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“Quadrupole Requirements and Changes for the CEBAF 12 GeV Upgrade”

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Abstract

This note is intended to document the Quadrupole requirements for the CEBAF 12 GeV upgrade project as they stand at the time of the Independent Design Review, July 12, 2005. It is expected that further changes will occur once the final beam transport geometry and aperture studies are complete.

The quadrupole specifications largely come from experience gained running the 6 GeV CEBAF machine and scaled up to the 12 GeV running requirements. They include primary beam focusing plus a margin for tuning and off normal conditions [1]. They are applied to individual magnets instead of whole families. The results from those studies indicate that, for the most part, the existing quadrupoles and present power supplies can meet the 12 GeV needs without any changes. In some locations, new 20 amp power supplies will replace the existing 10 amp ones, thereby increasing the focusing strength of those magnets. In a few locations, a second quadrupole is added with the new 20-amp power supply. Finally two new quads will be designed, one a higher strength quad based on an existing cross section, the other with an intermediate bore to meet the need of the higher passes. This TN will describe the changes for the upgrade for each magnet family, give preliminary design information on the new quads, and includes a spreadsheet listing quadrupole magnet and girder requirements for the entire upgraded machine.

I. Quadrupole Changes for 12 GeV

A summary of the 6 GeV and 12 GeV quadrupole requirements are given in Table 1. The definition used for field strength ($B'dl$) in this note is explained in section II. The max $B'dl$ number given in the table is what was used for 12 GeV planning. It allows for some cable losses from the power supply to the magnet. The QJ and QD families are Panofsky style magnets and will need no changes beyond their 6 GeV specifications. The QA, QB, and QC magnet families will all require some changes or modifications to meet the higher fields required for 12 GeV.

The QB and QC magnets with their larger bore can all be powered up to 20 amps with less than 3 % saturation [3]. Sixteen QB and twenty-nine QC magnets will be upgraded in this fashion. In two locations a QB magnet will be replaced with a QC magnet and 20-

amp power supply. In four cases, where the aperture requirements are such that a QA magnet will not work, we will pair a QB and QC magnet with a 20-amp power supply. This will require a modified girder and installation work. Most of the hardware for the girders, including the BPM and other diagnostics, will be reused.

A QA magnet has been tested with a 17-amp power supply to find its limitations. The 70% increase in current for this magnet only resulted in a 33% increase in field strength, up to 128 kG [2]. Allowing for cable losses, the extra ~25 kG gained by running these magnets into saturation is enough to meet the 12 GeV needs for 34 of the QA magnets already installed in CEBAF. The cost to build and install a 20 amp power supply is less than the cost of a new, measured and installed magnet, so this is the most cost effective means of upgrading these magnets. The QA magnet has a 40/60 center tap and is used as the QU at 40% and QV magnets at 60% field strength. Sixteen QU magnets will have their taps changed to QV magnets as required. There are only 10 QV magnets currently in CEBAF and they will all have their taps changed to QA magnets for the upgrade. Where the field requirements exceed the capabilities of the upgraded QA magnet, a newly designed QR magnet, described below, will be used. For Arc 10 and the Hall D transport, a QP magnet with a ~3.5 cm bore will be designed to meet the larger aperture requirements. All quads changed to 20 amp power supplies will require thermal interlocks that were not needed at 10 amps. The QR and QP magnet will also include thermal interlocks.

Table 1. Quadrupole Requirements for the 12 GeV upgrade.

Family	Bore Diameter (cm)	Bore Length (cm)	6 GeV Max Current (amps)	6 GeV B'dl (kG)	12 GeV Max Current (amps)	12 GeV Required B'dl (kG)
QJ	11.63	9.40	10	0.6	10	0.6
QD	4.14	16.55	10	3.3	10	3.3
QB	5.398	15.24	10	14.1	20	25.0
QC	5.398	30.48	10	22.8	20	40.0
QA	2.858	30.48	10	96.4	20	121
QU	2.858	30.48	10	38.6	10	38.6
QV	2.858	30.48	10	57.8	10	57.8
QR (new)	2.858	53.3	NA	NA	20	169
QP (new)	3.49	TBD	NA	NA	20	70

II. New high strength quadrupole (QR) preliminary design.

Based on initial estimates from CASA this magnet, designated QR, needs to deliver 169 kG. For simplicity, it will be designed with the current QA geometry with a bore radius of 1.43 cm and only lengthened. Since it will be similar to the QA magnet, we assume that the magnet will begin to saturate at 10 amps and so we will design the magnet based on that. The turn resistance of the magnet will require that the 20 amp powered supplies will be required and so the possibility of running them to higher currents will also be

explored. As time permits, we will try to improve the design of this magnet so as to better match it to the new power supply capabilities and increase its field strength or to reduce its length and relieve space constraints in some parts of the accelerator.

- B (field at the pole tip in kG) = $N(\text{number of turns}) * I(\text{current in amps}) / a(\text{radius in cm}) / 397.88 = 264 * 10 \text{ amps} / 1.43 \text{ cm} / 397.88 = 4.64 \text{ kG}$
- $B' = B / a = 4.64 \text{ kG} / 1.43 \text{ cm} = 3.25 \text{ kG/cm}$
- Required $B'dl = 169 \text{ kG}$
- Dividing the required $B'dl$ by B' yields a required effective length of 52 cm.
- Round up to a length of 53.3 cm (21 inches) gives a $B'dl$ of 173 kG.
- Based on QA measurements this magnet could be run up to ~17 amps, producing 33% more field or a $B'dl$ of 230 kG.

The rest of the parameters are given in Table 2.

Table 2. Preliminary design parameters for the QR Quadrupole.

Number of coils	4 coils
Number of turns per coil	264 turns
Coil Length	4512.0 ft
Total Res @ Room Temperature	3.5673 ohms
Operating Current	10 amps
Estimated Coil Temperature Rise	20 C
Total Res @ Operating Current	3.7100 ohms
Volt Drop @ Max Current and Temp	37.10 volts
Installed Resistance (+ 0.5 ohms)	4.210 ohms
Installed Voltage Drop	42.10 volts
Pole tip Field	4.64 kG
$B' = B/a$	3.245 kG/cm
Effective Length	53.34 cm
$B'dl$	173.1 kG
Water Flow through cooling plates	0.33 Gpm
Water flow dt	4.32 C
Klixon temperature protection	

III. 3.5 cm bore quadrupole (QP) preliminary design.

This quadrupole design is needed to both meet the larger aperture and higher field requirements of Arc 10 and the Hall D transport. It will have a minimum aperture of 3.5

to 3.8 cm. The required B'dl is 70 kG. In eight locations in Arc 10 and 4 in the Hall D transport it will be installed as a quad doublet and run in series. The voltage drop of the doublet must be such that it will be able to run on a single 20 amp power supply. This design is still very preliminary and still requires more detailed engineering.

IV. Listing of CEBAF 12 GeV quadrupole requirements.

Attached is a spreadsheet describing the requirements and solutions for all of the quadrupoles for the 12 GeV upgrade. It is ordered for the most part by the beam path. The 'Existing Name' is the name of the magnet currently installed in CEBAF. The "Dimad Name" refers to the name used for the beam physics study in new areas of the machine and is not necessarily the same as the "Existing Name", nor is it guaranteed to be unique. The "Original B'dl [kG]" is the 6 GeV field strength. "Tuning" when given, is the multiplier used to scale to the required 12 GeV field strength. The "B'dl [kG] with Tuning" is the required 12 GeV field strength. The machine region where the magnet is installed is given in "Location". Information regarding the magnet change is given in the "Change" and "Notes" columns. The rest of the columns count the changes.

Also included is a count for new BPM's and correctors for the new installations. For the linacs, the new girders will require new skew quads and correctors, but will use the existing power supplies so the correctors are not included in the new column, but is listed in "other" and the "notes". The type of girder used to support the quads is also included. The summary of changes is given in Table 3.

Table 3. Summary of Quad and Girder changes for the 12 GeV Upgrade.

Total New Magnet	Total Removed Magnet	New Girder	New DBL or TRPL Girder	Modify Girder	New 10 amp Power Supply	New 20 amp Power Supply	New BPM	New Corrector
128	43	63	18	34	-94	169	80	122
	QJ	QD	QB	QC	QA	QP	QR	Total
New Magnets	0	0	5	9	22	48	44	128
Removed Magnets	0	0	-2	0	-41	0	0	-43
Present Inventory	0	0	-1	-3	-9	0	0	-13
Spares	0	0	0	2	0	2	2	6
Total Procurements	0	0	2	8	0	50	46	106
Change QU to QV		16			Upgrade with 20 amp PS			
Change QV to QA		10				QB		16
Power 2ND QA on Girder		2				QC		29
2ND QA on Girder removed		8				QA		34
Double up existing QC with QB & new PS		4						

Note. A negative value indicates the item already exists and adds against new procurements.

References

[1] Y. Chao, memo "Rational for Quads", Oct 28, 2004.

- [2] J. Karn, memo "QA Magnet Maximum Gradient Integral," August 20, 1998.
[3] T. Hiatt, K. Baggett, M. Beck, K. Sullivan and M. Wiseman, "High Current Measurements of a QB and QC Magnet" JLAB-TN-05-037.

Attachments

- A. [12 GeV Quad Plan for TN 05 041.xls](#) [Located at M:\me-group\MWiseman\12 GeV\Quads]

Existing Name	Dimad Name	Original B'dl [kG]	Tuning	B'dL [kG] with tuning allowance	Location	Change	Upgrade with PS	New Magnet	Remove Magnet	New Girder	DBL or TRPL Girder	Modify Girder	New 10 amp	New 20 amp	New H corr	New V corr	New BPM	Other	Notes
							Count	128	43	63	18	34	-94	169	61	61	80	0	
1	MQJ0L01	MQZ1	0.112	0.18	5MeV Str.														
2	MQJ0L02	MQZ3	0.252	0.40	5MeV Str.														
3	MQJ0L02A	MQZ4	0.256	0.41	5MeV Str.														
4	MQJ0L03	MQZ6	0.102	0.16	5MeV Str.														
5	MQJ0L03A	MQA3	0.004	0.01	5NeV Chic														
6	MQJ0L04	MQA5	0.034	0.05	5NeV Chic														
7	MQJ0L05	MQJ0L05	0.000	0.53	CM girder														
8	MQD0L06	MQM6	1.692	2.16	2nd CM Girder														
9	MQD0L07	MQIC1	1.629	2.16	Re-Injection	Move?													Need Location
10	MQD0L08	MQIC4	0.970	2.16	Re-Injection	Move													
11	MQD0L09	MQD0R01	1.896	2.16	Re-Injection	Move													
12	MQD0L10	MQD0R02	1.211	2.16	Re-Injection	Move													
13	MQD0R01	MQD0R03	0.850	1.57	Re-Injection	Move													
14	MQD0R02	MQMC1	1.112	2.62	Re-Injection	Move													
15	MQD0R03	MQD0R04	0.967	0.85	Re-Injection	Move?													Need Location
16	MQD0R04	MQMC2	1.146	1.83	Re-Injection	Move?													Need Location
17	MQD0R05	MQD0R05	0.991	0.85	Re-Injection	Move?													Need Location
18	MQD0R06	MQD0R06	1.271	2.62	Re-Injection														
19	MQD0R07	MQD0R07	2.271	1.57	Re-Injection														
		MQMatch1	2.915																Need to review requirement could be QD
20				4.66	Pre-linac	New, QB ,Between last BL in Re-Inj & 1st CM girder.		QB		1			1						
21	MQB1L00		24616.8	1.5	36925.20	N Linac	QC +20A PS	QC	QB				1	-1	1				QA and 10 amp PS is an alternate
22	MQB1L01		-19693.5	1.5	-29540.25	N Linac	QC +20A PS	QC	QB				1	-1	1				QA and 10 amp PS is an alternate
23	MQB1L02		647.546	1.5	971.32	N Linac				LINAC								skew	New H & V Corrector
24	MQB1L03		-922.594	1.05	-968.72	N Linac													
25	MQB1L04		1101.066	1.05	1156.12	N Linac													
26	MQB1L05		-1279.536	1.05	-1343.51	N Linac													
27	MQB1L06		1458.008	1.05	1530.91	N Linac													
28	MQB1L07		-1636.485	1.05	-1718.31	N Linac													
29	MQB1L08		1814.955	1.05	1905.70	N Linac													
30	MQB1L09		-1993.425	1.05	-2093.10	N Linac													
31	MQB1L10		2171.895	1.05	2280.49	N Linac													
32	MQB1L11		-2350.365	1.05	-2467.88	N Linac													
33	MQB1L12		2528.835	1.05	2655.28	N Linac													
34	MQB1L13		-2707.305	1.05	-2842.67	N Linac													
35	MQB1L14		2885.775	1.05	3030.06	N Linac													
36	MQB1L15		-3064.245	1.05	-3217.46	N Linac													
37	MQB1L16		3242.715	1.05	3404.85	N Linac													
38	MQB1L17		-3421.185	1.05	-3592.24	N Linac													
39	MQB1L18		3599.655	1.05	3779.64	N Linac													
40	MQB1L19		-3778.125	1.05	-3967.03	N Linac													
41	MQB1L20		3956.595	1.05	4154.42	N Linac													
42	MQB1L21		-4135.065	1.05	-4341.82	N Linac													
43	MQB1L22		4313.535	1.05	4529.21	N Linac													
44	MQB1L23		-4918.515	1.05	-5164.44	N Linac													
45	MQB1L24		5523.495	1.05	5799.67	N Linac													
46	MQB1L25		-6128.475	1.05	-6434.90	N Linac													Skew New H & V Corrector
47	MQB1L26		6733.47	1.05	7070.14	N Linac													Skew New H Corrector
48	MQB1L27		-7338.45	1.05	-7705.37	N Linac													Skew New V Corrector
49	MQB1L28		7338.45	1.6	11741.52	N Linac													Skew New H Corrector
																			Skew New V Corrector
50	MQB1S01		-4233	-10588.07	1S Spr. 1st pass														
51	MQB1S02		6246	14445.98	1S Spr. 1st pass	20 Amp Power Supply													
52	MQB1S03		-8300	-18384.32	1S Spr. 1st pass	20 Amp Power Supply													
53	MQB1S04		-7295	-18082.95	1S Spr. 1st pass	20 Amp Power Supply													
54	MQB1S05		7337	18162.46	1S Spr. 1st pass	20 Amp Power Supply													
55	MQB1S06		236	4548.96	1S Spr. 1st pass														
56	MQB1S07		-5939	-15482.43	1S Spr. 1st pass	20 Amp Power Supply													
57	MQB1S08		4813	13323.43	1S Spr. 1st pass														
58	MQB1S09		-4777	-13254.81	1S Spr. 1st pass														
59	MQB1S10		2345	8592.00	1S Spr. 1st pass														
60	MQB1E01		-1181	-2264.14	1 Ext. 1st Pass														
61	MQB1E02		1761	3376.23	1 Ext. 1st Pass														
62	MQB1E03		-1940	-3719.41	1 Ext. 1st Pass														
63	MQB1A01		3518	6744.02	Arc 1														
64	MQB1A02		-1236	-2370.61	Arc 1														

Existing Name	Dimad Name	Original B'dl [kG]	Tuning	B'dL [kG] with tuning allowance	Location	Change	Upgrade with PS	New Magnet	Remove Magnet	New Girder	DBL or TRPL Girder	Modify Girder	New 10 amp	New 20 amp	New H corr	New V corr	New BPM	Other	Notes	
						Count		128	43	63	18	34	-94	169	61	61	80	0		
65	MQB1A03	-3551		-6807.69	Arc 1															
66	MQB1A04	6699		12844.14	Arc 1															
67	MQB1A05	-2675		-5129.29	Arc 1															
68	MQB1A06	2635		5051.92	Arc 1															
69	MQB1A07	-2687		-5152.28	Arc 1															
70	MQB1A08	4934		9459.74	Arc 1															
71	MQB1A09	-2397		-4594.72	Arc 1															
72	MQB1A11	3813		7748.32	Arc 1															
73	MQB1A13	-2839		-5443.78	Arc 1															
74	MQB1A14	4416		8466.79	Arc 1															
75	MQB1A15	-2703		-5182.19	Arc 1															
76	MQB1A16	1806		3462.44	Arc 1															
77	MQB1A17	-3184		-6104.32	Arc 1															
78	MQB1A18	4243		8133.81	Arc 1															
79	MQB1A19	-1867		-3579.57	Arc 1															
80	MQB1A21	2423		4877.92	Arc 1															
81	MQB1A23	-1867		-3579.59	Arc 1															
82	MQB1A24	4242		8133.79	Arc 1															
83	MQB1A25	-3184		-6104.32	Arc 1															
84	MQB1A26	1806		3462.44	Arc 1															
85	MQB1A27	-2703		-5182.17	Arc 1															
86	MQB1A28	4416		8466.79	Arc 1															
87	MQB1A29	-2839		-5443.78	Arc 1															
88	MQB1A31	3824		7478.40	Arc 1															
89	MQB1A33	-2397		-4594.75	Arc 1															
90	MQB1A34	4934		9459.68	Arc 1															
91	MQB1A35	-2687		-5152.28	Arc 1															
92	MQB1A36	2635		5051.97	Arc 1															
93	MQB1A37	-2675		-5129.29	Arc 1															
94	MQB1A38	6699		12844.15	Arc 1															
95	MQB1A39	-3551		-6807.69	Arc 1															
96	MQB1A40	881		1689.43	Arc 1															
97	MQB1R01	3262		10185.83	1R Rec. 1st pass															
98	MQB1R02	-5882		-15209.98	1R Rec. 1st pass	20 Amp Power Supply								-1	1					
99	MQB1R03	3583		10802.56	1R Rec. 1st pass															
100	MQB1R04	-5816		-15083.04	1R Rec. 1st pass	20 Amp Power Supply								-1	1					
101	MQB1R05	5148		13802.05	1R Rec. 1st pass															
102	MQB1R06	-4172		-11930.55	1R Rec. 1st pass															
103	MQB1R07	841		5545.27	1R Rec. 1st pass															
104	MQB1R08	-8071		-17945.86	1R Rec. 1st pass	20 Amp Power Supply								-1	1					
105	MQB1R09	5669		13340.47	1R Rec. 1st pass															
106	MQB1R10	-3988		-10117.10	1R Rec. 1st pass															
107	MQB2L01	7338.45	1.5	11007.68	S Linac															
108	MQB2L02	-7338.45	1.05	-7705.37	S Linac															
109	MQB2L03	7516.92	1.05	7892.77	S Linac															
110	MQB2L04	-7695.39	1.05	-8080.16	S Linac															
111	MQB2L05	7873.86	1.05	8267.55	S Linac															
112	MQB2L06	-8052.33	1.05	-8454.95	S Linac															
113	MQB2L07	8230.8	1.05	8642.34	S Linac															
114	MQB2L08	-8409.27	1.05	-8829.73	S Linac															
115	MQB2L09	8587.74	1.05	9017.13	S Linac															
116	MQB2L10	-8766.21	1.05	-9204.52	S Linac															
117	MQB2L11	8944.68	1.05	9391.91	S Linac															
118	MQB2L12	-9123.15	1.05	-9579.31	S Linac															
119	MQB2L13	9301.62	1.05	9766.70	S Linac															
120	MQB2L14	-9480.09	1.05	-9954.09	S Linac															
121	MQB2L15	9658.56	1.05	10141.49	S Linac															
122	MQB2L16	-9837.03	1.05	-10328.88	S Linac															
123	MQB2L17	10015.5	1.05	10516.28	S Linac															
124	MQB2L18	-10194	1.05	-10703.70	S Linac															
125	MQB2L19	10372.4	1.05	10891.02	S Linac															
126	MQB2L20	-10550.9	1.05	-11078.45	S Linac															
127	MQB2L21	10729.4	1.05	11265.87	S Linac															
128	MQB2L22	-10907.9	1.05	-11453.30	S Linac															
129	MQB2L23	11512.8	1.05	12088.44	S Linac															
130	MQB2L24	-12117.8	1.05	-12723.69	S Linac															
131	MQB2L25	12722.8	1.05	13358.94	S Linac															
132	MQB2L26	-13327.8	1.05	-13994.19	S Linac															
133	MQB2L27	14242	1.5	21363.00	S Linac	20 Amp Power Supply								-1	1	1	1	Skew	New H & V Corrector	

Existing Name	Dimad Name	Original B'dl [kG]	Tuning	B'dL [kG] with tuning allowance	Location	Change	Count	Upgrade with PS	New Magnet	Remove Magnet	New Girder	DBL or TRPL Girder	Modify Girder	New 10 amp	New 20 amp	New H corr	New V corr	New BPM	Other	Notes
134	MQB2S01	-8164		-20343.98	2S Spr. 1st pass	20 Amp Power Supply		QB												
135	MQC2S02	14787		33042.75	2S Spr. 1st pass	20 Amp Power Supply		QC												
136	MQC2S03	-17393		-38037.69	2S Spr. 1st pass	20 Amp Power Supply		QC												
137	MQC2S04	-13858		-34343.29	2S Spr. 1st pass	20 Amp Power Supply		QC												
138	MQC2S05	10003		26953.17	2S Spr. 1st pass	20 Amp Power Supply		QC												
139	MQC2S06	0		7774.83	2S Spr. 1st pass															
140	MQC2S07	0		7774.83	2S Spr. 1st pass															
141	MQC2S08	-3735		-14935.47	2S Spr. 1st pass															
142	MQC2S09	0		7774.83	2S Spr. 1st pass															
143	MQC2S10	3725		14916.74	2S Spr. 1st pass															
144	MQB2E01	-3175		-6087.50	2nd Ext. 1st pass															
145	MQB2E02	3411		6539.60	2nd Ext. 1st pass															
146	MQB2E03	-4030		-7727.24	2nd Ext. 1st pass															
147	MQC2A01	4766		9138.05	Arc 2															
148	MQC2A02	597		1144.44	Arc 2															
149	MQC2A03	-7444		-14272.37	Arc 2															
150	MQC2A04	14630		28048.37	Arc 2	20 Amp Power Supply		QC							-1		1			
151	MQC2A05	-6031		-11561.84	Arc 2															
152	MQC2A06	6419		12306.14	Arc 2															
153	MQC2A07	-6131		-11754.67	Arc 2															
154	MQC2A08	12934		26285.99	Arc 2	20 Amp Power Supply		QC							-1		1			
155	MQC2A09	-5320		-10199.06	Arc 2															
156	MQC2A11	6149		11789.84	Arc 2															
157	MQC2A13	-6863		-13158.27	Arc 2															
158	MQC2A14	12983		24890.90	Arc 2	20 Amp Power Supply		QC							-1		1			
159	MQC2A15	-4694		-8999.01	Arc 2															
160	MQC2A16	4625		8867.65	Arc 2															
161	MQC2A17	-5305		-10170.19	Arc 2															
162	MQC2A18	6627		12705.25	Arc 2															
163	MQC2A19	-3328		-6381.22	Arc 2															
164	MQC2A21	3384		6811.59	Arc 2															
165	MQC2A23	-3328		-6381.22	Arc 2															
166	MQC2A24	6627		12705.25	Arc 2															
167	MQC2A25	-5305		-10170.19	Arc 2															
168	MQC2A26	4625		8867.65	Arc 2															
169	MQC2A27	-4694		-8999.01	Arc 2															
170	MQC2A28	12983		24890.90	Arc 2	20 Amp Power Supply		QC							-1		1			
171	MQC2A29	-6863		-13158.27	Arc 2															
172	MQC2A31	6149		11789.84	Arc 2															
173	MQC2A33	-5320		-10199.06	Arc 2															
174	MQC2A34	12940		25305.41	Arc 2	20 Amp Power Supply		QC												
175	MQC2A35	-6131		-11754.67	Arc 2															
176	MQC2A36	6419		12306.14	Arc 2															
177	MQC2A37	-6031		-11561.84	Arc 2															
178	MQC2A38	14630		28048.37	Arc 2	20 Amp Power Supply		QC												
179	MQC2A39	-7444		-14272.37	Arc 2															
180	MQC2A40	1703		3265.68	Arc 2															
181	MQC2R01	12831		32063.24	2nd Rec. 1st pass	20 Amp Power Supply		QC												
182	MQC2R02	-18327		-42601.25	2nd Rec. 1st pass	Add QB + PS		QC+QB												
183	MQC2R03	22023		49686.86	2nd Rec. 1st pass	Add QB + PS		QC+QB												
184	MQC2R04	-15180		-36567.76	2nd Rec. 1st pass	20 Amp Power Supply		QC												
185	MQC2R05	11024		28599.78	2nd Rec. 1st pass	20 Amp Power Supply		QC												
186	MQC2R06	-1167		-9701.83	2nd Rec. 1st pass															
187	MQC2R07	-8435		-23636.79	2nd Rec. 1st pass	20 Amp Power Supply		QC												
188	MQC2R08	-17274		-37809.77	2nd Rec. 1st pass	20 Amp Power Supply		QC												
189	MQC2R09	16625		36565.88	2nd Rec. 1st pass	20 Amp Power Supply		QC												
190	MQB2R10	-8219		-20449.84	2nd Rec. 1st pass	20 Amp Power Supply		QC												
North Linac																				
191	MQU3S01	-14120		-34462.45	1S Spr. 2nd pass															
192	MQU3S02	17619		40213.16	1S Spr. 2nd pass	Change taps to QV														
193	MQU3S03	-20335		-46378.17	1S Spr. 2nd pass	Change taps to QV														
194	MQU3S04	-12396		-35699.02	1S Spr. 2nd pass															
195	MQU3S05	19143		47676.48	1S Spr. 2nd pass	Change taps to QV														
196	MQU3S06	550		12028.82	1S Spr. 2nd pass															
197	MQU3S07	-9564		-30268.49	1S Spr. 2nd pass															
198	MQU3S08	13623		37092.84	1S Spr. 2nd pass															
199	MQU3S09	-11610		-34192.08	1S Spr. 2nd pass															
200	MQU3S10	13219		36317.52	1S Spr. 2nd pass															
201	MQB3E01	-6471		-12406.64	1 Ext. 2nd Pass															
202	MQB3E02	5934		11376.00	1 Ext. 2nd Pass															
203	MQB3E03	-6000		-11502.77	1 Ext. 2nd Pass															

Existing Name	Dimad Name	Original B'dl [kG]	Tuning	B'dL [kG] with tuning allowance	Location	Change	Upgrade with PS	New Magnet	Remove Magnet	New Girder	DBL or TRPL Girder	Modify Girder	New 10 amp	New 20 amp	New H corr	New V corr	New BPM	Other	Notes	
						Count		128	43	63	18	34	-94	169	61	61	80	0		
204	MQU3A01	8416		15656.26	ARC 3															
205	MQU3A02	-9730		-19134.63	ARC 3															
206	MQU3A03	18548		37186.60	ARC 3															
207	MQU3A04	-9730		-19134.63	ARC 3															
208	MQU3A05	8401		15626.94	ARC 3															
209	MQU3A06	-9730		-19134.63	ARC 3															
210	MQU3A07	18548		37186.60	ARC 3															
211	MQU3A08	-9730		-19134.63	ARC 3															
212	MQU3A09	11169		20934.52	ARC 3															
213	MQU3A10	-9730		-19134.63	ARC 3															
214	MQU3A11	18548		37186.60	ARC 3															
215	MQU3A12	-9730		-19134.63	ARC 3															
216	MQU3A13	8401		15626.94	ARC 3															
217	MQU3A14	-9730		-19134.63	ARC 3															
218	MQU3A15	18548		37186.60	ARC 3															
219	MQU3A16	-9730		-19134.63	ARC 3															
220	MQU3A17	11169		20934.52	ARC 3															
221	MQU3A18	-9730		-19134.63	ARC 3															
222	MQU3A19	18548		37186.60	ARC 3															
223	MQU3A20	-9730		-19134.63	ARC 3															
224	MQU3A21	8401		15626.94	ARC 3															
225	MQU3A22	-9730		-19134.63	ARC 3															
226	MQU3A23	18548		37186.60	ARC 3															
227	MQU3A24	-9730		-19134.63	ARC 3															
228	MQU3A25	11169		20934.52	ARC 3															
229	MQU3A26	-9730		-19134.63	ARC 3															
230	MQU3A27	18548		37186.60	ARC 3															
231	MQU3A28	-9730		-19134.63	ARC 3															
232	MQU3A29	8401		15626.94	ARC 3															
233	MQU3A30	-9730		-19134.63	ARC 3															
234	MQU3A31	18548		37186.60	ARC 3															
235	MQU3A32	-9730		-19134.63	ARC 3															
236	MQU3R01	18018		45062.01	1R Rec. 2nd pass	Change taps to QV														
237	MQU3R02	-22535		-54680.90	1R Rec. 2nd pass	Change taps to QV														
238	MQU3R03	22087		52863.19	1R Rec. 2nd pass	Change taps to QV														
239	MQU3R04	-12358		-35167.81	1R Rec. 2nd pass															
240	MQU3R05	-9207		-29127.83	1R Rec. 2nd pass															
241	MQU3R06	23120		54842.52	1R Rec. 2nd pass	Change taps to QV														
242	MQU3R07	-11928		-34343.21	1R Rec. 2nd pass															
243	MQU3R08	-19922		-45586.41	1R Rec. 2nd pass	Change taps to QV														
244	MQU3R09	16340		37761.27	1R Rec. 2nd pass															
245	MQU3R10	-14461		-35116.09	1R Rec. 2nd pass															
					South Linac															
246	MQA4S01	-17812		-43952.88	2S Spr. 2nd pass															
247	MQA4S02	28276		62672.44	2S Spr. 2nd pass															
248	MQA4S03	-35020		-76943.85	2S Spr. 2nd pass															
249	MQA4S04	-16778		-47969.87	2S Spr. 2nd pass															
250	MQA4S05	29312		70658.85	2S Spr. 2nd pass															
251	MQA4S06	-14923		-44414.00	2S Spr. 2nd pass															
252	MQA4S07	0		-15803.51	2S Spr. 2nd pass															
253	MQA4S08	-4074		-23615.18	2S Spr. 2nd pass															
254	MQA4S09	0		-15803.51	2S Spr. 2nd pass															
255	MQA4S10	6896		27682.34	2S Spr. 2nd pass															
256	MQB4E01	-5391		-10336.35	2nd Ext. 2nd pass															
257	MQB4E02	6896		13221.23	2nd Ext. 2nd pass															
258	MQB4E03	-7771		-14899.59	2nd Ext. 2nd pass	20 Amp Power Supply	QB						-1	1						
259	MQU4A01	10814		20253.14	ARC4															
260	MQU4A02	-13051		-25501.15	ARC4															
261	MQU4A03	23197		46634.75	ARC4	Change taps to QV														
262	MQU4A04	-13051		-25501.15	ARC4															
263	MQU4A05	11278		21142.54	ARC4															
264	MQU4A06	-13051		-25501.15	ARC4															
265	MQU4A07	23197		46634.75	ARC4	Change taps to QV														
266	MQU4A08	-13051		-25501.15	ARC4															
267	MQU4A09	14670		27645.56	ARC4															
268	MQU4A10	-13051		-25501.15	ARC4															
269	MQU4A11	23197		46634.75	ARC4	Change taps to QV														
270	MQU4A12	-13051		-25501.15	ARC4															
271	MQU4A13	11278		21142.54	ARC4															
272	MQU4A14	-13051		-25501.15	ARC4															
273	MQU4A15	23197		46634.75	ARC4	Change taps to QV														

Existing Name	Dimad Name	Original B'dl [kG]	Tuning	B'dL [kG] with tuning allowance	Location	Change	Upgrade with PS	New Magnet	Remove Magnet	New Girder	DBL or TRPL Girder	Modify Girder	New 10 amp	New 20 amp	New H corr	New V corr	New BPM	Other	Notes	
							Count	128	43	63	18	34	-94	169	61	61	80	0		
274	MQU4A16	-13051		-25501.15	ARC4															
275	MQU4A17	14670		27645.56	ARC4															
276	MQU4A18	-13051		-25501.15	ARC4															
277	MQU4A19	23197		46634.75	ARC4	Change taps to QV														
278	MQU4A20	-13051		-25501.15	ARC4															
279	MQU4A21	11278		21142.54	ARC4															
280	MQU4A22	-13051		-25501.15	ARC4															
281	MQU4A23	23305		46634.75	ARC4	Change taps to QV														
282	MQU4A24	-13051		-25501.15	ARC4															
283	MQU4A25	14670		27645.56	ARC4															
284	MQU4A26	-13051		-25501.15	ARC4															
285	MQU4A27	23210		46659.54	ARC4	Change taps to QV														
286	MQU4A28	-13051		-25501.15	ARC4															
287	MQU4A29	11278		21142.54	ARC4															
288	MQU4A30	-13051		-25501.15	ARC4															
289	MQU4A31	23197		46634.34	ARC4	Change taps to QV														
290	MQU4A32	-13051		-25501.15	ARC4															
291	MQV4R01	28717		68914.17	2nd Rec. 2nd pass	Change taps to QA														
292	MQV4R02	-39347		-90636.67	2nd Rec. 2nd pass	Change taps to QA														
293	MQV4R03	51167		111956.36	2nd Rec. 2nd pass	Change taps to QA														
294	MQV4R04	-52920		-116658.53	2nd Rec. 2nd pass	Change taps to QA														New Power Supply
295	MQV4R05	21		-15158.35	2nd Rec. 2nd pass	Change taps to QA														New Power Supply
296	MQV4R06	36487		83810.59	2nd Rec. 2nd pass	Change taps to QA														
297	MQV4R07	-36025		-84266.51	2nd Rec. 2nd pass	Change taps to QA														
298	MQV4R08	-34944		-76799.74	2nd Rec. 2nd pass	Change taps to QA														
299	MQV4R09	25242		56856.04	2nd Rec. 2nd pass	Change taps to QA														
300	MQV4R10	-17204		-42787.66	2nd Rec. 2nd pass	Change taps to QA														
					North Linac															
301	MQA5S01	-16479		-43617.75	1S Spr. 3rd pass															
302	MQA5S02	29410		67067.09	1S Spr. 3rd pass															
303	MQA5S03	-39320		-87408.23	1S Spr. 3rd pass															
304	MQA5S04	-21038		-59816.83	1S Spr. 3rd pass															
305	MQA5S05	31190		77938.21	1S Spr. 3rd pass															
306	MQA5S06	-10446		-39510.01	1S Spr. 3rd pass															
307	MQA5S07	-7779		-34396.93	1S Spr. 3rd pass															
308	MQA5S08	5949		29546.59	1S Spr. 3rd pass															
309	MQA5S09	-20253		-58311.81	1S Spr. 3rd pass															
310	MQA5S10	19545		55612.55	1S Spr. 3rd pass															
311	MQB5E01	-9663		-18525.95	1 Ext. 3rd Pass	20 Amp Power Supply	QB													
312	MQB5E02	10282		19711.91	1 Ext. 3rd Pass	20 Amp Power Supply	QB													
313	MQB5E03	-9482		-18179.23	1 Ext. 3rd Pass	20 Amp Power Supply	QB													
314	MQA5A01	14127		26414.13	Arc 5															
315	MQA5A02	-16741		-32767.04	Arc 5															
316	MQA5A03	30932		62151.22	Arc 5															
317	MQA5A04	-16741		-32767.04	Arc 5															
318	MQA5A05	13834		25852.58	Arc 5															
319	MQA5A06	-16741		-32767.04	Arc 5															
320	MQA5A07	30932		62151.22	Arc 5															
321	MQA5A08	-16741		-32767.04	Arc 5															
322	MQA5A09	17571		33016.85	Arc 5															
323	MQA5A10	-16741		-32767.04	Arc 5															
324	MQA5A11	30932		62151.22	Arc 5															
325	MQA5A12	-16741		-32767.04	Arc 5															
326	MQA5A13	13834		25852.58	Arc 5															
327	MQA5A14	-16741		-32767.04	Arc 5															
328	MQA5A15	30932		62151.22	Arc 5															
329	MQA5A16	-16741		-32767.04	Arc 5															
330	MQA5A17	17571		33016.85	Arc 5															
331	MQA5A18	-16741		-32767.04	Arc 5															
332	MQA5A19	30932		62151.22	Arc 5															
333	MQA5A20	-16741		-32767.04	Arc 5															
334	MQA5A21	13834		25852.58	Arc 5															
335	MQA5A22	-16741		-32767.04	Arc 5															
336	MQA5A23	31246		62788.13	Arc 5															
337	MQA5A24	-16741		-32767.04	Arc 5															
338	MQA5A25	17571		33016.85	Arc 5															
339	MQA5A26	-16741		-32767.04	Arc 5															
340	MQA5A27	30693		61664.49	Arc 5															
341	MQA5A28	-16741		-32767.04	Arc 5															
342	MQA5A29	13835		25852.77	Arc 5															
343	MQA5A30	-16741		-32767.04	Arc 5															

Existing Name	Dimad Name	Original B'dl [kG]	Tuning	B'dL [kG] with tuning allowance	Location	Change	Upgrade with PS	New Magnet	Remove Magnet	New Girder	DBL or TRPL Girder	Modify Girder	New 10 amp	New 20 amp	New H corr	New V corr	New BPM	Other	Notes	
						Count		128	43	63	18	34	-94	169	61	61	80	0		
344	MQA5A31	30703		61684.82	Arc 5															
345	MQA5A32	-16741		-32767.04	Arc 5															
346	MQA5R01	19725		55206.04	1R Rec. 3rd pass															
347	MQA5R02	-44584		-104209.25	1R Rec. 3rd pass	20 Amp Power Supply	QA							-1		1				
348	MQA5R03	34379		83300.81	1R Rec. 3rd pass															
349	MQA5R04	-36071		-87887.57	1R Rec. 3rd pass															
350	MQA5R05	38544		91287.18	1R Rec. 3rd pass															
351	MQA5R06	22569		60658.04	1R Rec. 3rd pass															
352	MQA5R07	-25072		-66798.71	1R Rec. 3rd pass															
353	MQA5R08	-41354		-91309.27	1R Rec. 3rd pass															
354	MQA5R09	30175		68533.84	1R Rec. 3rd pass															
355	MQA5R10	-16168		-43021.76	1R Rec. 3rd pass															
					South Linac															
356	MQA6S01	-23492		-59282.40	2S Spr. 3rd pass															
357	MQA6S02	40595		90731.35	2S Spr. 3rd pass															
358	MQA6S03	-57181		-123873.00	2S Spr. 3rd pass	Change to QR		QR	QA				1	-1		1				
359	MQA6S04	-25830		-72683.17	2S Spr. 3rd pass															
360	MQA6S05	37716		94128.25	2S Spr. 3rd pass															
361	MQA6S06	-17881		-57442.80	2S Spr. 3rd pass															
362	MQA6S07	0		-23161.16	2S Spr. 3rd pass															
363	MQA6S08	-9065		-40541.03	2S Spr. 3rd pass															
364	MQA6S09	0		-23161.16	2S Spr. 3rd pass															
365	MQA6S10	11777		44398.79	2S Spr. 3rd pass															
366	MQC6E01	-10063		-19292.42	2nd Ext. 3rd pass															
367	MQC6E02	11052		21189.90	2nd Ext. 3rd pass															
368	MQC6E03	-11458		-21966.56	2nd Ext. 3rd pass															
369	MQA6A01	16635		31222.14	Arc 6															
370	MQA6A02	-19637		-38319.12	Arc 6															
371	MQA6A03	35371		71171.18	Arc 6															
372	MQA6A04	-19637		-38319.12	Arc 6															
373	MQA6A05	16606		31165.39	Arc 6															
374	MQA6A06	-19637		-38319.12	Arc 6															
375	MQA6A07	35371		71171.18	Arc 6															
376	MQA6A08	-19637		-38319.12	Arc 6															
377	MQA6A09	20958		39510.28	Arc 6															
378	MQA6A10	-19637		-38319.12	Arc 6															
379	MQA6A11	35371		71171.18	Arc 6															
380	MQA6A12	-19637		-38319.12	Arc 6															
381	MQA6A13	16606		31165.39	Arc 6															
382	MQA6A14	-19637		-38319.12	Arc 6															
383	MQA6A15	35371		71171.18	Arc 6															
384	MQA6A16	-19637		-38319.12	Arc 6															
385	MQA6A17	20958		39510.28	Arc 6															
386	MQA6A18	-19637		-38319.12	Arc 6															
387	MQA6A19	35371		71171.18	Arc 6															
388	MQA6A20	-19637		-38319.12	Arc 6															
389	MQA6A21	16606		31165.39	Arc 6															
390	MQA6A22	-19637		-38319.12	Arc 6															
391	MQA6A23	35371		71171.37	Arc 6															
392	MQA6A24	-19637		-38319.12	Arc 6															
393	MQA6A25	20958		39510.28	Arc 6															
394	MQA6A26	-19637		-38319.12	Arc 6															
395	MQA6A27	35371		71171.79	Arc 6															
396	MQA6A28	-19637		-38319.12	Arc 6															
397	MQA6A29	16606		31165.39	Arc 6															
398	MQA6A30	-19637		-38319.12	Arc 6															
399	MQA6A31	35371		71171.37	Arc 6															
400	MQA6A32	-19637		-38319.12	Arc 6															
401	MQA6R01	30276		78965.79	2nd Rec. 3rd pass															
402	MQA6R02	-41028		-100922.19	2nd Rec. 3rd pass	20 Amp Power Supply	QA							-1		1				
403	MQA6R03	40132		97863.26	2nd Rec. 3rd pass	20 Amp Power Supply	QA							-1		1				
404	MQA6R04	-61485		-140142.59	2nd Rec. 3rd pass	Change to QR		QR	QA				1	-1		1				
405	MQA6R05	59910		135781.30	2nd Rec. 3rd pass	new		QR	QA				1	-1		1				
406	MQA6R06	-2713		-27465.28	2nd Rec. 3rd pass															
407	MQA6R07	-37844		-94819.10	2nd Rec. 3rd pass															
408	MQA6R08	-56802		-123147.42	2nd Rec. 3rd pass	Change to QR		QR	QA				1	-1		1				
409	MQA6R09	43169		95667.89	2nd Rec. 3rd pass															
410	MQA6R10	-24080		-60411.73	2nd Rec. 3rd pass															
					North Linac															
411	MQA7S01	-28904		-71878.55	1S Spr. 4th pass															
412	MQA7S02	40946		93624.81	1S Spr. 4th pass															

Existing Name	Dimad Name	Original B'dl [kG]	Tuning	B'dL [kG] with tuning allowance	Location	Change	Upgrade with PS	New Magnet	Remove Magnet	New Girder	DBL or TRPL Girder	Modify Girder	New 10 amp	New 20 amp	New H corr	New V corr	New BPM	Other	Notes	
						Count		128	43	63	18	34	-94	169	61	61	80	0		
413	MQA7S03	-44290		-101376.71	1S Spr. 4th pass	20 Amp Power Supply	QA													
414	MQA7S04	-20955		-67014.59	1S Spr. 4th pass															
415	MQA7S05	51529		124290.03	1S Spr. 4th pass	Change to QR		QR	QA				1	-1	1					
416	MQA7S06	-19328		-63895.08	1S Spr. 4th pass															
417	MQA7S07	200		-26456.54	1S Spr. 4th pass															
418	MQA7S08	200		-26456.54	1S Spr. 4th pass															
419	MQA7S09	-19385		-64005.89	1S Spr. 4th pass															
420	MQA7S10	24028		71565.68	1S Spr. 4th pass															
421	MQC7E01	-14041		-26919.70	1 Ext. 4th Pass	20 Amp Power Supply	QC							-1	1					
422	MQC7E02	12512		23988.85	1 Ext. 4th Pass	20 Amp Power Supply	QC							-1	1					
423	MQC7E03	-13600		-26073.25	1 Ext. 4th Pass	20 Amp Power Supply	QC							-1	1					
424	MQA7A01	16408		30787.31	Arc 7															
425	MQA7A02	-23884		-46461.94	Arc 7															
426	MQA7A03	44078		88866.01	Arc 7															
427	MQA7A04	-23884		-46461.94	Arc 7															
428	MQA7A05	18714		35207.08	Arc 7															
429	MQA7A06	-23884		-46461.94	Arc 7															
430	MQA7A07	44078		88866.01	Arc 7															
431	MQA7A08	-23884		-46461.94	Arc 7															
432	MQA7A09	23338		44072.32	Arc 7															
433	MQA7A10	-23884		-46461.94	Arc 7															
434	MQA7A11	44078		88866.01	Arc 7															
435	MQA7A12	-23884		-46461.94	Arc 7															
436	MQA7A13	18714		35207.08	Arc 7															
437	MQA7A14	-23884		-46461.94	Arc 7															
438	MQA7A15	44078		88866.01	Arc 7															
439	MQA7A16	-23884		-46461.94	Arc 7															
440	MQA7A17	23338		44072.32	Arc 7															
441	MQA7A18	-23884		-46461.94	Arc 7															
442	MQA7A19	44078		88866.01	Arc 7															
443	MQA7A20	-23884		-46461.94	Arc 7															
444	MQA7A21	18714		35207.08	Arc 7															
445	MQA7A22	-23884		-46461.94	Arc 7															
446	MQA7A23	45078		90898.27	Arc 7															
447	MQA7A24	-23884		-46461.94	Arc 7															
448	MQA7A25	23338		44072.31	Arc 7															
449	MQA7A26	-23884		-46461.94	Arc 7															
450	MQA7A27	44078		88866.01	Arc 7															
451	MQA7A28	-23884		-46461.94	Arc 7															
452	MQA7A29	18714		35207.08	Arc 7															
453	MQA7A30	-23884		-46461.94	Arc 7															
454	MQA7A31	44578		89882.14	Arc 7															
455	MQA7A32	-23884		-46461.94	Arc 7															
456	MQA7R01	40700		102483.39	1R Rec. 4th pass	20 Amp Power Supply	QA													
457	MQA7R02	-43970		-110095.72	1R Rec. 4th pass	20 Amp Power Supply	QA													
458	MQA7R03	67853		154541.51	1R Rec. 4th pass	Change to QR		QR	QA				1	-1	1					
459	MQA7R04	-61804		-144285.90	1R Rec. 4th pass	Change to QR		QR	QA				1	-1	1					
460	MQA7R05	50447		121171.68	1R Rec. 4th pass	Change to QR		QR	QA				1	-1	1					
461	MQA7R06	200		-25411.49	1R Rec. 4th pass															
462	MQA7R07	-36284		-95359.00	1R Rec. 4th pass															
463	MQA7R08	-45011		-102762.00	1R Rec. 4th pass	20 Amp Power Supply	QA							-1	1					
464	MQA7R09	41395		94486.89	1R Rec. 4th pass															
465	MQA7R10	-29029		-72119.82	1R Rec. 4th pass															
					South Linac															
466	MQA8S01	-38715		-92909.49	2S Spr. 4th pass															
467	MQA8S02	53910		120699.99	2S Spr. 4th pass	20 Amp Power Supply	QA													
468	MQA8S03	-59047		-131890.81	2S Spr. 4th pass	Change to QR		QR	QA				1	-1	1					
469	MQA8S04	-33060		-93902.72	2S Spr. 4th pass	2nd QA Installed & Unpowered			QA											
470	MQA8S05A	40189		106227.38	2S Spr. 4th pass	20 Amp Power Supply	QA													
471	MQA8S05B	40189		106227.38	2S Spr. 4th pass	20 Amp Power Supply	QA													
472	MQA8S06	-34117		-95928.06	2S Spr. 4th pass	2nd QA Installed & Unpowered			QA											
473	MQA8S07	0		-30518.81	2S Spr. 4th pass	2nd QA Installed & Unpowered			QA											
474	MQA8S08	0		-30518.81	2S Spr. 4th pass	2nd QA Installed & Unpowered			QA											
475	MQA8S09	-24501		-77492.27	2S Spr. 4th pass	2nd QA Installed & Unpowered			QA											
476	MQA8S10	30522		87693.22	2S Spr. 4th pass	2nd QA Installed & Unpowered			QA											
477	MQC8E01	-17146		-32871.91	2nd Ext. 4th pass	20 Amp Power Supply	QC													
478	MQC8E02	16211		31079.11	2nd Ext. 4th pass	20 Amp Power Supply	QC													
479	MQC8E03	-15358		-29443.91	2nd Ext. 4th pass	20 Amp Power Supply	QC													
480	MQA8A01	21933		41379.38	Arc 8															
481	MQA8A02	-26602		-51672.56	Arc 8															
482	MQA8A03	47115		95037.97	Arc 8															

Existing Name	Dimad Name	Original B'dl [kG]	Tuning	B'dL [kG] with tuning allowance	Location	Change	Upgrade with PS	New Magnet	Remove Magnet	New Girder	DBL or TRPL Girder	Modify Girder	New 10 amp	New 20 amp	New H corr	New V corr	New BPM	Other	Notes	
							Count	128	43	63	18	34	-94	169	61	61	80	0		
483	MQA8A04	-26602		-51672.56	Arc 8															
484	MQA8A05	21403		40362.68	Arc 8															
485	MQA8A06	-26602		-51672.56	Arc 8															
486	MQA8A07	47115		95037.76	Arc 8															
487	MQA8A08	-26602		-51672.56	Arc 8															
488	MQA8A09	27280		51631.34	Arc 8															
489	MQA8A10	-26602		-51672.56	Arc 8															
490	MQA8A11	47115		95037.76	Arc 8															
491	MQA8A12	-26602		-51672.56	Arc 8															
492	MQA8A13	21403		40362.68	Arc 8															
493	MQA8A14	-26602		-51672.56	Arc 8															
494	MQA8A15	47115		95037.76	Arc 8															
495	MQA8A16	-26602		-51672.56	Arc 8															
496	MQA8A17	27280		51631.34	Arc 8															
497	MQA8A18	-26602		-51672.56	Arc 8															
498	MQA8A19	47115		95037.76	Arc 8															
499	MQA8A20	-26602		-51672.56	Arc 8															
500	MQA8A21	21403		40362.68	Arc 8															
501	MQA8A22	-26602		-51672.56	Arc 8															
502	MQA8A23	47038		94882.50	Arc 8															
503	MQA8A24	-26602		-51672.56	Arc 8															
504	MQA8A25	27280		51631.34	Arc 8															
505	MQA8A26	-26602		-51672.56	Arc 8															
506	MQA8A27	47115		95037.76	Arc 8															
507	MQA8A28	-26602		-51672.56	Arc 8															
508	MQA8A29	21403		40362.68	Arc 8															
509	MQA8A30	-26602		-51672.56	Arc 8															
510	MQA8A31	47115		95037.97	Arc 8															
511	MQA8A32	-26602		-51672.56	Arc 8															
512	MQA8R01	39642		103986.50	2nd Rec. 4th pass	2nd QA Installed & Unpowered			QA											
513	MQA8R02	-59302		-143022.46	2nd Rec. 4th pass	2nd QA already installed														
514	MQA8R03	45102		114455.49	2nd Rec. 4th pass	2nd QA already installed														Originally PS upgrade
515	MQA8R04A	-49647		-124510.74	2nd Rec. 4th pass	Change to QR		QR	QA			1	-1	1						
516	MQA8R04B	-51152		-127396.15	2nd Rec. 4th pass	Change to QR		QR	QA				-1	1						
517	MQA8R05A	37144		99197.66	2nd Rec. 4th pass	20 Amp Power Supply	QA							-1	1					
518	MQA8R05B	37374		99638.05	2nd Rec. 4th pass	20 Amp Power Supply								-1	1					
519	MQA8R06	7083		41564.94	2nd Rec. 4th pass	2nd QA Installed & Unpowered			QA											
520	MQA8R07	-44639		-114909.48	2nd Rec. 4th pass	20 Amp Power Supply	QA							-1	1					
521	MQA8R08	-58862		-131537.00	2nd Rec. 4th pass	Change to QR		QR	QA			1	-1	1						
522	MQA8R09	53224		119386.04	2nd Rec. 4th pass	20 Amp Power Supply	QA							-1	1					
523	MQA8R10	-40512		-96355.61	2nd Rec. 4th pass															
North Linac																				
524	MQA9S02	-13586		-33147.36	1S Spr. 5th pass															
525	MQA9S03	22359		48625.09	1S Spr. 5th pass															
526	MQA9S04	0		-15419.62	1S Spr. 5th pass															
527	MQA9S05	-15035		-44245.61	1S Spr. 5th pass															
528	MQA9S06	21319		54950.42	1S Spr. 5th pass															
529	MQA9S07	-21319		-56292.47	1S Spr. 5th pass															
530	MQA9S08	25642		63239.53	1S Spr. 5th pass															
531	MQC9E01	-18693		-35839.19	1 Ext. 5th Pass	20 Amp Power Supply	QC							-1	1					
532	MQC9E02	18693		35839.19	1 Ext. 5th Pass	20 Amp Power Supply	QC							-1	1					
533	MQC9E03	-17414		-33387.07	1 Ext. 5th Pass	20 Amp Power Supply	QC							-1	1					
534	MQA9A01	24613		46518.30	Arc 9															
535	MQA9A02	-30482		-59110.80	Arc 9															
536	MQA9A03	56199		113499.58	Arc 9	20 Amp Power Supply	QA							-1	1					
537	MQA9A04	-30482		-59110.80	Arc 9															
538	MQA9A05	24370		46051.84	Arc 9															
539	MQA9A06	-30482		-59110.80	Arc 9															
540	MQA9A07	56199		113499.58	Arc 9	20 Amp Power Supply	QA							-1	1					
541	MQA9A08	-30482		-59110.80	Arc 9															
542	MQA9A09	30214		57256.66	Arc 9															
543	MQA9A10	-30482		-59110.80	Arc 9															
544	MQA9A11	56199		113499.58	Arc 9	20 Amp Power Supply	QA							-1	1					
545	MQA9A12	-30482		-59110.80	Arc 9															
546	MQA9A13	24370		46051.84	Arc 9															
547	MQA9A14	-30482		-59110.80	Arc 9															
548	MQA9A15	56199		113499.99	Arc 9	20 Amp Power Supply	QA							-1	1					
549	MQA9A16	-30482		-59110.80	Arc 9															
550	MQA9A17	30214		57256.66	Arc 9															
551	MQA9A18	-30482		-59110.80	Arc 9															
552	MQA9A19	56199		113499.58	Arc 9	20 Amp Power Supply	QA							-1	1					

Existing Name	Dimad Name	Original B'dl [kG]	Tuning	B'dL [kG] with tuning allowance	Location	Change	Upgrade with PS	New Magnet	Remove Magnet	New Girder	DBL or TRPL Girder	Modify Girder	New 10 amp	New 20 amp	New H corr	New V corr	New BPM	Other	Notes	
							Count	128	43	63	18	34	-94	169	61	61	80	0		
553	MQA9A20	-30482		-59110.80	Arc 9															
554	MQA9A21	24370		46051.84	Arc 9															
555	MQA9A22	-30482		-59110.80	Arc 9															
556	MQA9A23	56299		113703.01	Arc 9	20 Amp Power Supply	QA						-1	1						
557	MQA9A24	-30482		-59110.80	Arc 9															
558	MQA9A25	30214		57256.66	Arc 9															
559	MQA9A26	-30482		-59110.80	Arc 9															
560	MQA9A27	56199		113499.99	Arc 9	20 Amp Power Supply	QA						-1	1						
561	MQA9A28	-30482		-59110.80	Arc 9															
562	MQA9A29	24370		46051.84	Arc 9															
563	MQA9A30	-30482		-59110.80	Arc 9															
564	MQA9A31	56949		115024.18	Arc 9	20 Amp Power Supply	QA						-1	1						
565	MQA9A32	-30482		-59110.80	Arc 9															
566	MQA9R01	36140		83818.80	1R Rec. 5th pass															
567	MQA9R02	-39647		-91885.51	1R Rec. 5th pass															
568	MQA9R03	7782		29450.97	1R Rec. 5th pass															
569	MQA9R04	-7421		-30101.39	1R Rec. 5th pass															
570	MQA9R05	749		15968.01	1R Rec. 5th pass															
571	MQA9R06	23844		51900.77	1R Rec. 5th pass															
572	MQA9R07	-21480		-48709.75	1R Rec. 5th pass															
					South Linac															
					ARC 10															
573	MQAAT01	MQAAS02	-32871.78	1.3	-42733.31	S Spr 5th pass Arc 1	location?													
574	MQAAT02	MQAAS03	58995.66	1.3	76694.36	S Spr 5th pass Arc 1	location?													
575	MQAAT03	MQAAS04	1061.001	1.3	1379.30	S Spr 5th pass Arc 1	Move													
576		MQAAS05	-39710.04	1.3	-51623.05	S Spr 5th pass Arc 1	new	QA		1			1			1	1			
577		MQAAS06	37413.42	1.3	48637.45	S Spr 5th pass Arc 1	New	QA		1			1		1		1			
578	MQAAT04	MQAAS07	-42636.96	1.3	-55428.05	S Spr 5th pass Arc 1	Move													
579	MQAAT05	MQAAS08	54256.62	1.3	70533.61	S Spr 5th pass Arc 1	Move													
580		MQCAE01	-39776.13	1	-39776.13	d Ext. 5th pass Arc		QC		1			1			1	1			
581		MQCAE02	39776.13	1	39776.13	d Ext. 5th pass Arc		QC		1			1		1		1			
582		MQCAE03	-37054.41	1	-37054.41	d Ext. 5th pass Arc		QC		1			1			1	1			
583		MQAAA01	58055.76	1	58055.76	ARC 10		QP		1					1		1			
584		MQAAA02	-65120.49	1	-65120.49	ARC 10		QP		1						1	1			
585		MQAAA03	119629.65	1.06	126807.43	ARC 10		QP			1			1	1		1			
586								QP												
587		MQAAA04	-65120.49	1	-65120.49	ARC 10		QP		1				1			1	1		
588		MQAAA05	51810.48	1	51810.48	ARC 10		QP		1				1	1		1	1		
589		MQAAA06	-65120.49	1	-65120.49	ARC 10		QP		1				1			1	1		
590		MQAAA07	119629.65	1.06	126807.43	ARC 10		QP			1			1	1		1	1		
591								QP												
592		MQAAA08	-65120.49	1	-65120.49	ARC 10		QP		1				1			1	1		
593		MQAAA09	64290.03	1	64290.03	ARC 10		QP		1				1	1		1	1		
594		MQAAA10	-65120.49	1	-65120.49	ARC 10		QP		1				1			1	1		
595		MQAAA11	119629.65	1.06	126807.43	ARC 10		QP			1			1	1		1	1		
596								QP												
597		MQAAA12	-65120.49	1	-65120.49	ARC 10		QP		1				1			1	1		
598		MQAAA13	51810.48	1	51810.48	ARC 10		QP		1				1	1		1	1		
599		MQAAA14	-65120.49	1	-65120.49	ARC 10		QP		1				1			1	1		
600		MQAAA15	119629.65	1.06	126807.43	ARC 10		QP			1			1	1		1	1		
601								QP												
602		MQAAA16	-65120.49	1	-65120.49	ARC 10		QP		1				1			1	1		
603		MQAAA17	64290.03	1	64290.03	ARC 10		QP		1				1	1		1	1		
604		MQAAA18	-65120.49	1	-65120.49	ARC 10		QP		1				1			1	1		
605		MQAAA19	119629.65	1.06	126807.43	ARC 10		QP			1			1	1		1	1		
606								QP												
607		MQAAA20	-65120.49	1	-65120.49	ARC 10		QP		1				1			1	1		
608		MQAAA21	51810.48	1	51810.48	ARC 10		QP		1				1	1		1	1		
609		MQAAA22	-65120.49	1	-65120.49	ARC 10		QP		1				1			1	1		
610		MQAAA23	119629.65	1.06	126807.43	ARC 10		QP			1			1	1		1	1		
611								QP												
612		MQAAA24	-65120.49	1	-65120.49	ARC 10		QP		1				1			1	1		
613		MQAAA25	64290.03	1	64290.03	ARC 10		QP		1				1	1		1	1		
614		MQAAA26	-65120.49	1	-65120.49	ARC 10		QP		1				1			1	1		
615		MQAAA27	119629.65	1.06	126807.43	ARC 10		QP			1			1	1		1	1		
616								QP												
617		MQAAA28	-65120.49	1	-65120.49	ARC 10		QP		1				1			1	1		
618		MQAAA29	51810.48	1	51810.48	ARC 10		QP		1				1	1		1	1		
619		MQAAA30	-65120.49	1	-65120.49	ARC 10		QP		1				1			1	1		
620		MQAAA31	119629.65	1.06	126807.43	ARC 10		QP			1			1	1		1	1		
621								QP												

Existing Name	Dimad Name	Original B'dl [kG]	Tuning	B'dL [kG] with tuning allowance	Location	Change	Upgrade with PS	New Magnet	Remove Magnet	New Girder	DBL or TRPL Girder	Modify Girder	New 10 amp	New 20 amp	New H corr	New V corr	New BPM	Other	Notes
							Count	128	43	63	18	34	-94	169	61	61	80	0	
622	MQAAA32	-65120.49	1	-65120.49	ARC 10	new		QP		1									
623	MQAAR01	122697.48	1.3	159506.72	d Rec. 5th pass, Arc	new		QR		1				1	1				
624	MQAAR02	-108596.6	1.3	-141175.52	d Rec. 5th pass, Arc	new		QR		1				1		1	1		
625	MQAAR03	35379.45	1.3	45993.29	d Rec. 5th pass, Arc	new		QA		1			1		1				
626	MQAAR04	6520.944	1.3	8477.23	d Rec. 5th pass, Arc	new		QA		1			1			1	1		
627	MQAAR05	7098.819	1.3	9228.46	d Rec. 5th pass, Arc	new		QA		1			1		1				
628	MQAAR06	31596.93	1.3	41076.01	d Rec. 5th pass, Arc	new		QA		1			1			1	1		
629	MQAAR07	-41495.85	1.3	-53944.61	d Rec. 5th pass, Arc	new		QA		1			1		1				
630	MQB2T01			18822.74	Transport	20 Amp Power Supply	QB						-1	1					
631	MQB2T02			-20467.61	Transport	20 Amp Power Supply	QB						-1	1					
632	MQB2T03			4723.54	Transport														
633	MQB2T04			4723.29	Transport														
634	MQB2T05			-13153.93	Transport														
635	MQB2T06			13188.94	Transport														
636	MQC2T07			-38004.35	Transport	20 Amp Power Supply	QC						-1	1					
637	MQC2T08			27474.07	Transport	20 Amp Power Supply	QC						-1	1					
638	MQC2T09			-20303.47	Transport														
639	MQA4T01			35981.77	Transport														
640	MQA4T02			-39872.02	Transport														
641	MQA4T03			-10224.03	Transport														
642	MQA4T04			-10224.03	Transport														
643	MQA4T05			-30793.03	Transport														
644	MQA4T06			29376.81	Transport														
645	MQA4T07			-77311.83	Transport														
646	MQA4T08			60056.58	Transport														
647	MQA4T09			-42990.46	Transport														
648	MQA6T01			66908.76	Transport														
649	MQA6T02			-63282.47	Transport														
650	MQA6T03			-21704.59	Transport														
651	MQA6T04			-21704.59	Transport														
652	MQA6T05			-74148.12	Transport														
653	MQA6T06			90713.48	Transport														
654	MQA6T07			-124255.78	Transport	Change to QR		QR	QA			1	-1	1					
655	MQA6T08			105430.39	Transport	20 Amp Power Supply	QA						-1	1					
656	MQA6T09			-57968.15	Transport														
657	MQA8T01			97786.44	Transport	20 Amp Power Supply	QA						-1	1					
658	MQA8T02			-98459.88	Transport	20 Amp Power Supply	QA						-1	1					
659	MQA8T03			-23492.22	Transport														
660	MQA8T04			-23492.22	Transport														
661	MQA8T05			-55432.30	Transport														
662	MQA8T06			87951.40	Transport														
663	MQA8T07			-123399.70	Transport	Change to QR		QR	QA			1	-1	1					
664	MQA8T08			110051.63	Transport	20 Amp Power Supply	QA						-1	1					
665	MQA8T09			-87058.62	Transport														
666	N Ext. 1			46000.00	Transport	new		QA		1			1		1	1	1		Depends on Aperature
667	N Ext. 2			46000.00	Transport	new		QA		1			1		1	1	1		Depends on Aperature
668	N Ext. 3			46000.00	Transport	new		QA		1			1		1	1	1		Depends on Aperature
669																			
670	MQCAT06	7812		25532.46	AT 5th pass BSY	20 Amp Power Supply	QC						-1	1					Depends on Aperature
671	MQCAT07	-18352		-45740.29	AT 5th pass BSY	Add QB + PS	QC+QB						-1	1					Depends on Aperature
672	MQCAT08	16840		42841.27	AT 5th pass BSY	Add QB + PS	QC+QB				1		-1	1					Depends on Aperature
673	MQA1C01	37890		100049.25	Hall A	20 Amp Power Supply	QA						-1	1					
674	MQA1C02	-61755		-147145.78	Hall A	Change to QR		QR	QA			1	-1	1					
675	MQA1C03	38741		101679.63	Hall A	20 Amp Power Supply	QA						-1	1					
676	MQA1C04	46367		116300.95	Hall A	20 Amp Power Supply	QA						-1	1					
677	MQA1C05	-26193		-78964.30	Hall A														
678	MQA1C06	3141		5351.29	Hall A														
679	MQA1C07	-17543		-34304.46	Hall A														
680	MQA1C08	26303		49757.18	Hall A														
681	MQA1C09	0		-671.03	Hall A														
682	MQA1C10	0		-671.03	Hall A														
683	MQA1C11	-23452		-45633.32	Hall A														
684	MQA1C12	47035		89505.15	Hall A														
685	MQA1C13	-20510		-39994.01	Hall A														
686	MQA1C14	0		-671.03	Hall A														
687	MQA1C15	0		-671.03	Hall A														
688	MQA1C16	25763		48721.87	Hall A														
689	MQA1C17	-15871		-31099.46	Hall A														
690	MQA1C18	16064		30126.96	Hall A														
691	MQA1C19	-58064		-111992.07	Hall A	20 Amp Power Supply	QA						-1	1					

Existing Name	Dimad Name	Original B'dl [kG]	Tuning	B'dL [kG] with tuning allowance	Location	Change	Upgrade with PS	New Magnet	Remove Magnet	New Girder	DBL or TRPL Girder	Modify Girder	New 10 amp	New 20 amp	New H corr	New V corr	New BPM	Other	Notes		
							Count	128	43	63	18	34	-94	169	61	61	80	0			
691	MQA1C20	31089		58933.35	Hall A																
692	MQA1H01	0		-671.03	Hall A																
693	MQM1H02	33922		65036.73	Hall A																
694	MQO1H03	0		0.00	Hall A																
695	MQO1H03A	-34092		-65360.99	Hall A																
696	MQA1H04	3787		6590.06	Hall A																
697	MQA1H04A	0		-671.03	Hall A																
698	MQA2C01	-10582		-49035.76	Hall B																
699	MQA2C02	23127		71744.76	Hall B																
700	MQA2C03	-40266		-105945.85	Hall B	20 Amp Power Supply	QA							-1	1						
701	MQA2C04	28470		81988.38	Hall B																
702	MQA2C05	-73220		-169126.66	Hall B	Change to QR		QR	QA				1	-1	1						
703	MQA2C06	80160		153012.83	Hall B	Change to QR		QR	QA				1	-1	1						
704	MQA2C07	-78746		-151644.12	Hall B	Change to QR		QR	QA				1	-1	1						
705	MQA2C08	80160		153012.83	Hall B	Change to QR		QR	QA				1	-1	1						
706	MQA2C09	-78746		-151644.12	Hall B	Change to QR		QR	QA				1	-1	1						
707	MQA2C10	80160		153012.83	Hall B	Change to QR		QR	QA				1	-1	1						
708	MQA2C11	-78746		-151644.12	Hall B	Change to QR		QR	QA				1	-1	1						
709	MQA2C12	80160		153012.83	Hall B	Change to QR		QR	QA				1	-1	1						
710	MQA2C13	-78746		-151644.12	Hall B	Change to QR		QR	QA				1	-1	1						
711	MQA2C14	80160		153012.83	Hall B	Change to QR		QR	QA				1	-1	1						
712	MQA2C15	-78746		-151644.12	Hall B	Change to QR		QR	QA				1	-1	1						
713	MQA2C16	80160		153012.83	Hall B	Change to QR		QR	QA				1	-1	1						
714	MQA2C17	-78746		-151644.12	Hall B	Change to QR		QR	QA				1	-1	1						
715	MQA2C18	80160		153012.83	Hall B	Change to QR		QR	QA				1	-1	1						
716	MQA2C19	-78746		-151644.12	Hall B	Change to QR		QR	QA				1	-1	1						
717	MQA2C20	70049		133627.62	Hall B	Change to QR		QR	QA				1	-1	1						
718	MQA2C21	-26171		-50846.10	Hall B																
719	MQA2C22	-47720		-92160.74	Hall B																
720	MQA2C23	81964		156471.66	Hall B	Change to QR		QR	QA				1	-1	1						
721	MQA2C24	-39126		-75683.90	Hall B																
722	MQA3C01	37657		99600.76	Hall C	20 Amp Power Supply	QA							-1	1						
723	MQA3C02	-59326		-142487.19	Hall C	Change to QR		QR	QA				1	-1	1						
724	MQA3C03	37657		99600.76	Hall C	20 Amp Power Supply	QA							-1	1						
725	MQA3C04	45409		114463.89	Hall C	20 Amp Power Supply	QA							-1	1						
726	MQA3C05	-30955		-88094.21	Hall C																
727	MQA3C06	7547		13797.93	Hall C																
728	MQA3C07	-16695		-32678.65	Hall C																
729	MQA3C08	38469		73082.65	Hall C																
730	MQA3C09	0		-671.03	Hall C																
731	MQA3C10	0		-671.03	Hall C																
732	MQA3C11	-23208		-45165.11	Hall C																
733	MQA3C12	46950		89342.64	Hall C																
734	MQA3C13	-20310		-39610.50	Hall C																
735	MQA3C14	0		-671.03	Hall C																
736	MQA3C16	22470		42408.86	Hall C																
737	MQA3C17	-12791		-25194.68	Hall C																
738	MQA3C18	-21617		-42116.00	Hall C																
739	MQA3C19	40692		77344.34	Hall C																
740	MQA3C20A	-21745		-42361.19	Hall C																
741	qMQCBS01	0	1.35	0.00	Hall D	new		QC		1			1		1	1	1				
742	qMQCBS02	-2,595	1.35	-3503.36	Hall D	new		QC		1			1		1	1	1				
743	qMQCBS03	-19,980	1.35	-26973.00	Hall D	new		QC		1				1	1	1	1				
744	qMQCBS04	20,580	1.35	27783.00	Hall D	new		QC		1				1	1	1	1				
745	qMQABE01	30,124	1.35	40666.98	Hall D	new		QA		1			1		1	1	1				
746	qMQABE02	-53,110	1.35	-71698.77	Hall D	new		QA		1			1		1	1	1				
747	qMQABE03	51,086	1.35	68965.99	Hall D	new		QA		1			1		1	1	1				
748	qMQABE04	-7,200	1.35	-9720.00	Hall D	new		QA		1			1		1	1	1				
749	qMQABT00	-13,500	1.35	-18225.00	Hall D	new		QA		1			1		1	1	1				
750	qMQABT01	47,600	1.35	64260.18	Hall D	new		QA		1			1		1	1	1				
751	qMQABT02	-91,257	1.35	-123196.34	Hall D	new		QR		1				1	1	1	1				
752	qMQABT03	65,529	1.35	88464.15	Hall D	new		QA		1			1		1	1	1				
753	qMQA5C01	67,560	1.35	91206.00	Hall D	new		QA		1			1		1	1	1				
754	qMQA5C02	-100,631	1.35	-135851.99	Hall D	new Dbl Girder		QR		1				1	1	1	1				
755	qMQA5C02A	-99,319	1.35	-134080.35	Hall D			QR		1				1							
756	qMQA5C03	59,136	1.35	79833.60	Hall D	new		QA		1			1		1	1	1				
757	qMQA5C04	0	1.35	0.00	Hall D	new		QA		1			1		1	1	1				
758	qMQA5C16	120,000	1.35	162000.00	Hall D	new		QR		1				1	1	1	1				
759	qMQA5C17	-120,000	1.35	-162000.00	Hall D	new		QR		1				1	1	1	1				
760	qMQA5C18	-120,000	1.35	-162000.00	Hall D	new		QR		1				1	1	1	1				

Existing Name	Dimad Name	Original B'dl [kG]	Tuning	B'dL [kG] with tuning allowance	Location	Change	Upgrade with PS	New	Remove	New	DBL or	Modify	New	New	New H	New	New	Other	Notes
								Magnet	Magnet	Girder	TRPL Girder	Girder	10 amp	20 amp	V corr	BPM			
							Count	128	43	63	18	34	-94	169	61	61	80	0	
761	qMQA5C19	109,430	1.35	147730.64	Hall D	new		QR		1				1	1	1	1		
762	qMQA5C05	60,084	1.35	81113.40	Hall D	new		QA		1			1	1	1	1	1		
763	qMQA5C06	-89,091	1.35	-120272.45	Hall D	new Dbl Girder		QR			1			1	1	1	1		
764	qMQA5C06A	-96,513	1.35	-130292.55	Hall D			QR						1					
765	qMQA5C07	60,846	1.35	82142.10	Hall D	new		QA		1			1	1	1	1	1		
766	qMQP5C08	0		0.00	Hall D	new Dbl Girder, Two 20 A PS		QP			1			1	1	1	1		
767				0.00	Hall D			QP											
768	qMQP5C09	-22,058	1.5	-33087.55	Hall D										1	1	1		
769	qMQP5C10	0		0.00	Hall D	new Dbl Girder, Two 20 A PS		QP			1			1	1	1	1		
770				0.00	Hall D			QP											
771	qMQP5C11	9,349		0.00	Hall D										1	1	1		
772	qMQP5C12	-41,400	1.5	-62100.00	Hall D	new Dbl Girder, Two 20 A PS		QP			1			1	1	1	1		
773				0.00	Hall D			QP											
774	qMQP5C13	-34,022	1.5	-51033.38	Hall D										1	1	1		
775	qMQP5C14	32,100	1.5	48150.00	Hall D	new Dbl Girder, Two 20 A PS		QP			1			1	1	1	1		
776				0.00	Hall D			QP											
777	qMQP5C15	32,191	1.5	48286.31	Hall D										1	1	1		
a	HVBPM Girder				Hall D	Correct/BPM girder				1					1	1	1		
b	HVBPM Girder				Hall D	Correct/BPM girder				1					1	1	1		