 D7	16536.08705	478.21498	-17.03489	27.34887
24 D8	16628.78343	620.68294	-13.41621	29.50016
E1	16679.5374	775.69388	-9.47893	30.99038
25 E2	16710.31531	938.53785	-5.34269	31.77426
26 E4	16774.54246	1269.75540	3.07024	31.88163
27 E5	16687.84685	1433.33395	7.22513	31.20357
28 E7	16578.53585	1746.042235	15.16742	28.42707
29 E8	1649.50295	1890.60543	18.83983	26.36883
30 F1	16292.59450	2018.92072	22.09903	23.70416
31 F2	16266.99811	2127.06942	24.84601	20.51401
32 F4	15912.26862	2296.33859	29.14545	13.28188
33 F5	15827.25755	2355.00056	30.63567	9.34460
34 F7	15501.80585	2411.68617	32.20228	1.07812
35 F8	15336.07678	2418.80091	32.25599	-3.13139

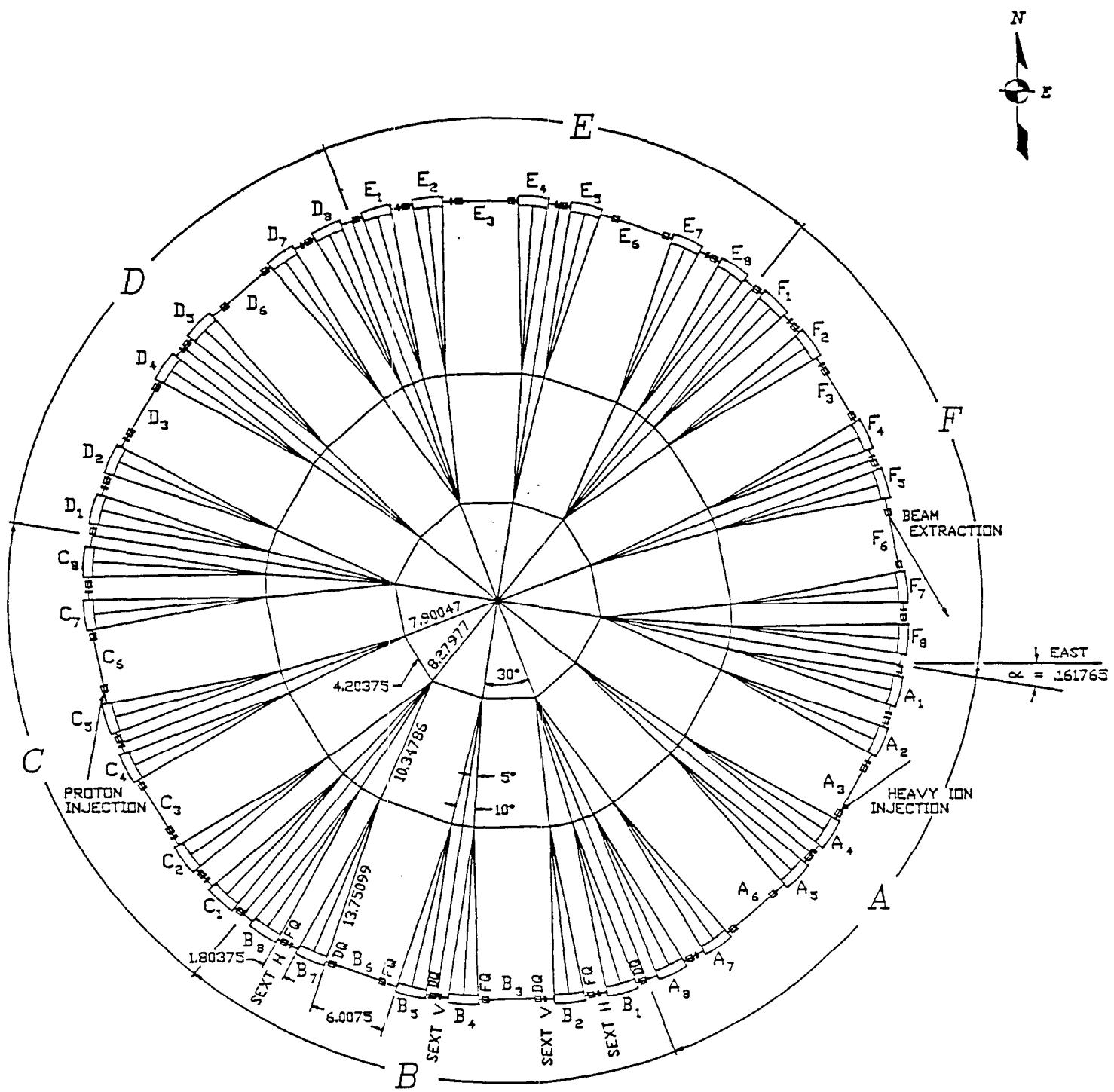


FIG. 1 Overall Layout of the AGS Booster

0 5
METERS
NOTE: ALL DIMENSIONS ARE IN METERS

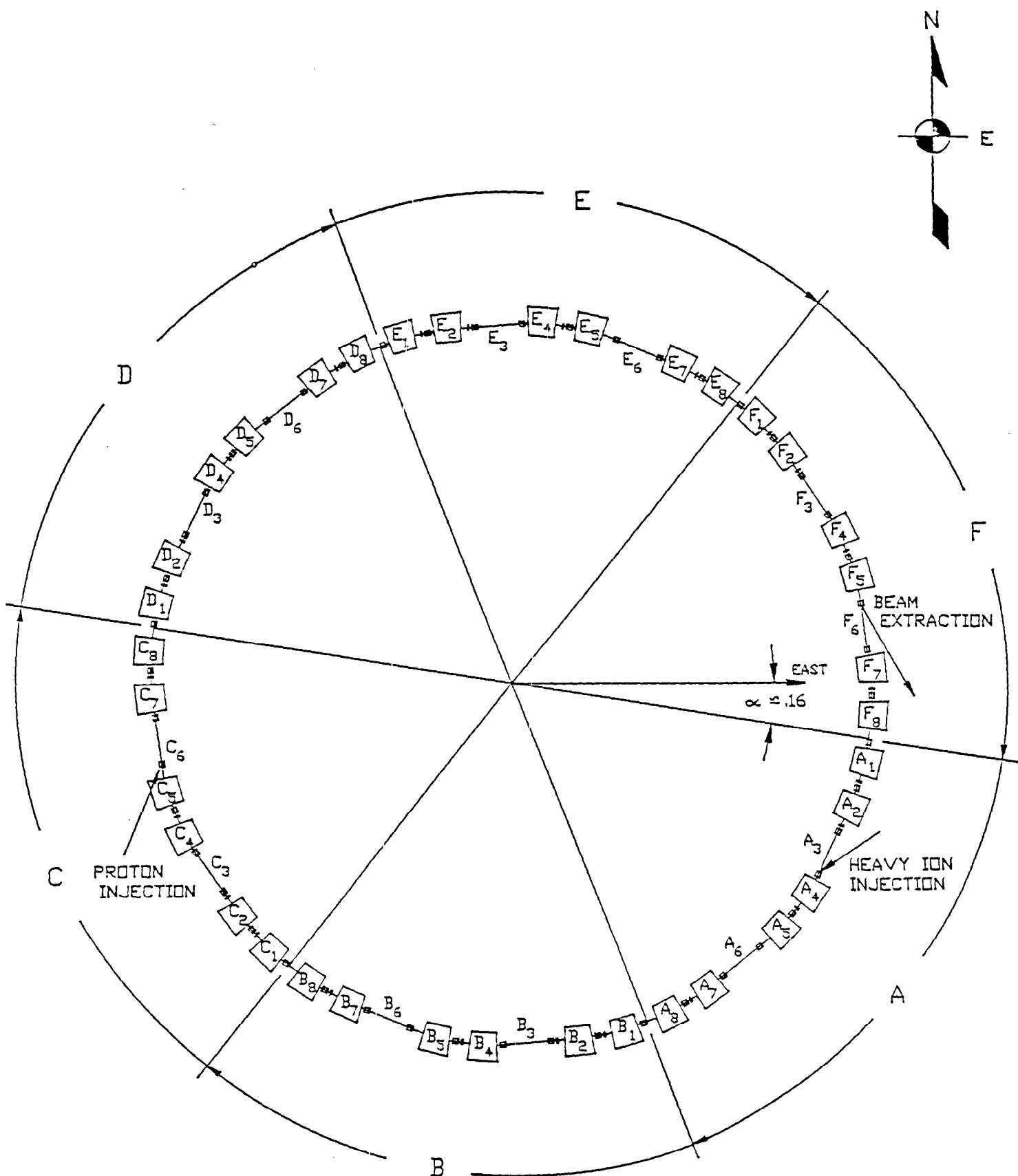


Fig.2 Layout of the AGS Booster showing the relative position of magnets (e.g. Dipole Apex locations) and labeling convention of the Booster Superperiods. (A to F, with the Beam in the Clockwise direction).

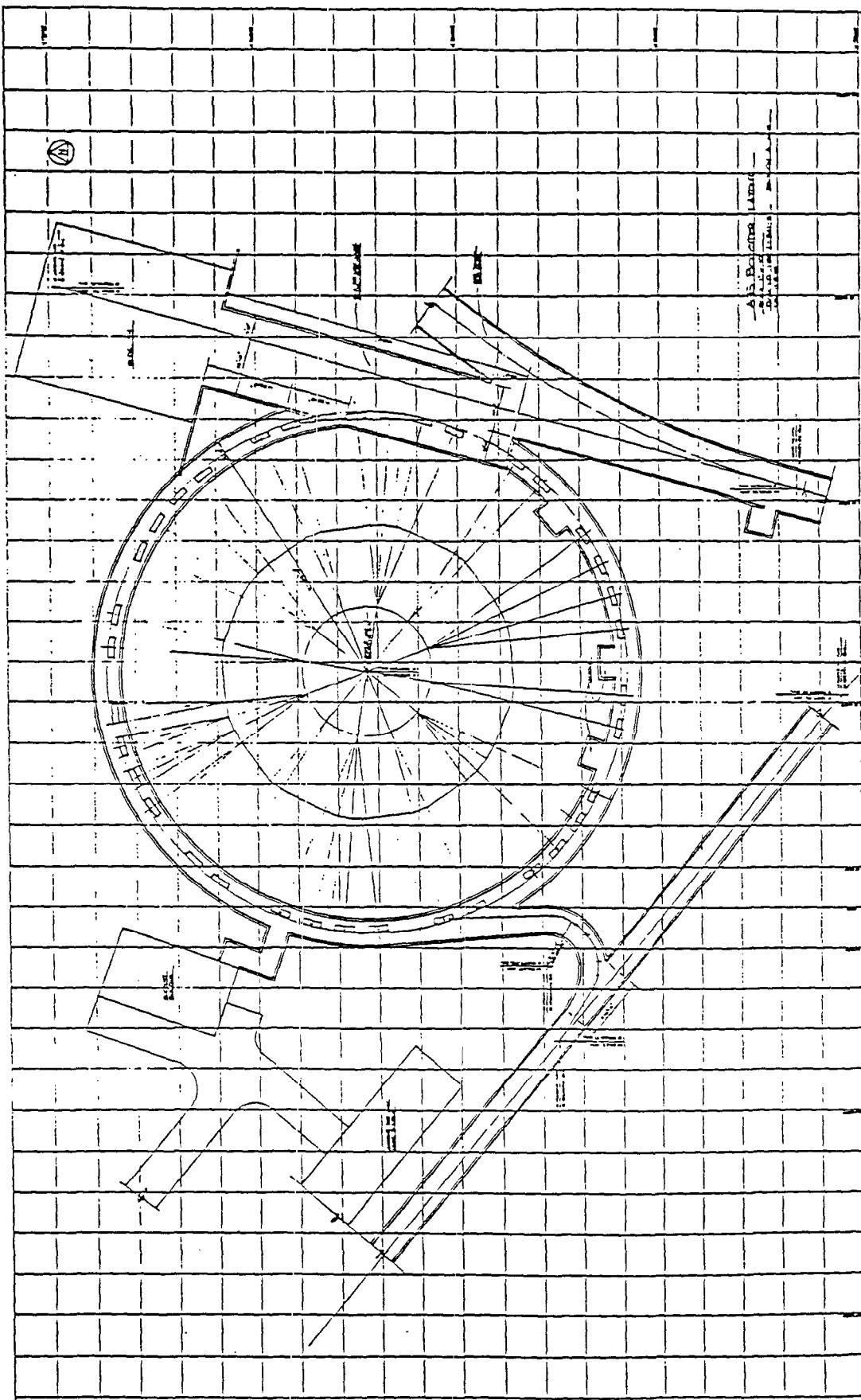


Fig. 3 Construction map of AGS Booster