HEBT Quadrupoles with 3 Inches Radius

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The existing quadrupoles (5Q20) will be in the HEBT. These quadrupoles has a radius of 50.8 mm and effective length of 203.6 mm. In couple of places in the HEBT, quadrupoles aperture has to be increased to accommodate the optics. Poisson simulations were made to see by increasing aperture radius what is effect on the field quality. Figure 1 and 2 shows the solution of the Poisson (1/8 of the quadrupoles)with 2 and 3 inches of radius respectively.

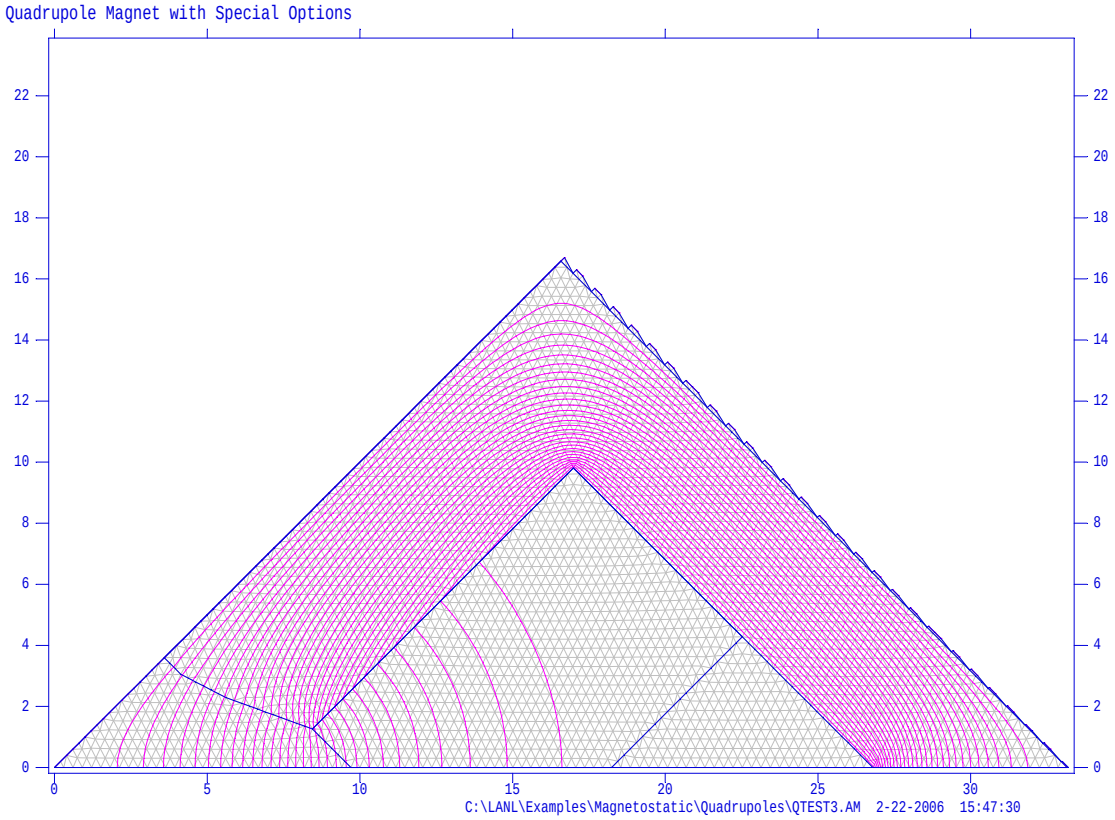

Figure 1: Poisson solution for the HEBT quadrupoles.

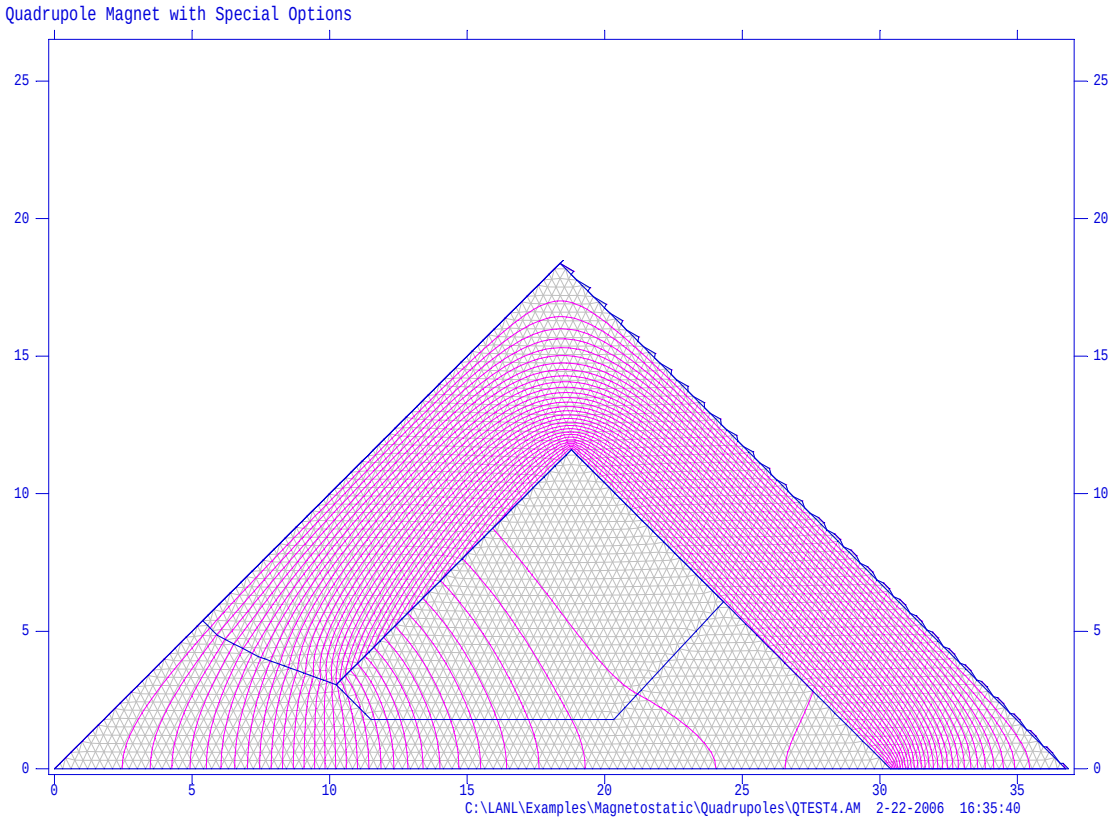

Figure 2: Poisson solutions for the HEBT quad with 3 inches radius.

Table 1 shows the field coefficients for the HEBT quadrupoles with 2 inches radius for current 11437 A.

Table 1: Field coefficient for the HEBT quad with 2 inches aperture radius

Field coefficients (Normalization radius = 1.00000)

(Bx - iBy) = i[sum n*(An + iBn)/r * (z/r)**(n-1)]

n	n(An)/r	n(Bn)/r	Abs(n(Cn)/r)
2	1.0000E+03	0.0000E+00	1.0000E+03
6	-8.5542E-03	0.0000E+00	8.5542E-03
10	5.9852E-06	0.0000E+00	5.9852E-06
14	3.1862E-09	0.0000E+00	3.1862E-09
18	2.2538E-13	0.0000E+00	2.2538E-13
22	-3.4207E-16	0.0000E+00	3.4207E-16
26	-1.5318E-19	0.0000E+00	1.5318E-19
30	-3.7420E-24	0.0000E+00	3.7420E-24
34	2.5980E-26	0.0000E+00	2.5980E-26
38	1.2093E-29	0.0000E+00	1.2093E-29

Table 2 shows the field coefficients for the HEBT quadrupoles with 3 inches radius for current 25687.5 A

Table 2: Field coefficient for the HEBT quad with 3 inches aperture radius

Field coefficients (Normalization radius = 1.00000)

(Bx - iBy) = i[sum n*(An + iBn)/r * (z/r)**(n-1)]

n	n(An)/r	n(Bn)/r	Abs(n(Cn)/r)
2	1.0000E+03	0.0000E+00	1.0000E+03
6	-2.2371E-02	0.0000E+00	2.2371E-02
10	1.9202E-06	0.0000E+00	1.9202E-06
14	-3.3823E-10	0.0000E+00	3.3823E-10
18	-1.2781E-14	0.0000E+00	1.2781E-14
22	2.4435E-17	0.0000E+00	2.4435E-17
26	-1.0033E-20	0.0000E+00	1.0033E-20
30	3.2005E-24	0.0000E+00	3.2005E-24
34	-4.2961E-28	0.0000E+00	4.2961E-28
38	-1.9998E-31	0.0000E+00	1.9998E-31

Appendix 1: Poisson input file for 2 inches aperture radius.
Appendix 2: Poisson output file for 2 inches aperture radius.
Appendix 3: Poisson input file for 3 inches aperture radius
Appendix 4: Poisson output file for 3 inches aperture radius.

Drawing used : Danfysik-62033D, 62049A, 62031D, 62037B, 62032G