SSC-N-210
SSC MAG Note-89
LBID-1164

MAGNETIC FIELD MEASUREMENTS OF MD-3 VOL. II - AXIAL SCANS*

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July 1986

*This work was supported by the Director, Office of Energy Research, Office of High Energy and Nuclear Physics, High Energy Physics Division, U.S. Dept. of Energy, under Contract No. DE-AC03-76SF00098.

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July 10, 1986

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Introduction

The magnetic field of the superconducting magnet MD-3 was measured while the magnet was in several different configurations at room temperature. The primary purpose of the measurements presented here was to determine the effect of an iron shell on the field quality in the end of the magnet. The approach used was to determine the "local" magnetic field with a 10 cm long search coil pair that was moved axially (either 1" or 1/2") with respect to the magnet between measurements.

This is the second of three reports on the field measurements of MD3; the first is available as SSC Mag Note-83, LBID-1164. The work described is the result of a concerted effort by the Supercon and Magmeasurement Groups.

Axial Scan Results

The format used to present results of the the axial scans consists of Tables of detailed data, which could be used for analysis, and graphs of the axial variations of the dipole field and the harmonics. The data are presented in three sets. These sets correspond to the three different configurations of the iron: "Regular" (or "Normal"), "Short", and "Long". The data for these measurements are contained in "Lotus" worksheet files, the names of which are included with some other information in Table 1.

The "normal" configuration of the MD3 magnet, i.e. with the iron extending almost to the edges of the straight sections is shown in the cross section of Fig. R1.

This is the configuration of the magnet during cold tests, as described in SSC Mag-83. Axial scans of the fields in the magnet in this configuration are shown in Figs. R2-R20. In the first subset, Figs. R2 through R8, both the inner and outer layers were energized. In the second set, Figs. R9 through R14 the inner layer only was energized, and in Figs. R15 through R20 the outer layer only was energized. The results of these measurements are given in Tables R1-RIII. Similar results are given in Figs. S1 to S20 (Tables SI-SIII) and Figs. L1 to L20 (Tables LI to LIII) for the short and long iron configurations.

TABLE I

Summary of Measurements of MD3

Date	Configuration		Worksheet Name	Run Numbers
	Coil	Iron		
3/13	Full	Normal	TBL02E	313A0-313G7
3/13	Inner	Normal	TBL07E	310M0-313O9
3/13	Outer	Normal	TBL05E	313I0-313K9
4/02	Full	Short	TBL23E	402B0-402D9
4/03	Inner	Short	TBL27E	403F0-403H9
4/03	Outer	Short	TBL25E	403B0-403D9
4/08	Full	Long	TBL29E	408B0-408D9
4/10	Inner	Long	TBL36E	410B0-410B9
4/09	Outer	Long	TBL34E	409G0-409I9

Table PIa

POSITION (in)	CURRENT (A)	B (T)	TRSF FN (T/kA)	b1	MD3 COMPLETE REG IRON a1	b2	a2	b3	a3
-2	10.01	0.0105	1.053	-0.87	-3.01	8.20	0.97	0.48	-0.32
-1	10.01	0.0105	1.052	-1.71	-2.23	8.32	1.20	0.78	-0.64
-2	10.01	0.0105	1.052	-0.87	-3.21	8.34	1.06	0.49	-0.34
-1.5	10.01	0.0105	1.052	-1.68	-2.71	8.12	1.06	0.62	-0.51
-1	10.01	0.0105	1.052	-2.04	-2.06	8.29	1.25	0.82	-0.67
-0.5	10.01	0.0105	1.051	-1.61	-1.81	8.44	1.48	0.87	-0.60
0	10.01	0.0105	1.051	-2.47	-1.45	8.47	1.64	0.88	-0.56
0.5	10.01	0.0105	1.050	-2.32	-1.61	8.49	1.81	0.94	-0.59
1	10.01	0.0105	1.050	-2.76	-1.08	8.49	1.58	0.85	-0.63
1.5	10.01	0.0105	1.050	-2.01	-1.24	8.76	1.50	0.87	-0.52
2	10.01	0.0105	1.050	-2.18	-0.79	8.90	1.43	0.85	-0.48
2.5	10.01	0.0105	1.050	-1.39	-1.24	9.15	1.25	0.99	-0.58
3	10.01	0.0105	1.049	-1.05	-1.84	8.97	1.05	0.77	-0.41
3.5	10.01	0.0105	1.049	-0.99	-2.60	9.04	1.09	0.68	-0.44
4	10.01	0.0105	1.049	-0.64	-2.76	9.05	0.69	0.71	-0.37
4.5	10.01	0.0105	1.049	-0.77	-3.23	9.10	0.80	0.68	-0.42
5	10.01	0.0105	1.048	-0.37	-3.18	9.01	0.49	0.81	-0.50
5.5	10.01	0.0105	1.048	-0.58	-3.78	8.80	0.55	0.77	-0.35
6	10.01	0.0105	1.049	-0.59	-3.88	8.46	0.46	0.78	-0.30
6.5	10.01	0.0105	1.049	-0.69	-3.59	7.91	0.33	0.65	-0.43
7	10.01	0.0105	1.049	-0.81	-3.28	7.64	0.19	0.73	-0.45
7.5	10.01	0.0105	1.049	-0.09	-2.69	7.71	0.02	0.84	-0.40
8	10.01	0.0105	1.050	-0.84	-2.29	7.24	0.01	0.77	-0.42
8.5	10.01	0.0105	1.050	-0.08	-1.51	6.98	-0.11	0.37	-0.53
9	10.01	0.0105	1.050	-0.56	-0.40	5.92	-0.09	0.59	-0.47
9.5	10.01	0.0105	1.050	-1.21	0.05	5.08	-0.12	0.45	-0.35
10	10.01	0.0105	1.049	-1.10	0.90	5.01	-0.19	0.14	-0.31
10.5	10.01	0.0105	1.049	-1.48	0.84	5.02	0.08	-0.01	-0.25
11	10.01	0.0105	1.047	-1.00	1.05	5.31	0.26	-0.05	-0.31
11.5	10.01	0.0104	1.044	-1.31	0.35	4.83	0.18	0.08	-0.18
12	10.01	0.0104	1.038	-1.66	-0.51	3.85	0.03	0.14	-0.18
12.5	10.01	0.0103	1.028	-1.14	-2.04	3.49	-0.05	-0.09	-0.01
13	10.01	0.0102	1.015	-1.39	-4.65	3.71	0.30	-0.34	0.30
13.5	10.01	0.0100	0.999	-1.81	-7.06	4.47	0.68	-0.37	0.33
14	10.01	0.0098	0.980	-2.24	-9.20	4.62	0.75	-0.51	0.54
14.5	10.01	0.0096	0.955	-2.53	-10.45	3.67	-0.23	-0.84	0.87
15	10.01	0.0092	0.921	-3.35	-10.34	1.08	-2.96	-1.20	1.27
15.5	10.01	0.0087	0.872	-4.40	-8.91	-2.39	-6.09	-1.57	1.71
16	10.01	0.0081	0.805	-4.38	-7.01	-9.93	-8.17	-2.08	2.08
16.5	10.01	0.0072	0.717	-3.95	-3.18	-24.28	-9.65	-2.46	2.45
17	10.01	0.0062	0.616	-3.23	-2.09	-32.23	-10.36	-2.31	2.33
17.5	10.01	0.0051	0.505	-1.75	0.23	-37.27	-10.85	-2.28	2.30
18	10.01	0.0039	0.391	-1.77	1.48	-39.67	-10.87	-2.11	2.11
18.5	10.01	0.0028	0.283	0.21	2.32	-39.89	-9.61	-1.67	1.64
19	10.01	0.0019	0.186	0.60	1.55	-38.30	-7.17	-1.36	1.35
19.5	10.01	0.0011	0.105	1.20	0.95	-33.72	-4.68	-1.24	1.24
20	10.01	0.0005	0.049	2.22	-0.14	-25.15	-4.04	-0.54	0.55
20.5	10.01	0.0001	0.015	2.02	-1.63	-10.06	-4.44	-0.32	0.30
21	10.01	.0000	0.003	-1.67	-0.98	-4.02	-3.36	-0.02	-0.08
21.5	10.01	0.0001	0.009	0.36	-1.79	1.19	-0.89	.00	-0.08
22	10.01	0.0001	0.010	0.48	-1.17	0.06	-0.04	-0.09	0.08
22.5	10.01	0.0001	0.010	0.44	-0.69	-0.14	0.05	-0.03	-0.08

Table RIb

POSITION (in)	b4	a4	b5	a5	b6	a6	b7	a7	b8	a8
-2	0.71	-0.01	0.05	-0.07	0.13	-0.02	0.01	-0.01	0.03	0.01
-1	0.65	-0.15	0.03	-0.15	0.12	-0.01	0.01	0.01	0.05	0.02
-2	0.76	0.01	0.09	-0.07	0.12	-0.02	.00	-0.02	0.05	0.01
-1.5	0.77	-0.06	0.03	-0.15	0.15	-0.01	.00	-0.02	0.04	0.02
-1	0.73	-0.08	0.07	-0.16	0.13	.00	0.01	-0.04	0.05	.00
-0.5	0.72	-0.19	0.10	-0.15	0.11	-0.02	0.01	-0.03	0.04	0.01
0	0.66	-0.14	0.03	-0.16	0.11	.00	-0.01	-0.02	0.02	0.01
0.5	0.76	-0.12	0.06	-0.18	0.15	.00	-0.01	-0.03	0.04	.00
1	0.67	-0.07	0.03	-0.19	0.15	.00	.00	-0.02	0.03	-0.01
1.5	0.70	-0.11	0.07	-0.18	0.16	.00	-0.01	-0.02	0.03	.00
2	0.66	-0.13	0.04	-0.19	0.17	0.01	-0.02	-0.02	0.03	.00
2.5	0.68	-0.14	0.08	-0.17	0.15	-0.01	-0.03	-0.02	0.02	.00
3	0.63	.00	0.07	-0.23	0.16	-0.01	-0.01	-0.02	0.03	.00
3.5	0.63	-0.06	0.10	-0.22	0.14	0.02	-0.03	-0.03	0.03	.00
4	0.58	-0.02	0.11	-0.18	0.18	0.02	.00	-0.02	0.03	.00
4.5	0.61	-0.09	0.13	-0.15	0.17	0.01	-0.01	-0.02	0.01	.00
5	0.58	-0.07	0.09	-0.15	0.18	-0.02	-0.01	.00	0.02	.00
5.5	0.58	-0.01	0.09	-0.16	0.17	0.01	-0.04	-0.02	.00	0.01
6	0.59	0.01	0.09	-0.15	0.19	0.02	.00	.00	0.01	0.01
6.5	0.53	-0.05	0.07	-0.12	0.16	0.03	-0.01	-0.01	0.02	-0.01
7	0.54	0.03	0.12	-0.08	0.15	0.04	-0.01	-0.03	0.02	0.01
7.5	0.55	0.05	0.12	-0.06	0.13	0.02	0.01	.00	0.02	-0.01
8	0.52	0.05	0.11	-0.02	0.14	0.04	-0.02	.00	0.01	0.01
8.5	0.60	-0.06	0.13	-0.07	0.15	0.04	0.03	-0.04	0.02	.00
9	0.48	-0.12	0.16	-0.06	0.16	0.03	.00	-0.01	0.02	0.01
9.5	0.30	-0.16	0.16	-0.04	0.16	0.03	0.02	-0.02	0.02	0.01
10	0.08	-0.19	0.17	-0.02	0.19	0.02	0.04	-0.02	0.03	-0.01
10.5	-0.01	-0.14	0.17	-0.04	0.11	-0.02	0.05	-0.01	0.03	0.01
11	-0.02	-0.13	0.17	-0.07	0.12	-0.02	0.06	-0.01	0.04	0.01
11.5	0.08	-0.18	0.18	-0.07	0.10	-0.03	0.06	-0.03	0.04	0.02
12	0.09	-0.21	0.13	-0.12	0.06	.00	0.06	-0.04	0.03	.00
12.5	-0.12	-0.36	0.12	-0.16	0.09	-0.02	0.04	-0.02	0.04	0.01
13	-0.58	-0.41	0.12	-0.17	0.10	-0.03	0.06	-0.02	0.03	.00
13.5	-0.92	-0.34	0.07	-0.16	0.06	-0.04	0.05	-0.01	0.01	0.01
14	-0.91	-0.29	0.08	-0.15	.00	-0.07	0.03	-0.02	0.02	0.02
14.5	-0.95	-0.26	0.10	-0.19	0.04	-0.06	0.01	-0.04	0.01	.00
15	-0.87	-0.30	0.05	-0.29	0.16	-0.06	0.03	-0.05	0.01	0.01
15.5	-0.58	-0.26	0.11	-0.47	0.44	-0.01	0.02	-0.07	0.04	0.02
16	-0.87	0.05	0.13	-0.19	.00	-0.09	.00	0.01	-0.05	.00
16.5	-1.96	-0.02	0.15	-0.16	0.02	-0.05	0.02	0.03	-0.04	0.01
17	-1.42	0.22	0.15	-0.07	-0.06	-0.06	0.02	0.04	-0.05	.00
17.5	-1.18	0.22	0.14	-0.09	-0.04	-0.02	0.04	0.02	-0.04	-0.01
18	-1.13	0.14	0.13	-0.07	0.02	0.01	0.03	0.02	-0.04	-0.01
18.5	-0.94	0.02	0.08	0.03	-0.08	0.01	0.03	0.02	-0.05	.00
19	-1.26	0.03	0.14	0.09	-0.12	.00	0.01	0.06	-0.07	-0.02
19.5	-1.89	-0.08	0.01	0.27	-0.31	-0.06	0.02	0.03	-0.02	-0.01
20	-0.78	-0.11	0.03	0.02	0.07	0.05	0.03	.00	0.01	.00
20.5	-0.20	-0.04	0.03	0.02	.00	-0.01	0.01	.00	0.02	-0.01
21	-0.02	0.08	0.03	0.05	-0.04	-0.01	0.01	.00	0.01	.00
21.5	.00	0.06	.00	-0.06	0.02	0.01	0.02	-0.01	.00	-0.01
22	-0.03	0.02	0.02	-0.02	.00	0.03	0.02	.00	-0.01	-0.01
22.5	-0.01	0.04	-0.01	.00	.00	0.05	0.01	.00	0.01	-0.01
23	0.06	0.04	-0.02	-0.02	0.02	0.03	.00	0.01	0.01	0.01

Table RIIa

POSITION (in)	CURRENT (A)	B-CENTR (T)	TRANSFER FUNCTIO (T/kA)	b1	MD3 INNER REG IRON a1	b2	a2	MAR 13, 1986 b3	a3
-2	10.01	0.0049	0.489	10.35	1.31	-163.4	2.75	3.74	-2.28
-1	10.01	0.0049	0.488	8.46	21.76	-162.8	3.38	6.56	-6.34
0	10.01	0.0049	0.487	2.76	23.63	-162.4	3.94	6.62	-6.62
1	10.01	0.0049	0.487	3.19	25.22	-162.4	4.27	6.70	-6.69
2	10.01	0.0049	0.487	4.84	24.58	-162.2	4.22	6.26	-6.25
3	10.01	0.0049	0.486	7.83	25.07	-163.3	4.17	6.94	-6.88
4	10.01	0.0049	0.486	4.24	24.88	-162.7	3.43	6.75	-6.75
5	10.01	0.0049	0.485	6.38	26.58	-163.4	3.31	6.79	-6.79
6	10.01	0.0049	0.485	8.10	28.21	-164.7	3.27	7.35	-7.31
7	10.01	0.0049	0.486	6.51	29.84	-165.6	2.62	7.86	-7.84
8	10.01	0.0049	0.487	6.19	32.64	-166.1	1.61	8.13	-8.11
9	10.01	0.0049	0.487	6.18	37.41	-168.3	1.81	8.34	-8.29
10	10.01	0.0049	0.487	3.85	39.68	-170.9	1.73	8.33	-8.28
11	10.01	0.0049	0.487	1.88	42.20	-169.2	2.09	8.44	-8.37
12	10.01	0.0048	0.483	2.73	38.71	-171.4	1.73	8.55	-8.36
13	10.01	0.0048	0.476	-1.07	30.77	-170.5	2.55	7.74	-7.63
14	10.01	0.0046	0.463	-0.63	21.47	-166.3	4.55	6.62	-6.54
15	10.01	0.0044	0.438	-2.82	15.70	-153.5	-3.21	5.32	-5.20
16	10.01	0.0038	0.379	-3.00	8.53	-130.4	-15.32	2.60	-2.57
17	10.01	0.0028	0.278	-1.34	5.31	-126.9	-22.48	1.05	0.26
18	10.01	0.0016	0.164	0.72	0.66	-86.8	-24.59	1.75	1.51
19	10.01	0.0007	0.066	5.72	-2.20	-59.5	-17.87	-1.78	1.75
20	10.01	0.0001	0.008	4.52	-1.12	-25.2	-23.60	-0.45	0.32
21	10.01	0.0001	0.005	-0.38	-3.16	-0.1	0.21	-0.15	-0.25
22	10.01	.0000	0.004	-0.02	-2.30	-0.1	0.28	0.03	-0.30
23	10.01	.0000	0.004	0.60	-1.70	-0.1	0.14	0.05	0.01
24	10.01	.0000	0.004	0.46	-1.77	-0.2	0.51	-0.25	-0.31
25	10.01	.0000	0.004	0.40	-1.12	-0.1	0.24	-0.41	-0.55
26	10.01	.0000	0.004	0.80	-1.85	-0.3	0.37	0.31	-0.14

Table RIIb

POSITION MD3 INNER REG IRON MAR 13, 1986

(in)	b4	a4	b5	a5	b6	a6	b7	a7	b8	a8
-2	18.99	0.31	0.24	-0.23	0.98	0.11	-0.02	-0.01	-0.03	-0.01
-1	18.87	-0.11	0.03	-0.49	0.87	0.01	0.05	-0.02	-0.04	0.04
0	19.02	-0.10	0.08	-0.76	0.92	0.03	0.03	-0.01	.00	-0.01
1	19.20	-0.10	0.15	-0.72	0.91	0.02	-0.08	0.08	-0.01	0.02
2	19.02	-0.25	0.20	-0.76	0.90	.00	.00	-0.02	-0.02	-0.01
3	19.06	-0.28	0.17	-0.71	0.98	0.01	-0.03	-0.01	0.02	-0.01
4	18.84	-0.27	0.11	-0.72	1.00	0.04	-0.05	0.04	-0.04	0.02
5	18.61	-0.29	0.15	-0.80	1.03	0.04	-0.05	.00	-0.06	0.02
6	18.89	-0.30	0.18	-0.66	0.94	0.06	-0.01	0.03	-0.03	0.01
7	18.64	-0.17	0.20	-0.57	0.99	0.09	0.02	0.01	-0.05	0.03
8	18.64	-0.04	0.22	-0.52	0.91	0.08	0.04	.00	-0.06	0.02
9	18.36	-0.34	0.20	-0.55	0.97	0.07	0.07	0.03	-0.07	-0.01
10	17.63	-0.61	0.39	-0.46	1.01	.00	0.13	0.02	-0.02	0.04
11	17.39	-0.50	0.36	-0.49	0.77	-0.03	0.14	-0.03	.00	0.03
12	17.52	-0.64	0.27	-0.71	0.83	-0.08	0.17	0.02	-0.04	.00
13	16.05	-0.95	0.23	-0.82	0.86	-0.11	0.15	0.05	-0.02	0.03
14	14.94	-0.56	0.19	-0.86	0.67	-0.23	0.13	.00	-0.04	0.04
15	14.06	-0.75	0.21	-0.90	0.91	-0.23	0.04	-0.07	.00	-0.04
16	9.85	-0.34	0.40	-0.77	0.46	-0.23	0.04	0.13	-0.14	.00
17	4.74	0.17	0.35	-0.44	0.17	-0.11	0.06	0.09	-0.14	.00
18	1.41	0.02	0.26	-0.33	0.16	-0.01	0.02	0.07	-0.09	.00
19	-1.98	0.03	0.26	0.09	-0.18	-0.03	0.04	0.19	-0.14	-0.06
20	-0.48	-0.78	0.12	0.08	-0.07	0.26	0.03	0.07	-0.01	0.01
21	-0.12	0.16	-0.05	0.02	0.07	0.04	0.01	0.01	0.03	0.02
22	0.02	-0.16	-0.03	-0.02	0.02	-0.08	-0.02	-0.03	-0.01	-0.01
23	0.03	-0.01	0.02	0.14	0.01	-0.05	-0.02	-0.01	.00	-0.01
24	-0.03	-0.02	0.03	-0.07	0.01	-0.08	0.03	.00	.00	0.01
25	-0.05	0.04	0.01	-0.07	0.05	-0.03	-0.01	0.03	.00	-0.01
26	0.05	0.03	-0.05	0.04	0.08	-0.05	-0.06	0.08	.00	-0.02

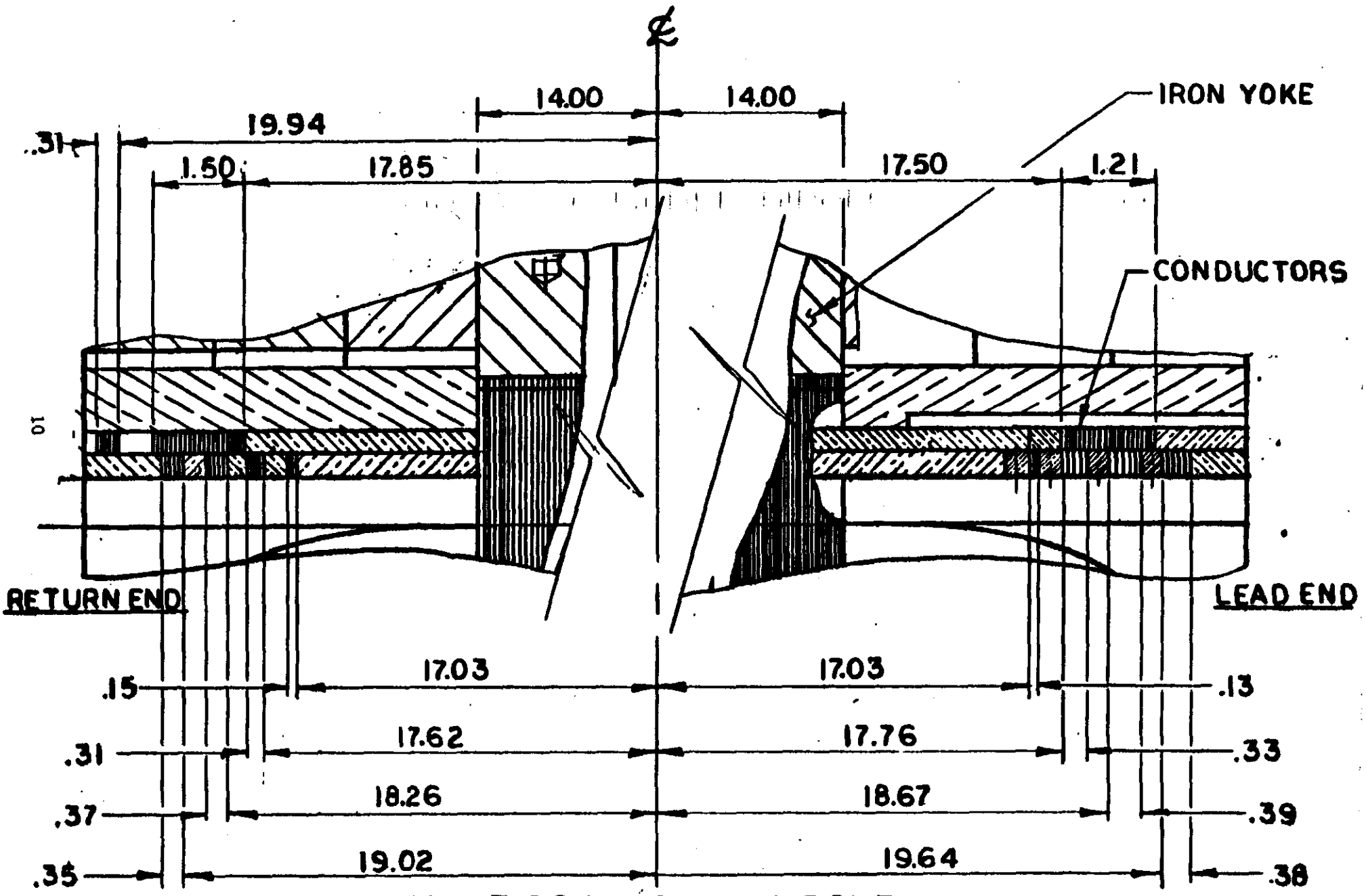
Table RIIIa

POSITION (in)	CURRENT (A)	B (T)	TRANSFER FUNCTIO (T/kA)	b1	a1	b2	a2	b3	a3
				MD3	OUTER	REG	IRON	MAR 13,	1986
-2	10.01	0.0059	0.585	-10.87	-11.34	150.80	1.16	-3.34	1.39
-1	10.01	0.0058	0.584	-13.67	-23.63	149.98	1.59	-5.54	4.52
0	10.01	0.0058	0.583	-11.51	-24.85	150.14	2.04	-5.08	4.48
1	10.01	0.0058	0.583	-12.97	-25.56	150.71	1.76	-5.25	4.50
2	10.01	0.0058	0.583	-11.67	-25.51	150.72	0.70	-5.29	4.66
3	10.01	0.0058	0.583	-11.00	-29.26	151.83	-0.11	-5.77	5.12
4	10.01	0.0058	0.582	-5.39	-29.49	151.53	-1.15	-5.20	4.95
5	10.00	0.0058	0.582	-5.69	-31.47	152.08	-1.05	-5.58	5.27
6	10.00	0.0058	0.582	-8.77	-33.27	151.83	-1.32	-6.12	5.75
7	10.00	0.0058	0.582	-8.64	-32.75	151.30	-1.33	-6.14	5.75
8	10.00	0.0058	0.583	-8.13	-32.62	151.25	-1.53	-6.10	5.75
9	10.00	0.0058	0.583	-5.95	-32.16	150.51	-1.24	-6.35	6.05
10	10.00	0.0058	0.583	-1.85	-31.01	150.08	-1.47	-6.38	6.26
11	10.00	0.0058	0.581	-2.36	-31.16	149.95	-1.20	-6.47	6.35
12	10.00	0.0057	0.574	-2.92	-32.09	149.94	-1.22	-6.65	6.54
13	10.00	0.0056	0.558	-0.83	-33.75	149.08	-0.84	-6.68	6.65
14	10.00	0.0053	0.533	-1.47	-35.10	146.94	-1.54	-6.57	6.52
15	10.00	0.0050	0.497	-3.02	-33.81	130.01	-1.22	-6.80	6.73
16	10.00	0.0044	0.437	-3.31	-22.66	90.53	0.40	-5.66	5.66
17	10.00	0.0035	0.346	-2.88	-11.49	46.92	1.92	-4.32	4.29
18	10.00	0.0023	0.233	-2.13	-1.65	0.24	1.74	-2.64	2.62
19	10.00	0.0012	0.123	-0.83	1.86	-18.82	1.08	-0.79	0.77
20	10.00	0.0004	0.043	2.19	-0.68	-16.73	-1.32	-0.34	0.37
21	10.00	.0000	0.004	2.77	0.98	0.81	-9.29	0.04	0.09
22	10.00	0.0001	0.007	0.96	-1.93	0.07	-0.25	0.21	-0.14
23	10.00	0.0001	0.006	0.94	-1.76	-0.25	0.46	0.07	-0.14
24	10.00	0.0001	0.006	-0.26	-0.99	-0.22	0.28	-0.18	-0.37
25	10.00	0.0001	0.005	0.70	-1.00	-0.01	0.39	0.32	-0.25
26	10.00	.0000	0.005	0.82	-0.52	0.05	0.06	0.18	-0.23

Table RIIIb

POSITION MD3 OUTER REG IRON MAR 13, 1986

(in)	b4	a4	b5	a5	b6	a6	b7	a7	b8	a8
-2	-14.60	-0.56	-0.12	-0.10	-0.54	-0.17	0.04	-0.02	0.07	0.05
-1	-14.39	-0.30	0.06	0.17	-0.53	-0.02	-0.07	-0.06	0.09	.00
0	-14.48	-0.32	-0.06	0.09	-0.52	-0.06	0.03	-0.06	0.06	-0.01
1	-14.49	-0.37	0.05	0.14	-0.54	0.01	0.03	-0.07	0.06	-0.04
2	-14.59	-0.24	-0.01	0.22	-0.50	0.02	-0.01	-0.04	0.05	0.03
3	-14.76	-0.21	0.04	0.22	-0.52	0.05	-0.02	-0.07	0.08	-0.02
4	-14.65	-0.06	.00	0.25	-0.52	-0.01	.00	-0.05	0.06	0.01
5	-14.69	-0.08	0.04	0.18	-0.50	0.06	0.02	-0.04	0.05	-0.02
6	-14.79	-0.12	.00	0.20	-0.55	0.11	-0.01	-0.08	0.06	-0.02
7	-14.73	-0.10	0.02	0.16	-0.45	-0.06	0.05	-0.07	0.05	-0.01
8	-14.73	-0.04	0.05	0.17	-0.48	-0.01	.00	-0.06	0.06	-0.01
9	-14.57	-0.06	0.11	0.21	-0.51	0.03	-0.02	-0.05	0.06	-0.02
10	-14.56	-0.13	0.05	0.14	-0.51	-0.06	0.01	-0.06	0.08	0.02
11	-14.57	-0.05	-0.01	0.31	-0.48	-0.02	.00	-0.04	0.07	.00
12	-14.52	-0.19	0.06	0.30	-0.48	-0.06	-0.01	-0.08	0.07	-0.01
13	-14.32	-0.09	0.06	0.25	-0.43	-0.02	0.02	-0.05	0.05	-0.01
14	-14.04	-0.01	0.03	0.32	-0.48	0.01	-0.02	-0.04	0.06	0.02
15	-13.09	-0.25	.00	0.32	-0.48	0.04	-0.02	-0.01	0.07	.00
16	-9.84	-0.25	-0.05	0.15	-0.28	0.04	0.02	.00	0.03	.00
17	-6.47	-0.24	0.01	0.13	-0.13	0.03	-0.01	.00	.00	0.01
18	-3.19	-0.03	.00	0.11	.00	.00	0.03	-0.02	0.02	-0.01
19	-0.67	-0.08	0.02	.00	0.02	0.02	0.05	0.01	.00	-0.01
20	-0.48	-0.25	0.01	0.06	-0.02	-0.04	.00	0.01	.00	-0.02
21	0.08	-0.17	-0.07	-0.02	-0.06	-0.06	0.02	0.02	-0.01	-0.02
22	0.01	.00	-0.10	.00	-0.02	0.01	.00	-0.01	.00	0.01
23	0.05	-0.11	.00	-0.03	0.05	0.02	-0.01	-0.04	.00	-0.02
24	-0.01	0.01	-0.04	-0.01	0.03	0.04	0.01	0.01	-0.02	-0.03
25	0.06	0.02	-0.02	-0.01	0.03	-0.03	-0.03	.00	-0.01	.00
26	0.05	0.06	0.12	-0.04	0.03	0.03	-0.02	0.03	.00	-0.04



MD-3 SSC MODEL DIPOLE

Fig. R1

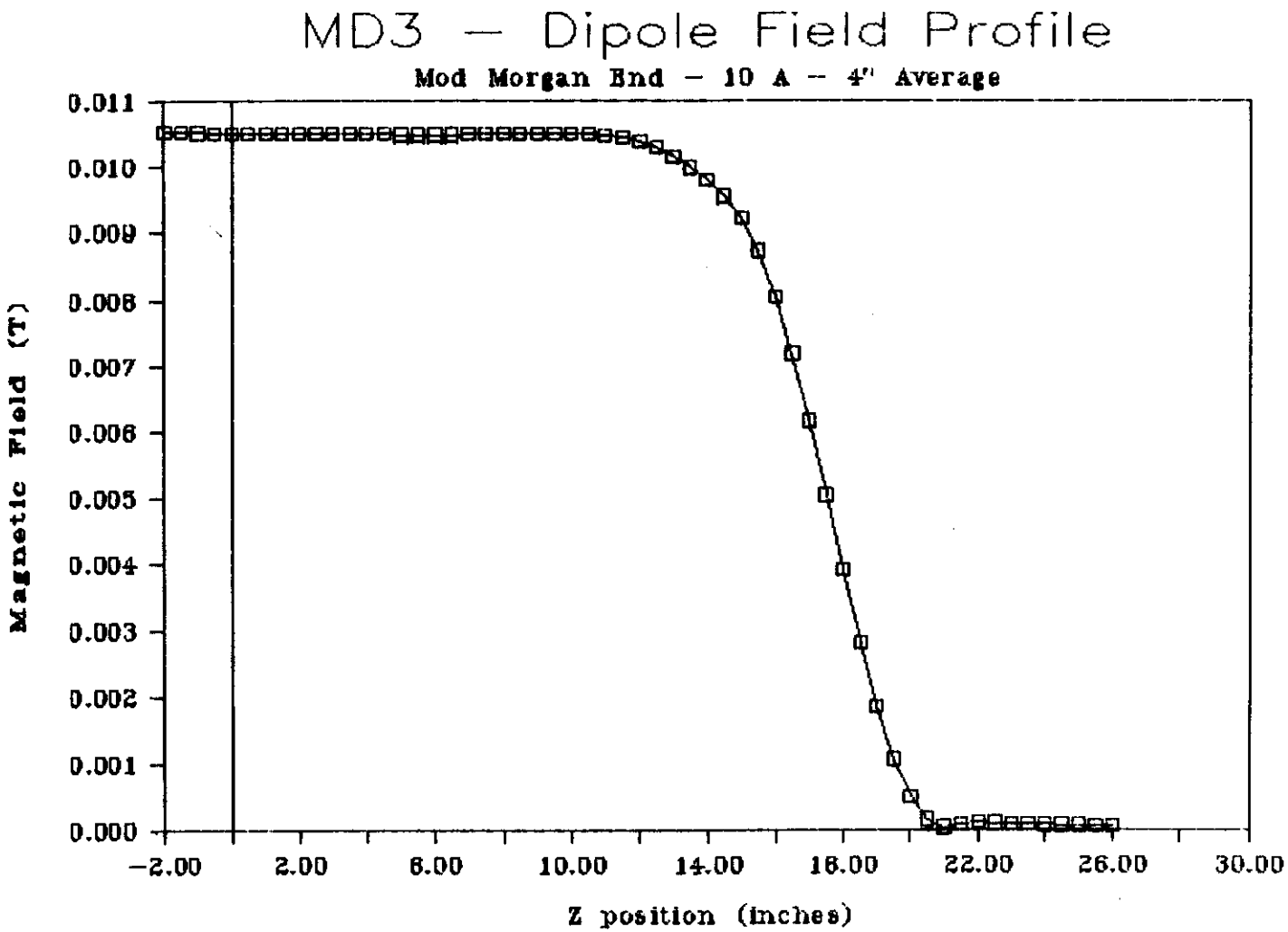

MD3 — Dipole Field Profile
Mod Morgan Bnd — 10 A — 4" Average
Magnetic Field (T)
0.011
0.010
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
-2.00
2.00
6.00
10.00
14.00
18.00
22.00
26.00
30.00
Z position (inches)

Fig. R2

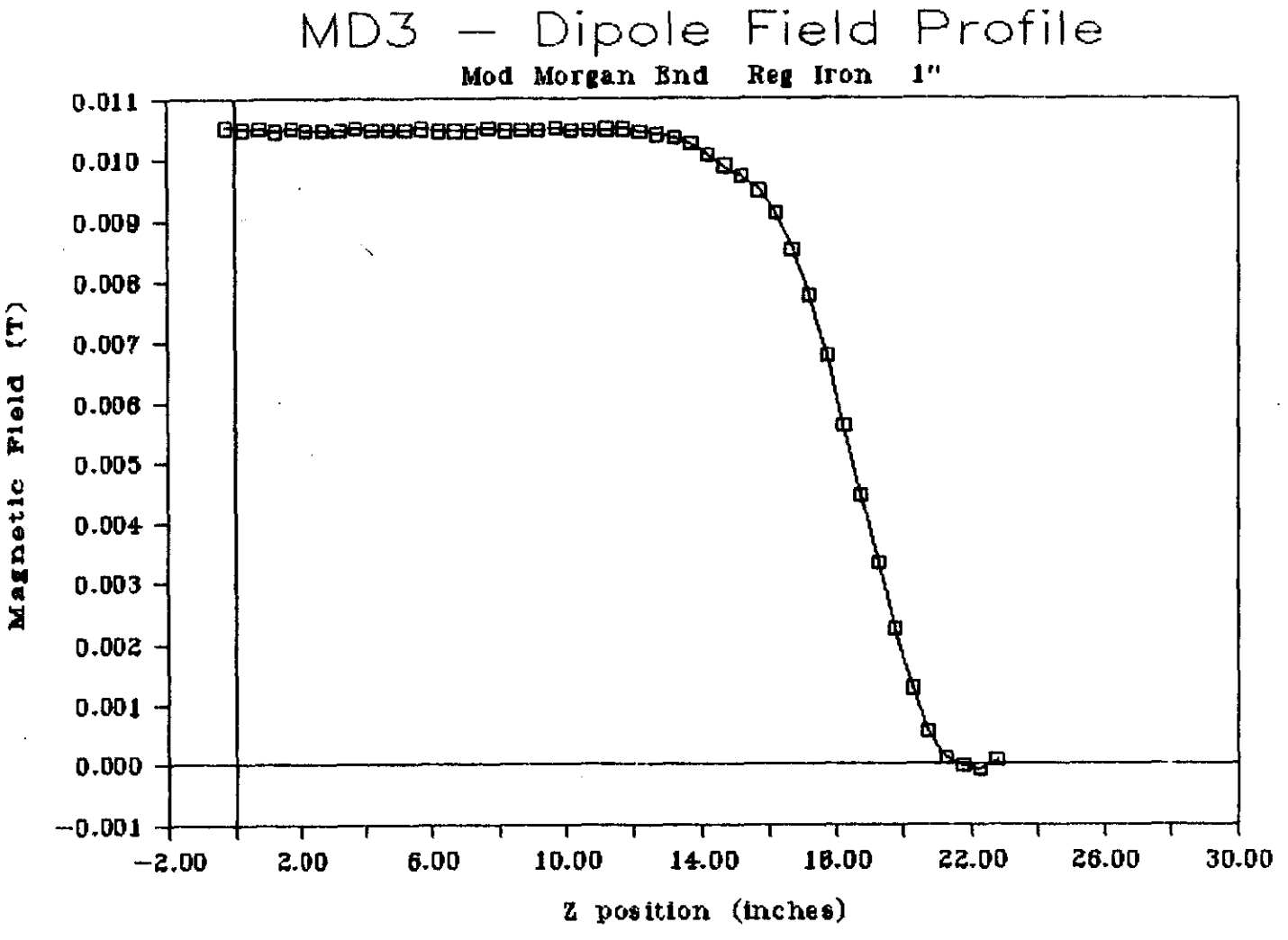

MD3 — Dipole Field Profile
Mod Morgan Bnd Reg Iron 1"
Magnetic Field (T)
0.011
0.010
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
-0.001
-2.00
2.00
6.00
10.00
14.00
18.00
22.00
26.00
30.00
Z position (inches)

Fig. R3

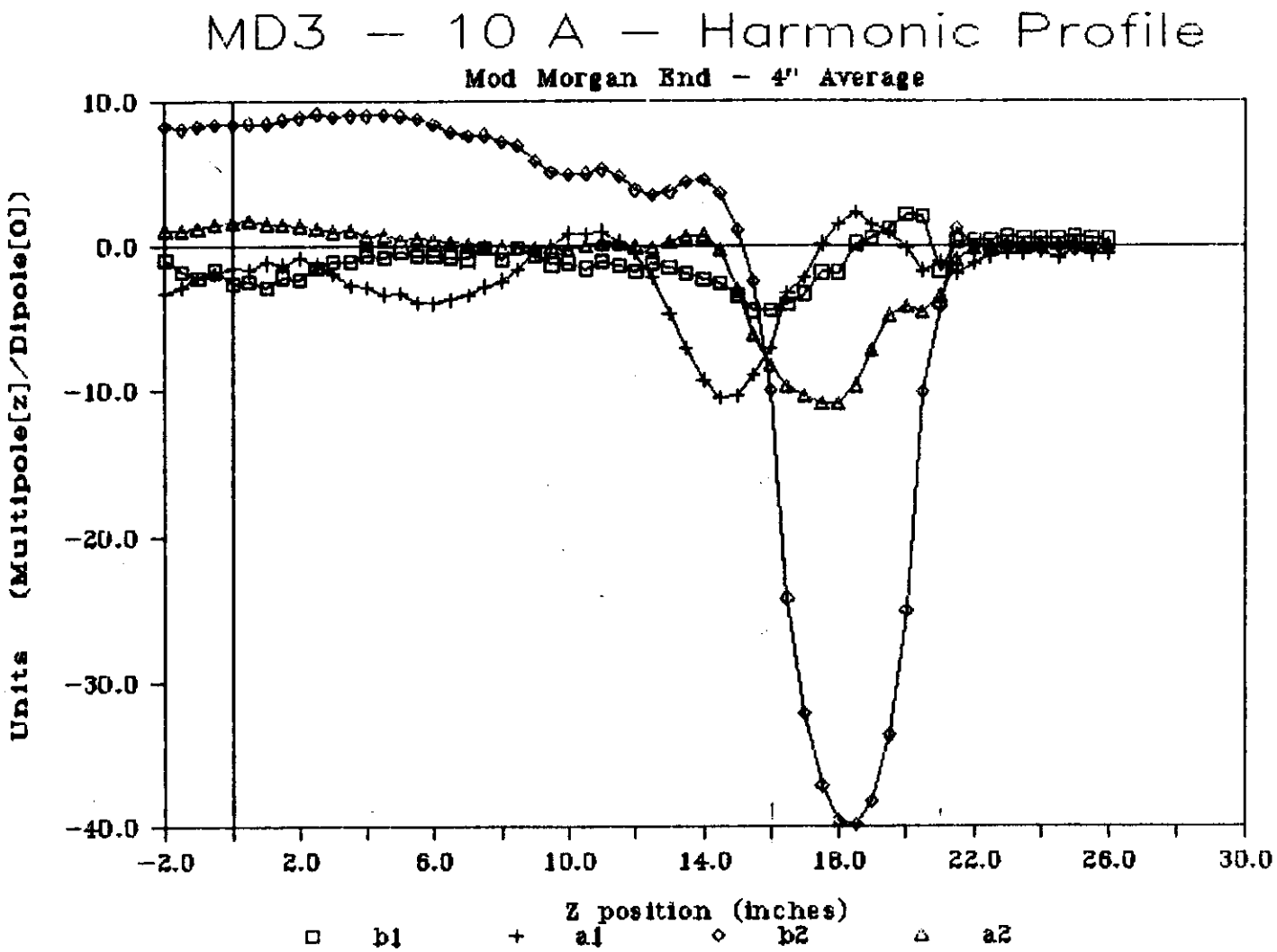

MD3 — 10 A — Harmonic Profile
Mod Morgan End - 4" Average
Units (Multipole[z]/Dipole[0])
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b1
a1
b2
a2

Fig. R4

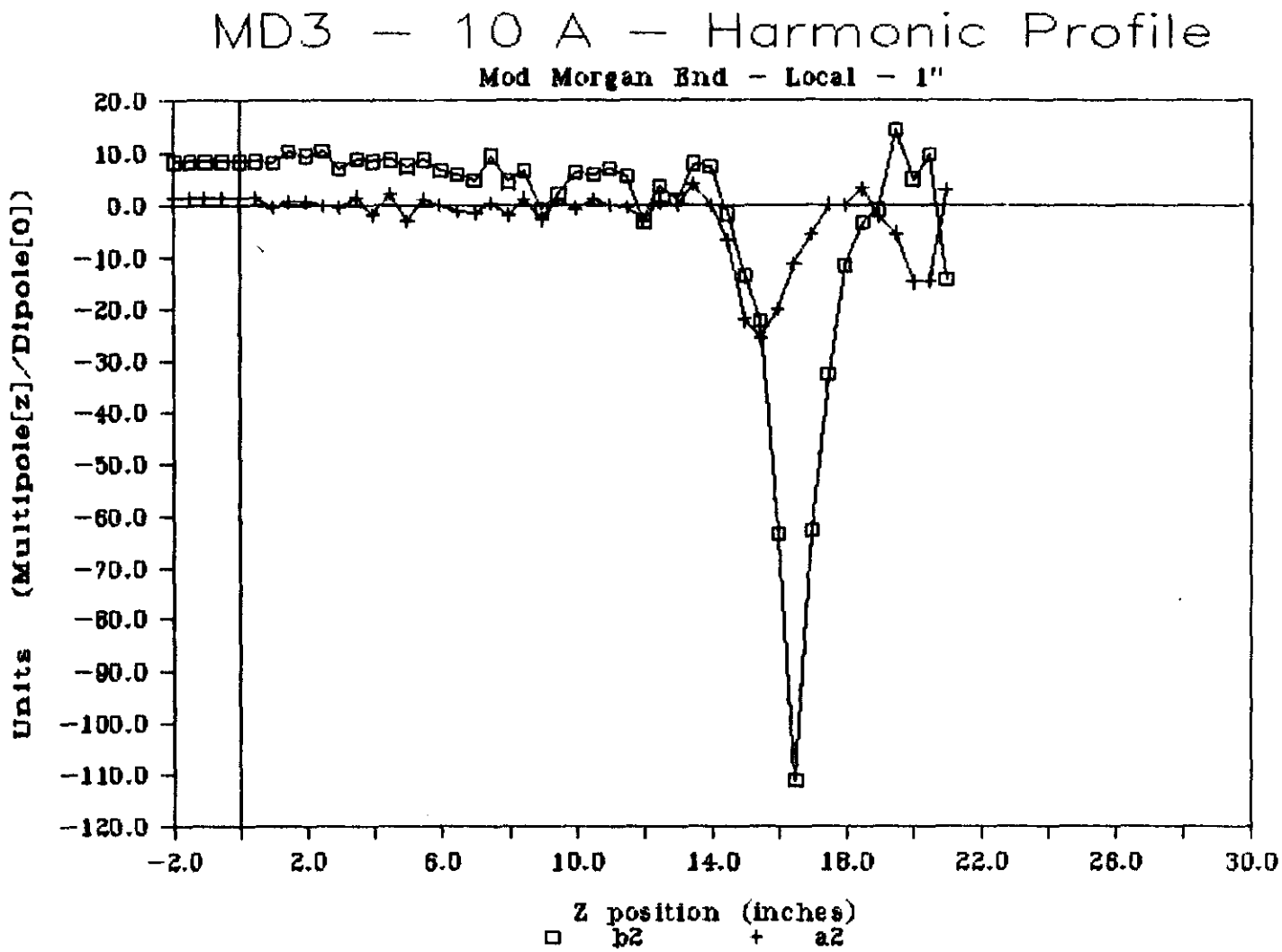

MD3 — 10 A — Harmonic Profile
Mod Morgan End - Local - 1"
Units (Multipole[z]/Dipole[0])
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
-110.0
-120.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b2
a2

Fig. R5

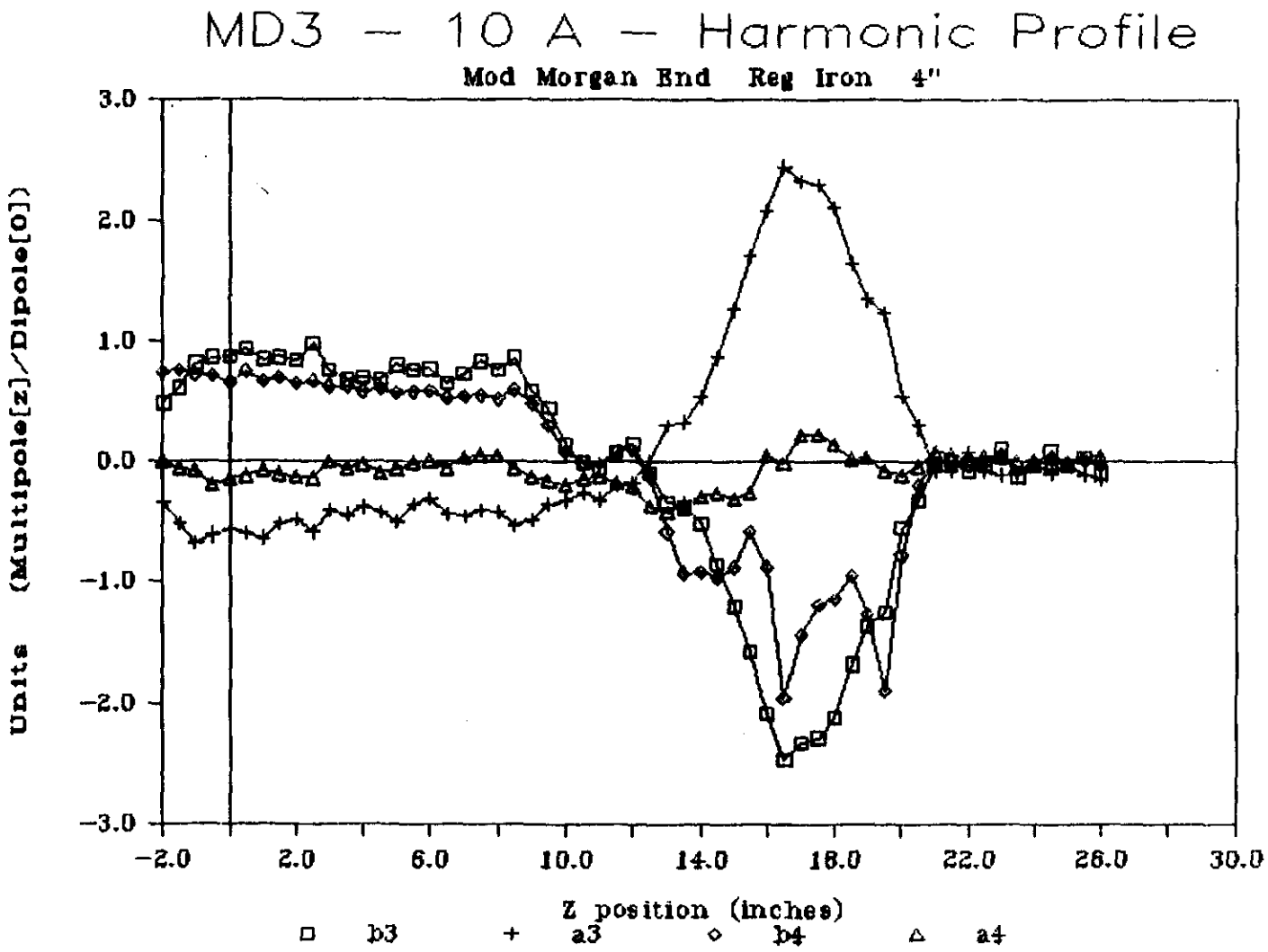

MD3 — 10 A — Harmonic Profile
Mod Morgan End Reg Iron 4"
Units (Multipole[z]/Dipole[0])
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b3
a3
b4
a4

Fig. R6

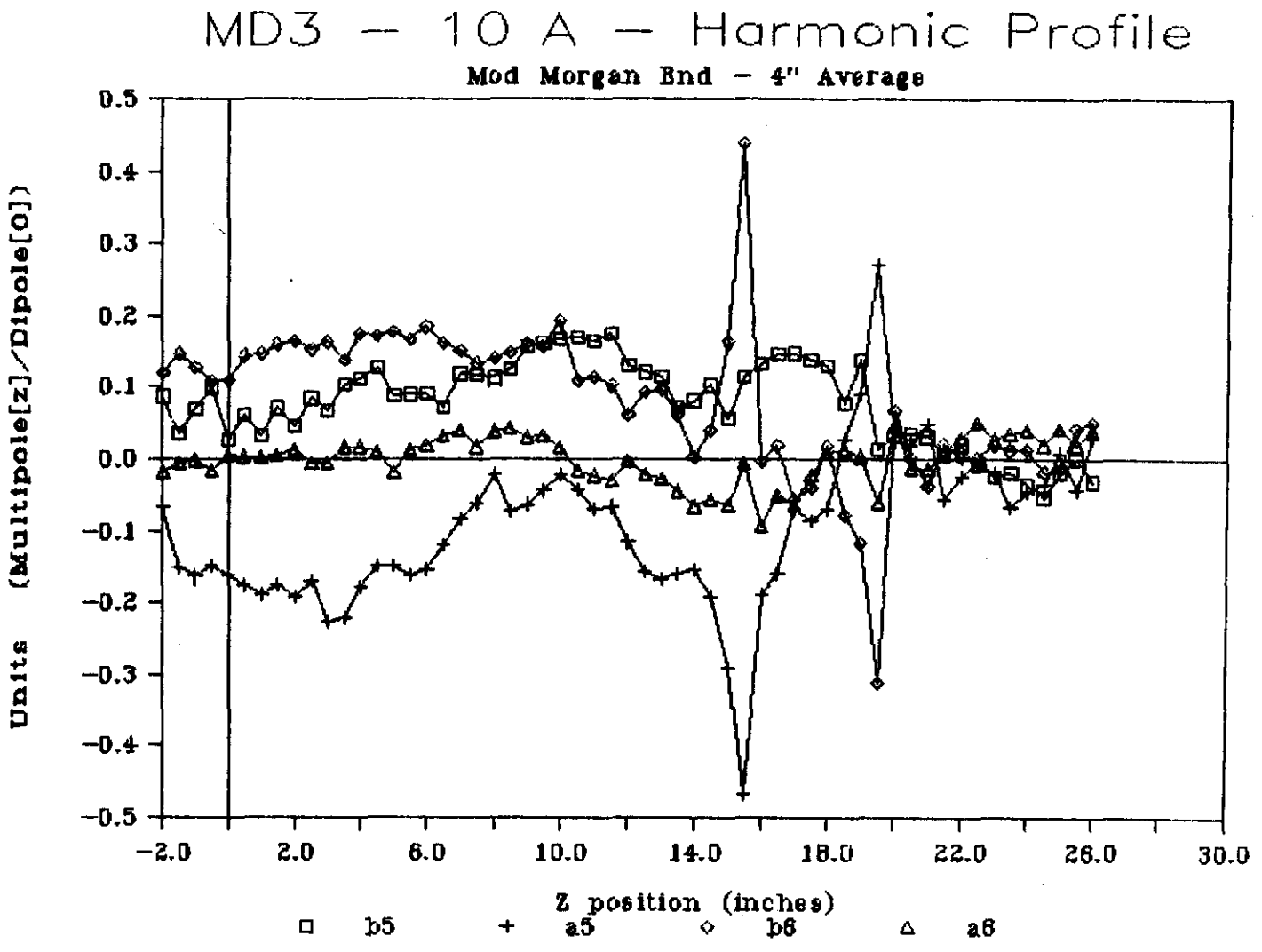

MD3 — 10 A — Harmonic Profile
Mod Morgan Bnd - 4" Average
Units (Multipole[z]/Dipole[0])
0.5
0.4
0.3
0.2
0.1
0.0
-0.1
-0.2
-0.3
-0.4
-0.5
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b5
a5
b6
a6

Fig. R7

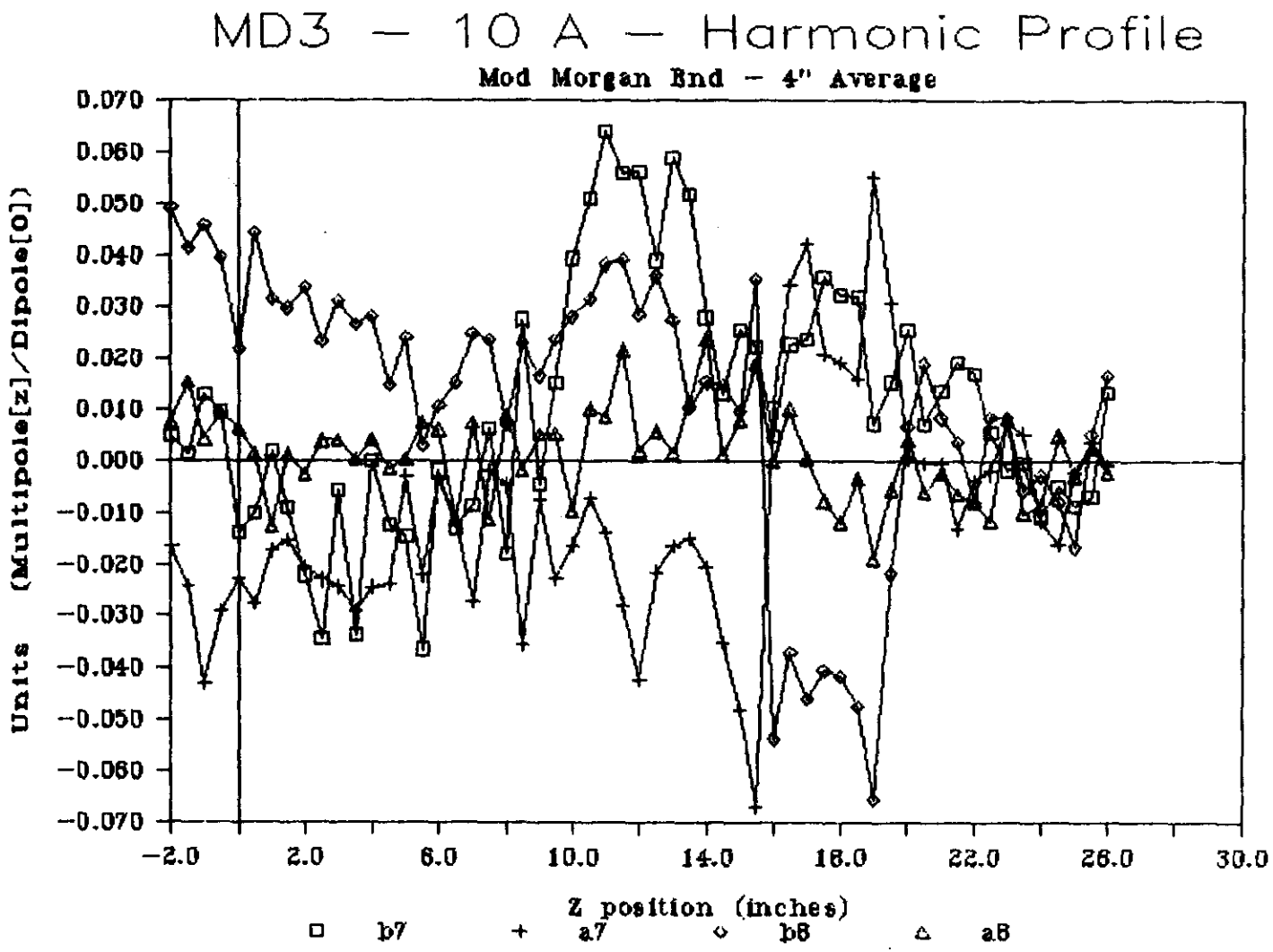

MD3 — 10 A — Harmonic Profile
Mod Morgan End - 4" Average
Units (Multipole[z]/Dipole[0])
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
-0.010
-0.020
-0.030
-0.040
-0.050
-0.060
-0.070
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b7
a7
b8
a8

Fig. R8

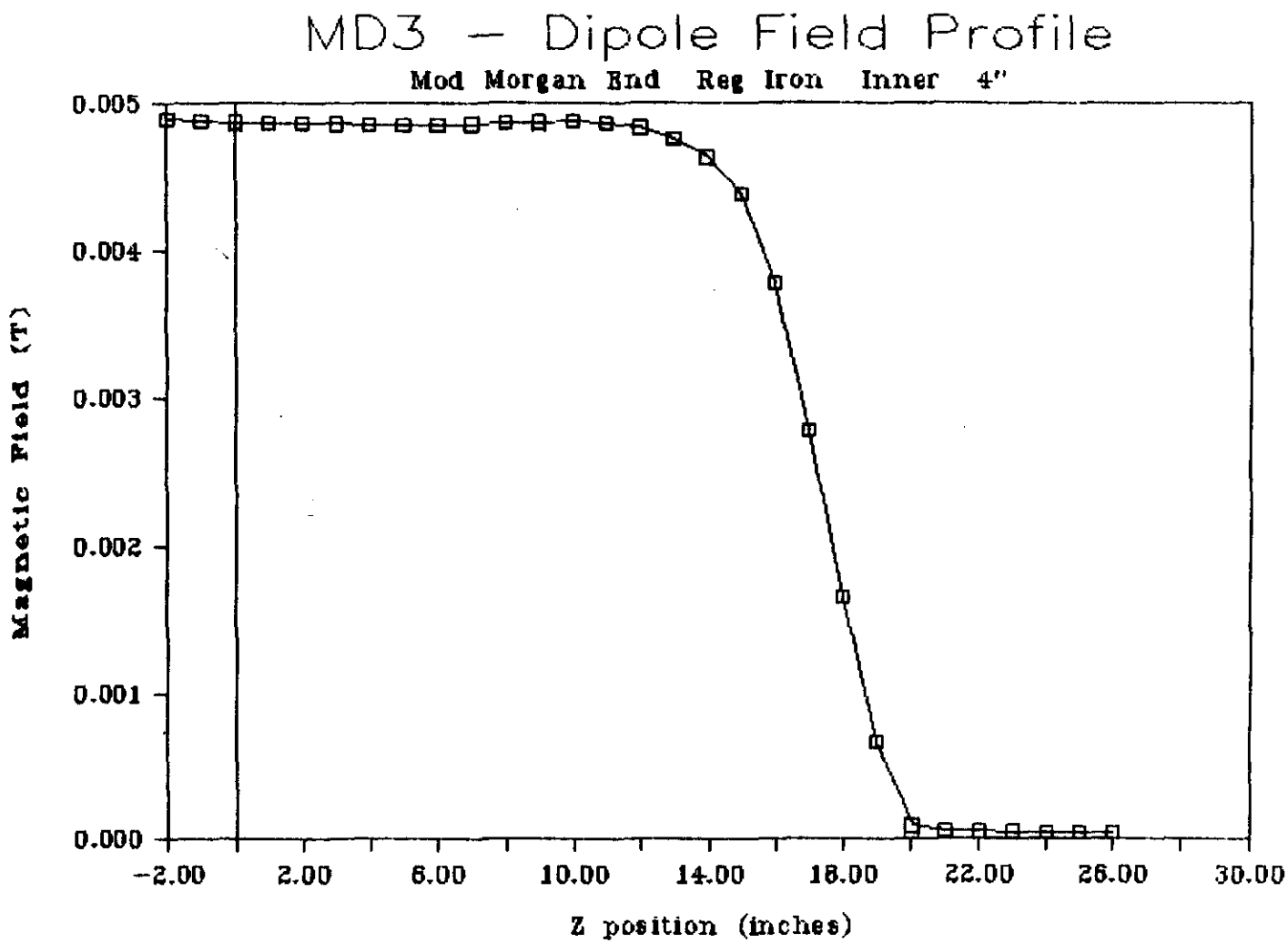

MD3 — Dipole Field Profile
Mod Morgan End Reg Iron Inner 4"
Magnetic Field (T)
0.005
0.004
0.003
0.002
0.001
0.000
-2.00
2.00
6.00
10.00
14.00
18.00
22.00
26.00
30.00
Z position (inches)

Fig. R9

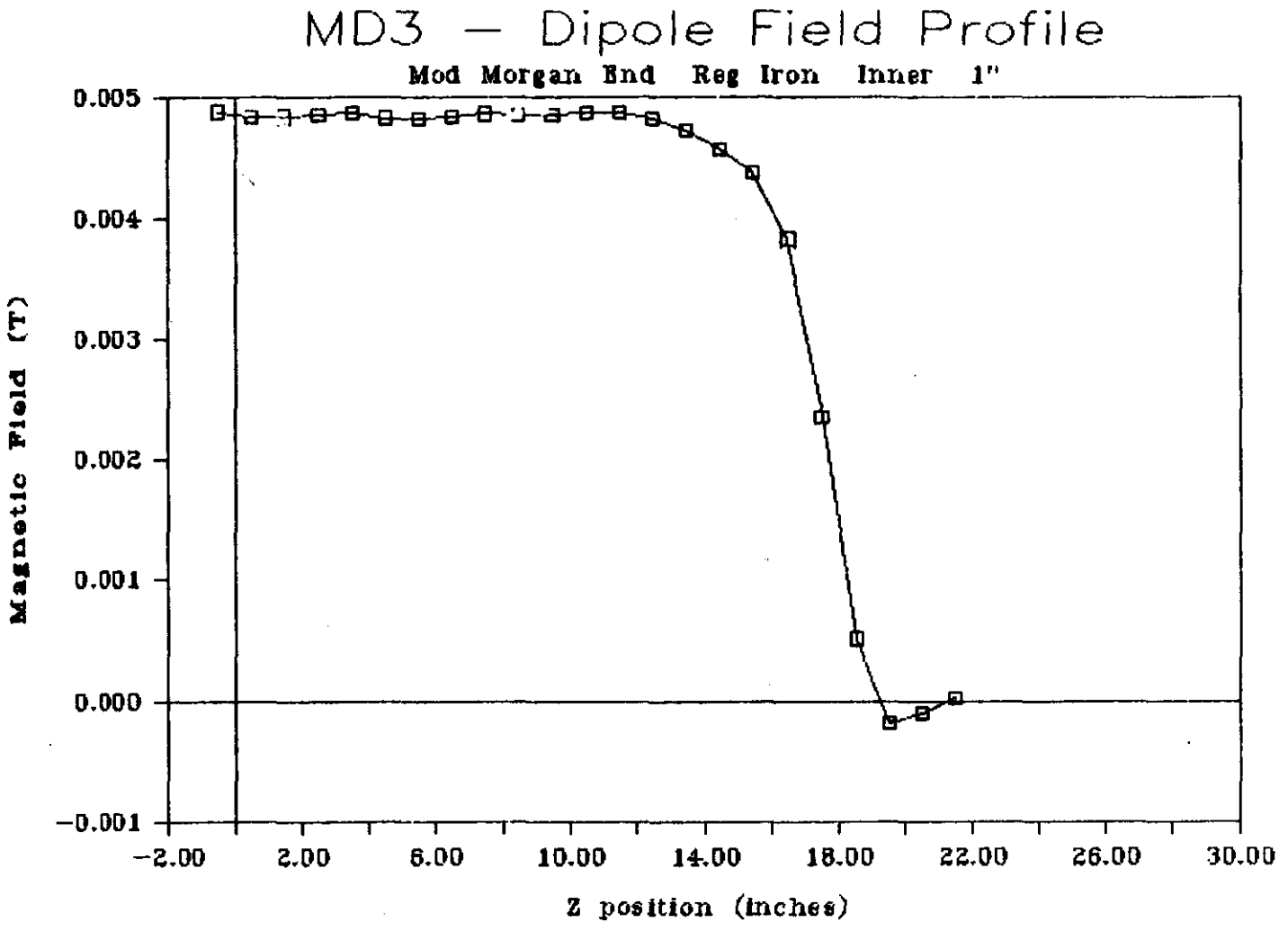

MD3 — Dipole Field Profile
Mod Morgan End Reg Iron Inner 1"
Magnetic Field (T)
0.005
0.004
0.003
0.002
0.001
0.000
-0.001
-2.00
2.00
6.00
10.00
14.00
18.00
22.00
26.00
30.00
Z position (inches)

Fig. R10

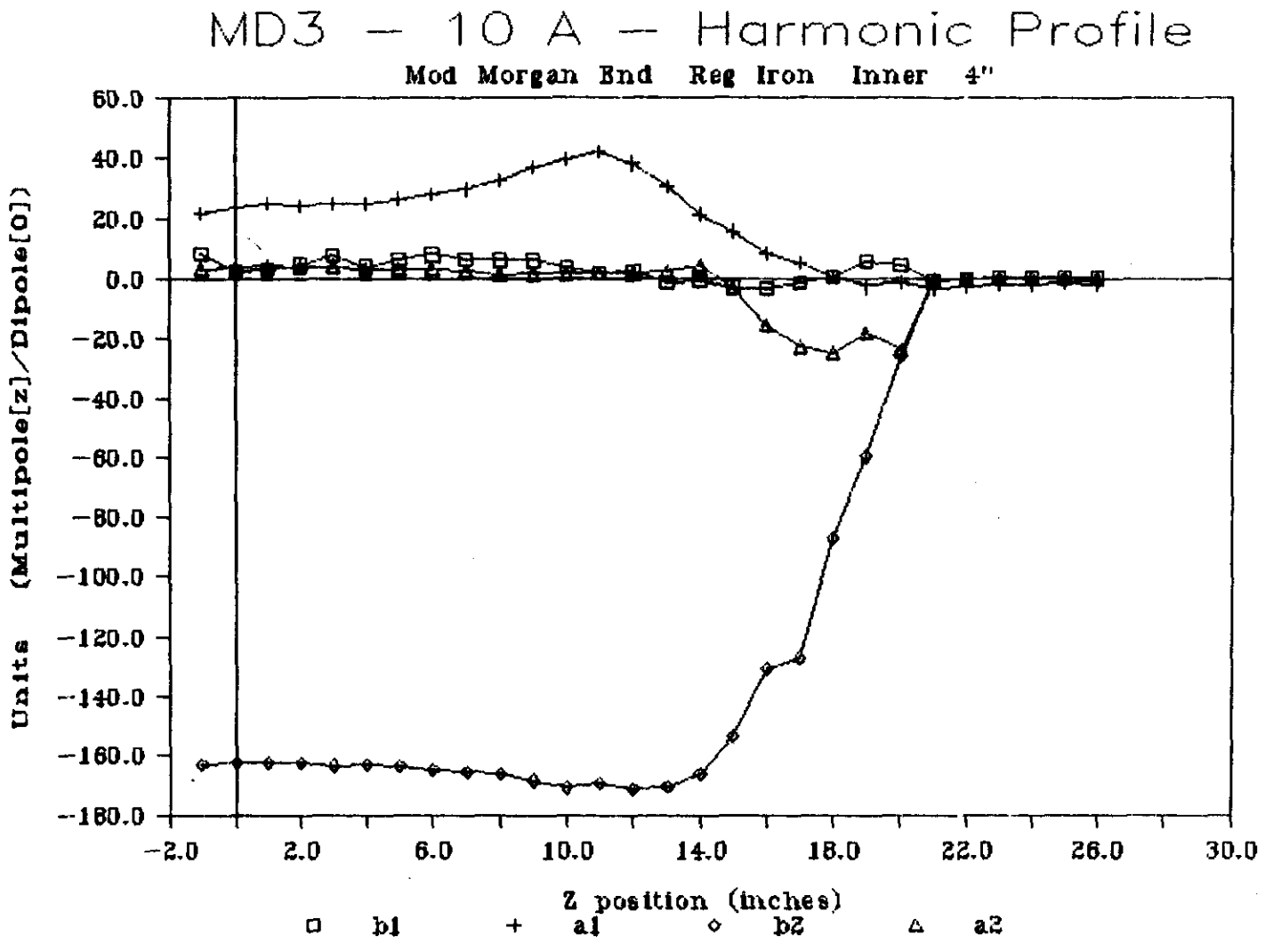

MD3 — 10 A — Harmonic Profile
Mod Morgan End Reg Iron Inner 4"
Units (Multipole[z]/Dipole[0])
60.0
40.0
20.0
0.0
-20.0
-40.0
-60.0
-80.0
-100.0
-120.0
-140.0
-160.0
-180.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b1
a1
b2
a2

Fig. R11

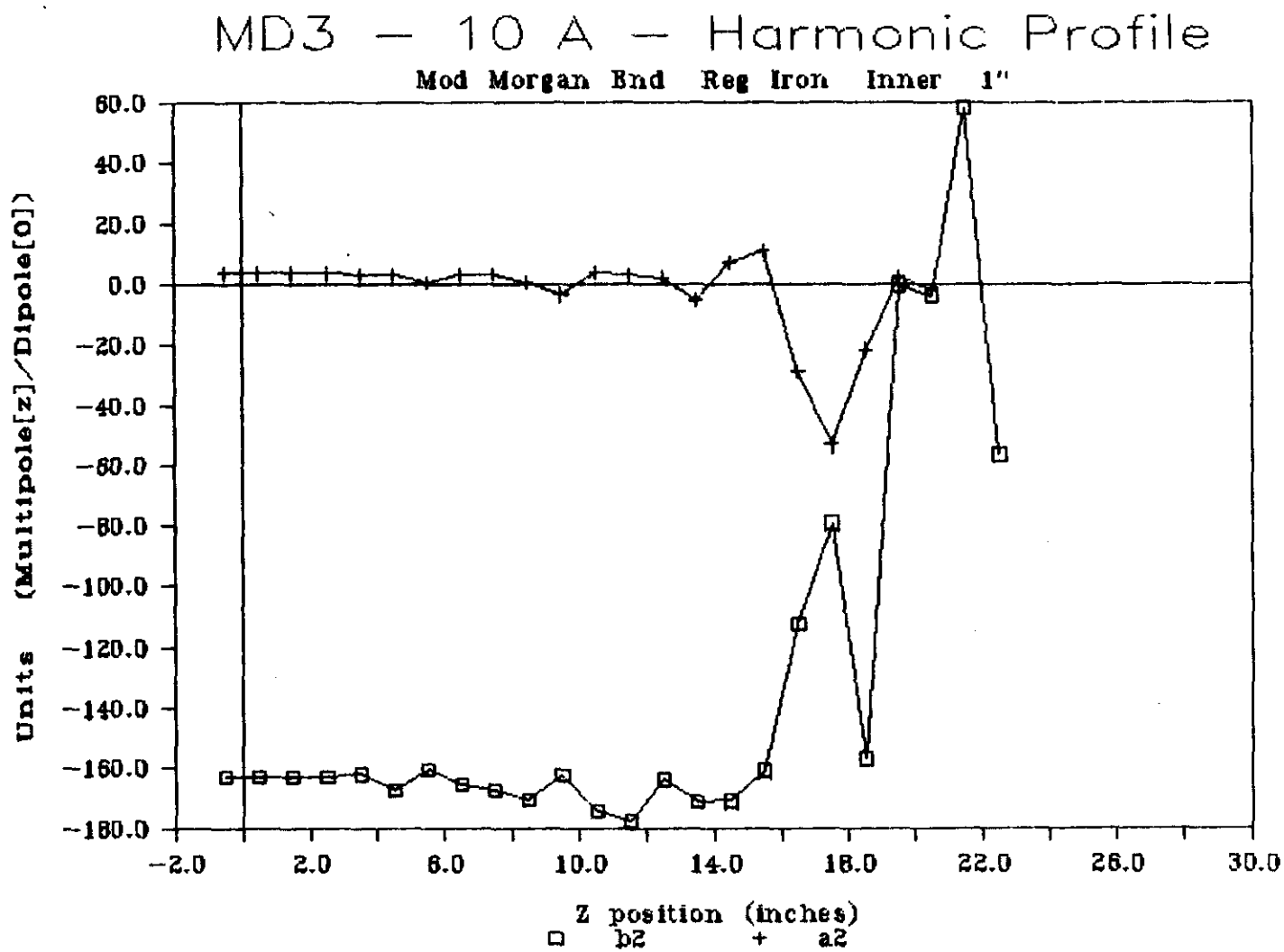

MD3 — 10 A — Harmonic Profile
Mod Morgan Bnd Reg Iron Inner 1"
Units (Multipole[z]/Dipole[0])
60.0
40.0
20.0
0.0
-20.0
-40.0
-60.0
-80.0
-100.0
-120.0
-140.0
-160.0
-180.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b2
a2

Fig. R12

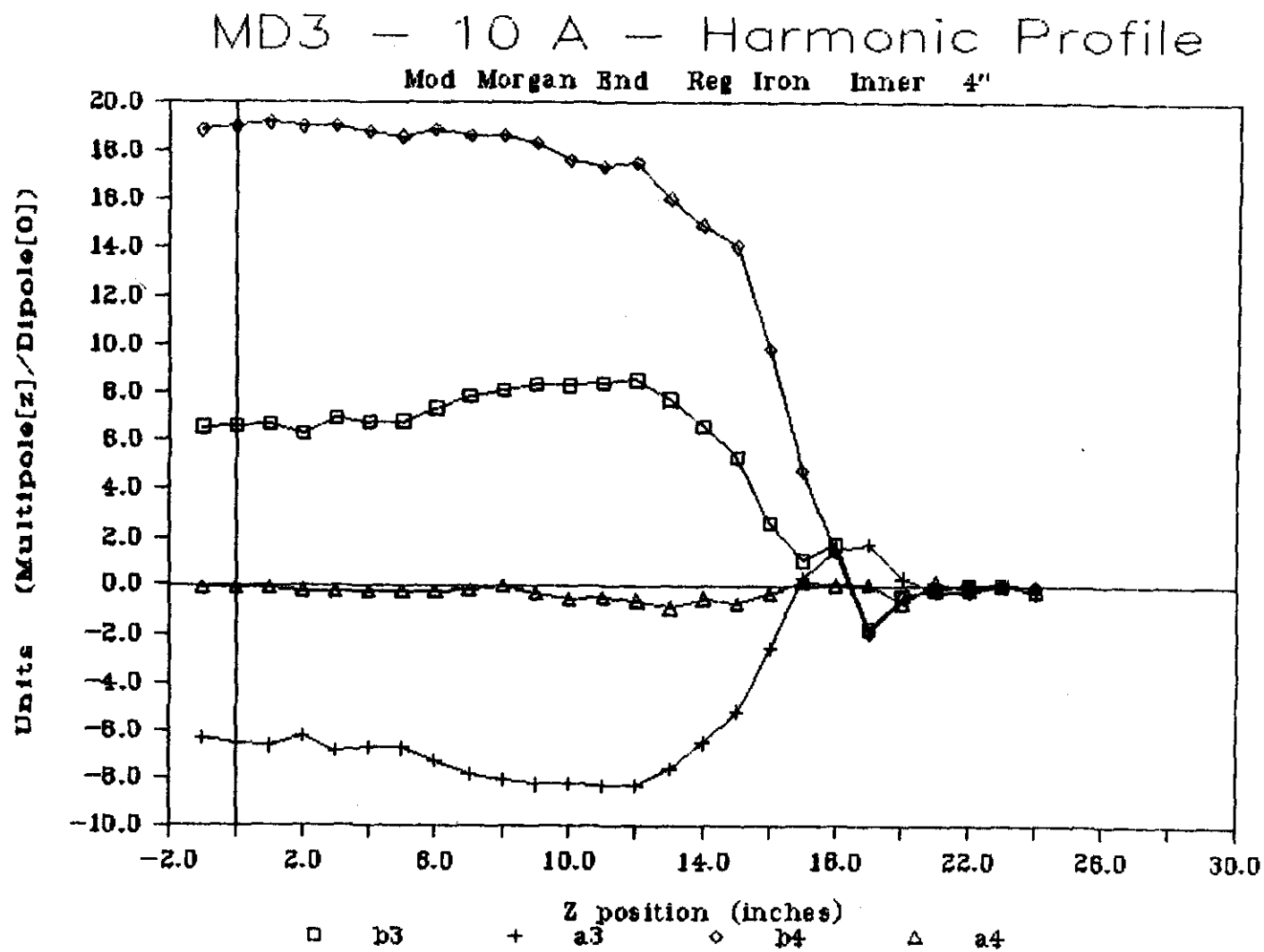

MD3 — 10 A — Harmonic Profile
Mod Morgan End Reg Iron Inner 4"
Units (Multipole[z]/Dipole[0])
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b3
a3
b4
a4

Fig. R13

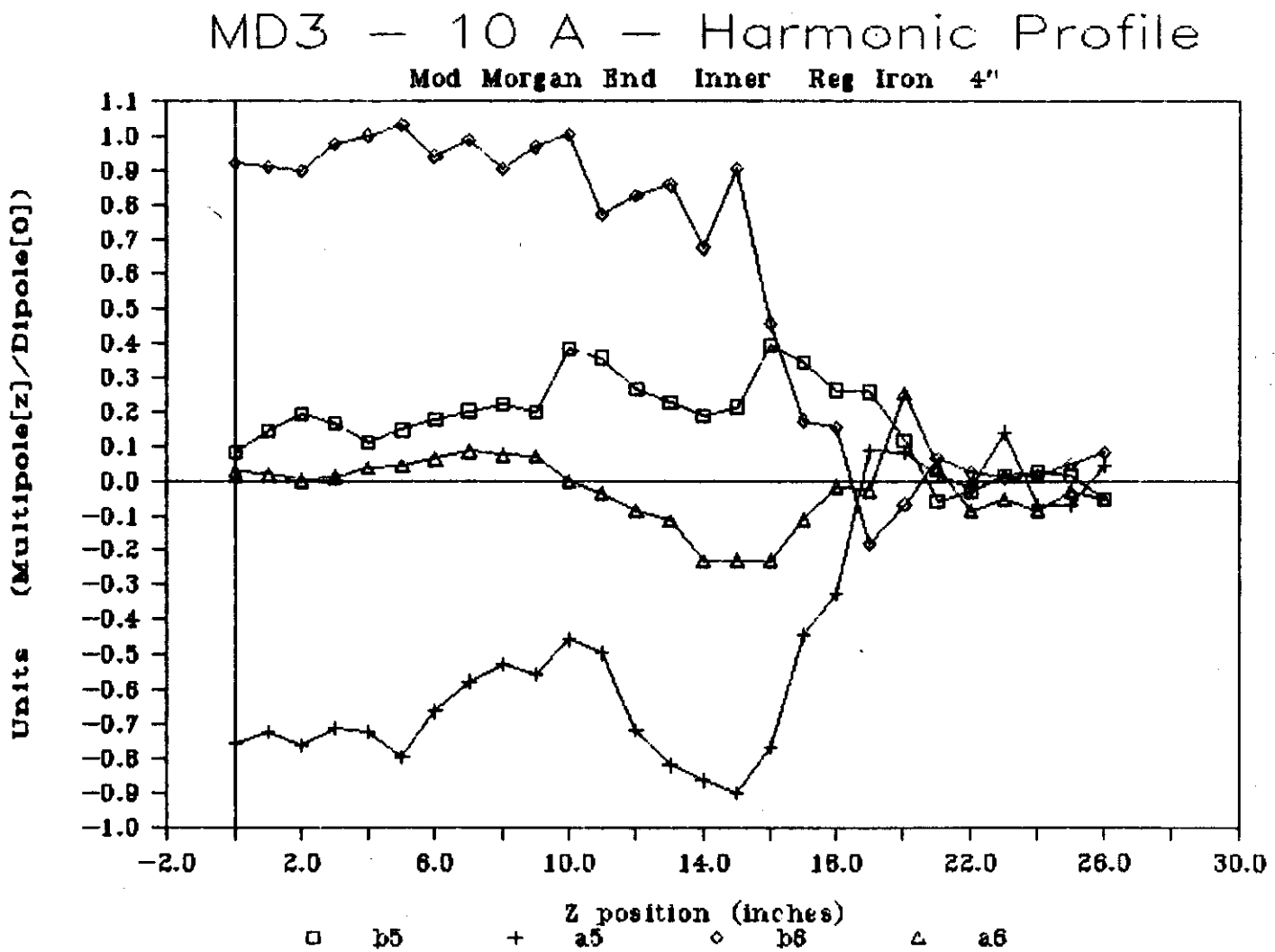

MD3 — 10 A — Harmonic Profile
Mod Morgan End Inner Reg Iron 4"
Units (Multipole[z]/Dipole[0])
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
−0.4
−0.5
−0.6
−0.7
−0.8
−0.9
−1.0
−2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b5
a5
b6
a6

Fig. R14

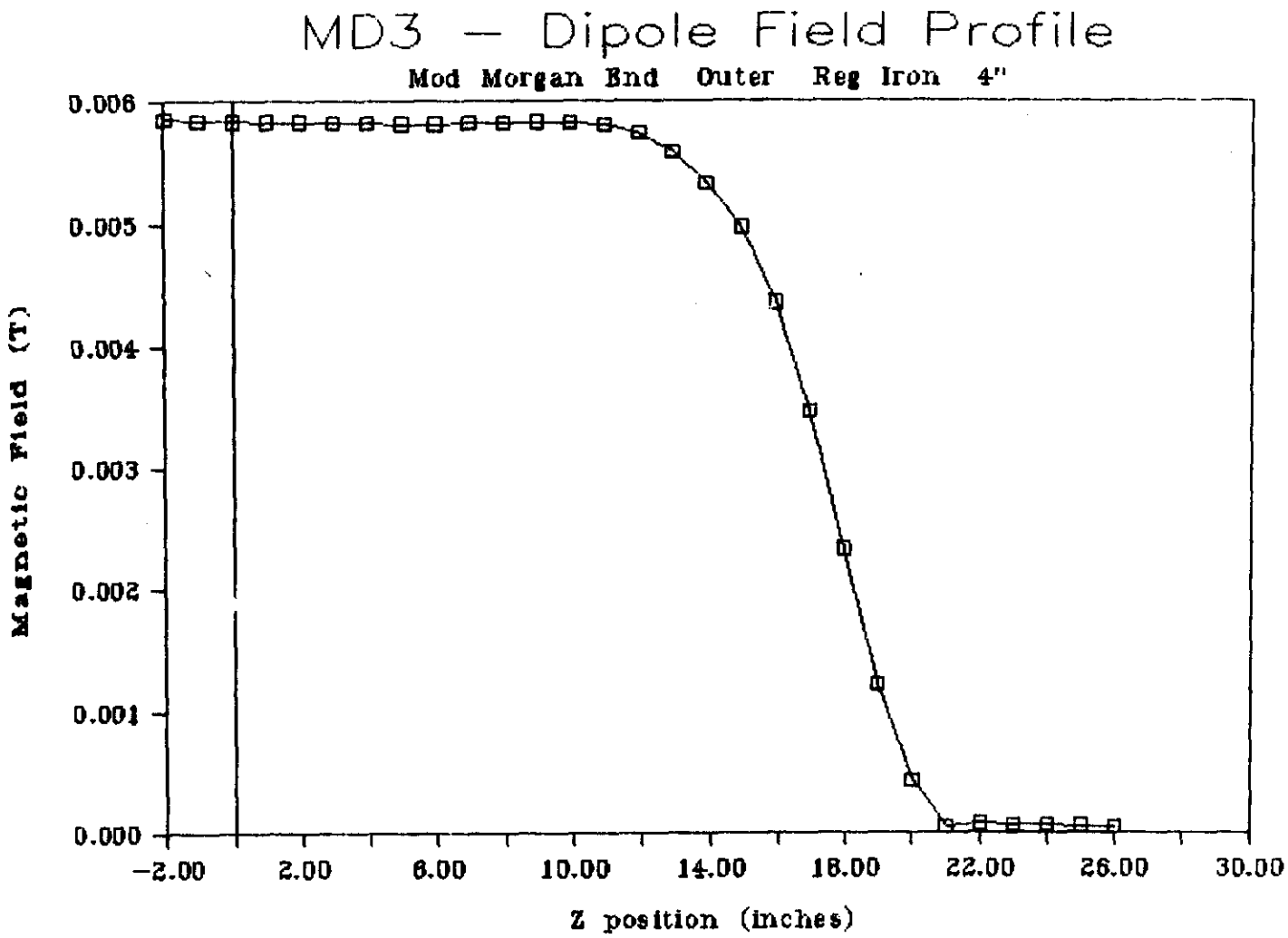

MD3 — Dipole Field Profile
Mod Morgan End Outer Reg Iron 4"
Magnetic Field (T)
0.006
0.005
0.004
0.003
0.002
0.001
0.000
-2.00
2.00
6.00
10.00
14.00
18.00
22.00
26.00
30.00
Z position (inches)

Fig. R15

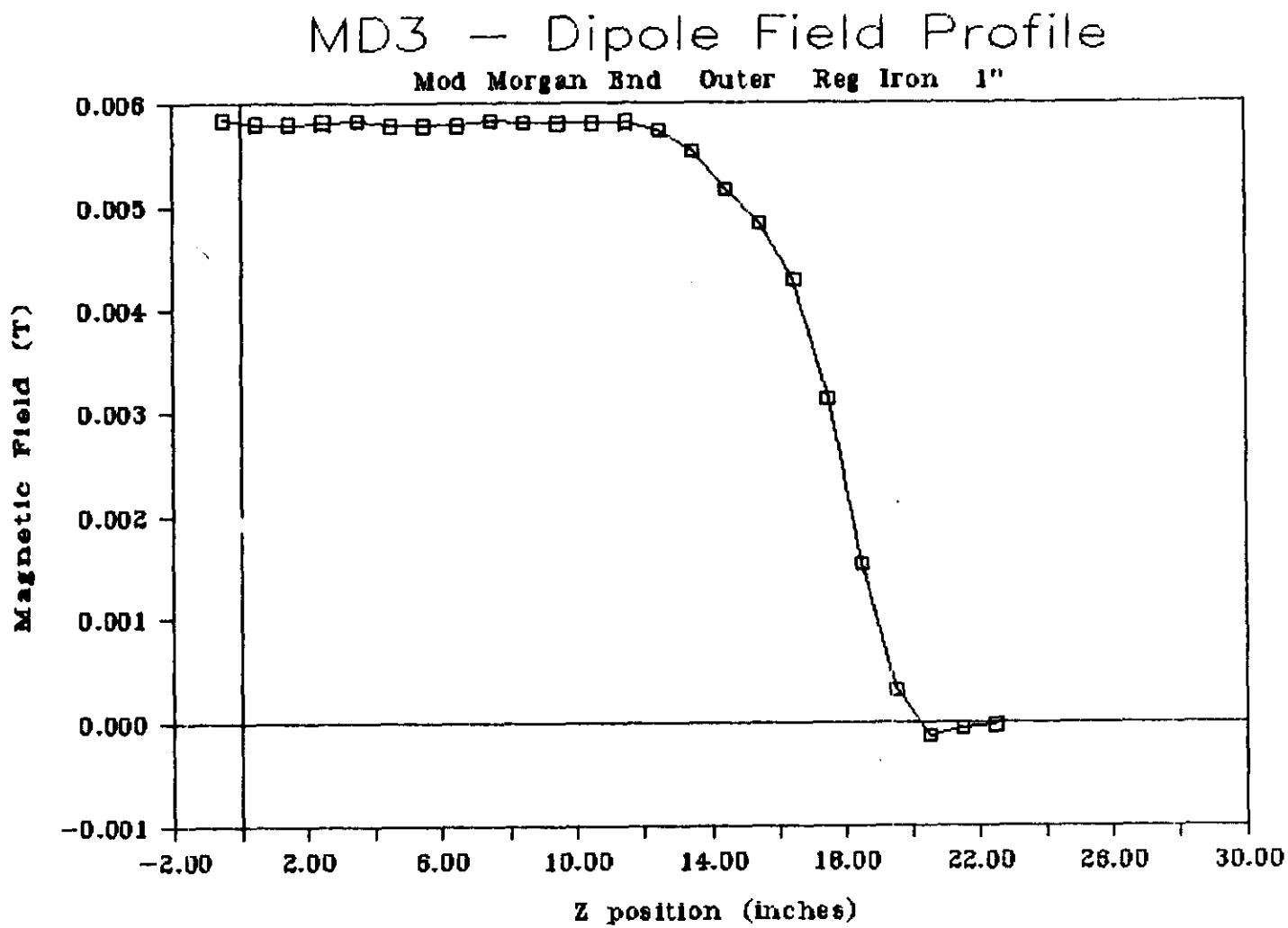

MD3 — Dipole Field Profile
Mod Morgan Bnd Outer Reg Iron 1"
Magnetic Field (T)
0.006
0.005
0.004
0.003
0.002
0.001
0.000
-0.001
-2.00
2.00
6.00
10.00
14.00
18.00
22.00
26.00
30.00
Z position (inches)

Fig. R16

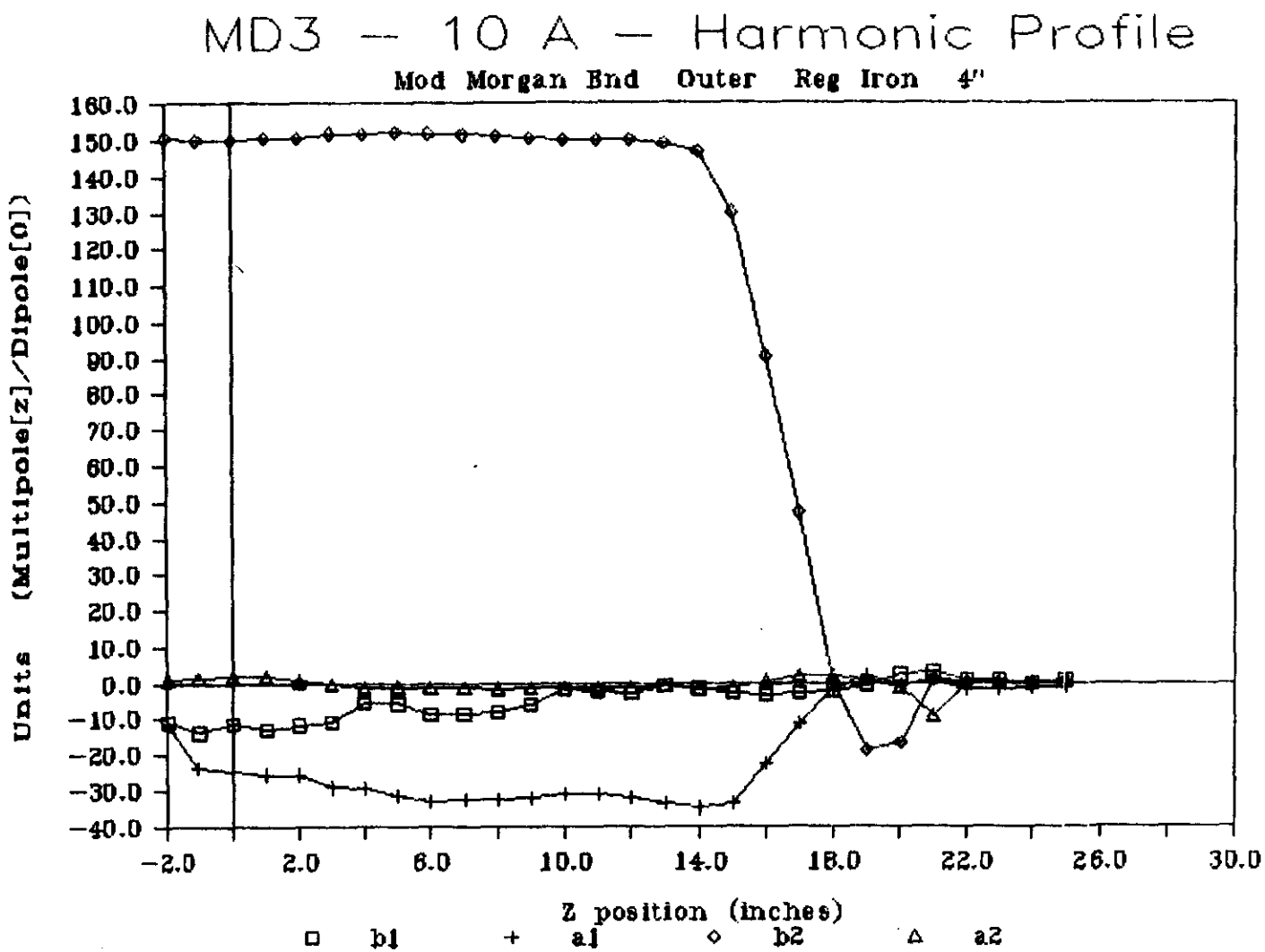

MD3 — 10 A — Harmonic Profile
Mod Morgan Bnd Outer Reg Iron 4"
Units (Multipole[z]/Dipole[0])
160.0
150.0
140.0
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b1
a1
b2
a2

Fig. R17

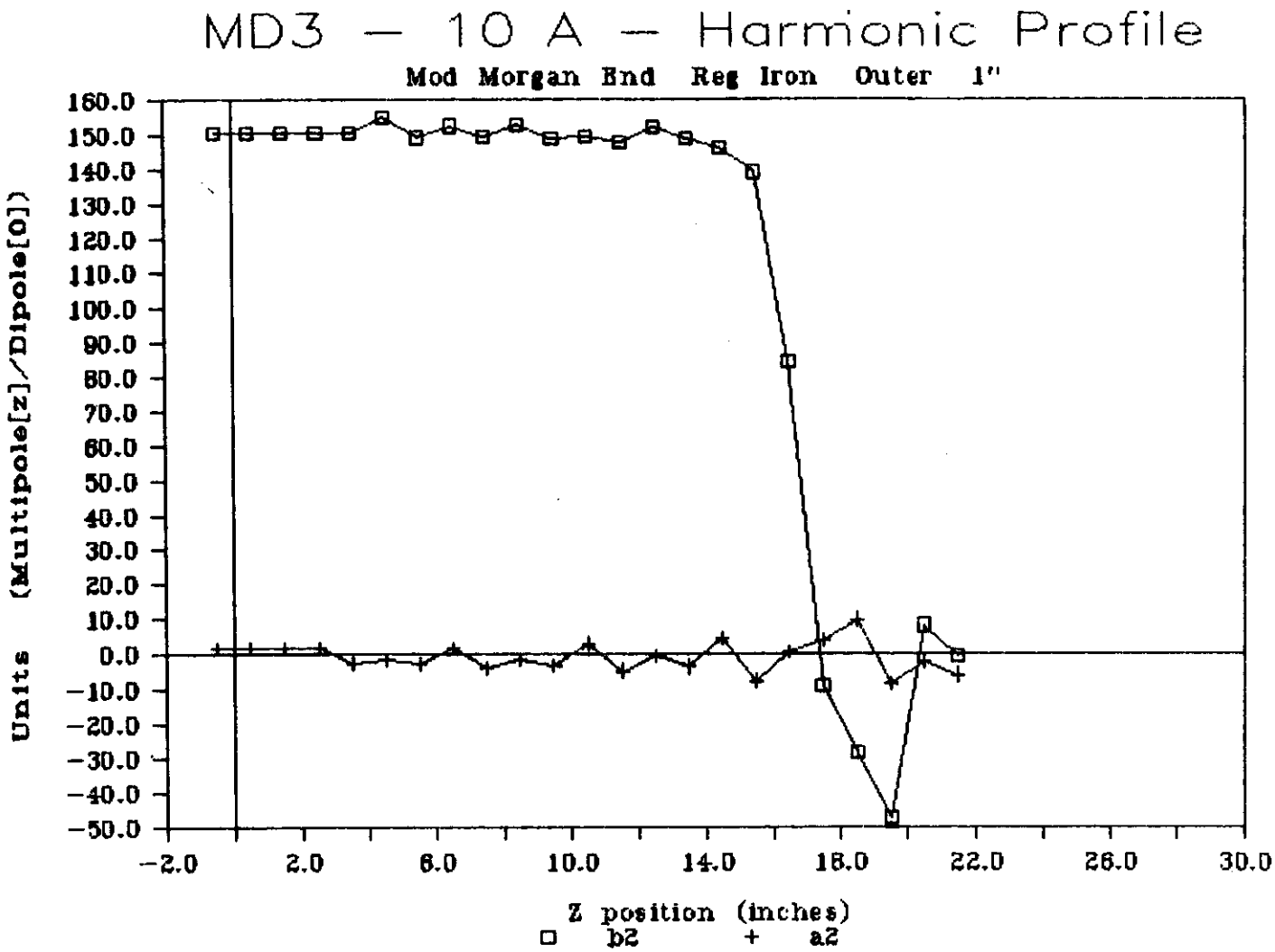

MD3 — 10 A — Harmonic Profile
Mod Morgan End Reg Iron Outer 1"
Units (Multipole[z]/Dipole[0])
160.0
150.0
140.0
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b2
a2

Fig. R18

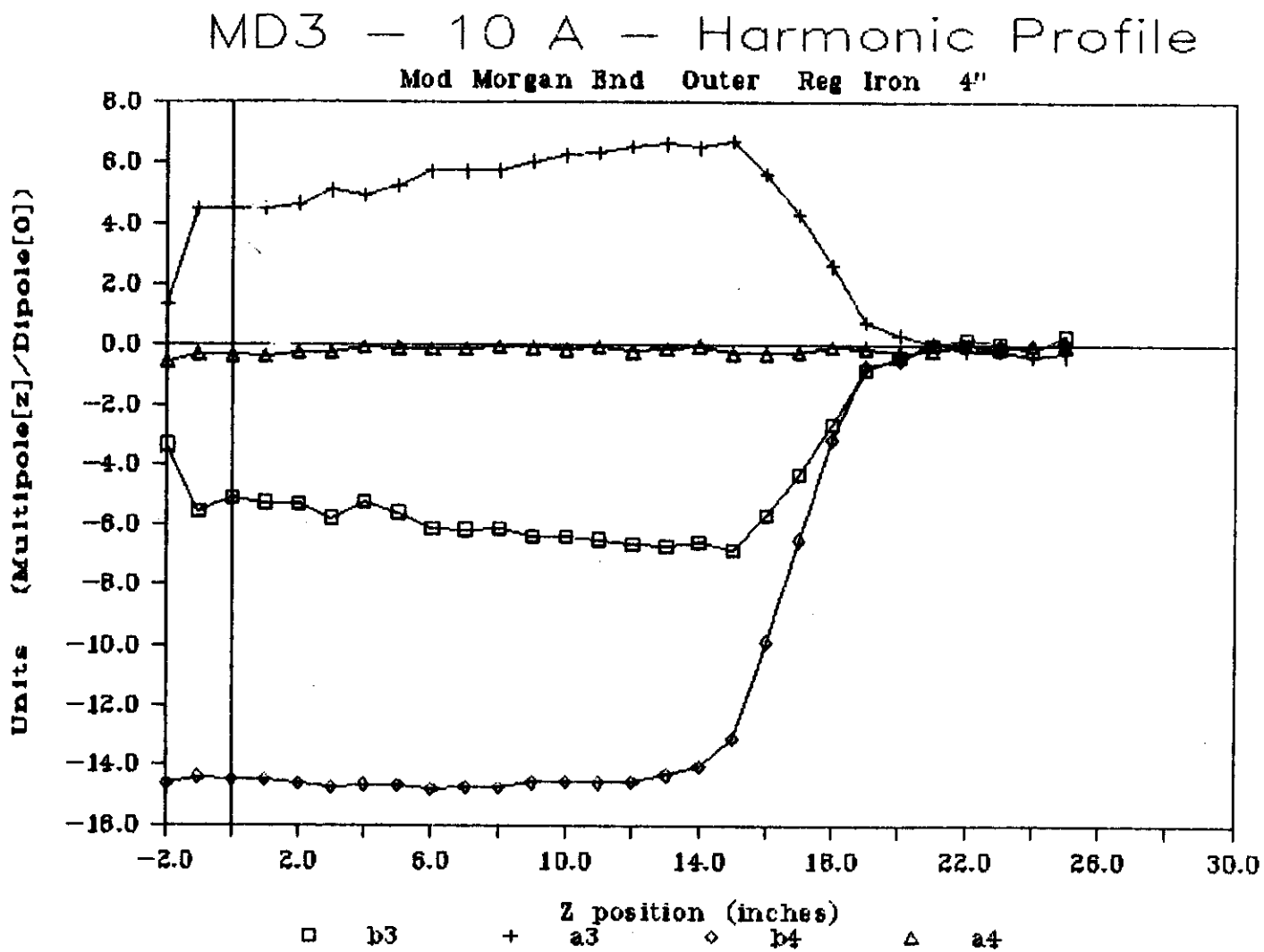

MD3 — 10 A — Harmonic Profile
Mod Morgan End Outer Reg Iron 4"
Units (Multipole[z]/Dipole[0])
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b3
a3
b4
a4

Fig. R19

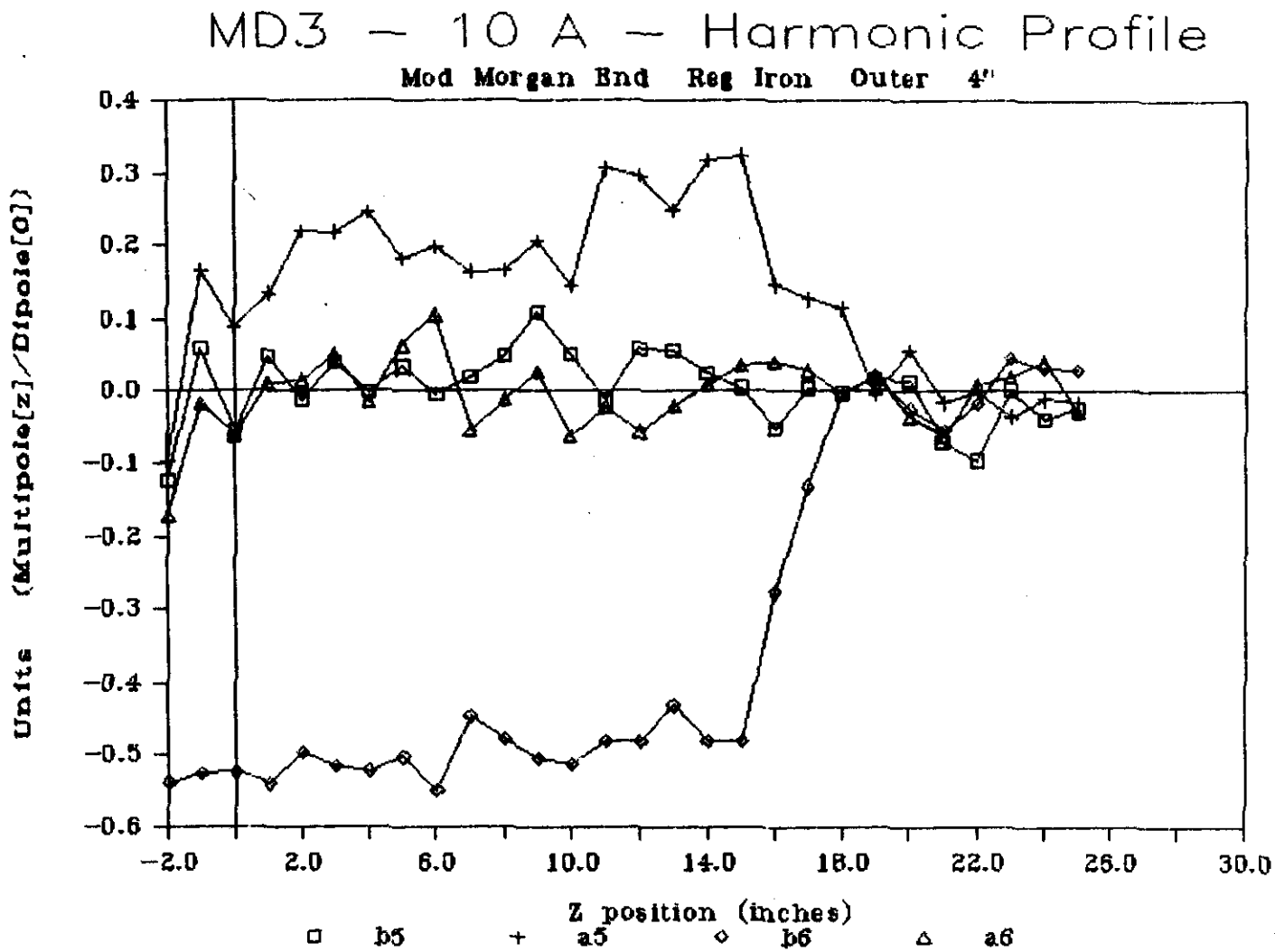

MD3 — 10 A — Harmonic Profile
Mod Morgan Bnd Reg Iron Outer 4"
Units (Multipole[z]/Dipole[0])
0.4
0.3
0.2
0.1
0.0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b5
a5
b6
a6

Fig. R20

Table SI

POSITION (in)	CURRENT (A)	B (T)	TRANSFER FUNCTIO (T/kA)	MD3 SHORT IRON b1	a1	b2	a2	b3	a3
-2	10.01	0.0101	1.005	-2.47	3.27	10.38	0.98	0.45	-0.37
-1	10.01	0.0101	1.005	-3.15	5.16	10.41	1.45	0.82	-0.51
0	10.01	0.0101	1.005	-3.69	6.28	10.45	1.69	0.93	-0.53
1	10.01	0.0101	1.005	-3.35	6.66	10.57	1.71	0.89	-0.38
2	10.01	0.0101	1.004	-3.27	5.62	10.93	1.47	0.87	-0.42
3	10.01	0.0100	0.999	-1.60	4.12	10.89	1.25	0.89	-0.29
4	10.01	0.0098	0.984	-0.92	2.62	10.21	0.85	0.59	-0.12
5	10.01	0.0096	0.954	-0.22	0.85	8.72	0.85	0.85	-0.33
6	10.01	0.0092	0.916	0.23	-0.33	6.76	0.69	0.70	-0.24
7	10.01	0.0088	0.877	0.80	0.07	4.96	0.30	0.64	-0.37
8	10.01	0.0085	0.846	0.57	0.51	3.54	0.30	0.83	-0.52
9	10.01	0.0083	0.827	0.55	0.84	1.76	0.14	0.67	-0.51
10	10.01	0.0082	0.818	-0.46	1.59	0.92	0.14	0.28	-0.40
11	10.01	0.0081	0.813	-0.28	1.00	0.94	0.40	0.27	-0.26
12	10.01	0.0081	0.811	0.26	-0.90	-0.33	-0.03	0.18	-0.17
13	10.01	0.0081	0.812	0.55	-5.14	0.53	0.96	-0.31	0.17
14	10.01	0.0081	0.812	0.66	-8.74	2.50	1.46	-0.48	0.52
15	10.01	0.0079	0.789	-0.98	-7.95	-0.58	-3.36	-1.18	1.32
16	10.01	0.0070	0.697	-0.59	-2.03	-15.43	-8.36	-2.12	2.12
17	10.01	0.0052	0.523	0.37	3.73	-35.50	-11.16	-2.14	2.16
18	10.01	0.0032	0.321	1.92	6.96	-41.33	-12.10	-1.85	1.82
19	10.01	0.0013	0.126	4.20	5.35	-37.77	-7.76	-0.95	0.94
20	10.01	0.0002	0.018	2.82	1.88	-16.78	-9.95	-0.22	0.16
21	10.01	0.0002	0.015	1.66	-0.52	2.67	-1.95	-0.02	-0.09
22	10.01	0.0002	0.016	1.23	0.04	-0.13	0.16	0.04	-0.08
23	10.01	0.0001	0.012	1.10	-0.23	-0.33	-0.09	0.02	-0.12
24	10.01	0.0001	0.009	1.06	-0.36	0.06	0.22	0.04	-0.04
25	10.01	0.0001	0.007	0.87	-0.18	-0.04	0.07	0.09	-0.08
26	10.01	0.0001	0.006	0.24	-0.30	-0.15	0.18	0.09	-0.12

Table SIa

POSITION (in)	b4	a4	b5	a5	b6	a6	b7	a7	b8	a8
-2	0.80	-0.09	0.06	-0.07	0.13	.00	0.01	-0.01	0.04	.00
-1	0.87	-0.18	0.05	-0.11	0.11	0.02	0.02	-0.02	0.04	.00
0	0.90	-0.24	0.06	-0.13	0.15	0.02	.00	-0.01	0.04	0.01
1	0.91	-0.15	0.03	-0.11	0.11	0.02	-0.01	-0.02	0.03	.00
2	0.77	-0.11	0.04	-0.14	0.18	0.01	.00	0.01	0.04	-0.02
3	0.80	-0.14	0.10	-0.14	0.18	0.03	-0.01	.00	0.04	.00
4	0.65	-0.12	0.10	-0.17	0.18	0.02	-0.02	-0.02	0.03	-0.02
5	0.70	-0.07	0.10	-0.15	0.18	0.03	-0.01	.00	0.02	-0.01
6	0.69	-0.08	0.07	-0.14	0.18	0.02	.00	-0.02	0.02	.00
7	0.69	.00	0.10	-0.04	0.17	0.09	-0.02	.00	0.02	.00
8	0.72	0.01	0.15	-0.02	0.17	0.05	0.02	-0.01	0.03	-0.02
9	0.65	-0.06	0.14	-0.04	0.20	0.07	0.02	-0.02	0.03	-0.01
10	0.22	-0.23	0.14	-0.05	0.14	0.02	0.05	-0.01	0.04	0.01
11	0.14	-0.06	0.18	-0.04	0.09	.00	0.06	-0.03	0.04	.00
12	0.21	-0.30	0.18	-0.13	0.10	.00	0.05	-0.02	0.04	0.01
13	-0.55	-0.34	0.04	-0.17	0.07	-0.01	0.05	-0.03	0.03	0.01
14	-0.72	-0.29	0.08	-0.14	0.03	-0.06	0.05	-0.03	0.02	0.01
15	-0.66	-0.32	0.06	-0.35	0.27	-0.07	0.04	-0.09	0.07	0.02
16	-1.53	-0.07	0.13	-0.21	.00	-0.12	0.02	0.01	-0.03	.00
17	-1.10	0.22	0.13	-0.12	-0.07	-0.05	-0.01	0.02	-0.04	.00
18	-1.03	0.04	0.13	-0.10	.00	-0.02	0.01	0.04	-0.05	-0.02
19	-1.37	.00	0.07	0.16	-0.30	-0.07	-0.01	0.06	-0.09	-0.05
20	-0.17	-0.06	0.02	0.01	.00	0.05	-0.02	.00	0.02	-0.01
21	-0.01	0.04	0.05	-0.04	-0.01	0.03	-0.01	-0.01	0.01	0.01
22	0.02	-0.04	.00	-0.04	0.01	0.03	-0.01	-0.02	-0.01	-0.01
23	0.01	0.04	0.01	-0.04	-0.01	0.05	-0.01	.00	.00	.00
24	0.05	-0.01	-0.03	.00	0.01	0.01	0.01	-0.01	.00	-0.01
25	0.05	.00	.00	-0.01	-0.01	.00	-0.01	0.01	.00	.00
26	0.03	0.03	.00	-0.03	0.01	-0.01	0.02	-0.01	0.01	-0.01

Table S2

POSITION (in)	CURRENT (A)	B (T)	TRANSFER FUNCTIO (T/kA)	b1	a1	b2	a2	b3	a3
				MD3 SHORT IRON INNER					
-2	10.01	0.0044	0.442	-0.87	12.21	-170.3	6.29	1.37	-1.37
-1	10.01	0.0044	0.442	-6.45	22.50	-172.3	6.35	3.06	-2.95
0	10.01	0.0044	0.443	-6.17	26.57	-173.2	6.49	3.24	-3.20
1	10.01	0.0044	0.443	-5.19	30.42	-173.8	6.58	3.56	-3.56
2	10.01	0.0044	0.443	-3.09	31.23	-175.2	5.44	4.31	-4.30
3	10.01	0.0044	0.442	-2.69	24.42	-174.9	4.30	3.80	-3.55
4	10.01	0.0044	0.438	0.50	25.02	-175.4	4.03	4.56	-4.43
5	10.01	0.0043	0.431	0.70	23.32	-176.7	2.54	4.67	-4.51
6	10.01	0.0042	0.420	2.18	22.86	-178.0	1.94	4.76	-4.72
7	10.01	0.0041	0.410	4.18	23.83	-179.1	1.15	5.69	-5.67
8	10.01	0.0040	0.401	0.32	26.9[illegible]	-179.9	0.33	6.08	-5.95
9	10.01	0.0040	0.397	2.88	30.99	-183.4	0.12	6.83	-6.83
10	10.01	0.0039	0.394	1.79	34.17	-184.4	-0.56	7.47	-7.43
11	10.01	0.0039	0.394	1.90	34.83	-184.3	-1.37	7.53	-7.52
12	10.01	0.0039	0.393	-0.62	33.44	-187.2	-1.77	7.88	-7.85
13	10.01	0.0039	0.394	0.80	27.18	-185.1	-0.64	7.24	-7.20
14	10.01	0.0039	0.394	-1.52	23.22	-180.0	1.67	7.03	-6.97
15	10.01	0.0038	0.380	-1.42	16.40	-161.2	-7.91	5.24	-5.24
16	10.01	0.0033	0.326	-1.75	11.69	-144.0	-20.30	1.49	-1.46
17	10.01	0.0023	0.231	-1.53	8.73	-131.0	-27.80	0.47	0.09
18	10.01	0.0012	0.125	1.73	3.99	-87.5	-29.53	1.70	1.47
19	10.01	0.0004	0.039	3.49	2.52	-60.3	-25.43	-1.99	1.29
20	10.01	0.0001	0.007	0.55	-1.63	11.1	-22.67	0.04	0.30
21	10.01	0.0001	0.011	3.97	-1.34	-1.2	0.46	-0.01	-0.01
22	10.01	0.0001	0.008	2.85	-1.27	-0.1	0.33	0.26	-0.19
23	10.01	0.0001	0.006	2.58	-1.51	.0	0.57	0.34	-0.37
24	10.01	.0000	0.005	1.39	-2.98	-0.1	0.57	0.26	-0.09
25	10.01	.0000	0.004	0.47	-1.42	-0.5	-0.19	-0.25	-0.25
26	10.01	.0000	0.004	0.63	-1.52	-0.1	0.37	-0.10	-0.07

Table S2a

POSITION MD3 SHORT IRON INNER

(in)	b4	a4	b5	a5	b6	a6	b7	a7	b8	a8
-2	20.65	-0.99	0.22	-0.35	1.03	0.05	0.05	0.03	-0.02	-0.01
-1	20.73	-0.76	0.33	-0.61	0.96	-0.04	-0.03	0.04	.00	-0.01
0	20.80	-0.84	0.30	-0.65	0.99	-0.03	-0.03	0.05	.00	-0.03
1	21.08	-0.81	0.37	-0.75	1.07	.00	-0.01	0.03	-0.04	-0.01
2	21.04	-0.59	0.22	-0.61	0.97	0.10	-0.12	0.03	-0.02	.00
3	21.25	-0.53	0.25	-0.57	1.08	0.07	-0.04	-0.05	-0.03	-0.01
4	21.04	-0.45	0.24	-0.46	1.07	0.02	-0.02	.00	.00	0.02
5	20.99	-0.24	0.31	-0.51	1.08	0.14	-0.01	0.03	-0.04	.00
6	21.00	-0.25	0.22	-0.51	1.08	0.17	-0.04	-0.01	-0.08	-0.03
7	20.73	0.03	0.33	-0.36	1.14	0.10	-0.02	0.04	-0.03	-0.03
8	20.69	0.23	0.42	-0.33	1.06	0.12	0.03	0.03	-0.06	0.01
9	20.36	0.10	0.31	-0.36	1.08	0.15	0.01	0.02	-0.04	0.01
10	19.41	-0.01	0.46	-0.45	1.00	0.10	0.09	0.03	-0.06	-0.01
11	19.41	0.16	0.47	-0.56	0.95	.00	0.11	-0.02	.00	-0.01
12	19.45	-0.14	0.42	-0.65	0.94	0.06	0.11	0.01	-0.01	-0.03
13	17.30	-0.68	0.31	-0.88	0.93	0.01	0.10	-0.03	-0.05	.00
14	17.02	-0.45	0.33	-1.05	0.80	-0.11	0.10	.00	-0.06	0.02
15	15.50	-0.91	0.36	-1.34	1.05	-0.18	0.11	-0.14	0.07	0.05
16	8.39	-0.66	0.34	-0.78	0.28	-0.18	-0.01	0.11	-0.12	-0.02
17	5.34	0.08	0.27	-0.47	0.08	-0.12	-0.03	0.06	-0.09	0.01
18	1.10	-0.19	0.15	-0.38	0.11	-0.04	.00	0.05	-0.10	-0.03
19	-2.62	-0.18	-0.01	0.14	-0.54	-0.17	-0.13	0.14	-0.18	-0.11
20	0.07	0.54	-0.11	-0.09	0.15	0.08	.00	0.05	-0.01	0.01
21	-0.14	0.05	0.03	-0.13	0.05	0.09	-0.01	-0.01	0.02	-0.01
22	0.17	0.10	-0.12	0.07	0.05	0.02	0.02	.00	.00	0.03
23	0.14	0.06	-0.14	-0.06	0.09	-0.02	-0.03	.00	-0.02	-0.03
24	0.23	-0.05	-0.05	0.01	0.09	-0.07	0.06	0.03	-0.02	-0.02
25	-0.09	0.03	0.02	0.06	-0.02	0.07	-0.01	-0.01	0.01	0.03
26	-0.09	0.10	0.01	0.03	0.01	-0.03	0.01	-0.03	-0.02	-0.01

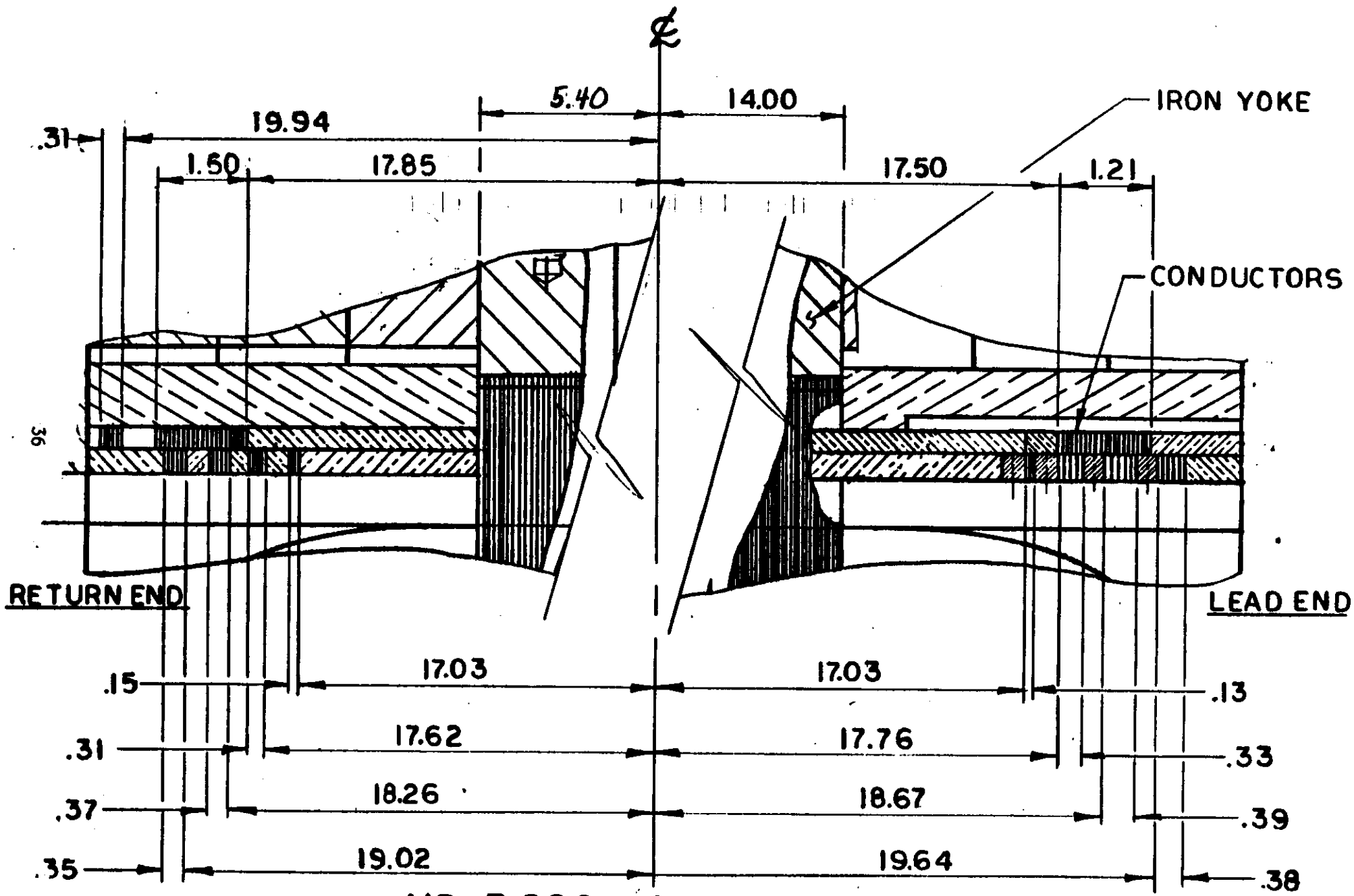
Table S3

POSITION (in)	CURRENT (A)	B-CENTR (T)	TRANSFER FUNCTIO (T/kA)	b1	a1	b2	a2	b3	a3
				MD3 SHORT IRON OUTER					
-2	10.01	0.0054	0.538	-7.42	6.13	161.4	-1.60	-1.31	0.25
-1	10.01	0.0054	0.539	-11.07	1.08	162.5	0.28	-2.55	1.45
0	10.01	0.0054	0.539	-9.91	-0.16	163.5	1.11	-3.33	1.97
1	10.01	0.0054	0.539	-9.48	-2.50	164.2	1.24	-3.12	2.37
2	10.01	0.0054	0.539	-11.74	-6.33	165.2	0.63	-3.89	2.73
3	10.01	0.0054	0.536	-6.84	-7.17	165.9	-0.14	-2.86	2.38
4	10.01	0.0053	0.526	-2.83	-13.20	165.2	-0.12	-3.24	3.11
5	10.01	0.0051	0.508	-3.03	-15.08	163.2	-0.27	-3.64	3.53
6	10.01	0.0048	0.483	-2.87	-17.49	160.0	0.34	-3.67	3.55
7	10.01	0.0046	0.457	-1.52	-19.40	156.9	0.72	-3.95	3.88
8	10.01	0.0044	0.437	2.19	-21.05	154.9	0.93	-4.43	4.43
9	10.01	0.0043	0.425	0.53	-23.24	153.9	0.68	-4.90	4.85
10	10.01	0.0042	0.419	2.84	-25.71	153.2	1.22	-5.38	5.38
11	10.01	0.0042	0.416	3.50	-26.20	153.0	1.93	-5.65	5.65
12	10.01	0.0041	0.414	6.58	-28.78	153.1	1.96	-5.84	5.83
13	10.01	0.0041	0.413	7.27	-31.02	153.9	2.55	-6.33	6.32
14	10.01	0.0041	0.413	8.82	-33.21	154.0	2.79	-6.77	6.75
15	10.01	0.0040	0.404	6.54	-27.09	133.7	2.88	-6.73	6.73
16	10.01	0.0037	0.366	6.00	-12.18	91.3	4.02	-5.43	5.34
17	10.01	0.0029	0.289	3.69	-0.33	43.4	4.53	-3.81	3.81
18	10.01	0.0019	0.187	-0.16	7.60	-3.8	2.54	-2.39	2.40
19	10.01	0.0009	0.087	-0.13	8.85	-19.7	0.03	-0.42	0.51
20	10.01	0.0002	0.020	1.90	3.58	-15.1	-6.58	-0.14	0.22
21	10.01	0.0001	0.009	2.34	-0.93	3.9	-5.60	0.18	-0.17
22	10.01	0.0001	0.012	2.43	-1.25	-0.2	0.16	0.03	0.14
23	10.01	0.0001	0.009	2.43	-1.43	-0.8	0.42	-0.14	-0.28
24	10.01	0.0001	0.007	1.74	-0.54	-0.2	-0.19	0.23	-0.18
25	10.01	0.0001	0.006	0.58	-0.93	0.1	0.17	0.04	-0.09
26	10.01	0.0001	0.006	0.54	-1.70	-0.4	0.25	-0.34	-0.05

Table S3a

POSITION MD3 SHORT IRON OUTER

(in)	b4	a4	b5	a5	b6	a6	b7	a7	b8	a8
-2	-14.92	0.45	-0.01	0.07	-0.57	-0.03	-0.01	-0.05	0.09	0.04
-1	-15.12	0.08	-0.07	0.08	-0.60	-0.05	-0.01	-0.02	0.08	-0.01
0	-15.09	0.10	-0.06	0.37	-0.66	0.09	-0.09	-0.05	0.04	-0.08
1	-15.40	0.06	-0.11	0.30	-0.58	0.02	-0.05	-0.06	0.05	-0.03
2	-15.62	0.26	-0.03	0.24	-0.56	-0.05	0.04	-0.04	0.06	-0.02
3	-15.85	0.15	-0.04	0.12	-0.57	-0.08	.00	-0.04	0.06	.00
4	-15.92	0.02	0.01	0.13	-0.55	-0.03	0.01	-0.03	0.06	.00
5	-15.96	-0.07	-0.08	0.13	-0.49	0.03	-0.01	-0.05	0.04	-0.02
6	-15.89	-0.06	-0.06	0.18	-0.49	-0.01	.00	-0.05	0.05	.00
7	-15.81	-0.14	-0.13	0.14	-0.53	.00	-0.03	-0.03	0.07	-0.02
8	-15.70	-0.25	-0.10	0.20	-0.57	0.01	.00	-0.03	0.04	-0.01
9	-15.62	-0.36	-0.07	0.26	-0.54	0.05	-0.01	-0.03	0.06	-0.02
10	-15.52	-0.42	-0.01	0.22	-0.51	-0.05	0.02	-0.04	0.06	-0.01
11	-15.59	-0.52	-0.06	0.21	-0.53	-0.02	0.01	-0.02	0.08	-0.01
12	-15.50	-0.47	-0.06	0.28	-0.53	-0.03	.00	-0.02	0.08	.00
13	-15.45	-0.42	-0.07	0.31	-0.60	0.03	0.01	-0.04	0.09	0.02
14	-15.06	-0.31	-0.10	0.40	-0.52	-0.03	-0.01	-0.03	0.05	.00
15	-13.76	-0.44	-0.02	0.30	-0.40	-0.01	0.01	-0.05	0.05	-0.03
16	-9.71	-0.40	-0.07	0.17	-0.27	-0.02	0.02	-0.02	0.06	-0.02
17	-6.49	-0.36	.00	0.19	-0.13	-0.02	0.03	-0.01	0.02	.00
18	-2.86	-0.33	0.07	0.04	-0.01	0.03	-0.03	-0.04	0.01	-0.01
19	-0.45	-0.35	0.06	0.01	-0.01	0.04	0.02	.00	-0.02	-0.01
20	-0.46	-0.61	0.01	0.02	0.02	-0.06	-0.04	0.01	0.01	-0.03
21	0.16	-0.03	0.02	-0.16	-0.01	0.06	0.01	-0.02	-0.01	-0.01
22	.00	0.03	0.03	-0.02	-0.06	0.02	.00	-0.02	.00	.00
23	-0.08	0.13	0.03	-0.13	.00	0.01	-0.05	-0.03	0.04	0.01
24	0.11	-0.05	0.03	-0.05	0.04	0.08	0.03	0.01	0.02	0.01
25	0.09	-0.24	-0.02	-0.04	.00	.00	.00	0.02	-0.03	.00
26	-0.04	-0.01	0.01	-0.09	-0.01	0.04	-0.03	0.01	.00	-0.02



MD-3 SSC MODEL DIPOLE

Fig. S1

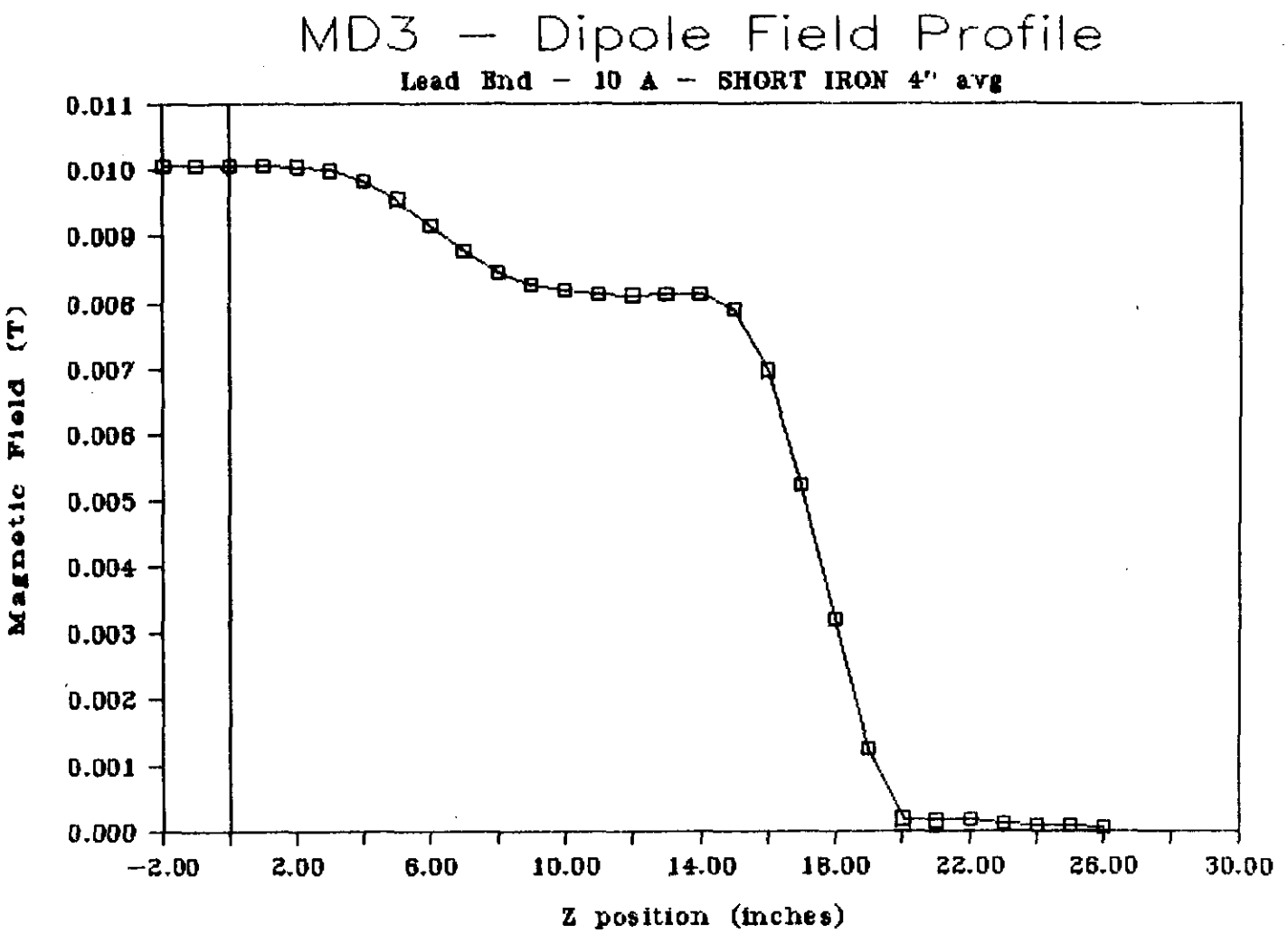

MD3 — Dipole Field Profile
Lead End - 10 A - SHORT IRON 4" avg
Magnetic Field (T)
0.011
0.010
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
-2.00
2.00
6.00
10.00
14.00
18.00
22.00
26.00
30.00
Z position (inches)

Fig. S2

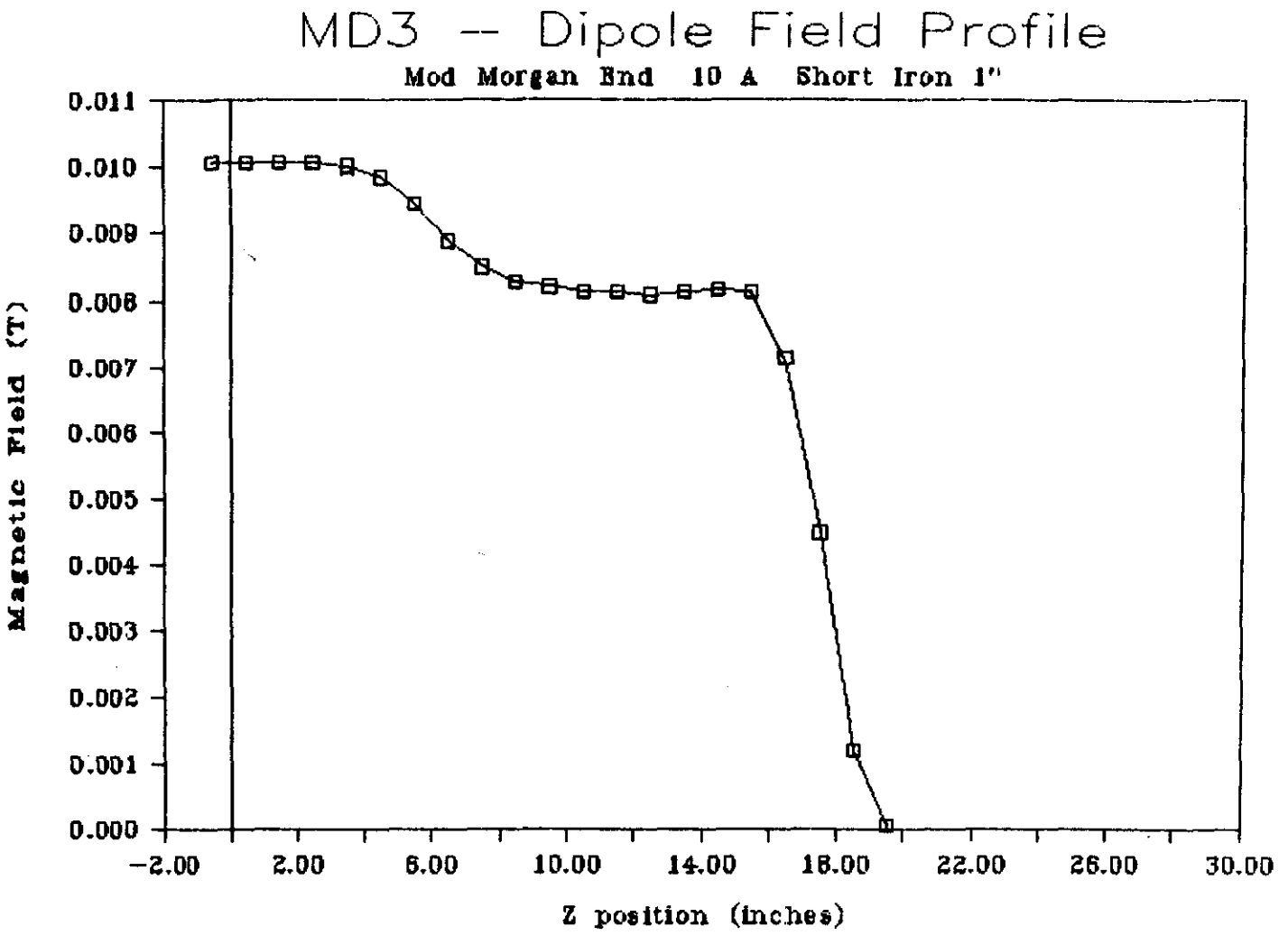

MD3 -- Dipole Field Profile
Mod Morgan End 10 A Short Iron 1"
Magnetic Field (T)
0.011
0.010
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
-2.00
2.00
6.00
10.00
14.00
18.00
22.00
26.00
30.00
Z position (inches)

Fig. S3

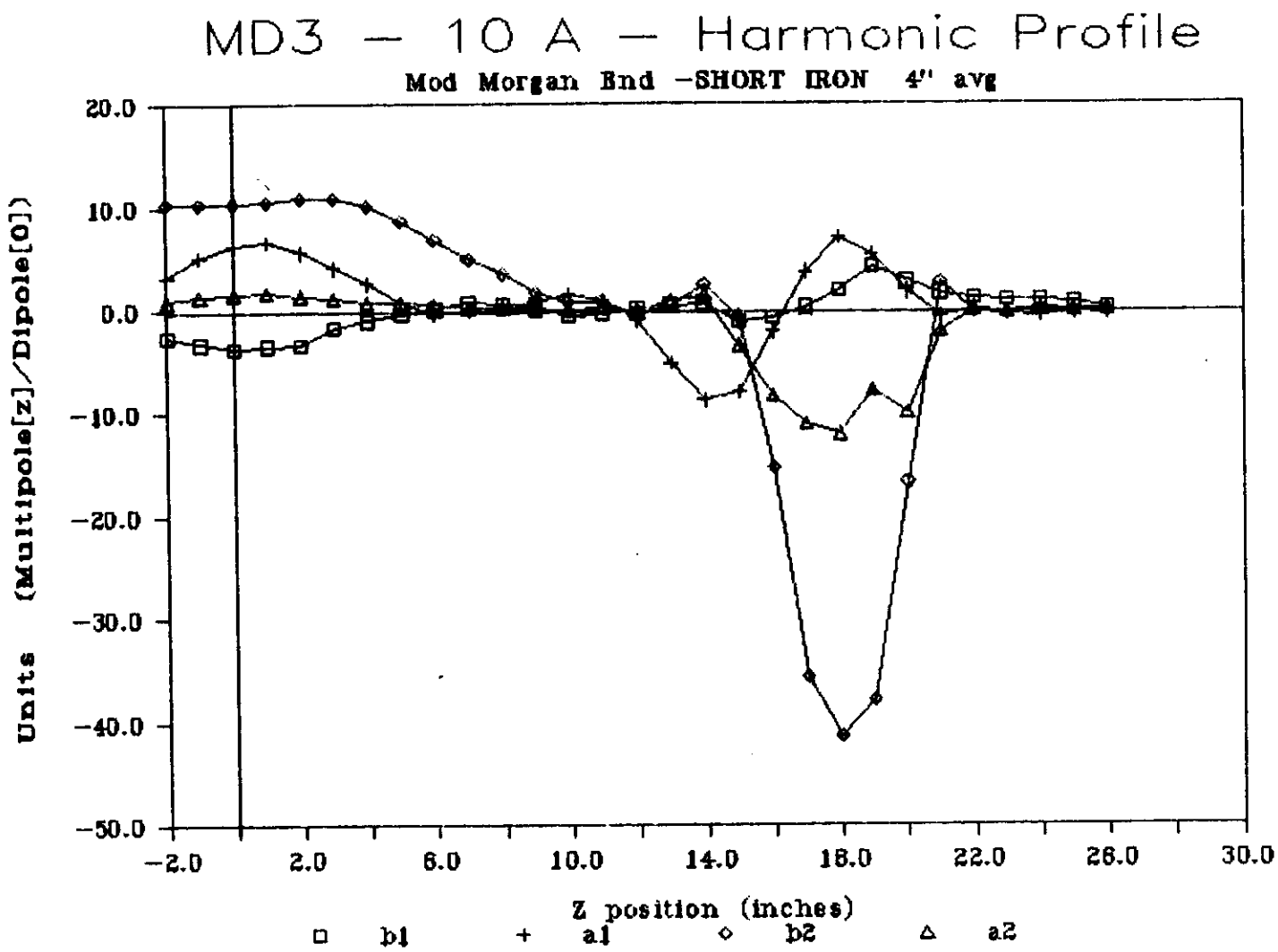

MD3 — 10 A — Harmonic Profile
Mod Morgan Bnd -SHORT IRON 4" avg
Units (Multipole[z]/Dipole[0])
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b1
a1
b2
a2

Fig. S4

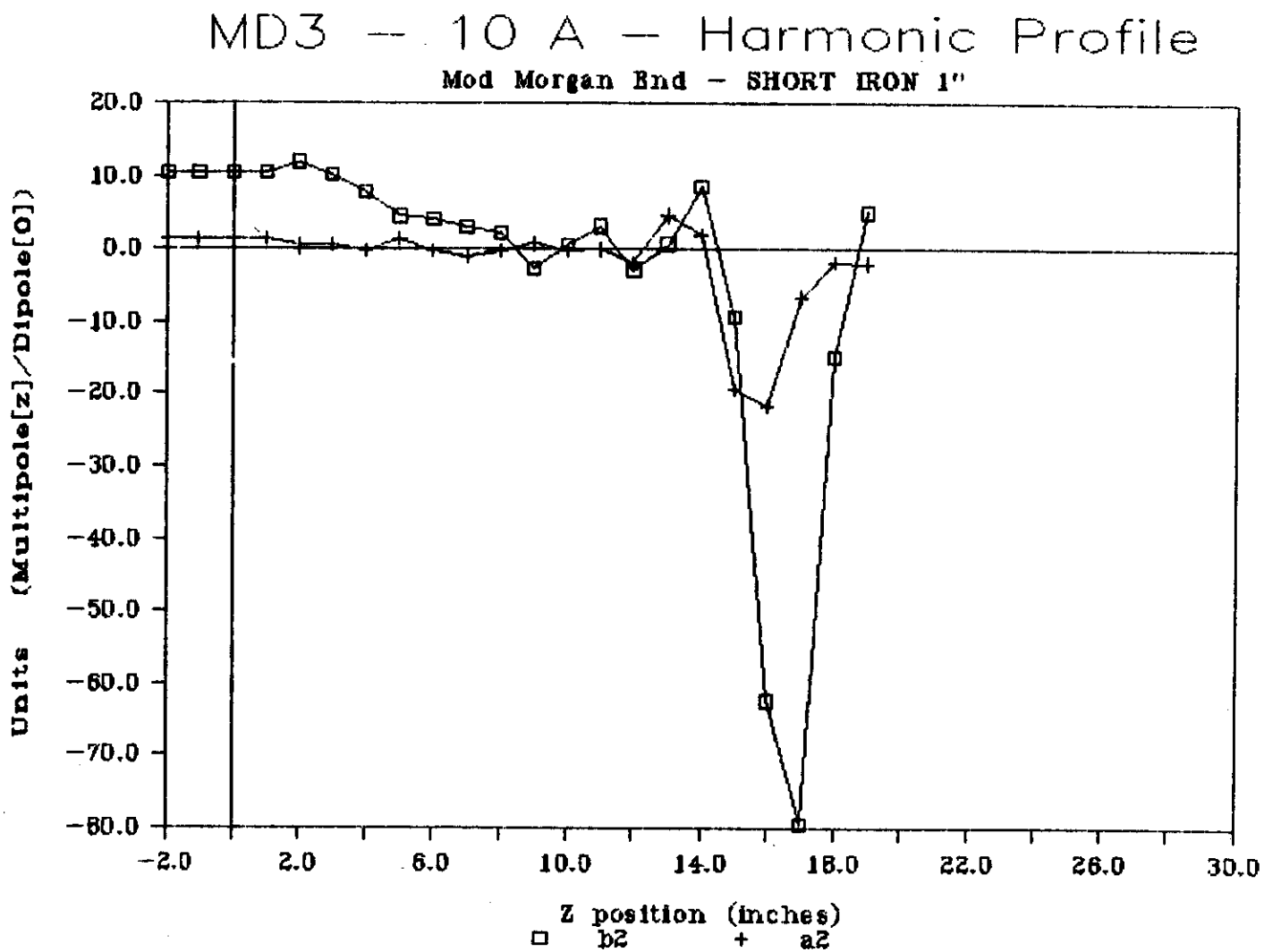

MD3 — 10 A — Harmonic Profile
Mod Morgan End - SHORT IRON 1"
Units (Multipole[n]/Dipole[0])
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b2
a2

Fig. S5

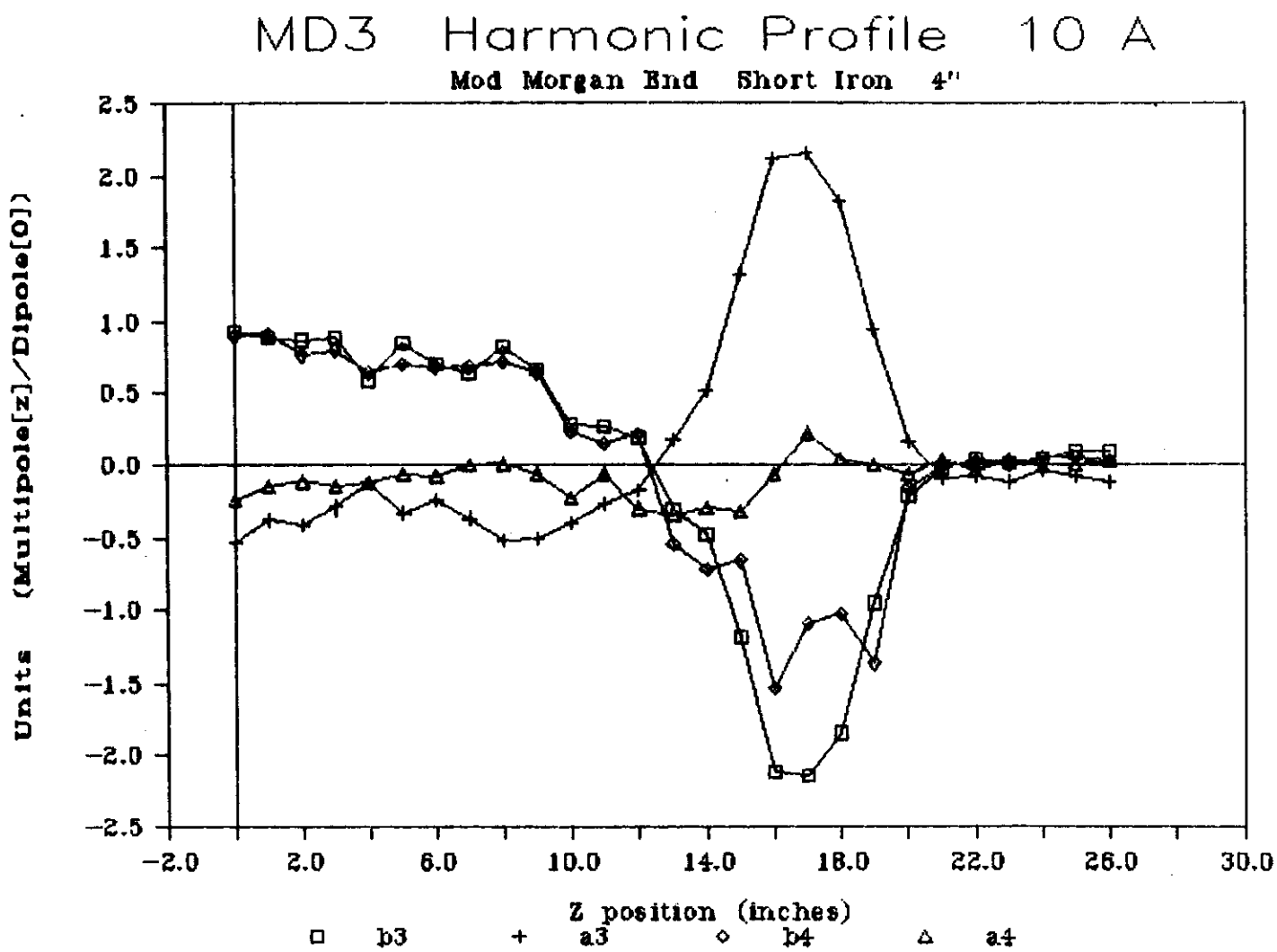

MD3 Harmonic Profile 10 A
Mod Morgan End Short Iron 4"
Units (Multipole[z]/Dipole[0])
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b3
a3
b4
a4

Fig. S6

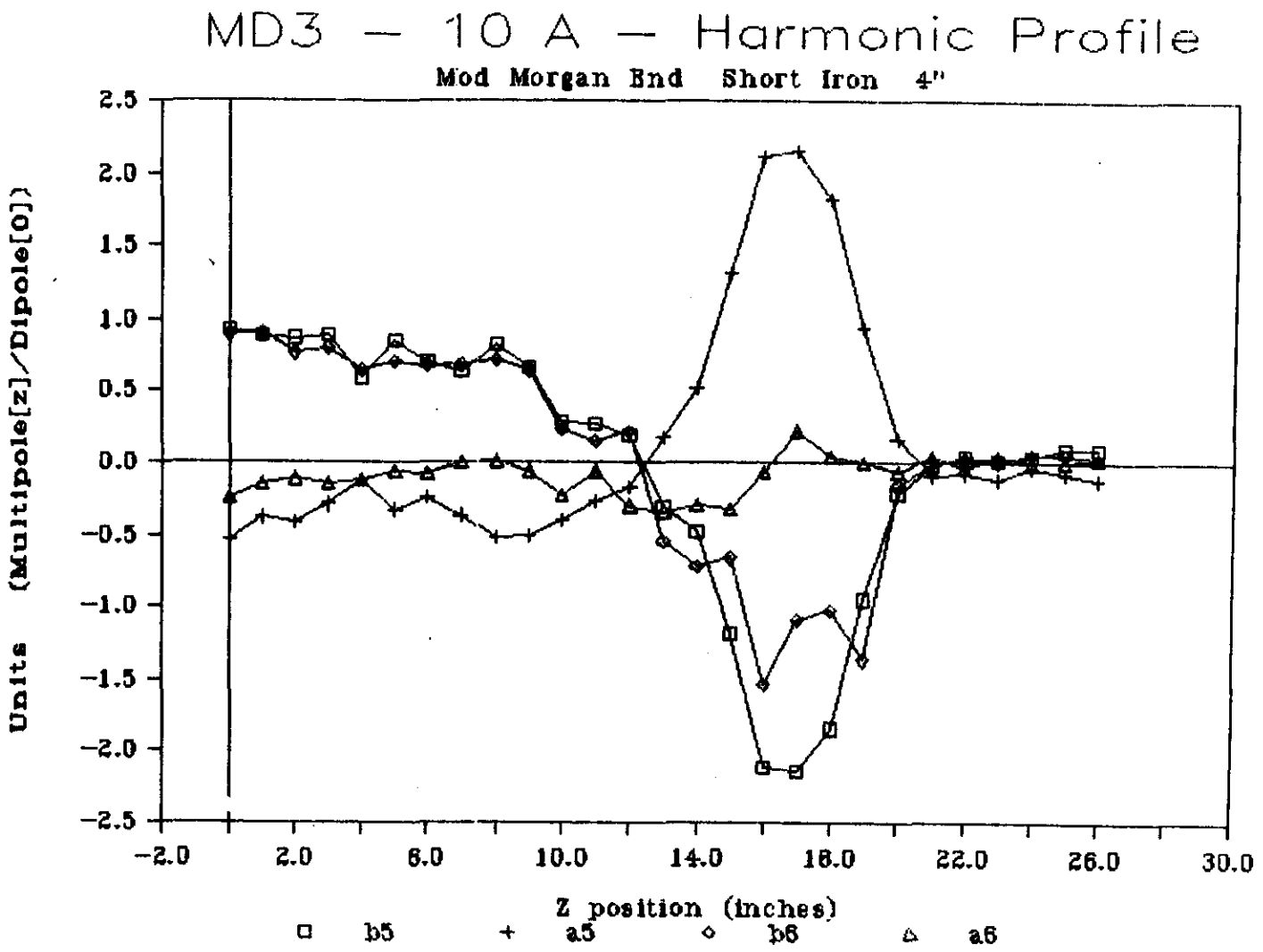

MD3 — 10 A — Harmonic Profile
Mod Morgan End Short Iron 4"
Units (Multipole[z]/Dipole[0])
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b5
a5
b6
a6

Fig. S7

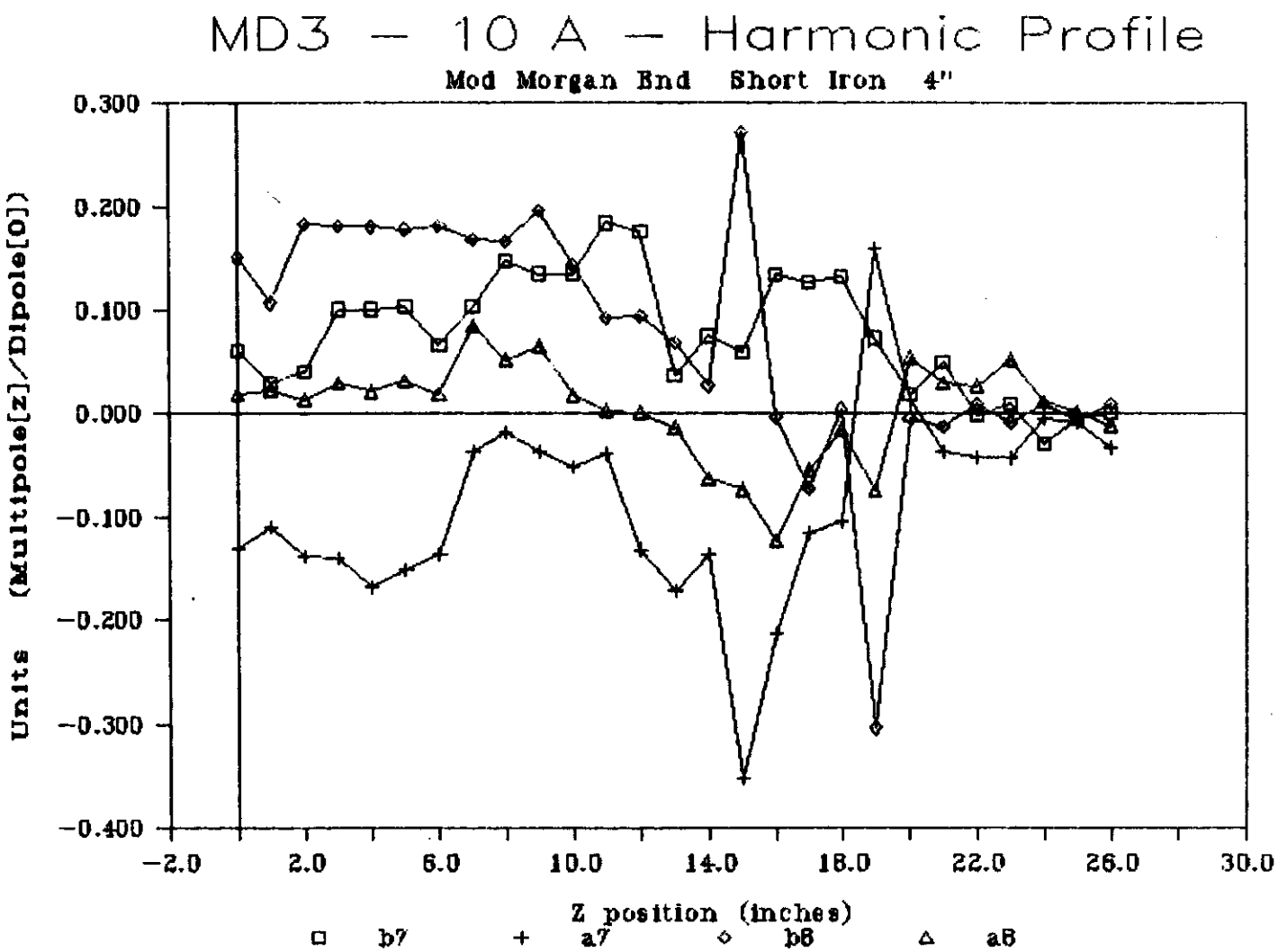

MD3 — 10 A — Harmonic Profile
Mod Morgan End Short Iron 4"
Units (Multipole[z]/Dipole[0])
0.300
0.200
0.100
0.000
−0.100
−0.200
−0.300
−0.400
−2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b7
a7
b8
a8

Fig. S8

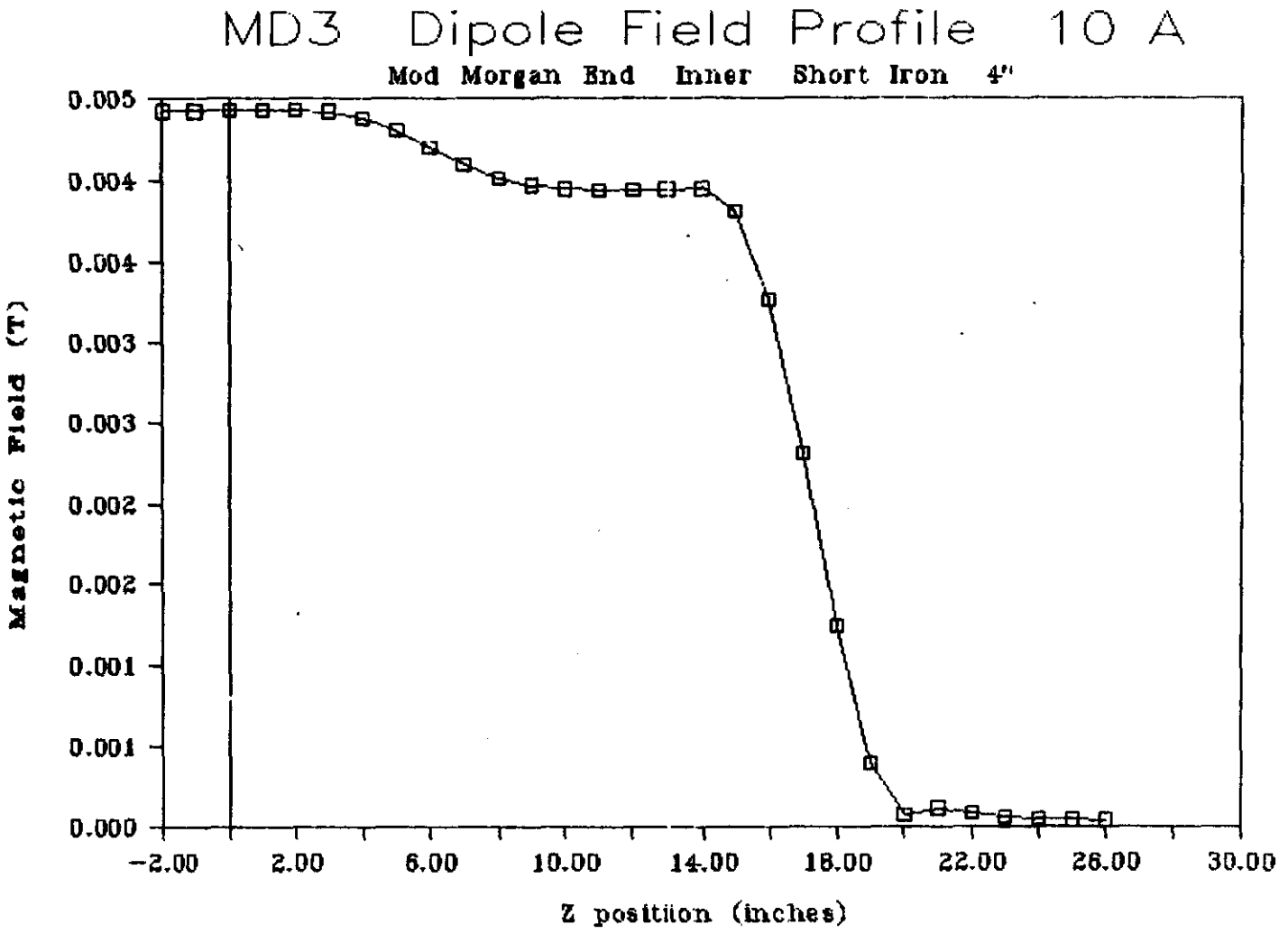

MD3 Dipole Field Profile 10 A
Mod Morgan End Inner Short Iron 4"
Magnetic Field (T)
0.005
0.004
0.004
0.003
0.003
0.002
0.002
0.001
0.001
0.000
-2.00
2.00
6.00
10.00
14.00
18.00
22.00
26.00
30.00
Z position (inches)

Fig. S9

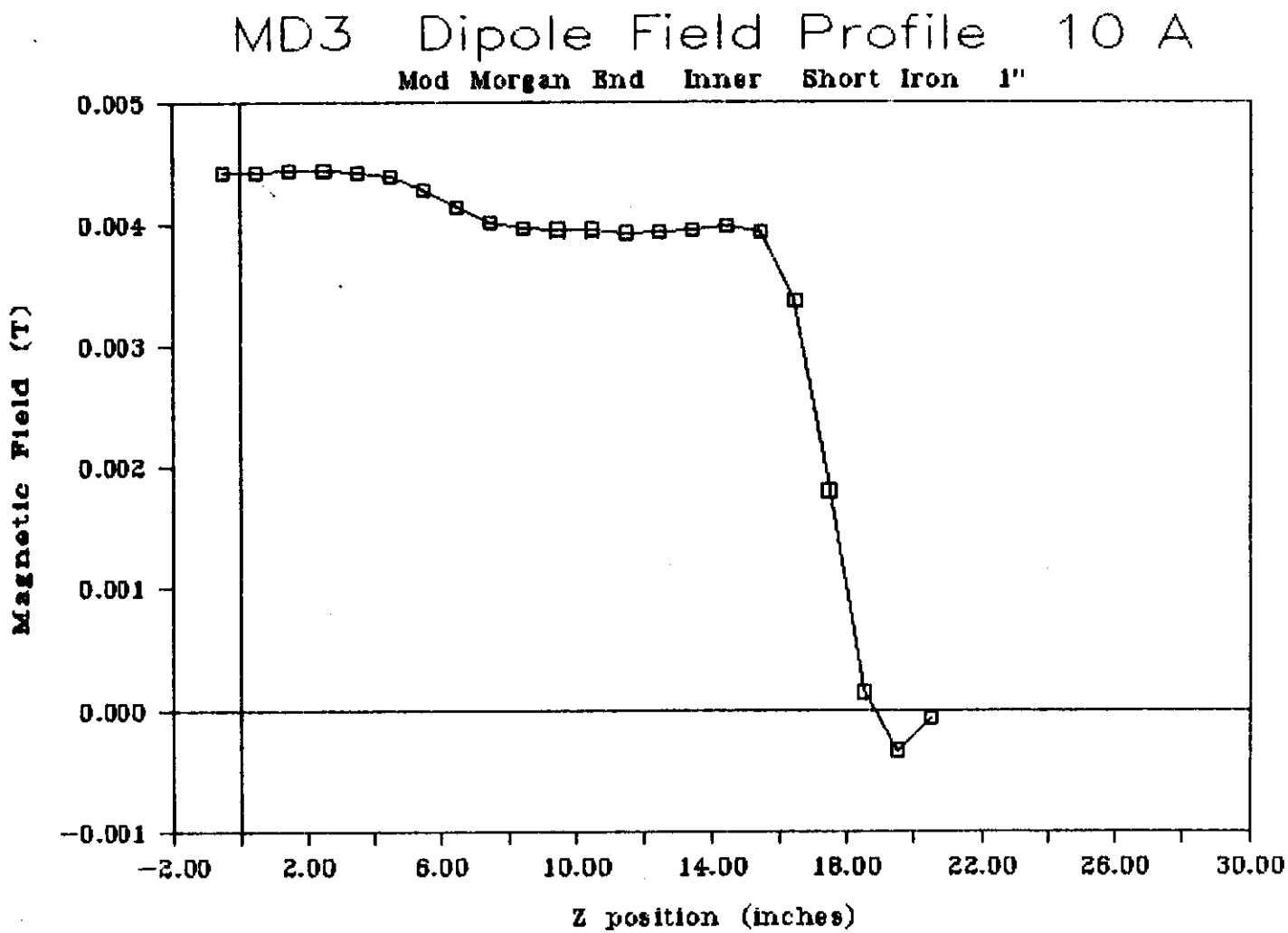

MD3 Dipole Field Profile 10 A
Mod Morgan End Inner Short Iron 1"
Magnetic Field (T)
0.005
0.004
0.003
0.002
0.001
0.000
-0.001
-2.00
2.00
6.00
10.00
14.00
18.00
22.00
26.00
30.00
Z position (inches)

Fig. S10

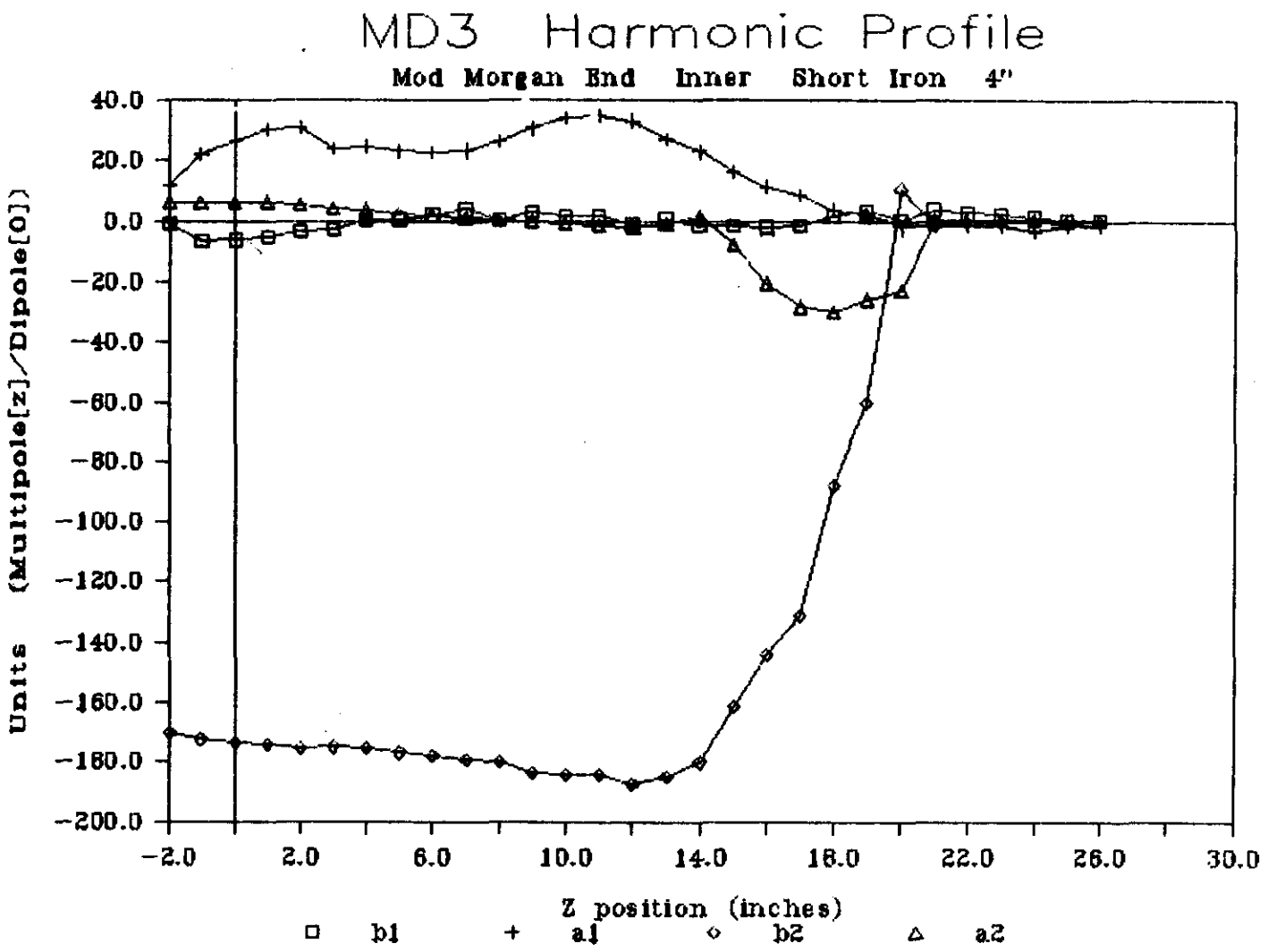

MD3 Harmonic Profile
Mod Morgan End Inner Short Iron 4"
Units (Multipole[z]/Dipole[0])
40.0
20.0
0.0
-20.0
-40.0
-60.0
-80.0
-100.0
-120.0
-140.0
-160.0
-180.0
-200.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b1
a1
b2
a2

Fig. S11

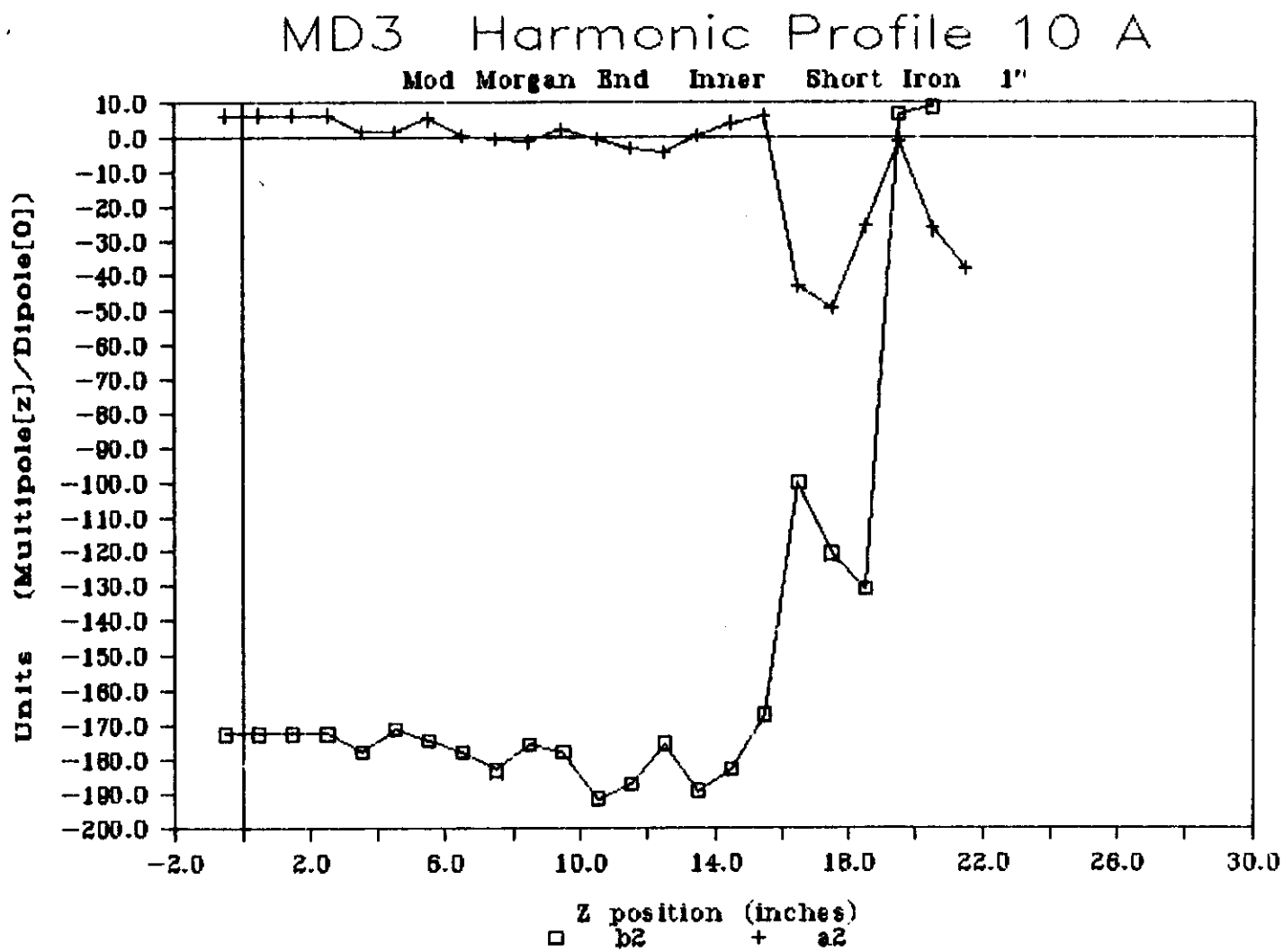

MD3 Harmonic Profile 10 A
Mod Morgan End Inner Short Iron 1"
Units (Multipole[z]/Dipole[0])
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
-110.0
-120.0
-130.0
-140.0
-150.0
-160.0
-170.0
-180.0
-190.0
-200.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b2
a2

Fig. S12

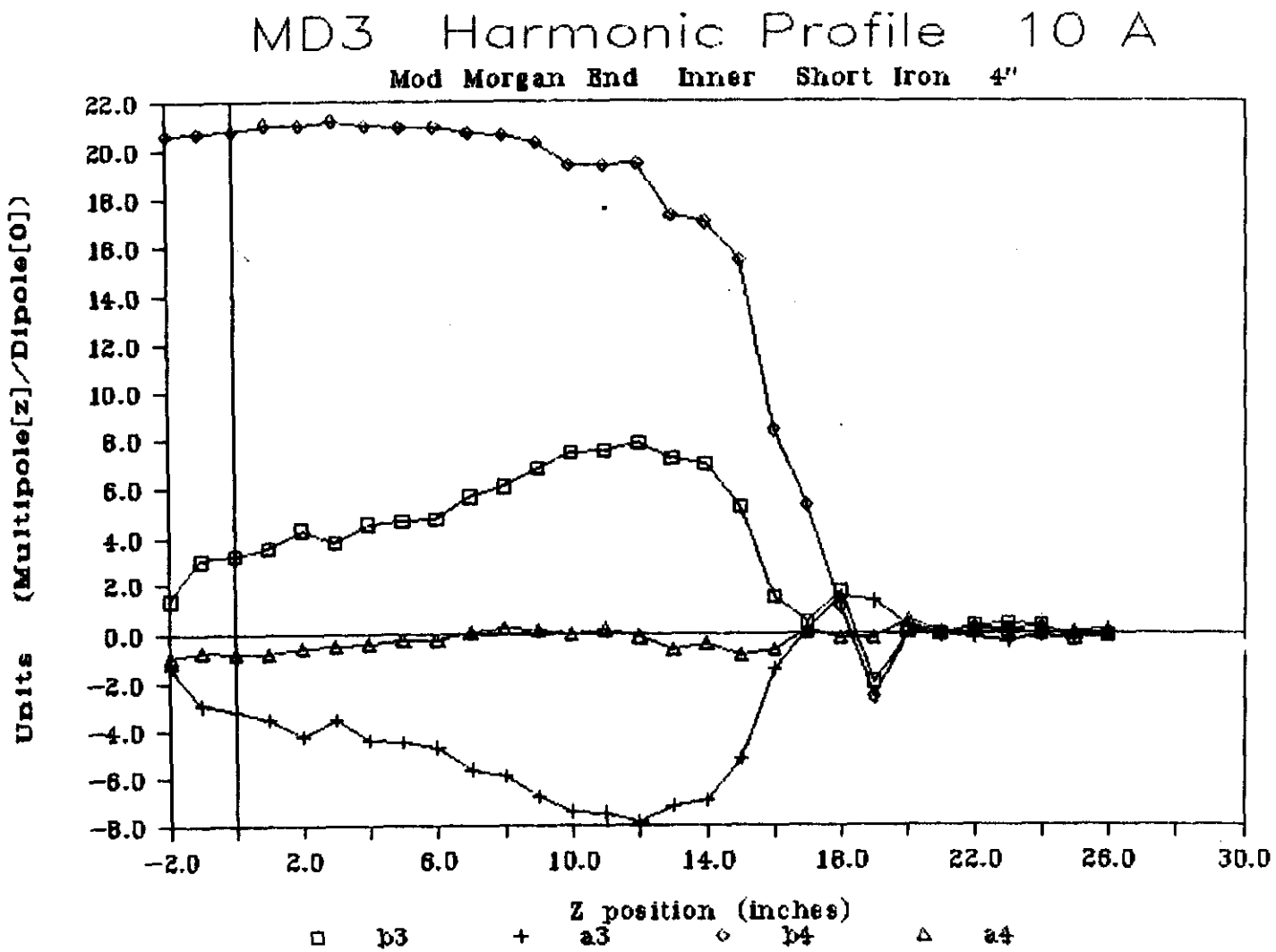

MD3 Harmonic Profile 10 A
Mod Morgan End Inner Short Iron 4"
Units (Multipole[z]/Dipole[0])
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
-8.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b3
a3
b4
a4

Fig. S13

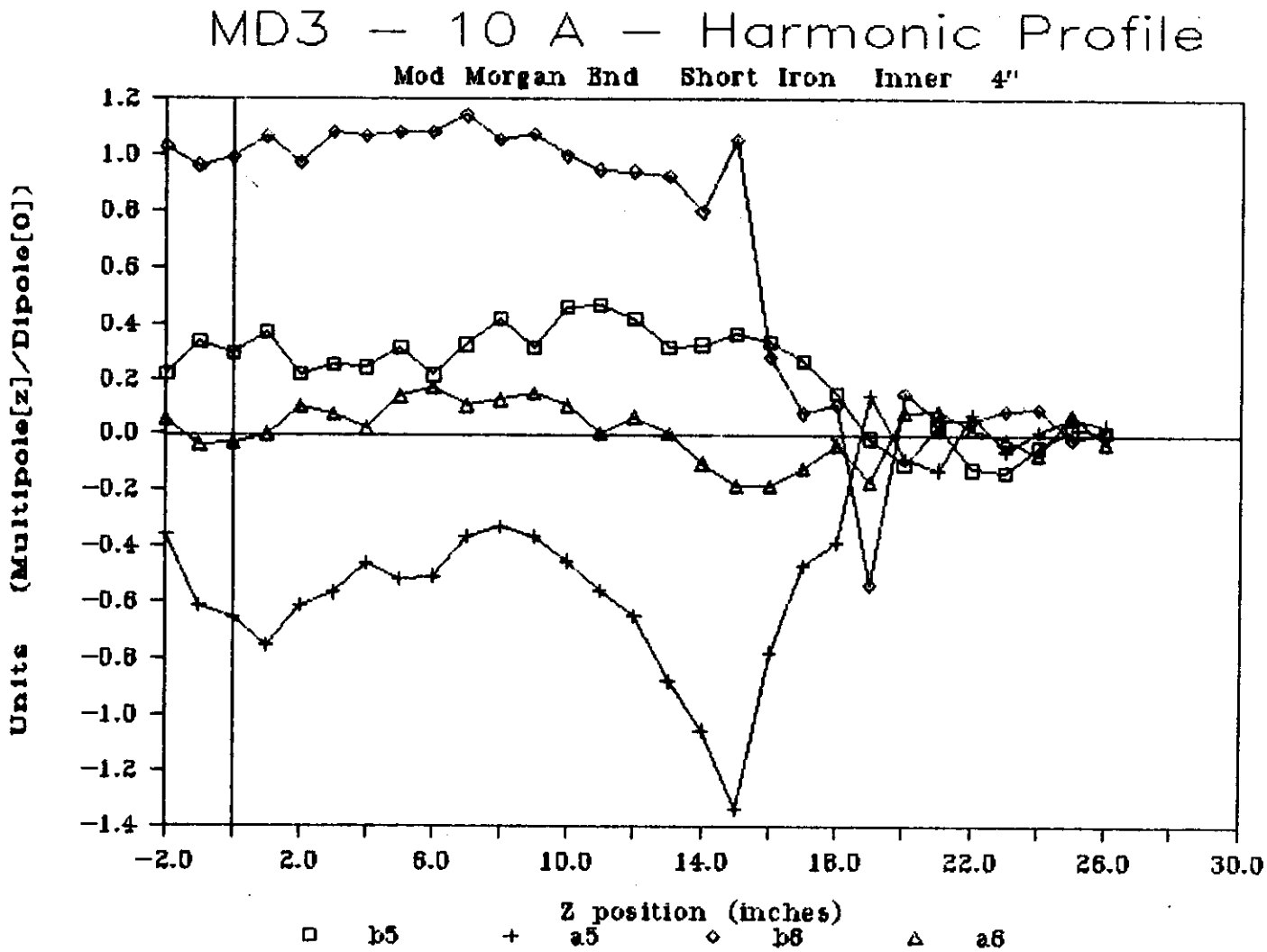

MD3 — 10 A — Harmonic Profile
Mod Morgan End Short Iron Inner 4"
Units (Multipole[z]/Dipole[0])
1.2
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−1.2
−1.4
−2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b5
a5
b6
a6

Fig. S14

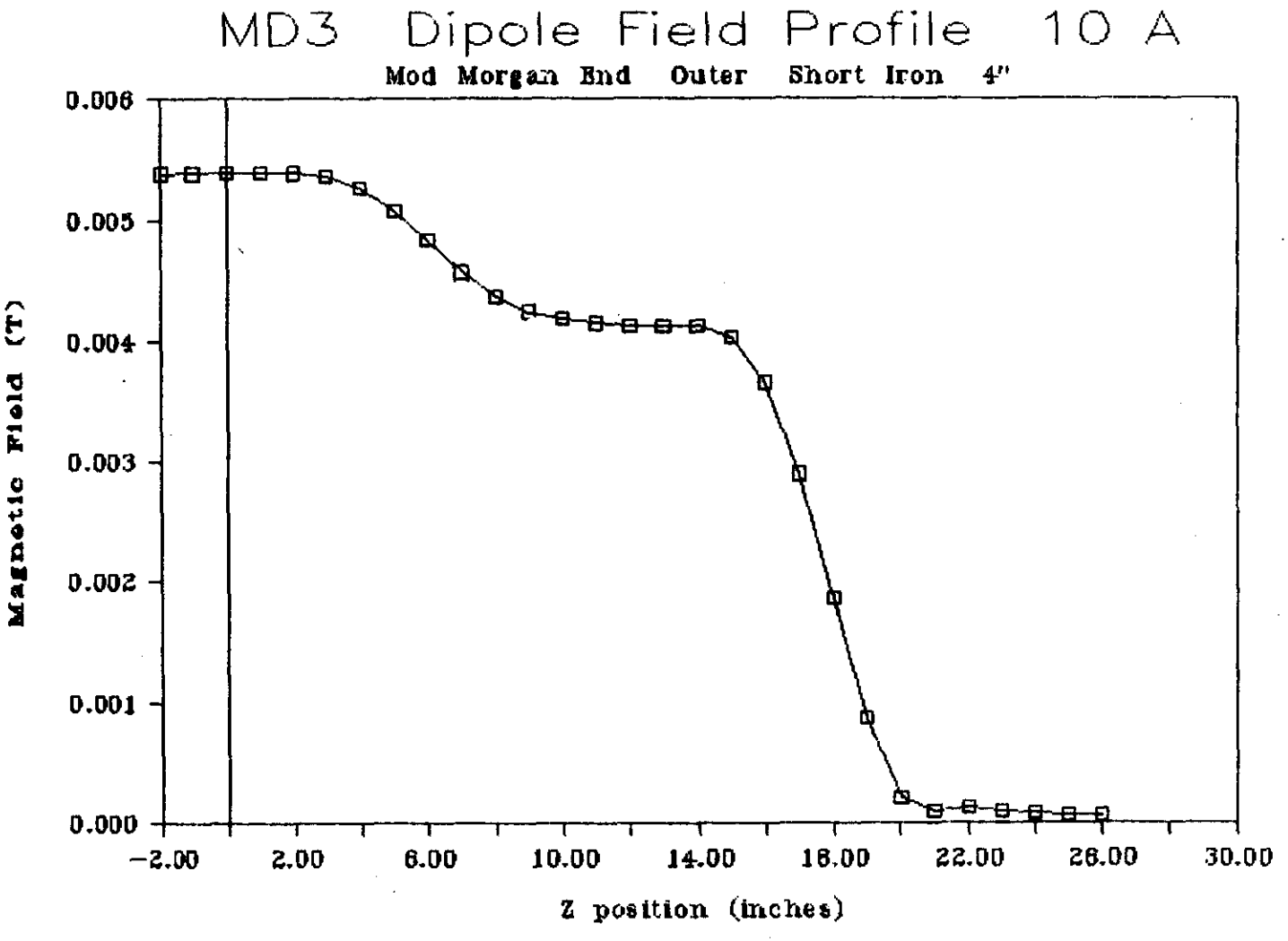

MD3 Dipole Field Profile 10 A
Mod Morgan End Outer Short Iron 4"
Magnetic Field (T)
0.006
0.005
0.004
0.003
0.002
0.001
0.000
-2.00
2.00
6.00
10.00
14.00
18.00
22.00
26.00
30.00
Z position (inches)

Fig. S15

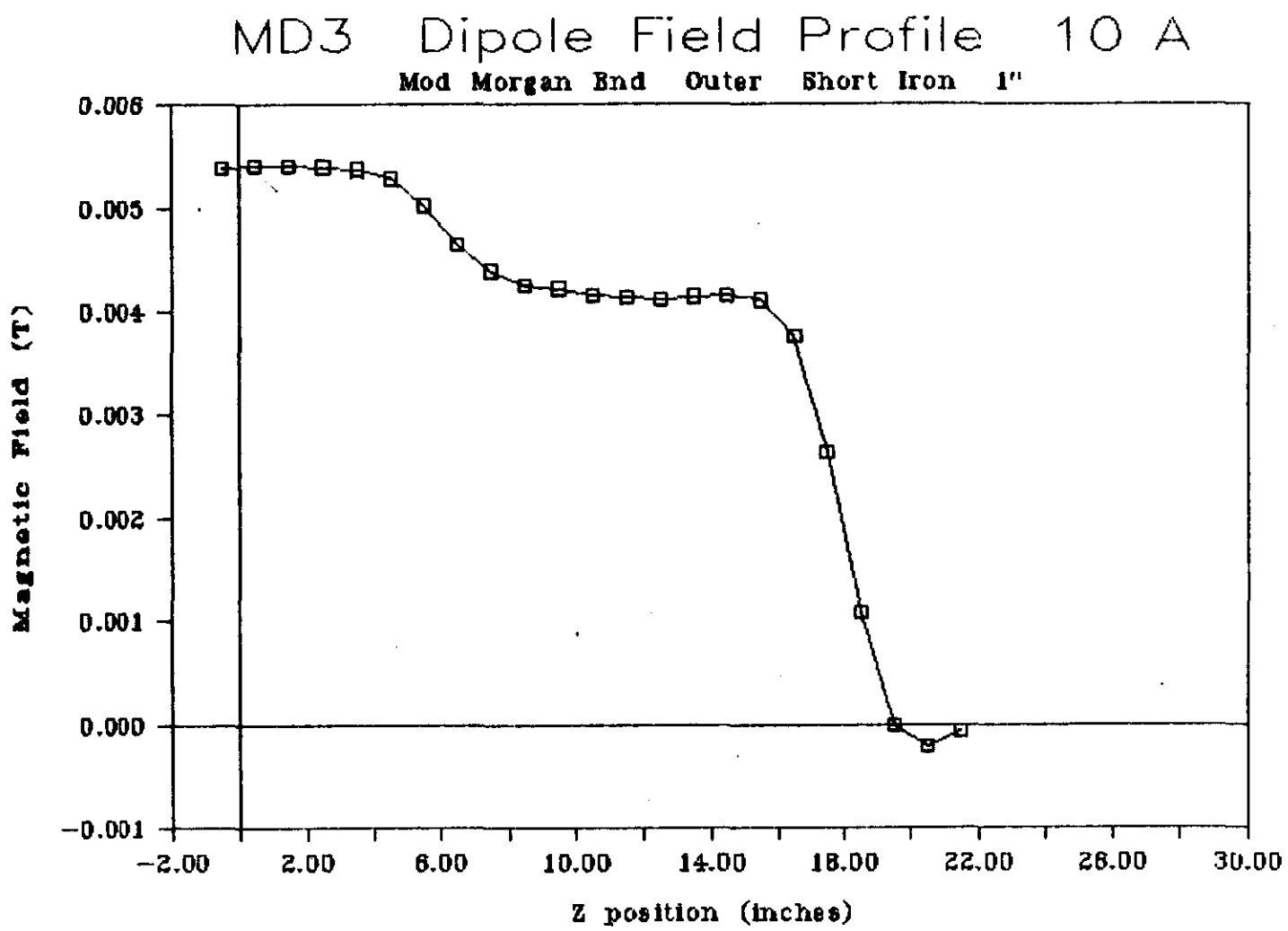

MD3 Dipole Field Profile 10 A
Mod Morgan Bnd Outer Short Iron 1"
Magnetic Field (T)
0.006
0.005
0.004
0.003
0.002
0.001
0.000
-0.001
-2.00
2.00
6.00
10.00
14.00
18.00
22.00
26.00
30.00
Z position (inches)

Fig. S16

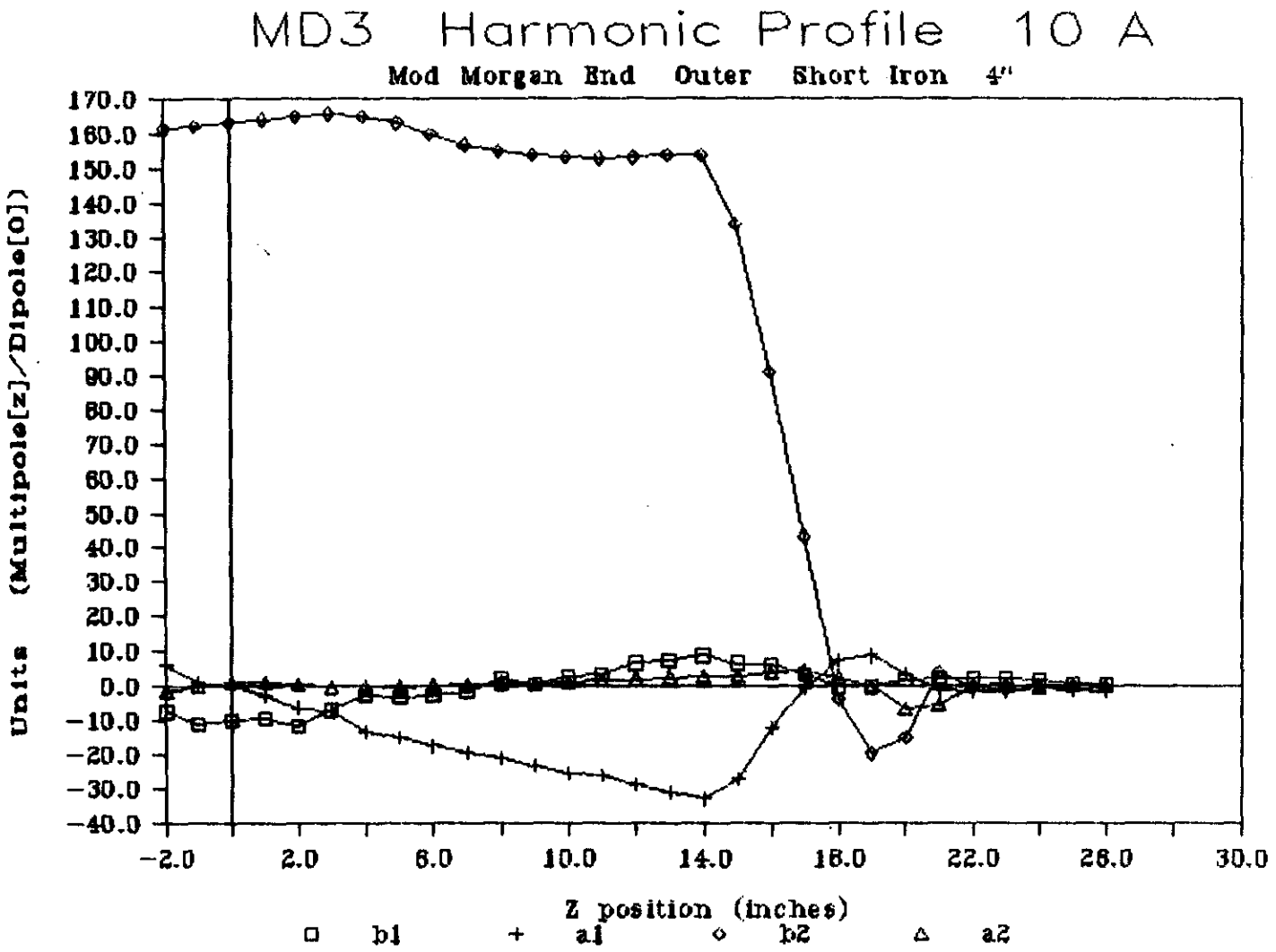

MD3 Harmonic Profile 10 A
Mod Morgan End Outer Short Iron 4"
Units (Multipole[z]/Dipole[0])
170.0
160.0
150.0
140.0
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b1
a1
b2
a2

Fig. S17

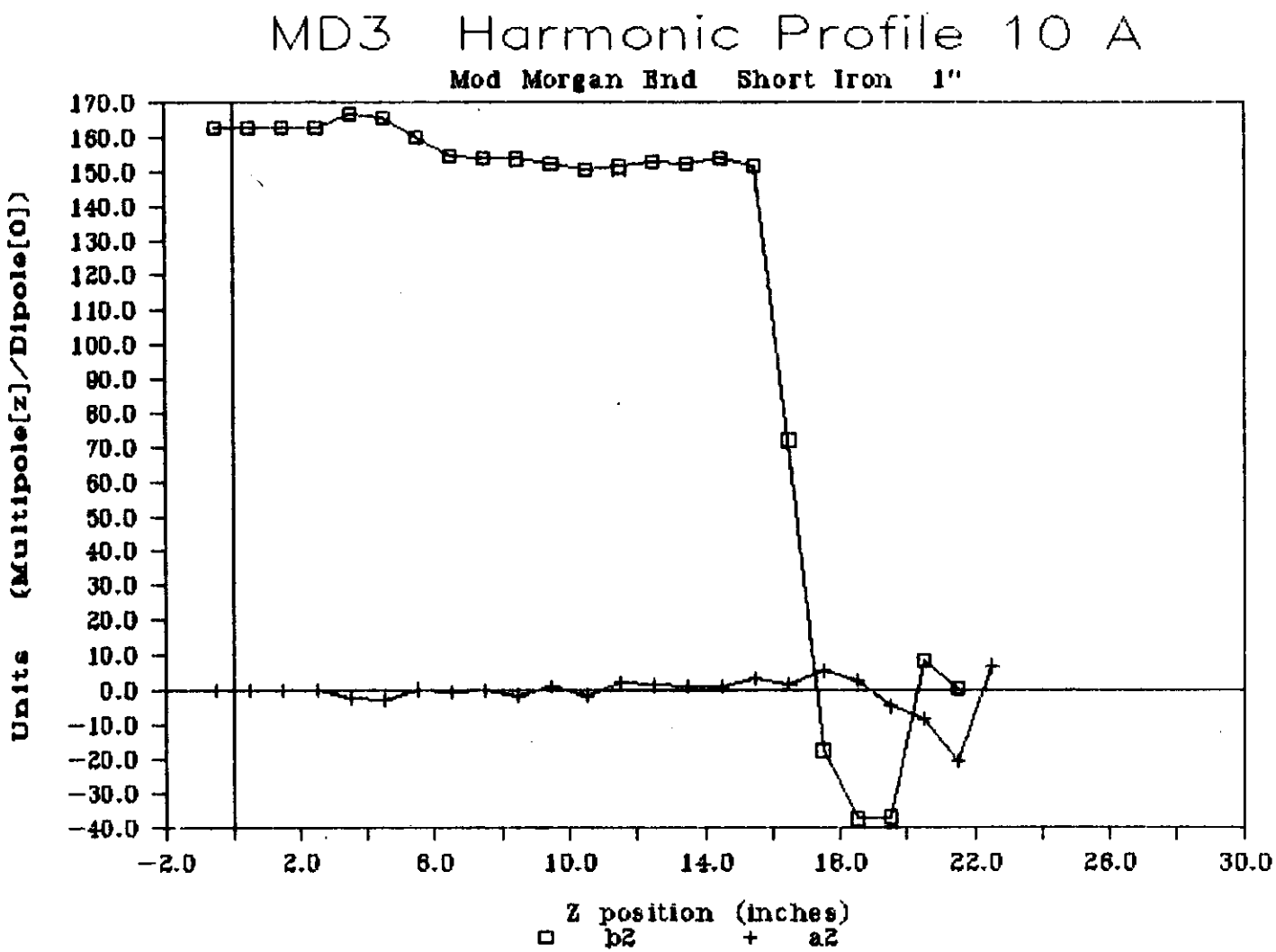

MD3 Harmonic Profile 10 A
Mod Morgan End Short Iron 1"
Units (Multipole[z]/Dipole[0])
170.0
160.0
150.0
140.0
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b2
a2

Fig. S18

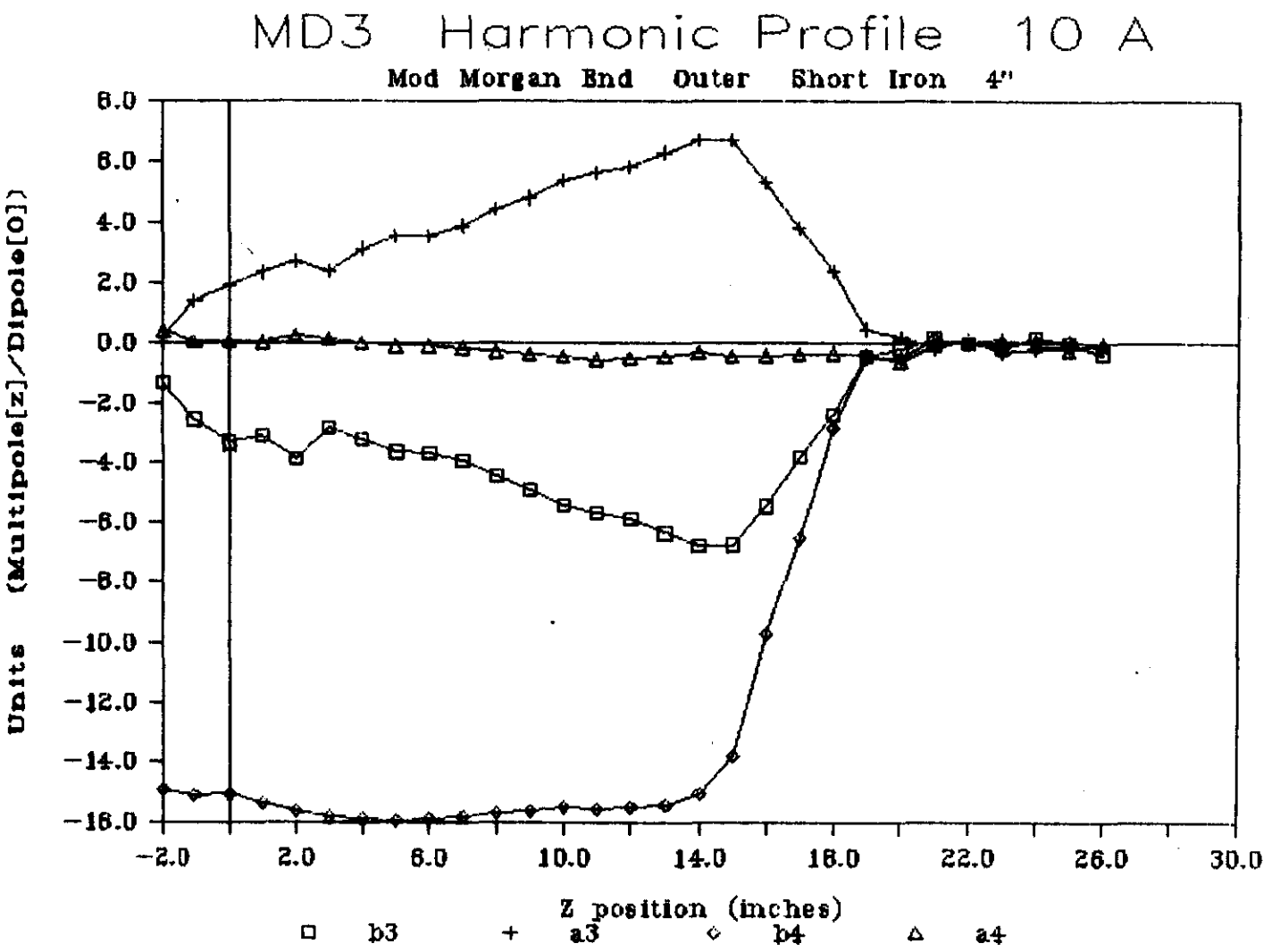

MD3 Harmonic Profile 10 A
Mod Morgan End Outer Short Iron 4"
Units (Multipole[z]/Dipole[0])
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b3
a3
b4
a4

Fig. S19

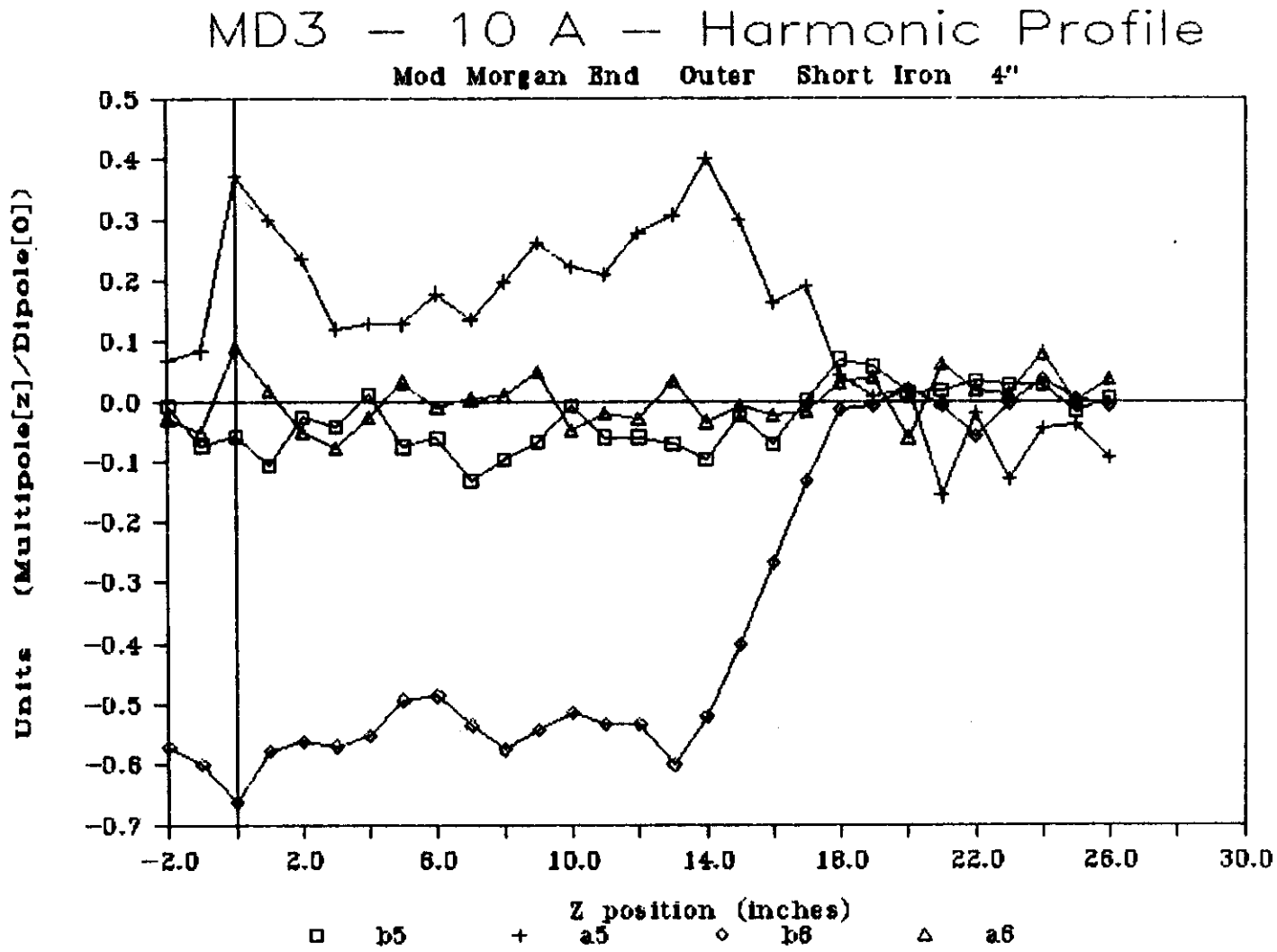

MD3 — 10 A — Harmonic Profile
Mod Morgan End Outer Short Iron 4"
Units (Multipole[z]/Dipole[0])
0.5
0.4
0.3
0.2
0.1
0.0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b5
a5
b6
a6

Fig. S20

Table L1a

POSITION (in)	CURRENT (A)	B (T)	TRSF FN (T/kA)	b1	a1	b2	a2	b3	a3
				MD3 LONG IRON					
-2	10.008	0.0101	1.0048	-1.77	2.98	10.80	0.60	0.39	-0.29
-1	10.009	0.0101	1.0056	-2.84	4.16	10.49	1.22	0.60	-0.44
0	10.008	0.0101	1.0061	-3.38	5.09	10.65	1.60	0.81	-0.37
1	10.008	0.0101	1.0066	-3.65	6.41	10.54	1.87	0.89	-0.36
2	10.008	0.0101	1.0070	-3.29	6.08	10.74	1.90	0.78	-0.24
3	10.008	0.0101	1.0077	-2.35	5.11	11.16	1.58	0.80	-0.36
4	10.008	0.0101	1.0087	-1.88	3.45	11.04	1.19	0.63	-0.17
5	10.008	0.0101	1.0096	-0.35	1.24	11.11	1.09	0.68	-0.35
6	10.008	0.0101	1.0100	0.08	-0.07	10.66	0.73	0.70	-0.16
7	10.008	0.0101	1.0098	0.07	-0.51	9.91	0.42	0.51	-0.24
8	10.008	0.0101	1.0089	0.26	-0.75	9.60	0.39	0.61	-0.21
9	10.008	0.0101	1.0082	-0.44	-0.46	8.82	0.12	0.66	-0.28
10	10.008	0.0101	1.0077	-2.06	-0.90	7.40	-0.05	0.48	-0.33
11	10.008	0.0101	1.0080	-2.66	-1.74	6.97	0.16	0.27	-0.36
12	10.008	0.0101	1.0085	-1.93	-2.52	6.49	0.30	0.24	-0.33
13	10.008	0.0101	1.0091	-1.95	-5.52	4.97	0.13	-0.04	-0.14
14	10.008	0.0101	1.0089	-1.19	-9.47	7.07	0.80	-0.32	0.15
15	10.008	0.0100	1.0006	-0.96	-12.40	7.36	0.16	-0.70	0.75
16	10.008	0.0095	0.9495	-2.22	-11.39	1.44	-6.32	-1.02	1.34
17	10.008	0.0081	0.8092	-1.98	-5.53	-21.77	-10.24	-2.20	2.20
18	10.008	0.0059	0.5862	-0.91	-2.77	-37.25	-11.32	-2.05	2.04
19	10.008	0.0034	0.3399	-0.14	-1.15	-41.90	-10.00	-1.50	1.47
20	10.008	0.0014	0.1423	0.68	-2.20	-35.79	-3.51	-1.02	0.98
21	10.008	0.0003	0.0299	-0.04	-4.37	-12.12	-0.24	-0.20	0.22
22	10.008	.0000	0.0032	-0.49	-2.99	1.49	-0.53	-0.05	0.07
23	10.008	0.0001	0.0067	0.45	-1.29	-0.22	0.13	-0.06	0.02
24	10.008	0.0001	0.0053	0.47	-0.83	-0.11	0.04	-0.04	-0.16
25	10.008	.0000	0.0042	0.48	-0.81	-0.11	0.05	.00	0.02
26	10.008	.0000	0.0037	0.33	-0.84	-0.12	0.10	0.08	-0.10
-2	10.008	0.0101	1.0052	-1.88	2.54	10.74	0.93	0.37	-0.27

Table L1b

POSITION (in)	b4	a4	b5	a5	b6	a6	b7	a7	b8	a8
			MD3 LONG IRON							
-2	0.93	-0.01	0.07	-0.04	0.17	-0.03	0.02	0.02	0.04	0.01
-1	0.91	-0.04	-0.01	-0.04	0.12	.00	0.03	-0.02	0.05	0.01
0	0.93	-0.17	.00	-0.13	0.13	-0.04	-0.01	-0.01	0.05	0.01
1	0.92	-0.16	0.02	-0.12	0.11	-0.01	.00	-0.02	0.05	.00
2	0.96	-0.14	0.06	-0.14	0.15	-0.02	.00	-0.03	0.04	.00
3	0.91	-0.08	0.06	-0.16	0.15	.00	-0.02	.00	0.06	-0.01
4	0.80	-0.11	0.01	-0.11	0.18	-0.01	-0.01	-0.02	0.04	.00
5	0.76	-0.07	0.07	-0.11	0.16	-0.04	.00	0.01	0.04	.00
6	0.72	-0.06	0.09	-0.08	0.14	0.01	-0.02	-0.01	0.03	-0.01
7	0.68	-0.04	0.07	-0.07	0.19	0.01	0.01	.00	0.03	.00
8	0.68	0.03	0.07	-0.03	0.16	0.04	0.01	.00	0.04	.00
9	0.67	0.02	0.09	.00	0.16	0.03	0.01	.00	0.04	.00
10	0.39	-0.10	0.13	0.05	0.17	0.03	0.02	-0.01	0.05	0.01
11	0.14	-0.13	0.14	0.01	0.08	.00	0.07	-0.02	0.05	0.01
12	0.20	-0.20	0.13	-0.08	0.08	-0.03	0.08	-0:03	0.06	0.02
13	-0.04	-0.36	0.09	-0.16	0.06	-0.03	0.06	-0.04	0.05	0.02
14	-0.87	-0.39	0.01	-0.15	0.05	-0.07	0.06	-0.03	0.03	0.01
15	-0.80	-0.32	0.07	-0.19	0.07	-0.08	0.03	-0.04	0.04	0.01
16	-0.48	-0.41	0.12	-0.50	0.42	-0.05	0.05	-0.05	0.05	0.02
17	-1.85	-0.09	0.06	-0.20	-0.01	-0.09	0.02	0.03	-0.02	0.01
18	-1.03	0.09	0.12	-0.15	-0.09	-0.07	0.01	0.02	-0.03	-0.01
19	-0.92	-0.01	-0.01	-0.07	-0.08	-0.06	0.02	0.01	-0.02	.00
20	-1.79	0.09	-0.01	0.22	-0.41	-0.07	.00	0.02	-0.05	-0.02
21	-0.03	0.02	0.01	0.03	-0.03	-0.03	0.01	-0.02	0.01	0.01
22	-0.05	0.08	-0.01	0.01	0.01	0.04	0.01	-0.02	-0.02	.00
23	-0.03	-0.01	-0.01	-0.01	0.03	.00	.00	-0.03	.00	0.01
24	-0.02	0.08	0.01	-0.01	0.02	0.02	-0.01	-0.01	-0.01	0.01
25	.00	0.01	.00	-0.02	0.04	-0.01	-0.03	-0.01	0.01	0.01
26	0.06	0.04	.00	-0.03	0.03	0.02	-0.02	-0.01	.00	-0.01
-2	0.89	-0.01	0.06	0.01	0.16	-0.01	0.01	-0.01	0.06	.00

Table L2a

POSITION (in)	CURRENT (A)	B (T)	TRANSFER FUNCTIO (T/kA)	b1	a1	MD3 LONG IRON b2	INNER a2	b3	a3
-2	10.01	0.0044	0.44	6.66	4.73	-172.5	5.96	2.99	-0.34
-1	10.01	0.0044	0.44	4.00	10.20	-172.4	6.13	2.69	-1.16
0	10.01	0.0044	0.44	-1.52	18.97	-172.9	6.50	2.56	-2.52
1	10.01	0.0044	0.44	-3.65	23.26	-173.1	6.68	2.38	-2.38
2	10.01	0.0044	0.44	-1.45	25.50	-174.5	5.68	2.75	-2.75
3	10.01	0.0044	0.44	0.74	21.87	-175.5	5.24	2.54	-2.54
4	10.01	0.0045	0.45	5.73	15.97	-175.6	4.66	2.21	-2.09
5	10.01	0.0045	0.45	2.59	12.24	-176.2	3.88	1.95	-1.91
6	10.01	0.0045	0.45	4.39	8.10	-176.7	3.29	1.88	-1.82
7	10.01	0.0045	0.45	3.70	9.89	-178.2	2.66	2.45	-2.39
8	10.01	0.0045	0.45	2.57	10.44	-179.0	2.92	2.82	-2.72
9	10.01	0.0045	0.44	0.67	12.07	-180.4	2.65	3.73	-3.64
10	10.01	0.0044	0.44	-1.72	13.40	-183.3	2.72	3.62	-3.62
11	10.01	0.0045	0.45	-2.61	21.24	-183.8	3.11	5.74	-5.65
12	10.01	0.0045	0.45	-6.50	24.96	-184.9	2.34	6.69	-6.69
13	10.01	0.0045	0.45	-5.79	23.22	-188.7	2.76	7.89	-7.84
14	10.01	0.0045	0.45	-5.23	18.79	-184.8	4.15	7.27	-7.28
15	10.01	0.0044	0.44	-5.79	13.65	-180.1	4.01	6.52	-6.53
16	10.01	0.0042	0.42	-4.43	9.15	-155.5	-9.64	5.23	-5.24
17	10.01	0.0034	0.34	-0.59	3.98	-151.5	-19.40	1.50	-1.22
18	10.01	0.0023	0.23	1.72	-1.97	-121.4	-23.79	1.09	-0.02
19	10.01	0.0011	0.11	3.33	-6.43	-81.9	-21.64	1.47	1.19
20	10.01	0.0003	0.03	1.69	-9.72	-58.3	-2.63	-1.86	1.94
21	10.01	0.0001	0.01	.00	-10.68	8.7	0.97	-0.39	0.38
22	10.01	0.0001	0.01	0.69	-4.98	-0.9	-0.15	-0.14	0.04
23	10.01	0.0001	0.01	0.72	-3.14	-0.6	0.12	-0.06	-0.06
24	10.01	0.0001	0.01	1.31	-2.06	-0.5	0.04	-0.03	-0.01
25	10.01	.0000	.00	1.34	-1.37	0.1	0.47	-0.03	-0.08
26	10.01	.0000	.00	0.65	-0.93	-0.2	0.21	0.01	-0.15

Table L2b

POSITION MD3 LONG IRON INNER

(in)	b4	a4	b5	a5	b6	a6	b7	a7	b8	a8
-2	20.83	-0.56	0.05	-0.18	1.01	-0.07	0.03	0.03	0.04	-0.03
-1	20.92	-0.78	0.21	-0.23	0.98	-0.13	0.03	0.05	0.03	-0.01
0	21.25	-0.86	0.07	-0.47	1.00	0.05	0.02	0.05	-0.02	-0.03
1	21.43	-1.00	0.24	-0.65	0.99	0.02	0.05	0.10	0.02	-0.02
2	21.44	-0.66	0.07	-0.49	0.99	-0.08	.00	0.10	-0.01	-0.01
3	21.30	-0.56	-0.04	-0.50	1.02	0.01	-0.03	0.03	-0.02	0.02
4	21.32	-0.40	0.03	-0.39	1.02	-0.09	-0.03	0.01	.00	.00
5	21.07	-0.50	0.11	-0.37	1.06	-0.05	-0.02	-0.04	-0.01	-0.02
6	21.23	-0.43	0.09	-0.36	1.04	0.06	-0.02	0.01	-0.03	.00
7	20.98	-0.44	0.07	-0.29	1.00	-0.02	.00	0.02	-0.04	-0.05
8	20.96	-0.27	0.22	-0.04	1.06	0.10	-0.02	0.06	.00	-0.01
9	20.90	-0.15	0.18	-0.11	1.00	0.01	0.05	0.02	-0.05	0.01
10	20.19	-0.56	0.22	-0.13	1.04	0.06	0.05	0.02	-0.01	.00
11	19.44	-0.49	0.22	-0.34	0.91	-0.04	0.13	.00	0.01	0.01
12	19.64	-0.76	0.34	-0.54	0.80	-0.04	0.18	0.01	0.01	-0.02
13	19.08	-1.14	0.15	-0.87	0.80	-0.09	0.13	0.03	0.03	-0.01
14	17.02	-1.25	0.02	-0.86	0.87	-0.23	0.12	-0.02	-0.02	0.01
15	16.68	-1.20	0.10	-1.05	0.75	-0.26	0.08	-0.04	.00	-0.02
16	14.71	-1.75	0.12	-1.60	1.47	-0.24	0.09	-0.11	0.05	0.03
17	6.16	-0.95	0.09	-0.81	0.25	-0.23	.00	0.06	-0.07	0.01
18	4.43	-0.10	0.11	-0.77	0.02	-0.15	0.07	0.06	-0.08	-0.01
19	0.37	-0.16	-0.09	-0.28	-0.14	-0.06	0.07	0.03	-0.09	0.01
20	-3.25	1.03	0.04	0.43	-0.83	0.12	.00	0.08	-0.11	0.01
21	-0.61	-0.06	-0.05	-0.08	0.04	0.08	-0.03	0.01	-0.01	0.02
22	-0.07	0.05	0.02	-0.10	-0.03	-0.01	.00	-0.01	-0.01	0.01
23	-0.13	0.07	-0.05	-0.01	-0.01	0.05	-0.02	0.02	.00	0.01
24	-0.09	0.14	-0.01	-0.07	0.02	0.10	-0.02	-0.04	0.01	0.01
25	-0.03	0.07	.00	0.01	0.06	0.03	-0.04	-0.04	0.01	0.02
26	.00	0.15	0.02	-0.08	.00	0.04	-0.02	-0.03	0.04	-0.01

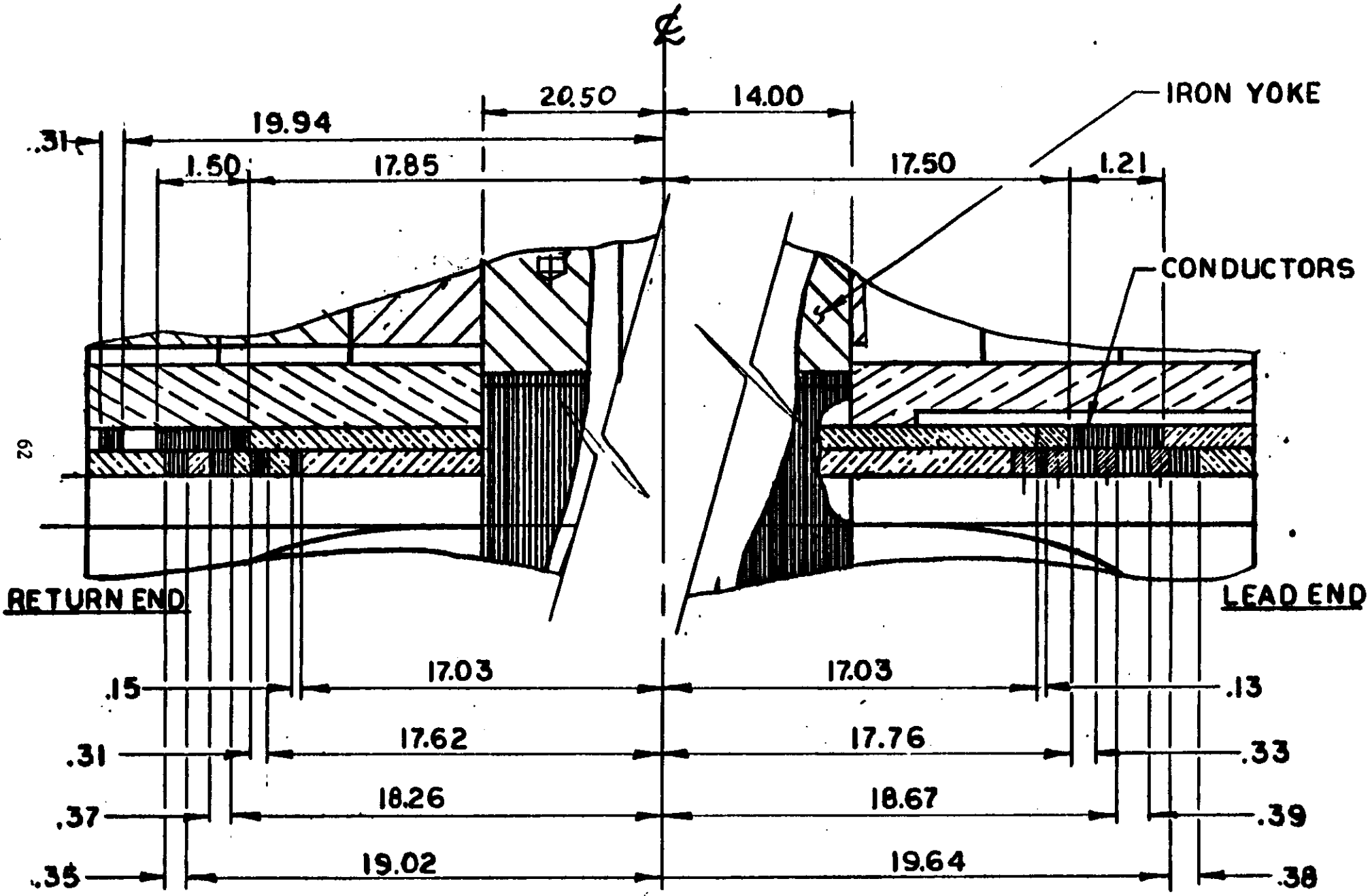
Table L3a

POSITION (in)	CURRENT (A)	B-CENTR (T)	TRANSFER FUNCTIO (T/kA)	b1	a1	b2	a2	b3	a3
					MD3 OUTER LONG IRON				
-0.5	10.01	0.0054	0.538	-12.19	6.31	163.38	-1.52	-3.42	0.07
0.5	10.01	0.0054	0.539	-13.99	3.39	164.30	-0.26	-3.71	0.90
1.5	10.01	0.0054	0.539	-13.29	2.76	163.97	0.61	-3.42	1.73
2.5	10.01	0.0054	0.540	-12.38	2.40	164.52	1.66	-3.28	1.79
3.5	10.01	0.0054	0.540	-12.88	0.51	164.90	0.85	-3.48	2.09
4.5	10.01	0.0054	0.541	-10.60	-1.72	166.01	0.36	-2.87	1.95
5.5	10.01	0.0054	0.542	-9.43	-2.31	166.10	-0.43	-2.64	1.33
6.5	10.01	0.0054	0.543	-1.98	-5.14	166.65	-0.76	-1.70	1.47
7.5	10.01	0.0054	0.543	-2.82	-6.43	166.37	-0.87	-1.77	1.39
8.5	10.01	0.0054	0.543	-1.03	-8.57	166.20	-0.99	-1.87	1.74
9.5	10.01	0.0054	0.542	-2.57	-8.79	165.99	-1.21	-1.86	1.58
10.5	10.01	0.0054	0.542	-1.05	-12.87	165.17	-1.63	-2.41	2.37
11.5	10.01	0.0054	0.541	-3.79	-15.71	165.06	-1.60	-2.67	2.54
12.5	10.01	0.0054	0.541	-3.79	-23.28	164.53	-1.75	-4.00	3.91
13.5	10.01	0.0054	0.542	-0.38	-30.12	164.78	-1.33	-5.18	5.18
14.5	10.01	0.0054	0.542	1.01	-34.05	164.75	-1.37	-5.87	5.86
15.5	10.01	0.0054	0.542	3.29	-35.90	165.51	-1.51	-6.42	6.42
16.5	10.01	0.0054	0.538	2.48	-36.49	161.61	-1.62	-6.52	6.51
17.5	10.01	0.0051	0.514	-0.06	-30.79	129.99	-0.97	-6.83	6.81
18.5	10.01	0.0045	0.450	-2.49	-18.89	84.46	0.64	-5.21	5.20
19.5	10.01	0.0034	0.341	-2.21	-9.09	29.10	1.50	-3.77	3.76
20.5	10.01	0.0021	0.211	-2.78	-2.52	-12.13	2.02	-1.78	1.78
21.5	10.01	0.0010	0.096	-2.04	-3.51	-19.46	1.96	-0.34	0.31
22.5	10.01	0.0003	0.026	-0.57	-5.55	-15.71	0.25	-0.24	0.10
23.5	10.01	.0000	0.003	-0.23	-5.49	3.05	-0.57	-0.05	-0.12
24.5	10.01	0.0001	0.006	0.47	-2.58	-0.29	0.03	0.09	0.03
25.5	10.01	0.0001	0.005	1.05	-1.85	-0.14	-0.20	.00	0.07
26.5	10.01	.0000	0.004	0.78	-0.97	-0.13	0.09	-0.02	-0.01
27.5	10.01	.0000	0.004	1.06	-0.58	-0.04	.00	0.26	-0.21

Table L3b

MD3 LONG IRON OUTER

POSITION	b4	a4	b5	a5	b6	a6	b7	a7	b8	a8
-2	-15.40	0.34	-0.03	0.06	-0.58	-0.05	.00	-0.05	0.08	0.01
-1	-15.33	0.20	-0.06	0.06	-0.57	-0.09	-0.02	-0.04	0.11	0.01
0	-15.30	0.20	-0.19	0.12	-0.56	-0.10	-0.01	-0.03	0.09	.00
1	-15.45	0.07	-0.10	0.07	-0.61	-0.10	0.02	-0.03	0.09	-0.02
2	-15.65	0.05	.00	0.01	-0.59	-0.12	0.07	-0.05	0.07	-0.02
3	-15.81	-0.07	0.10	0.06	-0.58	-0.03	-0.05	-0.05	0.09	-0.05
4	-16.00	0.06	.00	-0.05	-0.54	-0.09	-0.01	-0.05	0.09	-0.01
5	-16.13	-0.07	0.11	0.01	-0.54	-0.05	.00	-0.02	0.08	-0.03
6	-15.96	0.08	0.01	-0.03	-0.53	-0.02	0.01	0.01	0.09	0.01
7	-15.97	0.02	.00	0.06	-0.49	-0.06	0.01	-0.03	0.09	-0.03
8	-16.00	0.18	0.07	.00	-0.55	-0.04	-0.01	-0.03	0.09	-0.03
9	-15.83	.00	0.02	0.12	-0.51	-0.05	0.05	-0.02	0.09	-0.01
10	-15.73	0.01	0.05	0.11	-0.53	0.01	0.02	-0.04	0.07	-0.01
11	-15.70	0.08	0.02	0.13	-0.49	.00	-0.01	-0.06	0.09	-0.02
12	-15.68	0.14	-0.06	0.25	-0.56	-0.02	-0.02	-0.03	0.07	.00
13	-15.72	0.17	0.02	0.29	-0.59	.00	-0.01	-0.08	0.05	-0.01
14	-15.61	0.15	-0.05	0.39	-0.50	-0.03	0.01	-0.06	0.05	0.01
15	-15.15	0.13	0.02	0.42	-0.50	-0.02	-0.02	-0.04	0.07	-0.01
16	-12.97	0.09	0.07	0.32	-0.38	-0.03	-0.01	-0.04	0.07	-0.01
17	-8.69	0.19	.00	0.21	-0.18	-0.03	.00	-0.03	0.04	0.02
18	-5.37	0.06	0.02	0.16	-0.12	0.01	0.02	.00	.00	0.01
19	-1.90	-0.01	0.01	0.04	-0.02	-0.04	0.01	.00	0.01	-0.01
20	-0.31	-0.20	-0.10	0.02	-0.03	-0.06	0.01	.00	0.02	-0.01
21	-0.62	-0.16	0.02	0.11	-0.02	-0.10	-0.01	-0.02	0.01	-0.01
22	-0.07	0.19	0.09	-0.03	.00	0.04	0.01	-0.03	0.01	0.01
23	0.06	0.09	-0.01	-0.04	0.04	0.01	-0.03	-0.01	.00	0.01
24	.00	0.16	0.03	-0.02	0.01	.00	.00	-0.04	0.01	0.02
25	-0.05	0.05	-0.03	0.01	0.03	0.05	-0.02	-0.02	0.01	0.01



MD-3 SSC MODEL DIPOLE

Fig. L1

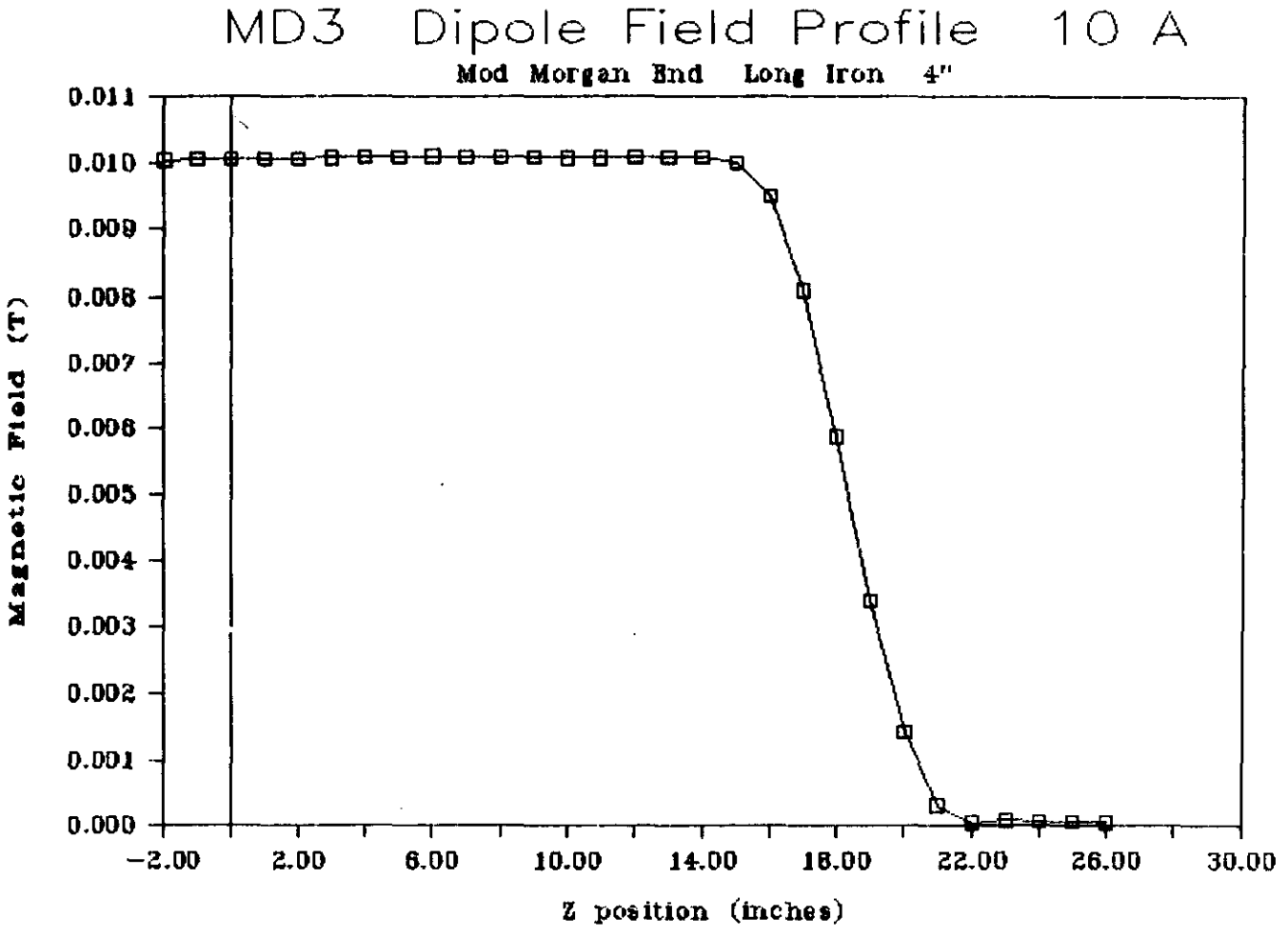

MD3 Dipole Field Profile 10 A
Mod Morgan End Long Iron 4"
Magnetic Field (T)
0.011
0.010
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
-2.00
2.00
6.00
10.00
14.00
18.00
22.00
26.00
30.00
Z position (inches)

Fig. L2

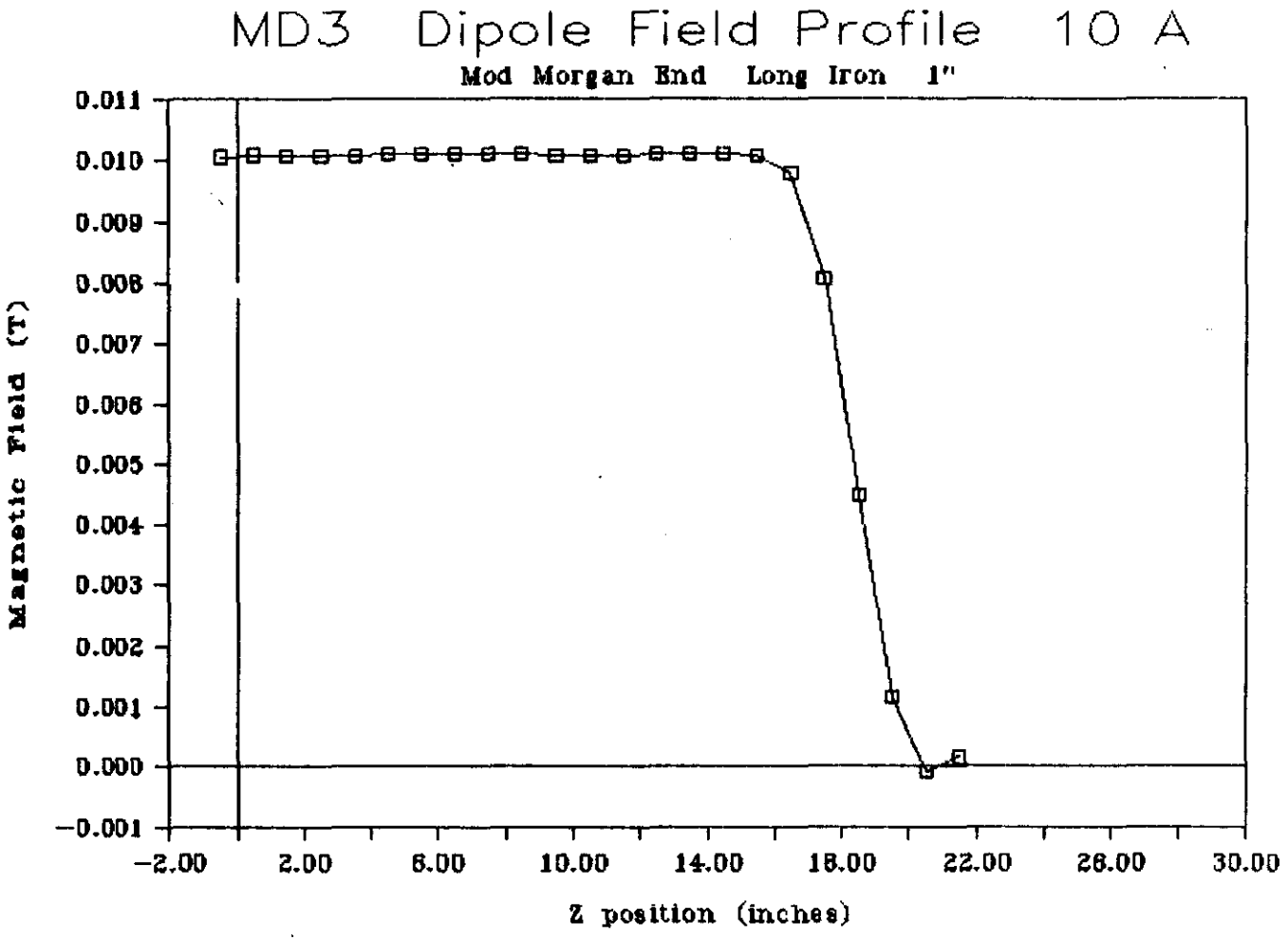

MD3 Dipole Field Profile 10 A
Mod Morgan End Long Iron 1"
Magnetic Field (T)
0.011
0.010
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
-0.001
-2.00
2.00
6.00
10.00
14.00
18.00
22.00
26.00
30.00
Z position (inches)

Fig. L3

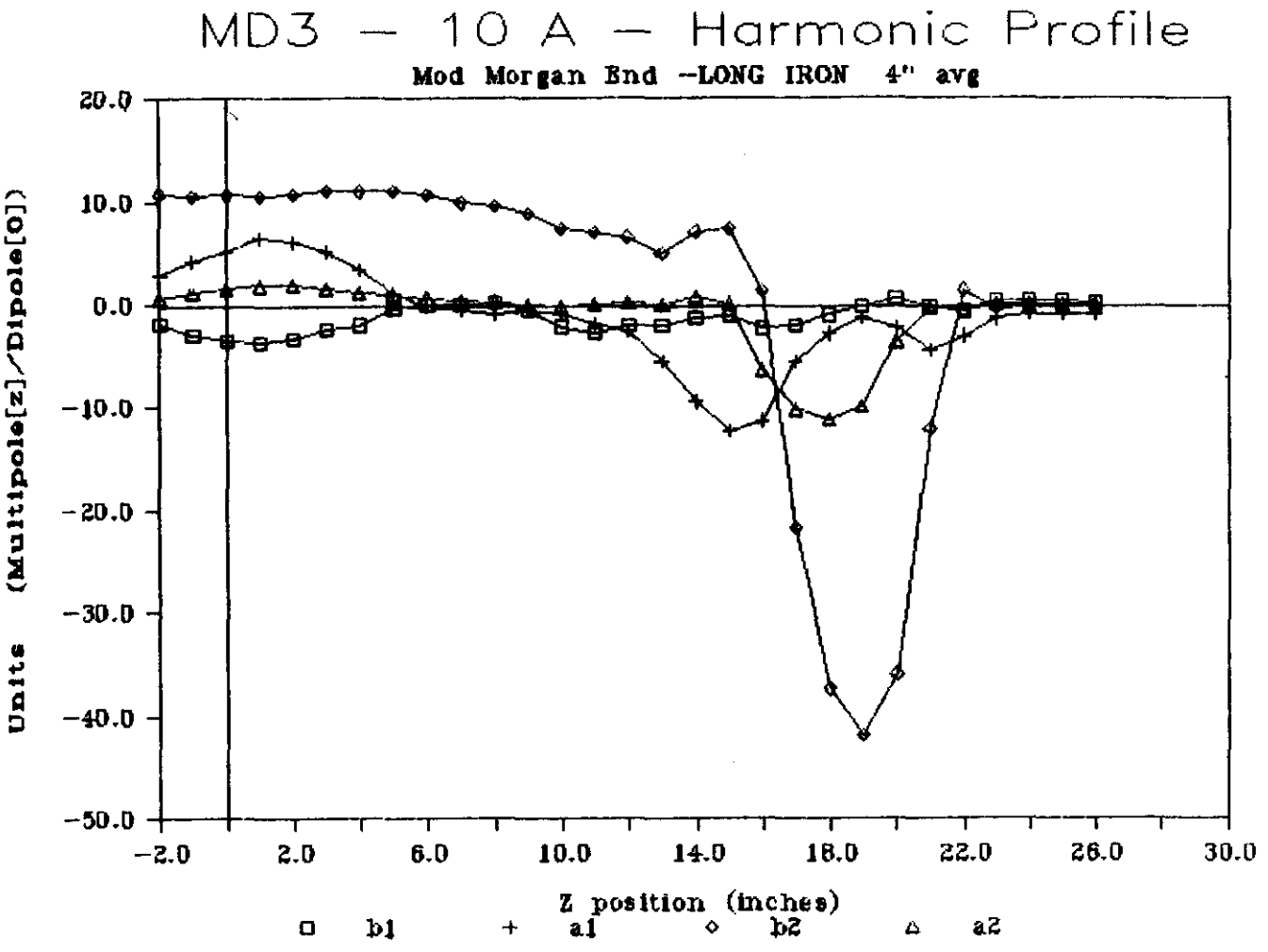

MD3 — 10 A — Harmonic Profile
Mod Morgan End -LONG IRON 4" avg
Units (Multipole[z]/Dipole[0])
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b1
a1
b2
a2

Fig. L4

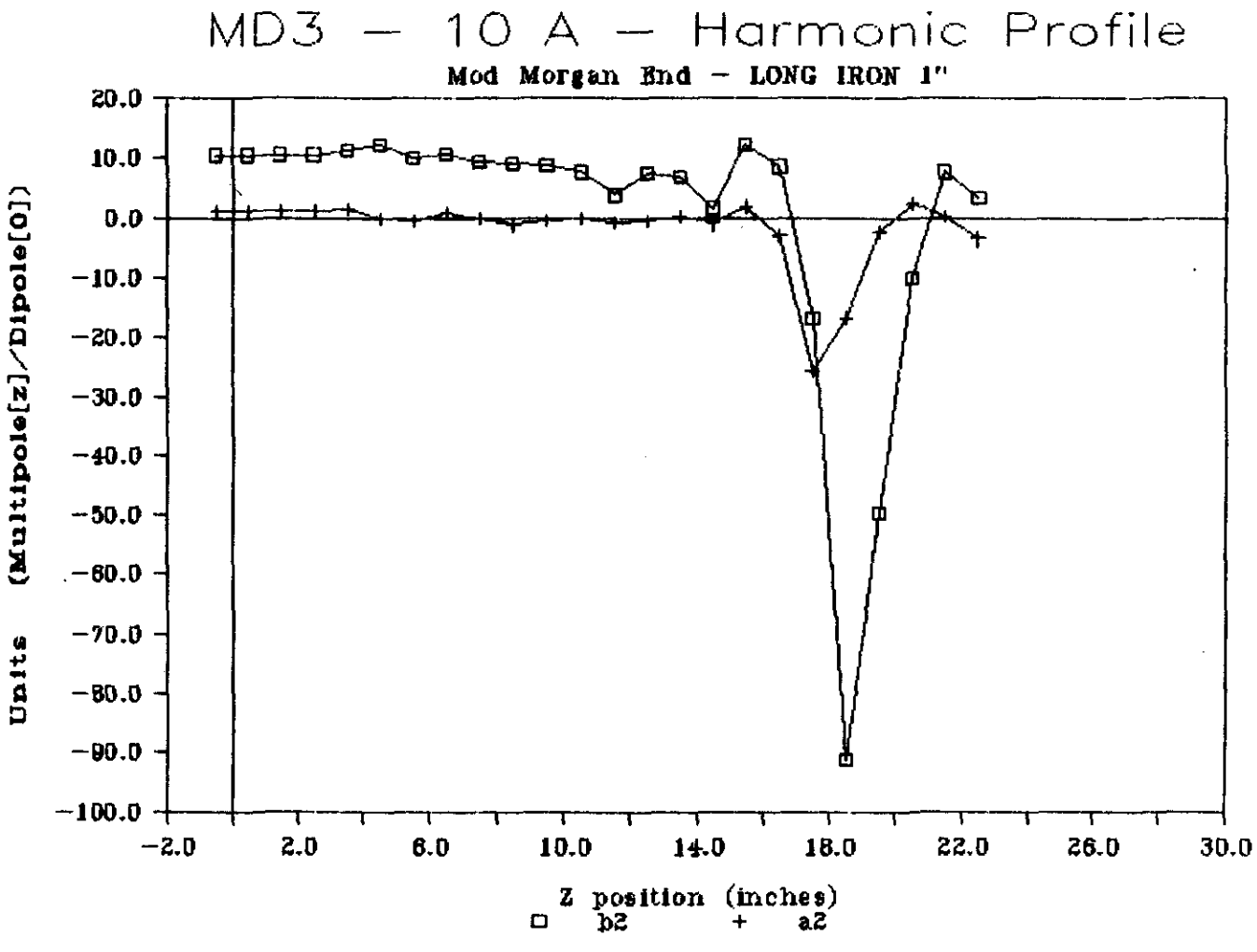

MD3 — 10 A — Harmonic Profile
Mod Morgan End - LONG IRON 1"
Units (Multipole[z]/Dipole[0])
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b2
a2

Fig. L5

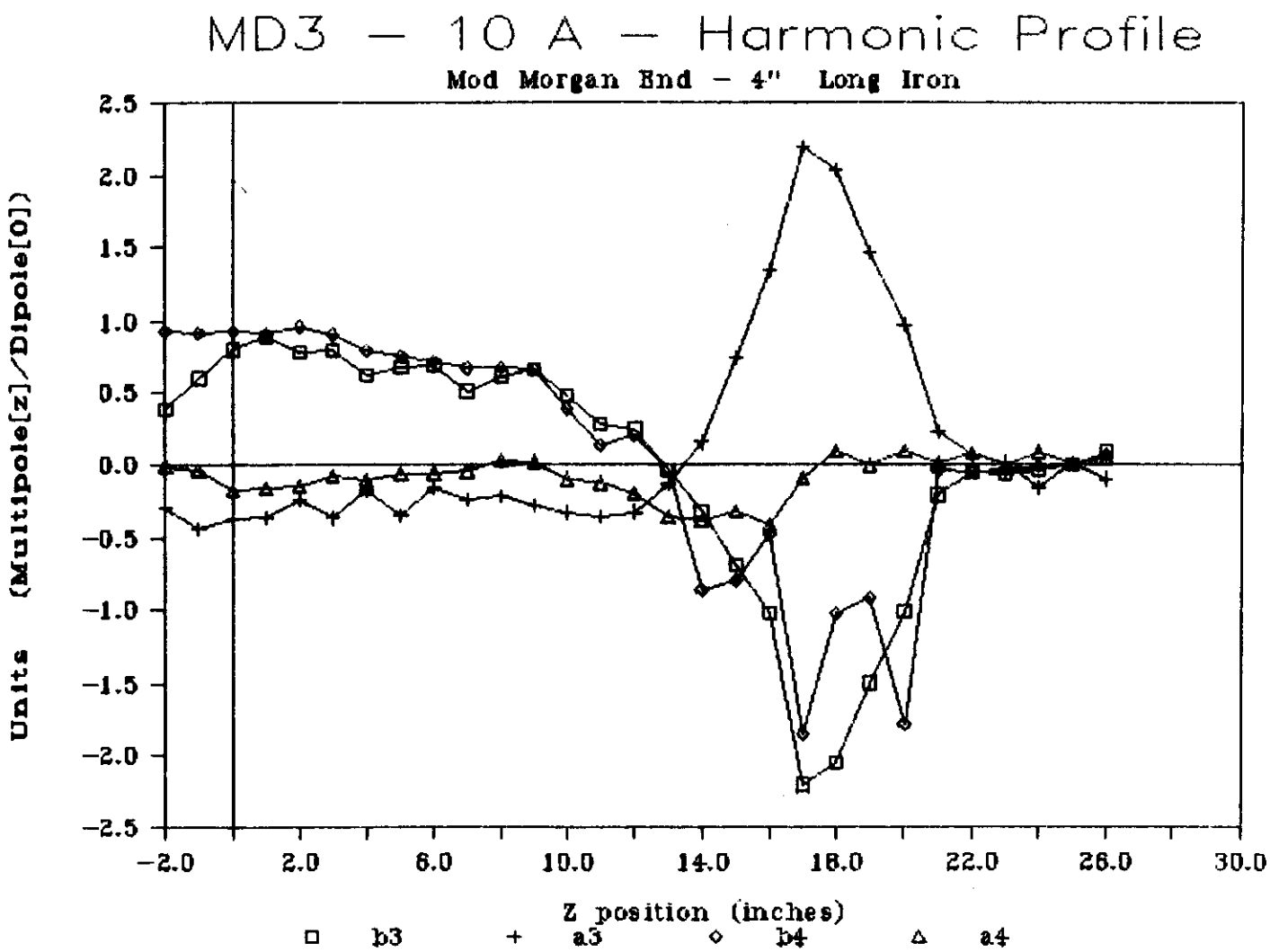

MD3 — 10 A — Harmonic Profile
Mod Morgan End - 4" Long Iron
Units (Multipole[z]/Dipole[0])
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b3
a3
b4
a4

Fig. L6

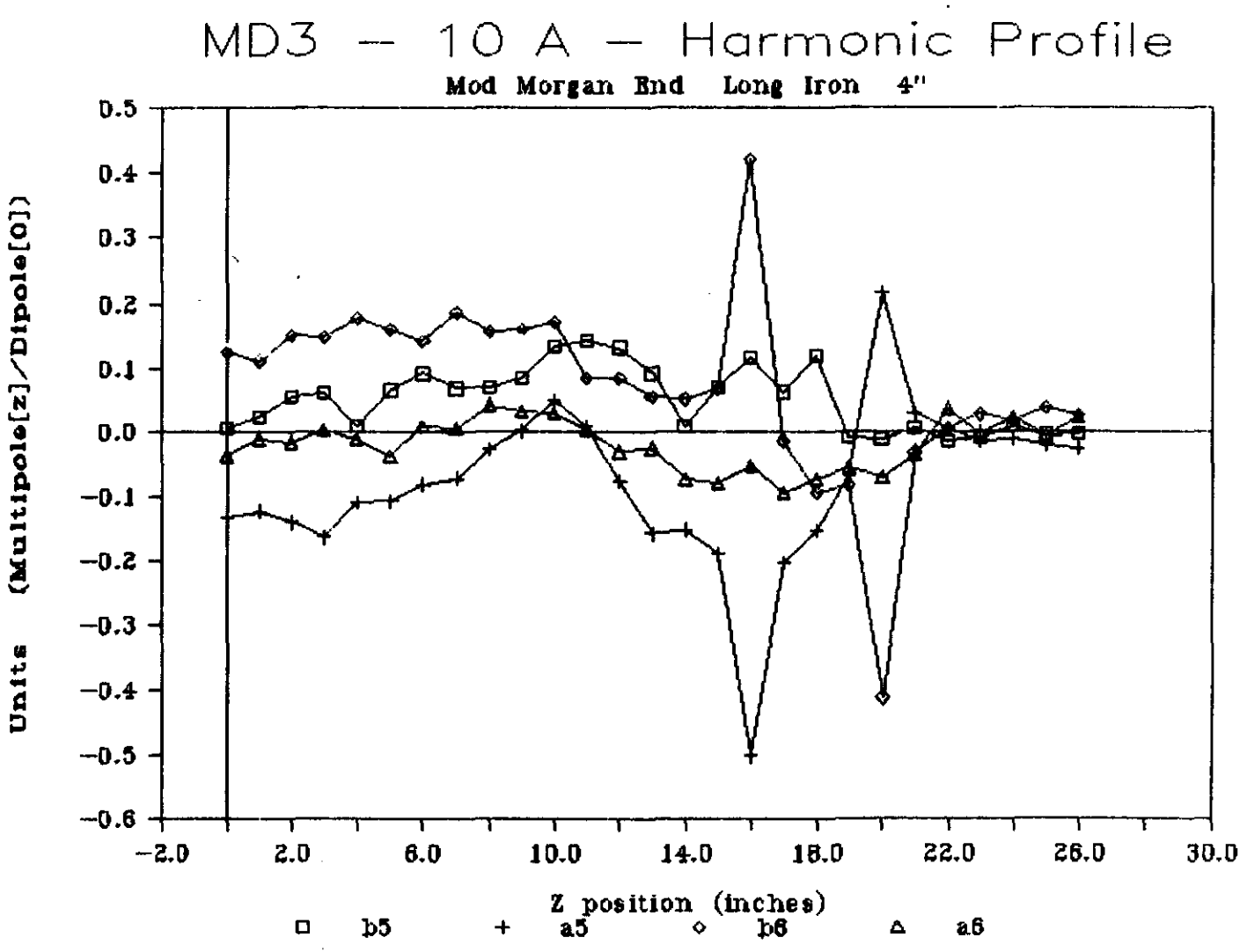

MD3 — 10 A — Harmonic Profile
Mod Morgan Bnd Long Iron 4"
Units (Multipole[z]/Dipole[0])
0.5
0.4
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
−0.4
−0.5
−0.6
−2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b5
a5
b6
a6

Fig. L7

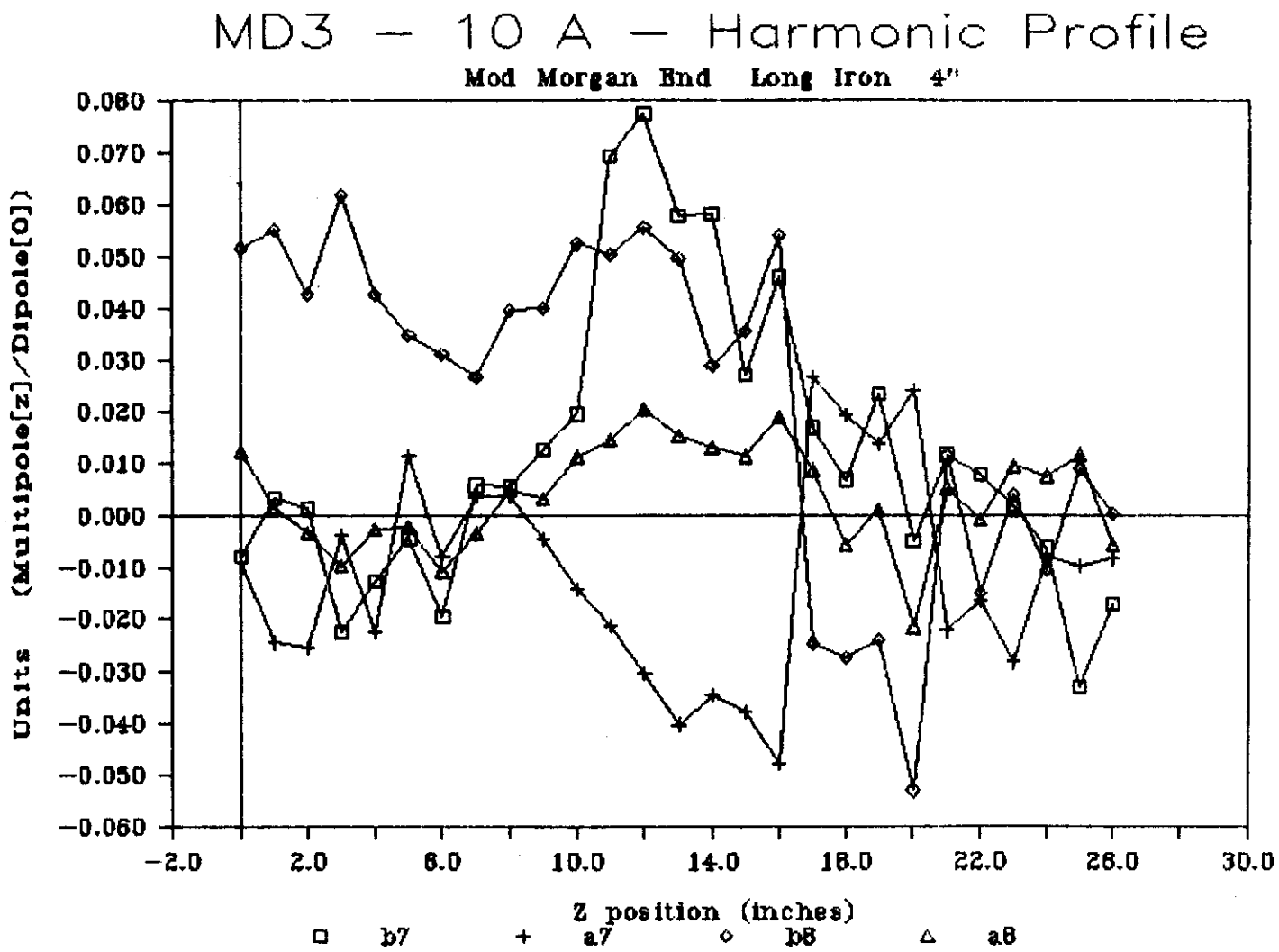

MD3 — 10 A — Harmonic Profile
Mod Morgan End Long Iron 4"
Units (Multipole[z]/Dipole[0])
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
-0.010
-0.020
-0.030
-0.040
-0.050
-0.060
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b7
a7
b8
a8

Fig. L8

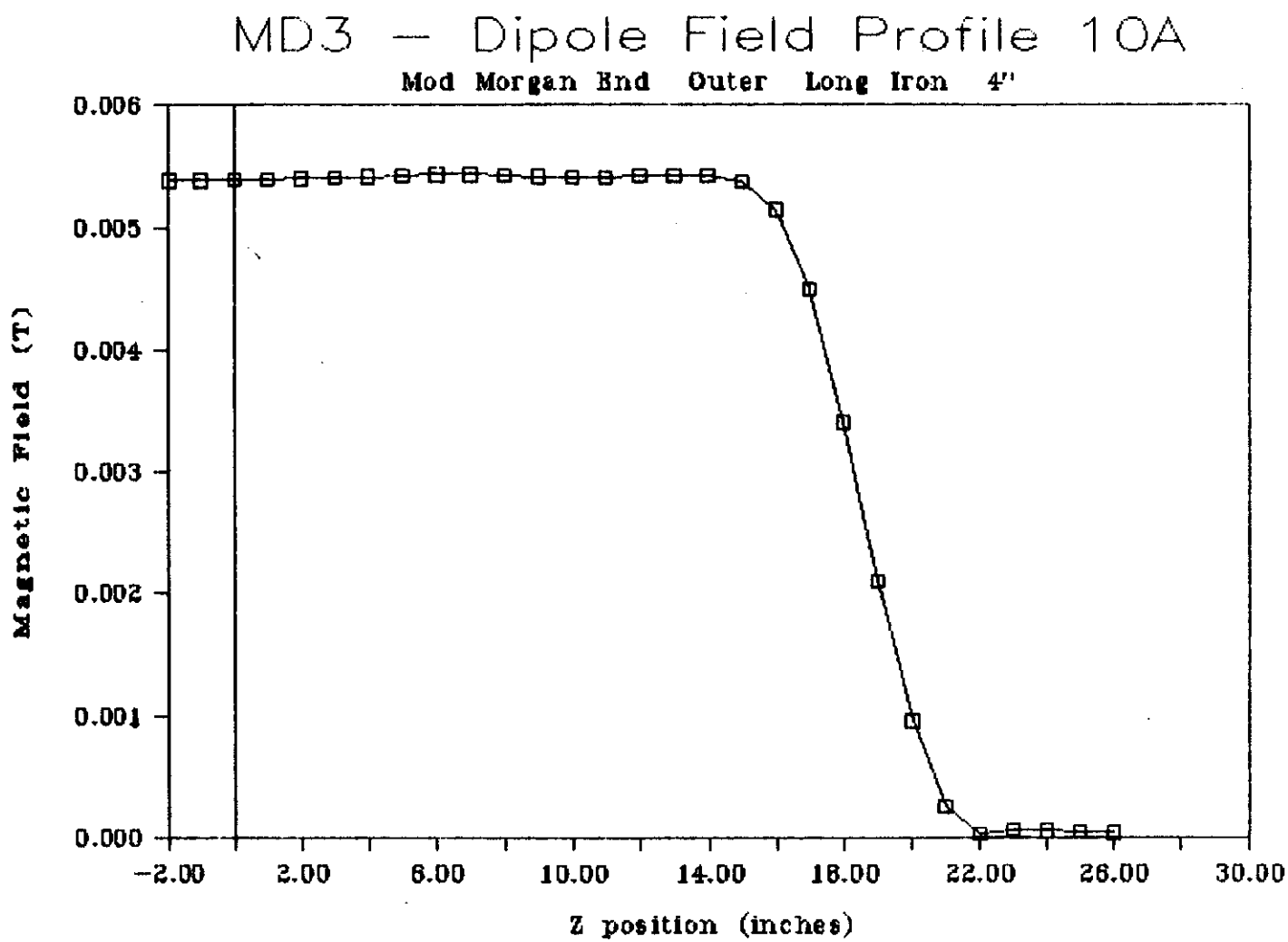

MD3 — Dipole Field Profile 10A
Mod Morgan End Outer Long Iron 4"
Magnetic Field (T)
0.006
0.005
0.004
0.003
0.002
0.001
0.000
-2.00
2.00
6.00
10.00
14.00
18.00
22.00
26.00
30.00
Z position (inches)

Fig. L9

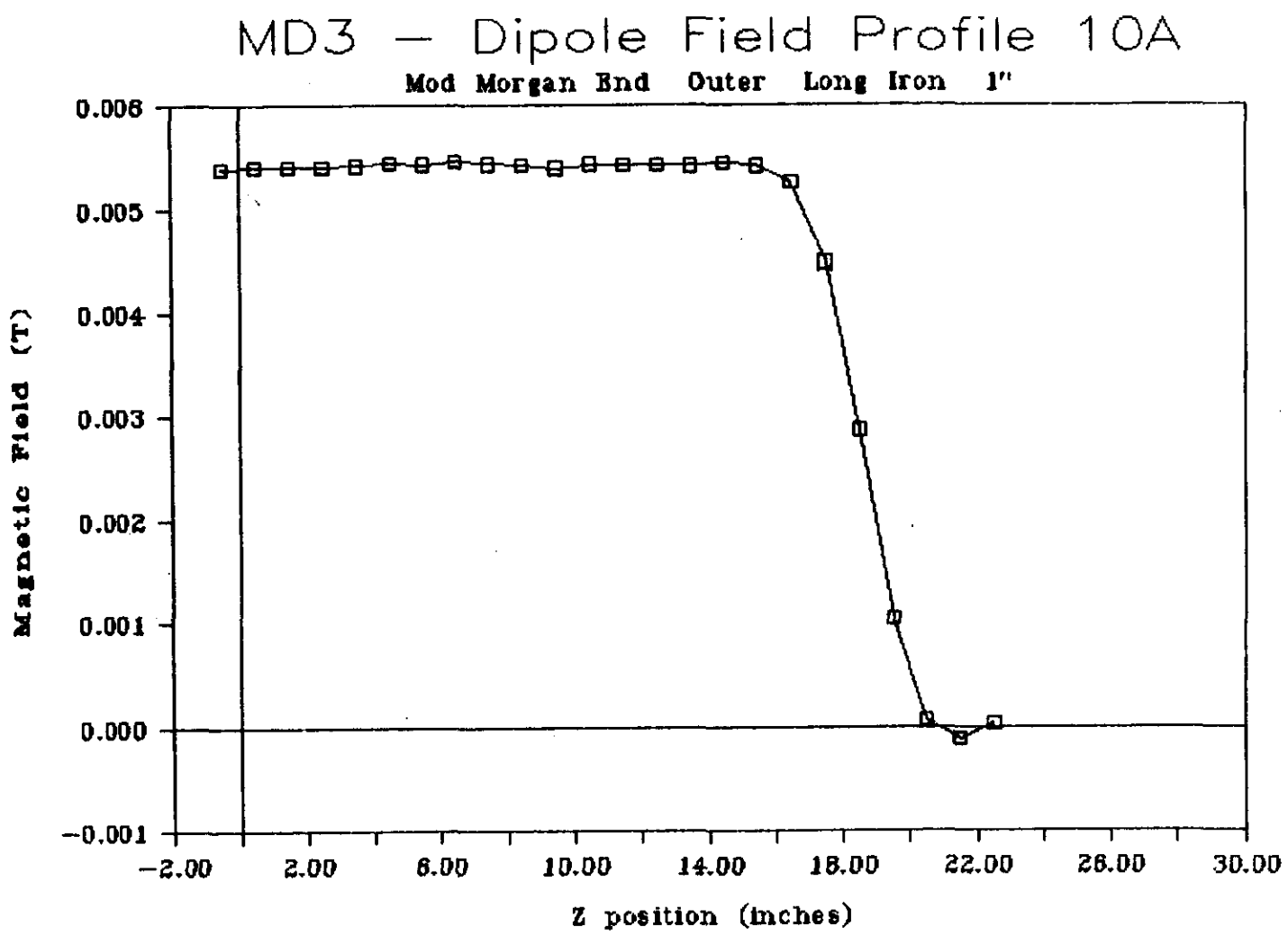

MD3 — Dipole Field Profile 10A
Mod Morgan Bnd Outer Long Iron 1"
Magnetic Field (T)
0.006
0.005
0.004
0.003
0.002
0.001
0.000
-0.001
-2.00
2.00
6.00
10.00
14.00
18.00
22.00
26.00
30.00
Z position (inches)

Fig. L10

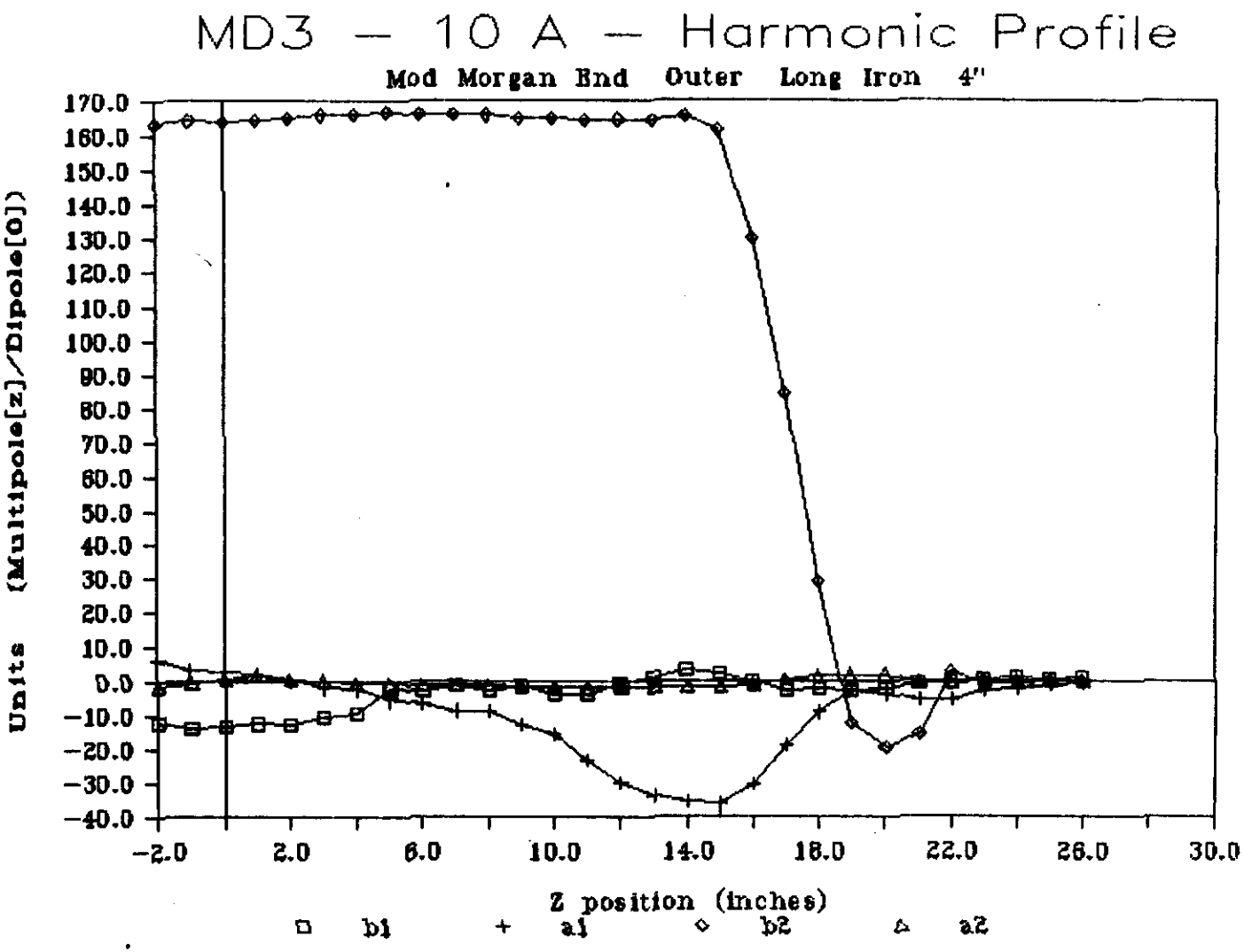

MD3 — 10 A — Harmonic Profile
Mod Morgan End Outer Long Iron 4"
Units (Multipole[z]/Dipole[0])
170.0
160.0
150.0
140.0
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b1
a1
b2
a2

Fig. L11

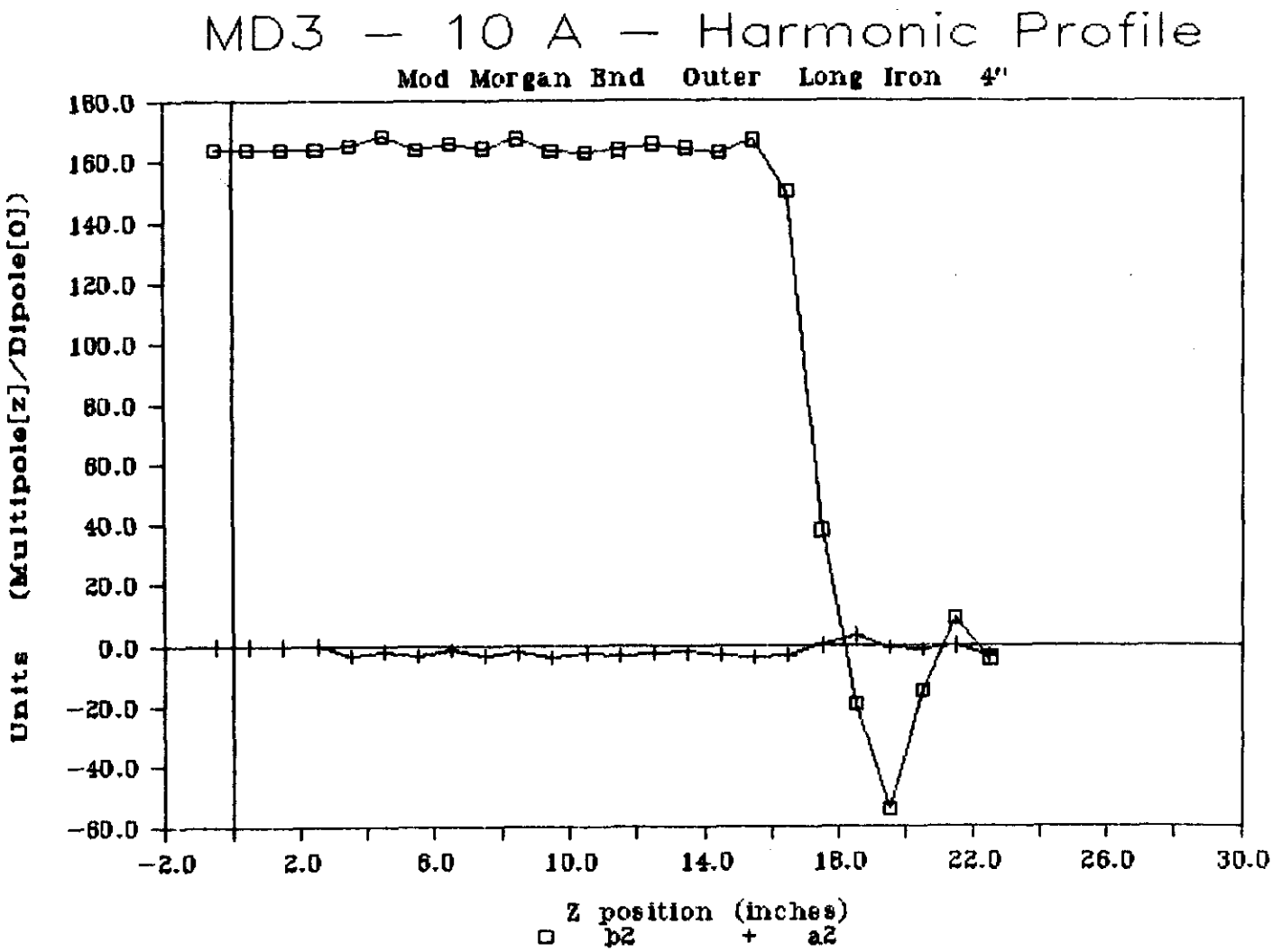

MD3 — 10 A — Harmonic Profile
Mod Morgan End Outer Long Iron 4"
Units (Multipole[z]/Dipole[0])
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
-20.0
-40.0
-60.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b2
a2

Fig. L12

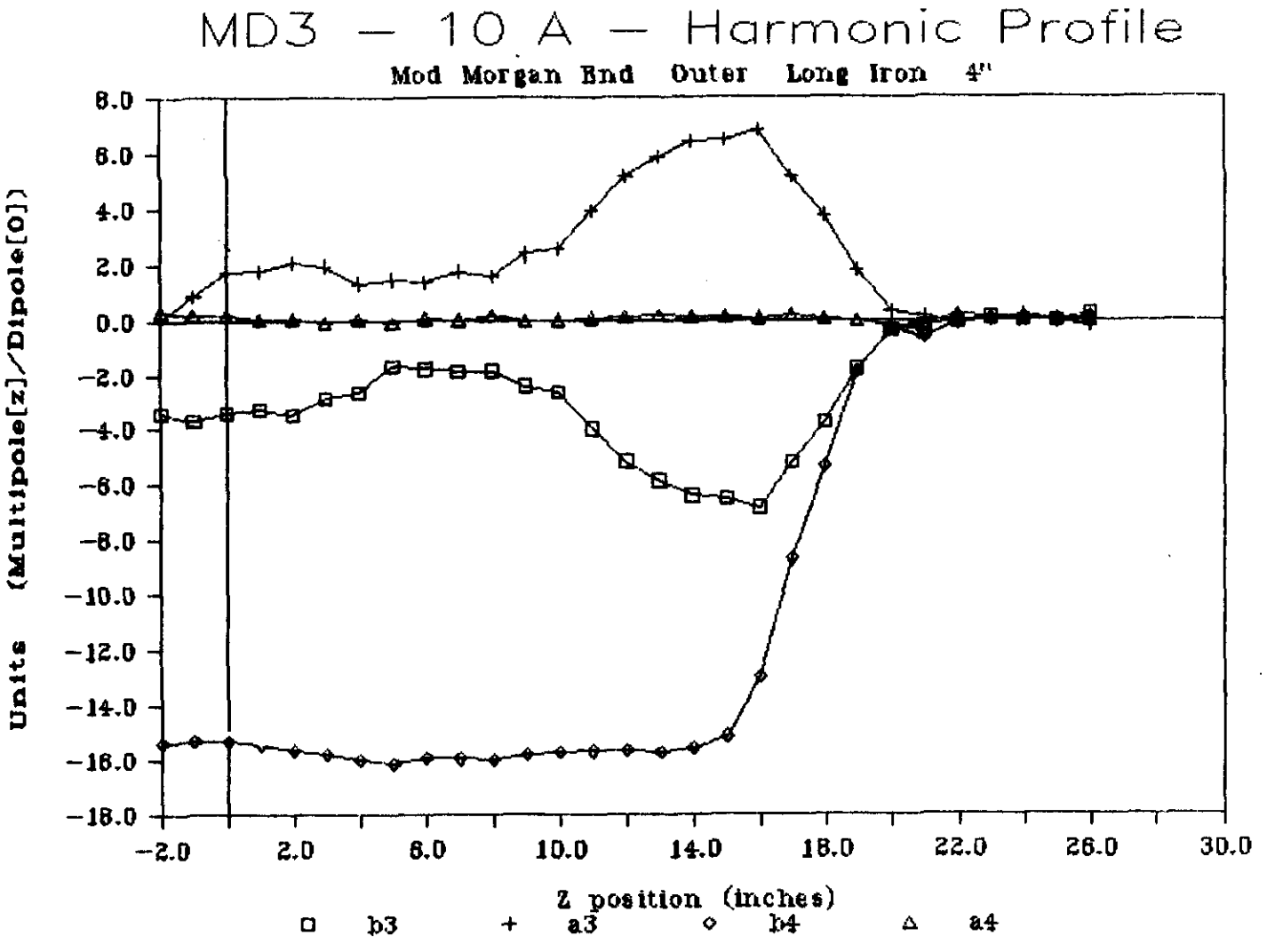

MD3 — 10 A — Harmonic Profile
Mod Morgan Bnd Outer Long Iron 4"
Units (Multipole[z]/Dipole[0])
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-14.0
-16.0
-18.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b3
a3
b4
a4

Fig. L13

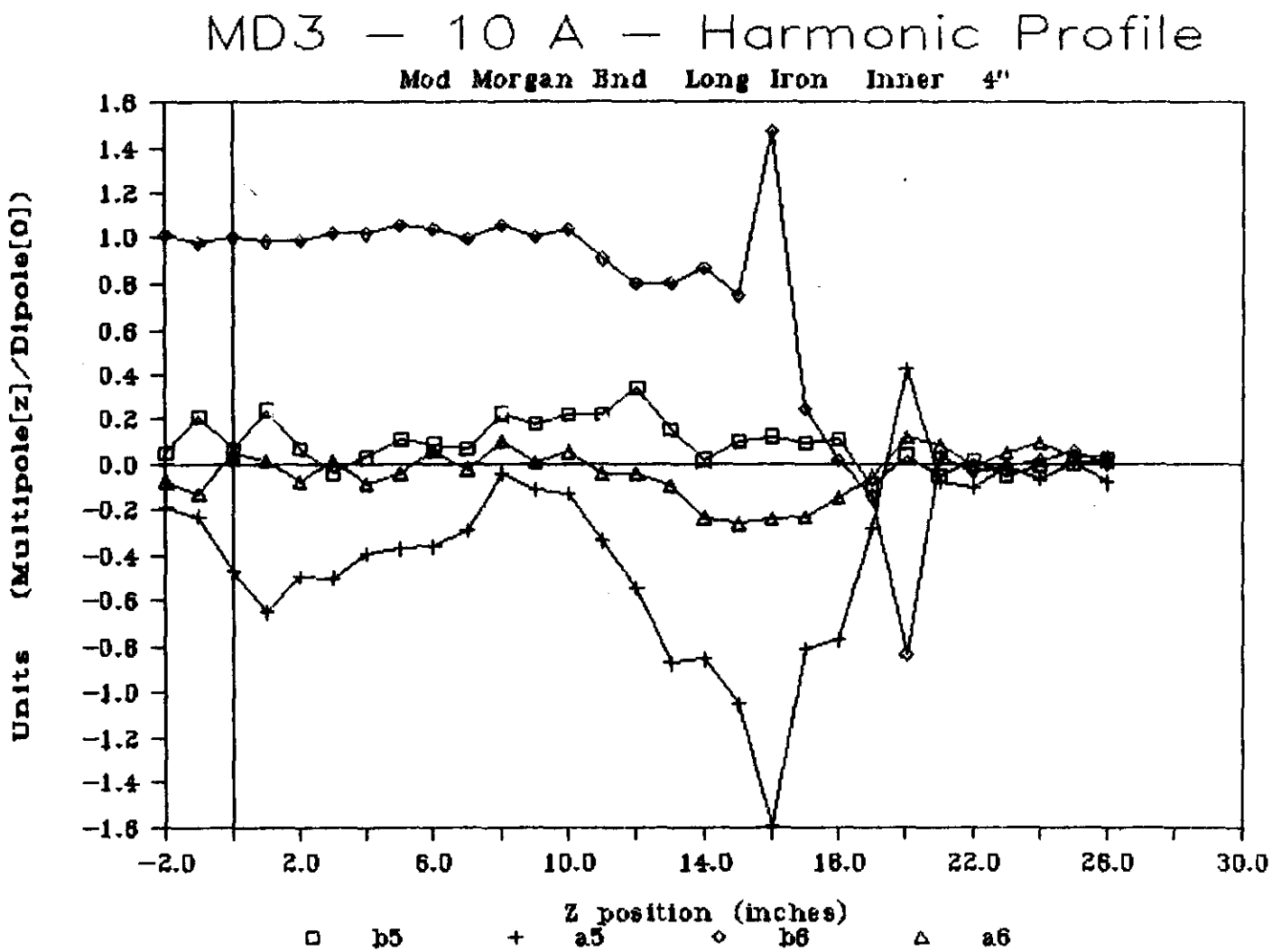

MD3 — 10 A — Harmonic Profile
Mod Morgan End Long Iron Inner 4"
Units (Multipole[z]/Dipole[0])
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
-1.4
-1.6
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b5
a5
b6
a6

Fig. L14

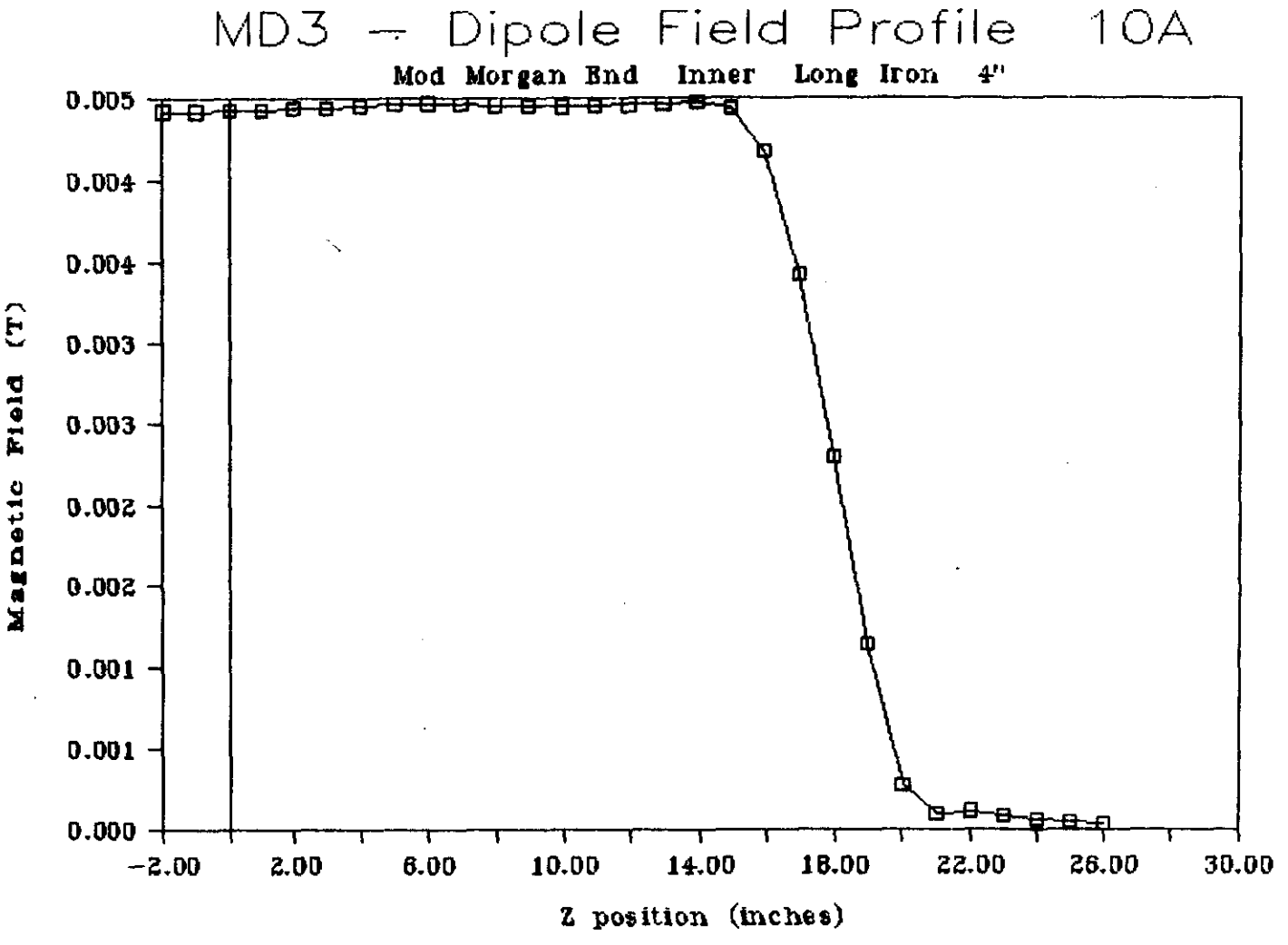

MD3 – Dipole Field Profile 10A
Mod Morgan End Inner Long Iron 4"
Magnetic Field (T)
0.005
0.004
0.004
0.003
0.003
0.002
0.002
0.001
0.001
0.000
-2.00
2.00
6.00
10.00
14.00
18.00
22.00
26.00
30.00
Z position (inches)

Fig. L15

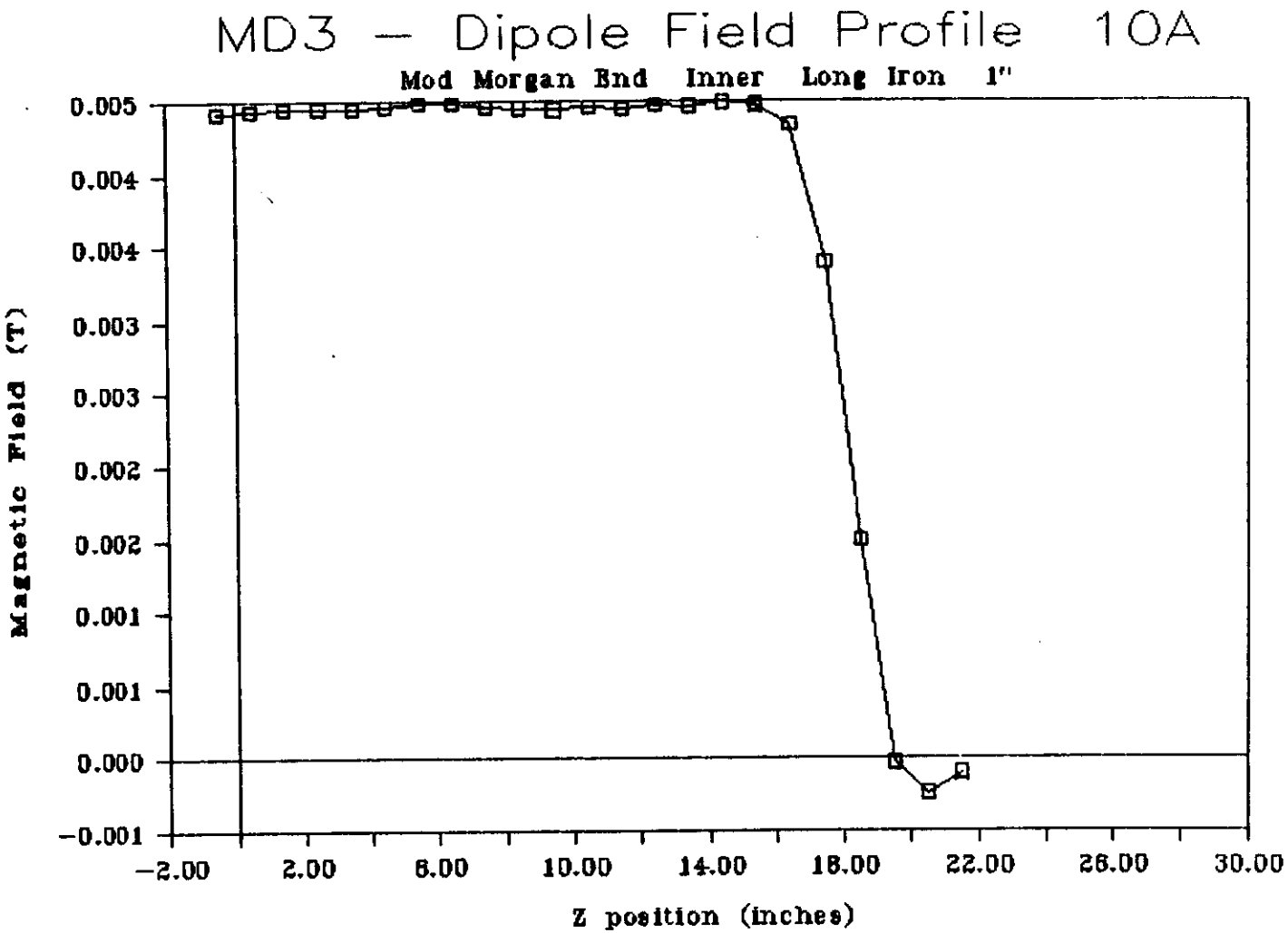

MD3 — Dipole Field Profile 10A
Mod Morgan Bnd Inner Long Iron 1"
Magnetic Field (T)
0.005
0.004
0.004
0.003
0.003
0.002
0.002
0.001
0.001
0.000
-0.001
-2.00
2.00
6.00
10.00
14.00
18.00
22.00
26.00
30.00
Z position (inches)

Fig. L16

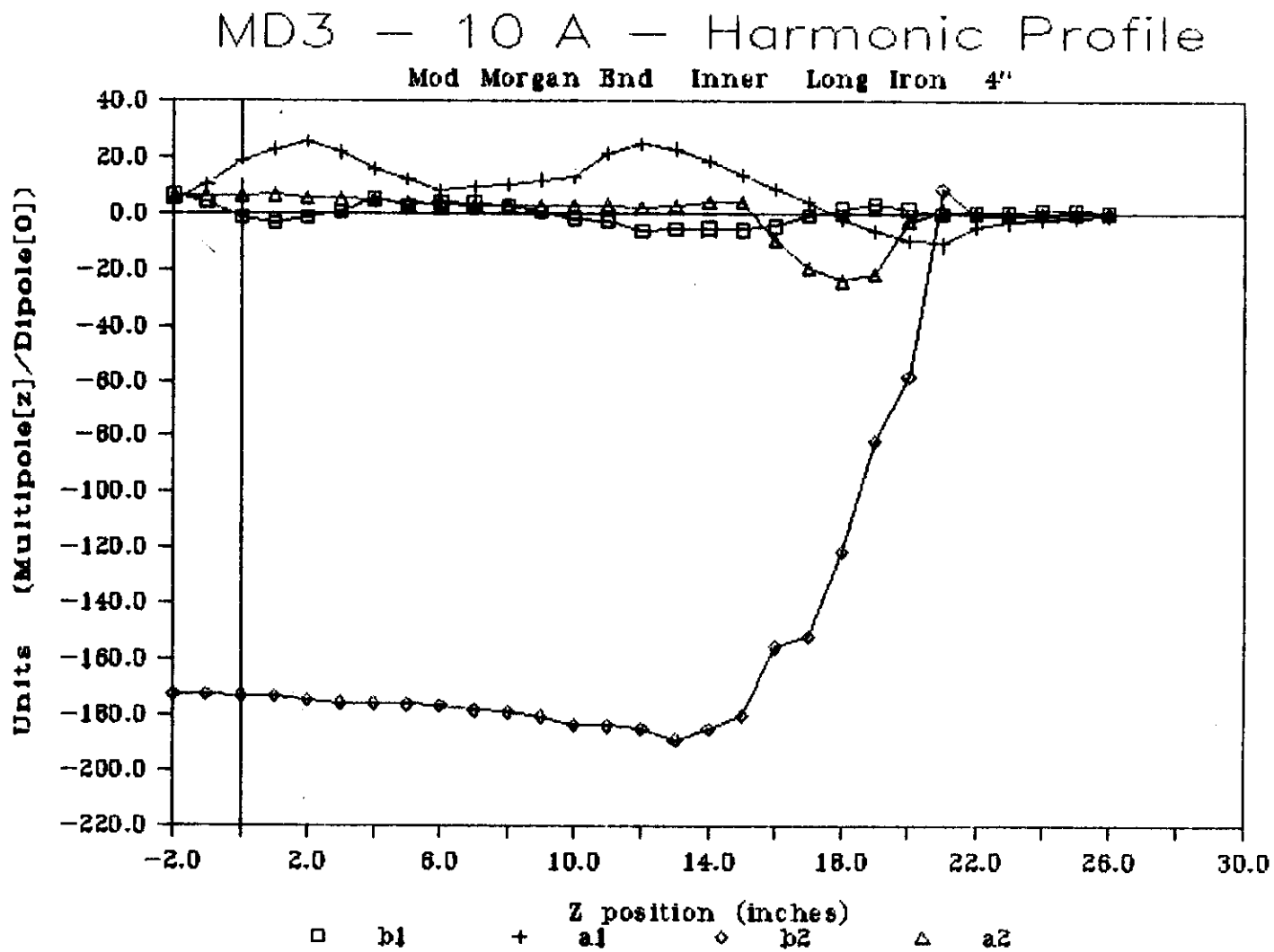

MD3 — 10 A — Harmonic Profile
Mod Morgan Bnd Inner Long Iron 4"
Units (Multipole[z]/Dipole[0])
40.0
20.0
0.0
-20.0
-40.0
-60.0
-80.0
-100.0
-120.0
-140.0
-160.0
-180.0
-200.0
-220.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b1
a1
b2
a2

Fig. L17

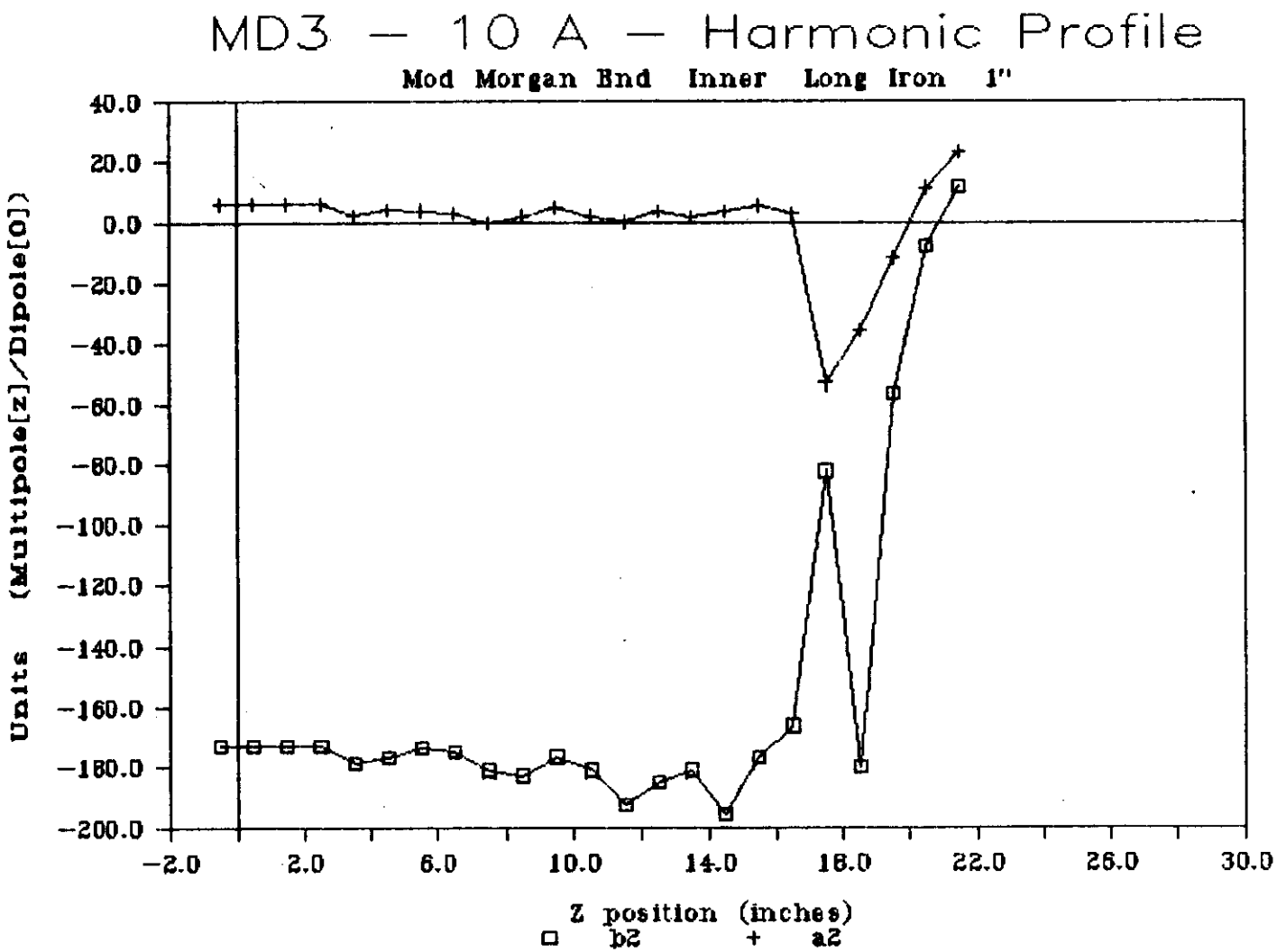

MD3 — 10 A — Harmonic Profile
Mod Morgan Bnd Inner Long Iron 1"
Units (Multipole[z]/Dipole[0])
40.0
20.0
0.0
-20.0
-40.0
-60.0
-80.0
-100.0
-120.0
-140.0
-160.0
-180.0
-200.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b2
a2

Fig. L18

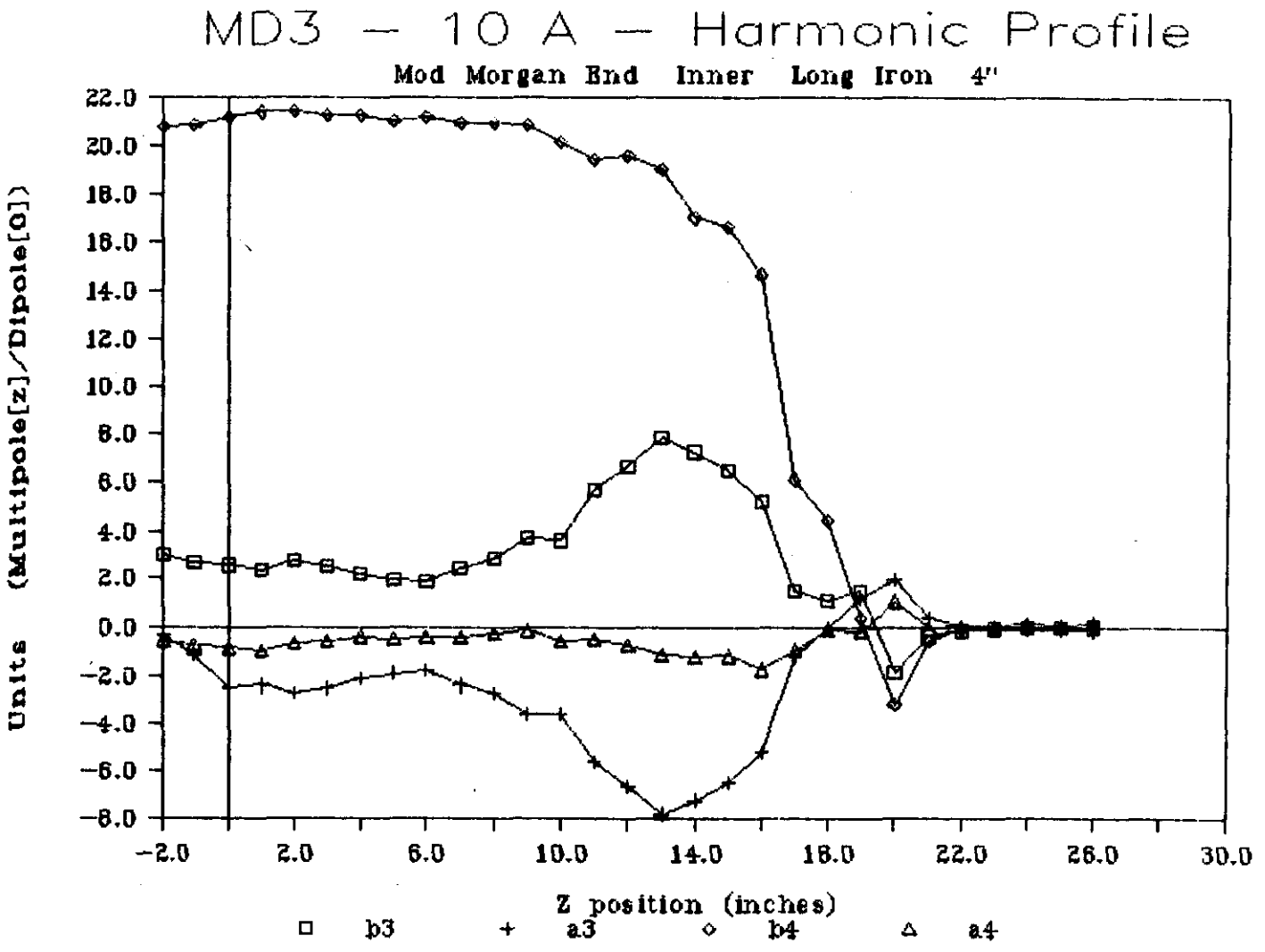

MD3 — 10 A — Harmonic Profile
Mod Morgan End Inner Long Iron 4"
Units (Multipole[z]/Dipole[0])
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
-8.0
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b3
a3
b4
a4

Fig. L19

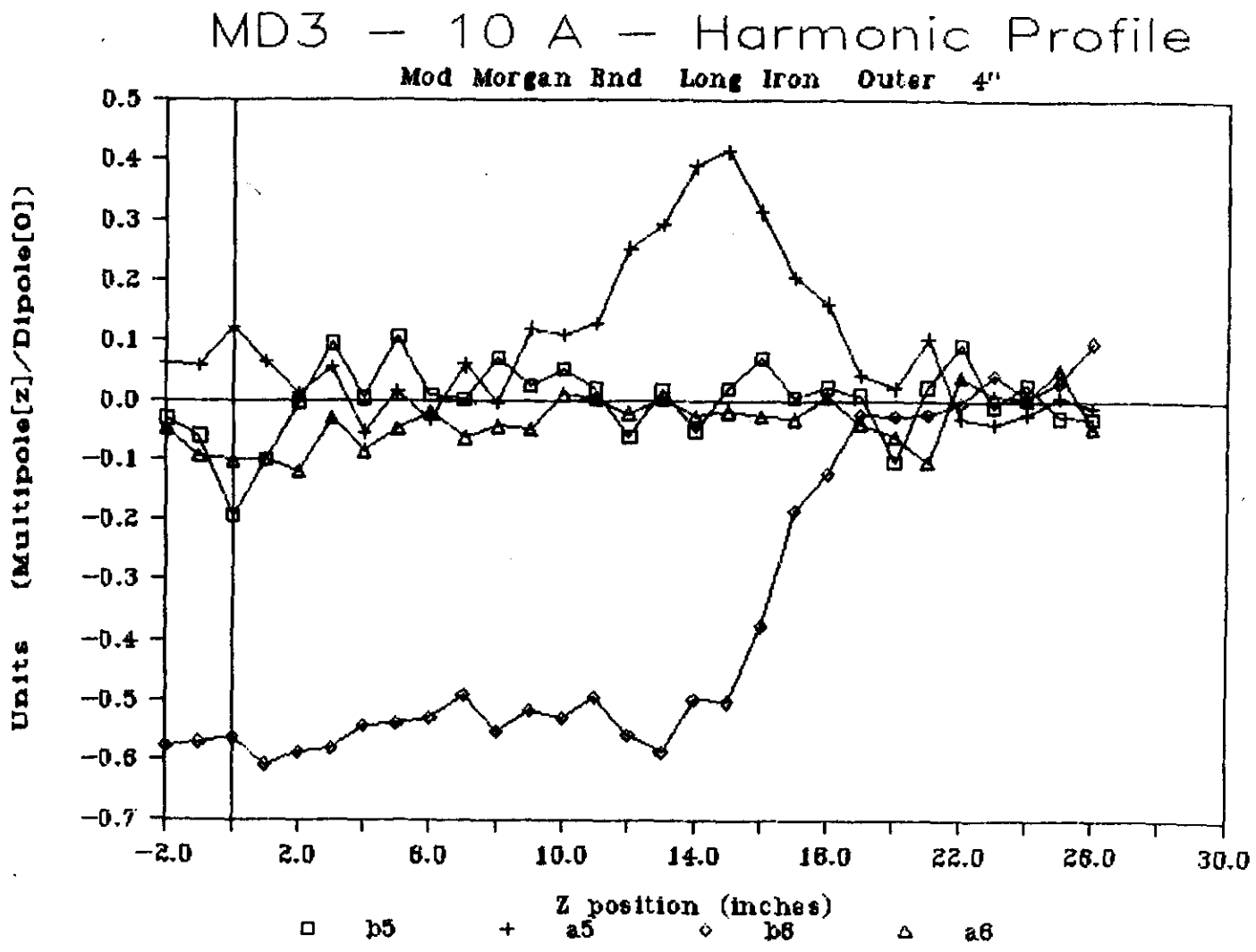

MD3 — 10 A — Harmonic Profile
Mod Morgan Bnd Long Iron Outer 4"
Units (Multipole[z]/Dipole[0])
0.5
0.4
0.3
0.2
0.1
0.0
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-2.0
2.0
6.0
10.0
14.0
18.0
22.0
26.0
30.0
Z position (inches)
b5
a5
b6
a6

Fig. L20