BOOSTER COORDINATES

WITH
1, 2, 4, 7 SEXTUPOLES

Booster Technical Note
No. 27

Z. PARSA
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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 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 [$E(\text{inch}), N(\text{inch})$] and 2) BNL [$E(\text{feet}), N(\text{feet})$] 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:

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. Schhaeffler, 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)
0							
1	QD	31.86063	-5.55399	2403.23542	15240.59914	99.89	0.000
2	QD	31.82006	-5.80257	2401.63829	15230.91226	100.33	.552
3	S30	31.77174	-6.09866	2399.73601	15219.25543	100.87	.552
4	BEND	31.18098	-8.42167	2376.47750	15127.79823	105.11	2.952
5	SEXV	31.16098	-8.42167	2376.47750	15127.79823	105.11	2.952
6	S70	30.94998	-9.08246	2367.38316	15101.78296	106.35	3.652
7	SXF	30.54998	-9.08246	2367.38316	15101.78296	106.35	3.652
8	S30	30.85098	-9.36565	2363.48559	15090.63356	106.89	3.952
9	QF	30.76786	-9.60342	2360.21325	15081.27270	107.33	4.204
10	QF	30.68475	-9.84118	2356.94091	15071.91185	107.78	4.456
11	S30	30.58575	-10.12438	2353.04334	15060.76245	108.32	4.756
12	SEXV	30.58575	-10.12438	2353.04334	15060.76245	108.32	4.756
13	BEND	29.60057	-12.30951	2314.25678	14974.73350	112.58	7.156
14	SEXV	29.60057	-12.30951	2314.25678	14974.73350	112.58	7.156
15	S70	29.25834	-12.92015	2300.78309	14950.69267	113.83	7.856
16	SXF	29.25834	-12.92015	2300.78309	14950.69267	113.83	7.856
17	S30	29.11167	-13.18185	2295.00866	14940.38946	114.36	8.156
18	QD	28.98853	-13.40157	2290.16053	14931.73906	114.81	8.408
19	QD	28.86538	-13.62129	2285.31241	14923.08865	115.26	8.659
20	S370	27.05644	-16.84894	2214.09435	14786.01572	121.91	12.359
21	QF	26.93330	-17.06866	2209.24623	14787.56532	122.36	12.611
22	QF	26.81016	-17.28839	2204.39811	14778.71491	122.82	12.863
23	S30	26.66349	-17.55009	2198.62367	14768.41170	123.35	13.163
24	SEXV	26.66349	-17.55009	2198.62367	14768.41170	123.35	13.163
25	BEND	25.31383	-19.53095	2145.48758	14690.42495	127.65	15.563
26	SEXV	25.31383	-19.53095	2145.48758	14690.42495	127.65	15.563
27	S70	24.87076	-20.07288	2128.04334	14669.08905	128.91	16.263
28	SXD	24.87076	-20.07288	2128.04334	14669.08905	128.91	16.263
29	S30	24.68088	-20.30514	2120.56809	14659.94509	129.44	16.563
30	QD	24.52145	-20.50014	2114.29149	14652.26797	129.90	16.815
31	QD	24.36203	-20.69514	2108.01490	14644.59086	130.35	17.067
32	S30	24.17214	-20.92739	2100.53995	14635.44690	130.88	17.367
33	SEXV	24.17214	-20.92739	2100.53995	14635.44690	130.88	17.367
34	BEND	22.49901	-22.64380	2034.66794	14567.87194	135.18	19.767
35	SEXV	22.49901	-22.64380	2034.66794	14567.87194	135.18	19.767
36	S100	21.74124	-23.29631	2004.83426	14542.18237	136.98	20.767
37	QF	21.55037	-23.46066	1997.31990	14535.71181	137.43	21.019
38	QF	21.35951	-23.62502	1989.80554	14529.24124	137.88	21.271
39	S370	18.55574	-26.03932	1879.42090	14434.18981	144.53	24.971
40	QD	18.36487	-26.20368	1871.90654	14427.71925	144.98	25.223
41	QD	18.17401	-26.36803	1864.39210	14421.24869	145.42	25.474
42	S30	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	16.00092	-27.96357	1778.83742	14358.43189	150.22	28.174
45	SEXV	16.00092	-27.96357	1778.83742	14358.43189	150.22	28.174
46	S70	15.39922	-28.32128	1755.14844	14344.34879	151.47	28.974
47	SXF	15.39922	-28.32128	1755.14844	14344.34879	151.47	28.974
48	S30	15.14135	-28.47459	1744.59602	14338.31318	152.00	29.174
49	QF	14.92484	-28.60330	1736.47222	14333.24577	152.45	29.426
50	QF	14.70634	-28.73201	1727.94842	14328.17837	152.89	29.678
51	S30	14.45047	-28.88532	1717.79600	14322.14275	153.42	29.978
52	SEXV	14.45047	-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	S100	11.35595	-30.27995	1595.96453	14267.23579	159.44	33.378
56	QD	11.12038	-30.36912	1586.69028	14263.72552	159.89	33.630

Table 1

	ELEMENT	X (M)	Y (M)	E-AGS(IN)	N-AGS(IN)	ANGLE	S (ORBIT)
57	OD	18.88462	-38.45828	1577.41603	14258.21523	160.33	33.882
58	S30	18.60424	-38.56447	1566.36978	14256.03425	160.87	34.182
59	SENV	18.60424	-38.56447	1566.36978	14256.03425	160.87	34.182
60	BEND	8.29787	-31.21436	1475.53627	14238.44811	165.11	36.582
61	SENV	8.29787	-31.21436	1475.53627	14238.44811	165.11	36.582
62	S70	7.60931	-31.34471	1448.43922	14225.31640	166.35	37.282
63	SXF	7.60931	-31.34471	1448.43922	14225.31640	166.35	37.282
64	S30	7.31456	-31.40057	1436.89476	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	SENV	6.52487	-31.55023	1405.76450	14217.22480	168.32	38.386
69	BEND	4.13989	-31.78361	1311.86796	14207.80046	172.58	40.786
70	SENV	4.13989	-31.78361	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	OD	2.88812	-31.80560	1262.58556	14207.17120	174.81	42.037
75	OD	2.63627	-31.80881	1252.57003	14207.04460	175.26	42.289
76	S370	-1.06333	-31.85805	1107.01261	14205.18478	181.91	45.989
77	QF	-1.31529	-31.85527	1097.09708	14205.05816	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	14204.78878	183.35	46.793
80	SENV	-1.86712	-31.86631	1075.37149	14204.78878	183.35	46.793
81	BEND	-4.25742	-31.68791	981.26494	14211.80461	187.65	49.193
82	SENV	-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	-5.2437	-31.52885	942.08886	14218.14558	189.44	50.193
86	OD	-5.49295	-31.48628	932.62198	14219.74272	189.90	50.445
87	OD	-5.74184	-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	SENV	-6.03762	-31.39739	911.17828	14223.24215	190.88	50.997
90	BEND	-8.36054	-30.80663	819.72110	14246.50072	195.18	53.397
91	SENV	-8.36054	-30.80663	819.72110	14246.50072	195.18	53.397
92	S100	-9.30462	-30.47563	782.55643	14259.49266	195.98	54.397
93	QF	-9.54238	-30.39351	773.89558	14262.78501	197.43	54.649
94	QF	-9.78005	-30.31840	763.83473	14266.03735	197.88	54.901
95	S370	-13.27289	-29.08941	626.32546	14314.10754	204.53	58.601
96	OD	-13.51065	-29.00629	616.96461	14317.37988	204.98	58.852
97	OD	-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	SENV	-14.03161	-28.82418	596.45436	14324.54981	205.96	59.404
100	BEND	-16.21675	-27.83980	510.42544	14353.33643	210.22	61.804
101	SENV	-16.21675	-27.83980	510.42544	14353.33643	210.22	61.804
102	S70	-16.82738	-27.49677	486.58462	14362.81014	211.47	62.504
103	SXF	-16.82738	-27.49677	486.58462	14362.81014	211.47	62.504
104	S30	-17.08908	-27.35810	476.88142	14382.58458	212.00	62.804
105	QF	-17.30880	-27.22695	467.43102	14387.43271	212.45	63.056
106	QF	-17.52852	-27.10381	458.78062	14392.28884	212.89	63.308
107	S30	-17.79003	-26.95714	448.47741	14398.05528	213.42	63.608
108	SENV	-17.79003	-26.95714	448.47741	14398.05528	213.42	63.608
109	BEND	-19.77189	-25.60748	370.49070	14451.13143	217.67	66.008
110	SENV	-19.77189	-25.60748	370.49070	14451.13143	217.67	66.008
111	S100	-20.54528	-24.97453	340.01085	14476.11094	219.44	67.008
112	OD	-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	324.65562	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	SEXV	-23.34070	-22.26222	229.95493	14582.89460	226.35	70.912
120	S30	-23.53645	-22.03389	222.24806	14591.84470	226.89	71.212
121	QF	-23.70000	-21.84402	209.30692	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	72.018
124	SEXV	-24.06091	-21.42583	201.60004	14615.82351	228.32	72.018
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	-25.57172	-18.62050	126.57132	14726.26051	234.35	75.415
130	QD	-26.10043	-18.40399	121.30391	14734.79331	234.81	75.667
131	QD	-26.22914	-18.18749	116.23850	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	25.62570	14895.73023	243.35	80.423
136	SEXV	-28.53063	-14.31620	25.62570	14895.73023	243.35	80.423
137	BEND	-29.57128	-12.15693	-15.34376	14900.74081	247.65	82.823
138	SEXV	-29.57128	-12.15693	-15.34376	14900.74081	247.65	82.823
139	S70	-29.81908	-11.50225	-15.09337	15006.51540	248.91	83.523
140	SXD	-29.81908	-11.50225	-15.09337	15006.51540	248.91	83.523
141	S30	-29.92527	-11.22168	-25.09337	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	-1.24600	-119.53310	15464.26570	270.22	95.434
157	SEXV	-32.21769	-1.24600	-119.53310	15464.26570	270.22	95.434
158	S70	-32.22663	-0.82455	-119.88494	15491.82251	271.47	96.134
159	SXF	-32.22663	-0.82455	-119.88494	15491.82251	271.47	96.134
160	S30	-32.23006	1.12452	-120.02372	15503.63257	272.00	96.434
161	QF	-32.23367	1.37638	-120.16332	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	-120.43371	15535.27369	273.42	97.238
164	SEXV	-32.24072	1.92821	-120.43371	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	5.20546	-107.07180	15668.23631	278.44	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	OD	-31.82012	5.80263	-103.80053	15687.81006	280.33	101.142
170	S30	-31.77180	6.09871	-101.97825	15699.46089	280.87	101.442
171	SENV	-31.77180	6.09871	-101.97825	15699.46089	280.87	101.442
172	BEND	-31.18103	8.42173	-78.71974	15790.92409	285.11	103.842
173	SENV	-31.18103	8.42173	-78.71974	15790.92409	285.11	103.842
174	S70	-30.95004	9.08252	-69.62540	15816.93336	286.35	104.542
175	SXF	-30.95004	9.08252	-69.62540	15816.93336	286.35	104.542
176	S30	-30.95184	9.36571	-65.72783	15828.08076	286.89	104.842
177	QF	-30.76792	9.60348	-62.45549	15837.44962	287.33	105.094
178	QF	-30.68480	9.84124	-59.18315	15846.81047	287.78	105.346
179	S30	-30.58501	10.12444	-55.28557	15857.95987	288.32	105.646
180	SENV	-30.58501	10.12444	-55.28557	15857.95987	288.32	105.646
181	BEND	-29.60053	12.30957	-16.45002	15943.98082	292.58	108.046
182	SENV	-29.60053	12.30957	-16.45002	15943.98082	292.58	108.046
183	S70	-29.25840	12.92021	-3.02533	15968.02965	293.83	108.746
184	SXD	-29.25840	12.92021	-3.02533	15968.02965	293.83	108.746
185	S30	-29.11172	13.18191	2.74911	15978.33286	294.36	109.046
186	QD	-28.98858	13.40163	7.59723	15986.98326	294.81	109.297
187	QD	-28.86544	13.62135	12.44535	15995.63367	295.26	109.549
188	S370	-27.05650	16.84900	83.66341	16122.70660	301.91	113.249
189	QF	-26.93335	17.06872	88.51153	16131.35700	302.26	113.501
190	QF	-26.81022	17.28844	93.35965	16140.00741	302.82	113.753
191	S30	-26.66355	17.55015	99.13409	16150.31062	303.35	114.053
192	SENV	-26.66355	17.55015	99.13409	16150.31062	303.35	114.053
193	BEND	-25.31389	19.53101	152.27018	16228.29737	307.65	116.453
194	SENV	-25.31389	19.53101	152.27018	16228.29737	307.65	116.453
195	S70	-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	S30	-24.68093	20.30520	177.18967	16256.77723	309.44	117.453
198	QD	-24.52151	20.50020	183.46627	16266.45435	309.90	117.705
199	QD	-24.36288	20.69520	189.74286	16274.13147	310.35	117.957
200	S30	-24.17220	20.92745	197.21671	16283.27542	310.88	118.257
201	SENV	-24.17220	20.92745	197.21671	16283.27542	310.88	118.257
202	BEND	-22.49907	22.64386	263.00982	16350.85038	315.18	120.657
203	SENV	-22.49907	22.64386	263.00982	16350.85038	315.18	120.657
204	S100	-21.74130	23.29537	292.92350	16376.53995	316.98	121.657
205	QF	-21.55043	23.46872	300.43786	16383.01052	317.43	121.909
206	QF	-21.35937	23.62508	307.95222	16389.48108	317.88	122.161
207	S370	-18.55580	26.03938	418.33686	16484.53251	324.53	125.861
208	QD	-18.36493	26.20373	425.85122	16491.00307	324.98	126.112
209	QD	-18.17487	26.36809	433.36558	16497.47363	325.42	126.364
210	S30	-17.94673	26.56384	442.31568	16505.18051	325.96	126.654
211	SENV	-17.94673	26.56384	442.31568	16505.18051	325.96	126.654
212	BEND	-16.00098	27.96363	518.92034	16560.29043	330.22	129.084
213	SENV	-16.00098	27.96363	518.92034	16560.29043	330.22	129.084
214	S70	-15.39958	28.32134	542.60932	16574.37353	331.47	129.764
215	SXF	-15.39958	28.32134	542.60932	16574.37353	331.47	129.764
216	S30	-15.14140	28.47465	552.76174	16580.40915	332.00	130.004
217	QF	-14.92490	28.60336	561.28554	16585.47655	332.44	130.316
218	QF	-14.70839	28.73207	569.80934	16590.54395	332.89	130.588
219	S30	-14.45052	28.88538	579.96176	16596.57957	333.42	130.868
220	SENV	-14.45052	28.88538	579.96176	16596.57957	333.42	130.868
221	BEND	-12.29125	29.92603	664.97237	16637.54997	337.67	133.268
222	SENV	-12.29125	29.92603	664.97237	16637.54997	337.67	133.268
223	S100	-11.35600	30.28001	701.79323	16651.48653	339.44	134.268
224	QD	-11.12044	30.36917	711.06748	16654.99680	339.89	134.520

Table 1

ELEMENT	X(M)	Y(M)	E-AGS(IN)	N-AGS(IN)	ANGLE	S(ORBIT)
225	OD	-10.88487	30.45834	16658.50779	340.33	134.772
226	S30	-10.60430	30.56453	16662.68807	340.87	135.072
227	SENV	-10.60430	30.56453	16662.68807	340.87	135.072
228	BEND	-8.29713	31.21442	16688.27432	345.11	137.472
229	SENV	-8.29713	31.21442	16688.27432	345.11	137.472
230	S70	-7.60937	31.34477	16693.40592	346.35	138.172
231	SXF	-7.60937	31.34477	16693.40592	346.35	138.172
232	S30	-7.31462	31.40063	16695.60523	346.89	138.472
233	OF	-7.06715	31.44753	16697.45172	347.33	138.772
234	OF	-6.81968	31.49443	16699.29822	347.78	138.976
235	S30	-6.52492	31.55029	16701.49753	348.32	139.276
236	SENV	-6.52492	31.55029	16701.49753	348.32	139.276
237	BEND	-4.13995	31.78967	16710.92186	352.58	141.676
238	SENV	-4.13995	31.78967	16710.92186	352.58	141.676
239	S70	-3.44001	31.79861	16711.27372	353.83	142.376
240	SXD	-3.44001	31.79861	16711.27372	353.83	142.376
241	S30	-3.14003	31.80244	16711.42451	354.36	142.676
242	OD	-2.88818	31.80565	16711.55112	354.81	142.927
243	OD	-2.63632	31.80887	16711.67772	355.26	143.179
244	S370	1.06337	31.85611	16713.53754	1.91	146.879
245	OF	1.31523	31.85933	16713.56414	2.36	147.131
246	OF	1.56708	31.86254	16713.79075	2.82	147.383
247	S30	1.86706	31.86637	16713.94155	3.35	147.633
248	SENV	1.86706	31.86637	16713.94155	3.35	147.633
249	BEND	4.25737	31.86797	16706.91772	7.65	150.083
250	SENV	4.25737	31.86797	16706.91772	7.65	150.083
251	S70	4.94823	31.87522	16702.47903	8.91	150.783
252	SXD	4.94823	31.87522	16702.47903	8.91	150.783
253	S30	5.24431	31.87691	16700.57674	9.44	151.083
254	OD	5.49290	31.88634	16698.97900	9.90	151.325
255	OD	5.74148	31.88634	16697.38277	10.35	151.567
256	S30	6.03757	31.39745	16695.48018	10.80	151.807
257	SENV	6.03757	31.39745	16695.48018	10.80	151.807
258	BEND	8.36058	30.80668	16672.22160	15.18	154.287
259	SENV	8.36058	30.80668	16672.22160	15.18	154.287
260	S100	9.30456	30.47669	16659.22966	16.98	155.287
261	OF	9.54233	30.39357	16655.95731	17.43	155.539
262	OF	9.78009	30.31045	16652.68457	17.88	155.791
263	S370	13.27223	29.08947	16604.61478	24.53	159.491
264	OD	13.51059	29.00635	16601.34244	24.98	159.742
265	OD	13.74836	28.92324	16598.07009	25.42	159.994
266	S30	14.03155	28.82424	16594.17251	25.96	160.294
267	SENV	14.03155	28.82424	16594.17251	25.96	160.294
268	BEND	16.21659	27.83906	16555.38559	30.22	162.694
269	SENV	16.21659	27.83906	16555.38559	30.22	162.694
270	S70	16.82733	27.49683	16541.91219	31.47	163.394
271	SXF	16.82733	27.49683	16541.91219	31.47	163.394
272	S30	17.06803	27.35015	16536.13774	32.00	163.694
273	OF	17.30875	27.22701	16531.28961	32.44	163.946
274	OF	17.52847	27.10387	16526.44148	32.89	164.198
275	S30	17.79017	26.95720	16520.66704	33.42	164.498
276	SENV	17.79017	26.95720	16520.66704	33.42	164.498
277	BEND	19.77103	25.60754	16467.53089	37.67	166.888
278	SENV	19.77103	25.60754	16467.53089	37.67	166.888
279	S100	20.54522	24.97459	16442.61138	39.44	167.098
280	OD	20.74022	24.81516	16436.33478	39.89	168.110

Table 1

	ELEMENT	X (M)	Y (M)	E-AGS (IN)	N-AGS (IN)	ANGLE	S (ORBIT)
281	QD	20.93522	24.65573	1973.10114	15430.05819	40.33	168.402
282	S30	21.16747	24.46585	1982.24511	16422.58235	40.87	168.702
283	SEV	22.88388	22.79272	2049.82011	16356.71129	45.11	171.102
284	BEND	22.88388	22.79272	2049.82011	16356.71129	45.11	171.102
285	SEV	23.34064	22.26228	2067.80283	16335.82772	46.35	171.802
286	S70	23.34064	22.26228	2067.80283	16335.82772	46.35	171.802
287	SXF	23.53639	22.03455	2075.50971	16326.87762	46.89	172.102
288	QD	23.70075	21.84408	2081.90027	16319.36327	47.33	172.354
289	OF	23.86510	21.65342	2088.45084	16311.84891	47.78	172.606
290	QD	24.06085	21.42589	2096.15772	16302.89881	48.32	172.906
291	S30	24.06085	21.42589	2096.15772	16302.89881	48.32	172.906
292	SEV	25.46065	19.48013	2151.26770	16226.29420	52.58	175.306
293	BEND	25.46065	19.48013	2151.26770	16226.29420	52.58	175.306
294	SEV	25.46065	19.48013	2151.26770	16226.29420	52.58	175.306
295	S70	25.61036	18.87643	2165.35082	16202.60523	53.83	176.006
296	SXD	25.61036	18.87643	2165.35082	16202.60523	53.83	176.006
297	S30	25.97166	18.62056	2171.38544	16192.45281	54.36	176.306
298	QD	26.10038	18.40405	2176.45385	16183.92901	54.81	176.557
299	QD	26.22209	18.18755	2181.52126	16175.40522	55.26	176.809
300	S370	28.11985	15.00714	2259.96062	16050.19210	61.91	180.509
301	OF	28.24856	14.79063	2261.02803	16041.66830	62.36	180.761
302	QD	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	SEV	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	SEV	29.57123	12.15699	2313.10152	15937.98151	67.65	183.713
307	S70	29.81982	11.50231	2322.85714	15912.20692	68.91	184.413
308	SXD	29.81982	11.50231	2322.85714	15912.20692	68.91	184.413
309	S30	29.92532	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	30.10324	10.75061	2334.05867	15882.61217	70.35	185.217
312	S30	30.20974	10.47003	2338.23955	15871.56591	70.88	185.517
313	SEV	30.20974	10.47003	2338.23955	15871.56591	70.88	185.517
314	BEND	30.85962	8.16286	2363.82572	15780.73238	75.18	187.917
315	SEV	30.85962	8.16286	2363.82572	15780.73238	75.18	187.917
316	S100	31.04503	7.18035	2371.15670	15742.05087	76.98	188.917
317	OF	31.09273	6.93288	2373.00320	15732.30796	77.43	189.169
318	QD	31.13953	6.68541	2374.84959	15722.56505	77.88	189.421
319	S370	31.82800	3.005012	2401.97432	15579.44344	84.53	193.121
320	QD	31.87550	2.80265	2403.82001	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	SEV	31.97826	2.26043	2407.86660	15548.35317	85.96	193.924
324	BEND	32.21764	-1.12455	2417.29006	15454.45663	90.22	196.324
325	SEV	32.21764	-1.12455	2417.29006	15454.45663	90.22	196.324
326	S70	32.22657	-82449	2417.64270	15426.89982	91.47	197.824
327	SXF	32.22657	-82449	2417.64270	15426.89982	91.47	197.824
328	S30	32.23040	-1.12446	2417.79349	15415.09975	92.00	197.924
329	OF	32.23362	-1.137632	2417.92008	15405.17422	92.44	197.576
330	QD	32.23683	-1.162817	2418.04668	15395.25869	92.89	197.828
331	S30	32.24066	-1.192815	2418.19747	15383.44863	93.42	198.128
332	SEV	32.24066	-1.192815	2418.19747	15383.44863	93.42	198.128
333	BEND	32.66226	-4.31845	2411.17357	15289.34209	97.67	200.528
334	SEV	32.66226	-4.31845	2411.17357	15289.34209	97.67	200.528
335	S100	31.90120	-5.30540	2404.83256	15500.48601	99.44	201.528
336	QD	31.86063	-5.55399	2403.23542	15440.69914	99.89	201.780

Tab 2

APEX	N(IN)	E(IN)	X(M)	Y(M)
1	A1	2392.10750	31.57798	-7.28601
2	A2	2337.41334	30.18875	-11.26004
3	A4	2175.46711	26.07531	-18.59956
4	A5	2070.55952	23.41066	-21.85878
5	A7	1819.55050	17.03503	-27.34879
6	A8	1677.08292	13.41535	-35.56512
7	B1	1522.07224	9.47908	-30.99034
8	B2	1359.22841	5.34285	-31.77424
9	B4	1028.01087	-3.07008	-31.88165
10	B5	864.43221	-7.22497	-31.20360
11	B7	551.74332	-15.16727	-28.42714
12	B8	407.15988	-18.83969	-26.36892
13	C1	278.84412	-22.09891	-23.70425
14	C2	170.69486	-24.84590	-20.51412
15	C4	1.42441	-29.14537	-13.28201
16	C5	-57.24624	-30.63561	-9.34474
17	C7	-110.92531	-32.22225	-1.07927
18	C8	-121.04079	-32.25599	3.13125
19	D1	-94.24554	-31.57793	7.28614
20	D2	-39.65063	-30.18868	11.26017
21	D4	122.29683	-26.07521	18.59967
22	D5	227.20499	-23.41055	21.85889
23	D7	478.21498	-17.03489	27.34887
24	D8	620.68294	-13.41621	29.50016
25	E1	775.69388	-9.47893	30.99038
26	E2	938.53785	-5.34269	31.77425
27	E4	1269.75540	3.07024	31.88163
28	E5	1433.33395	7.22513	31.20357
29	E7	1746.02235	15.16742	28.42707
30	E8	1890.60543	18.83983	26.36883
31	F1	2018.92072	22.09903	23.70416
32	F2	2127.06942	24.84601	20.51401
33	F4	2296.33859	29.14545	13.28188
34	F5	2355.00856	30.63567	9.34460
35	F7	2416.68617	32.20228	1.07812
36	F8	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