

Outline

- Meshed with no iron for comparison
- Used Willy's conceptual design for iron pieces
 - Not optimized in any way
 - Used thin and thick pieces
- Compared fields (BMOD and BR)
- Compared tracks for no iron, thick iron and "giant" iron
- Reduced current density and compared optics

Note: op3 file names are:

no_iron_in_coils_test_ver2.op3 (smaller mesh size)

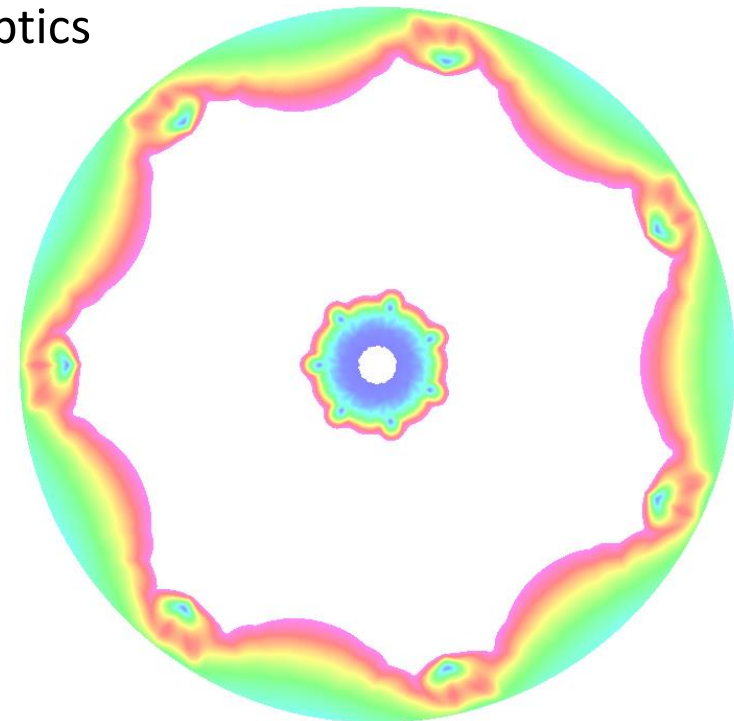
iron_in_coils_ver3.op3 (thin)

iron_in_coils_ver4.op3 (thick)

iron_in_coils_ver5.op3 (giant)

iron_in_coils_temp_BFIL_0_80.op3 (giant, reduced current)

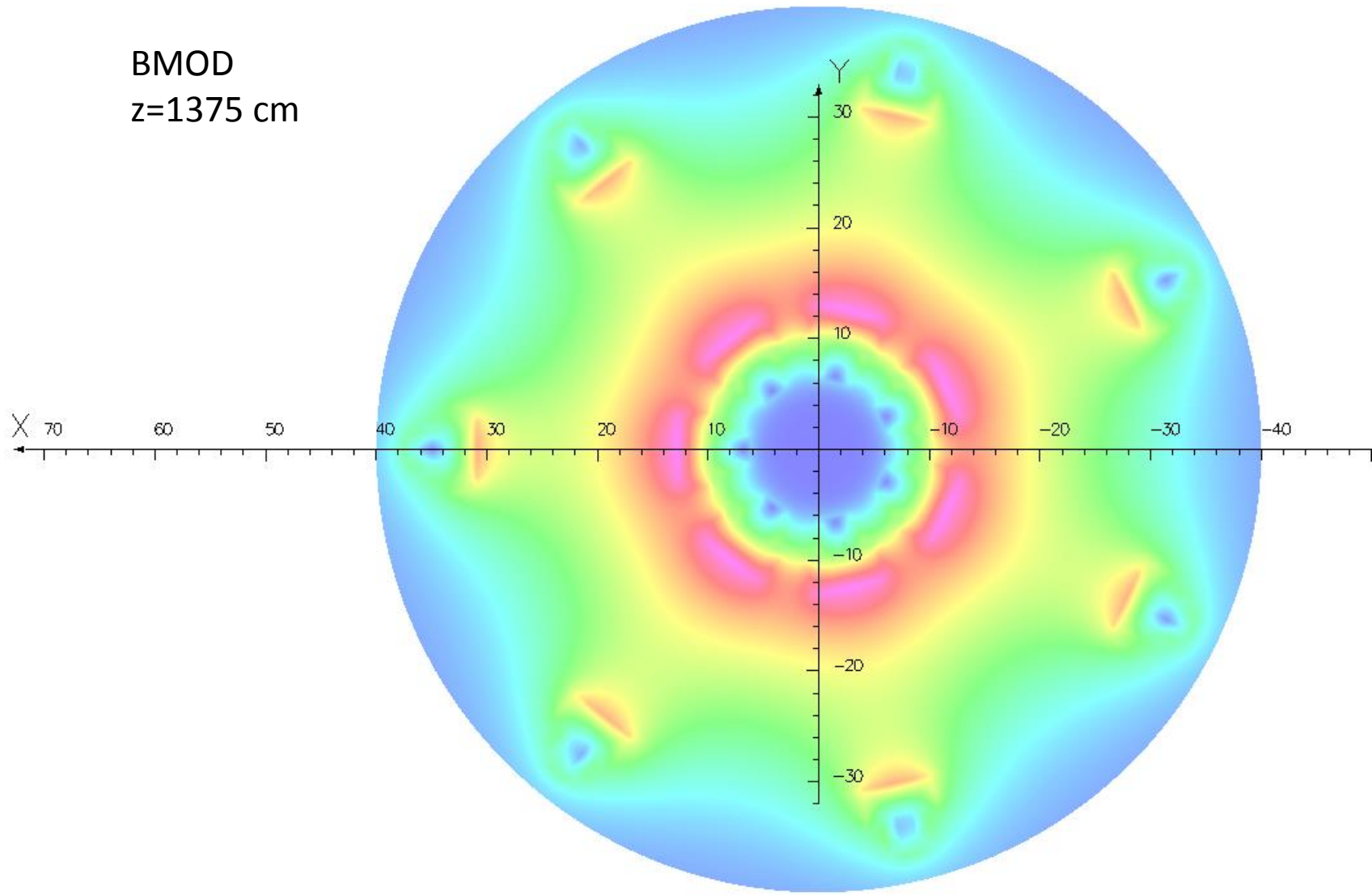
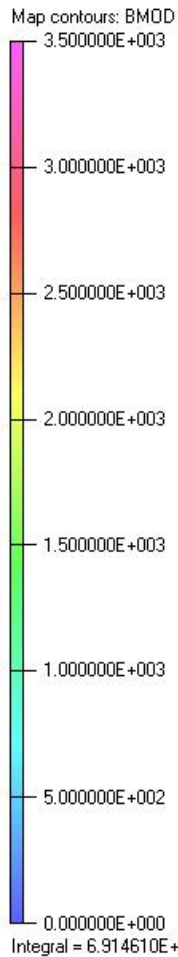
iron_in_coils_temp_BFIL_0_90.op3 (giant, reduced current)



No iron, coils only

27/Aug/2013 10:30:25

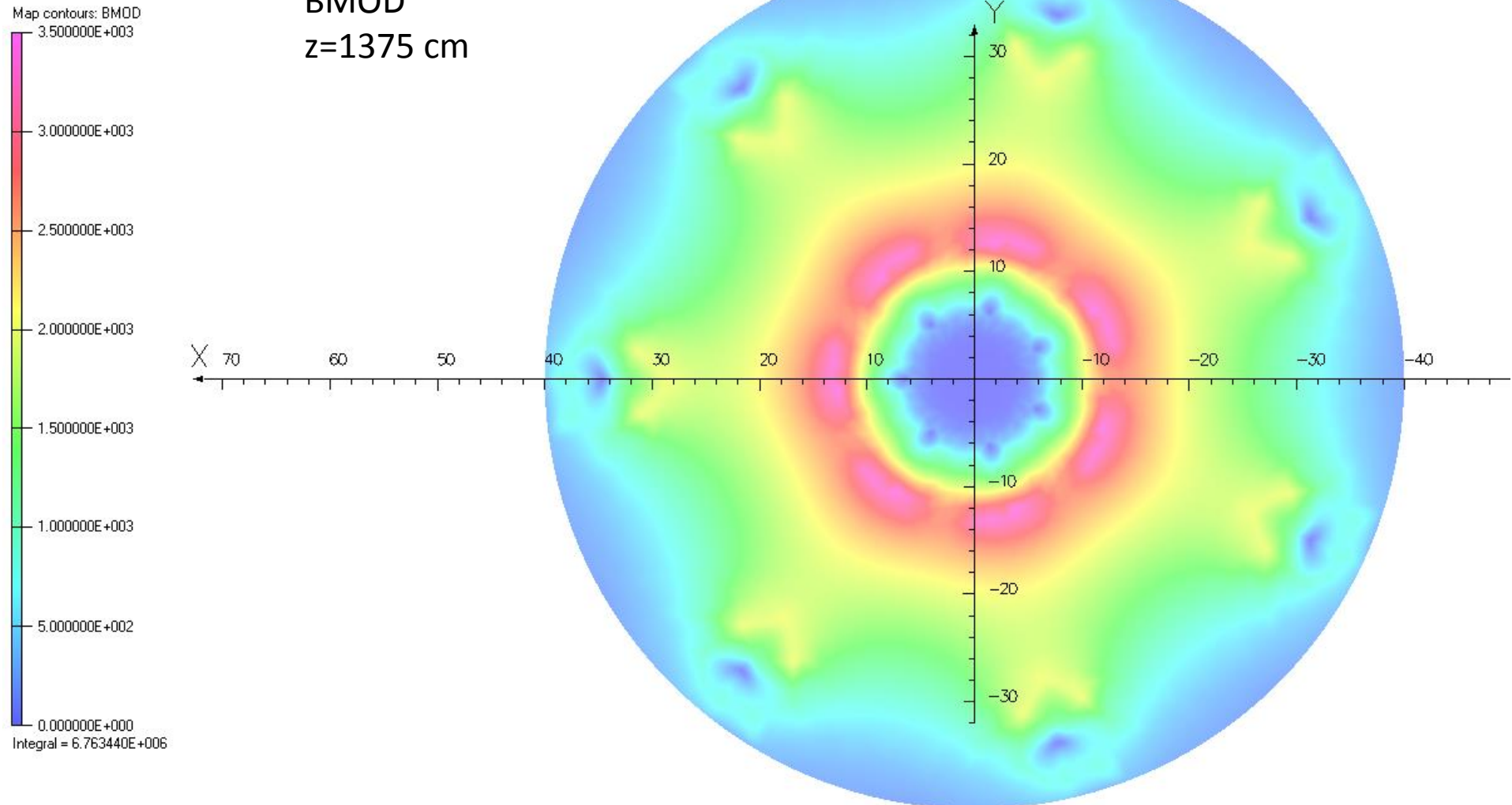
BMOD
z=1375 cm



No iron w/ mesh

27/Aug/2013 10:02:04

BMOD
z=1375 cm



Field on a line, middle of open sector

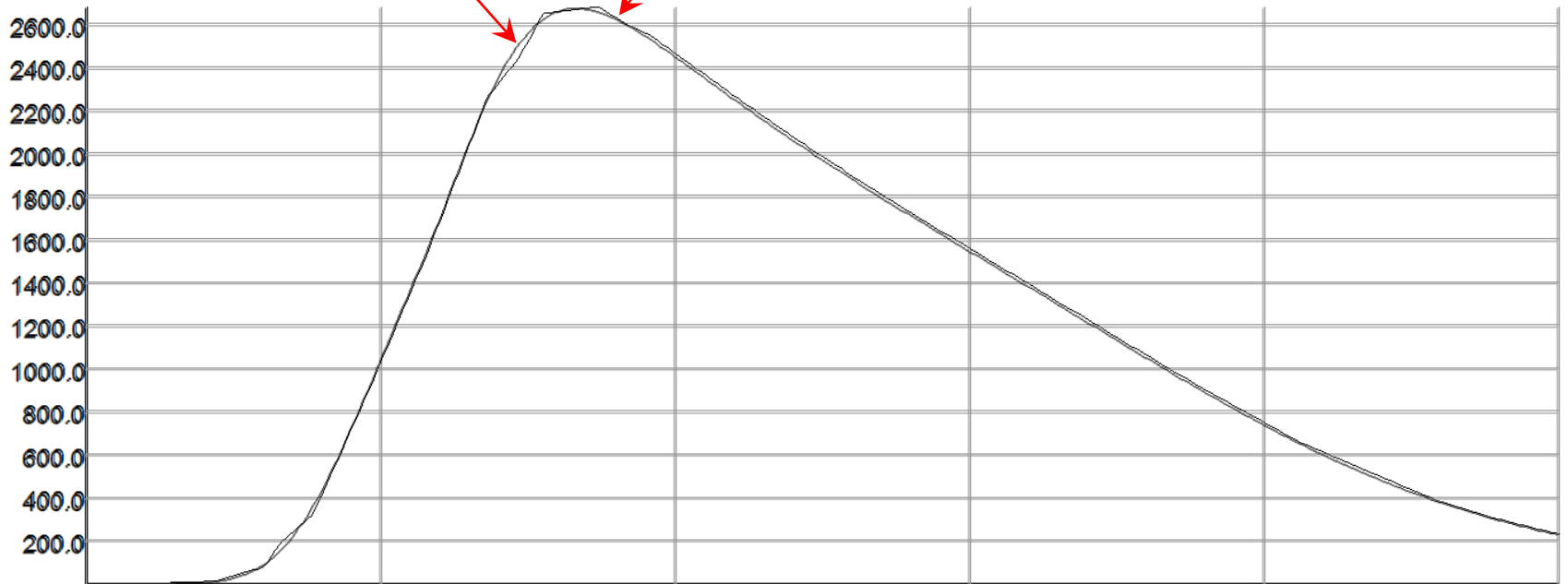
BMOD

$z=1375$ cm, $y=0$ cm, $0 < x < -40$ cm

BMOD

With coils only

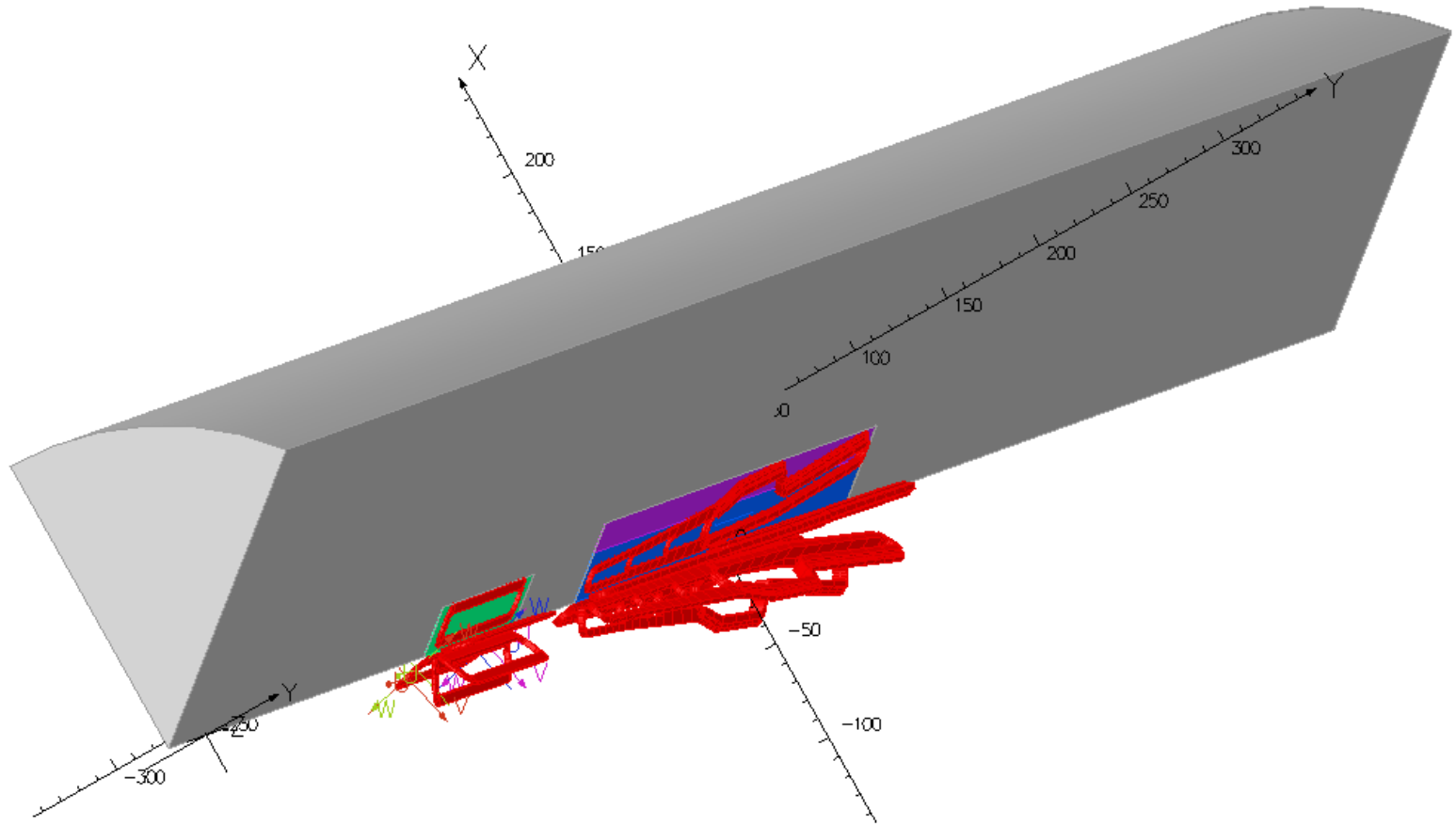
With mesh



X coord 0.0 -8.0 -16.0 -24.0 -32.0 -40.0
Y coord 0.0 0.0 0.0 0.0 0.0 0.0
Z coord 1375.0 1375.0 1375.0 1375.0 1375.0 1375.0

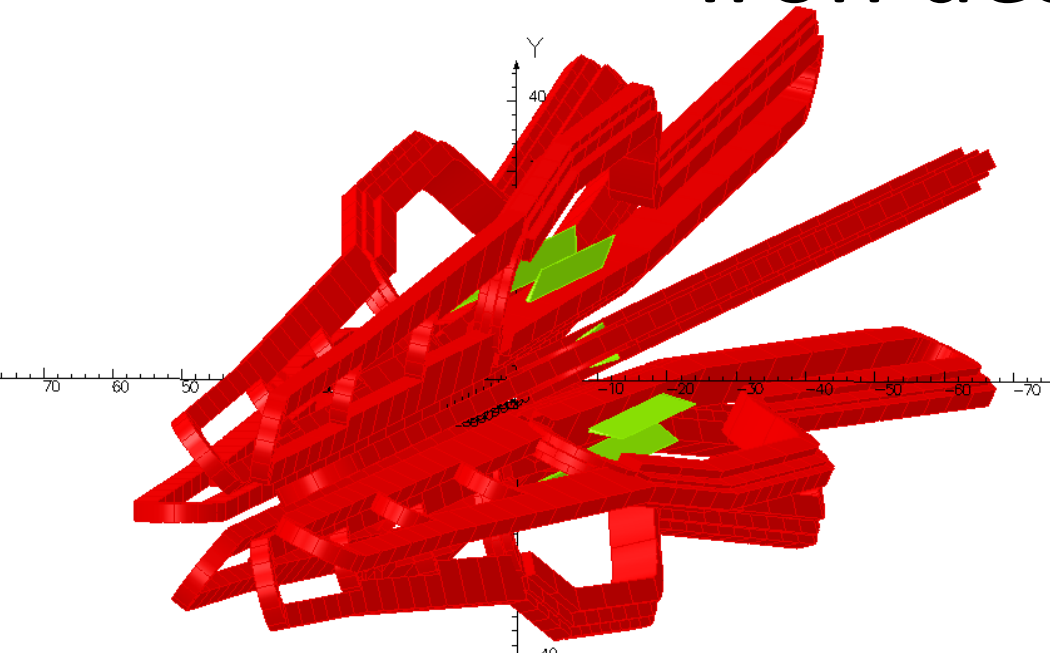
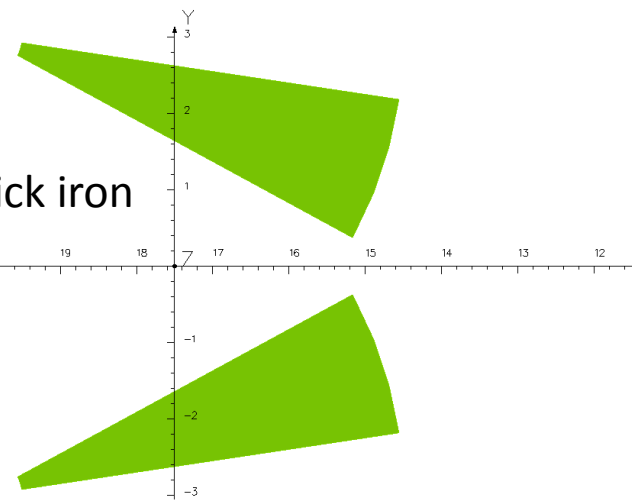
Component: BMOD, from buffer: Line, Integral = 48053.8689743928

Model body in mesh

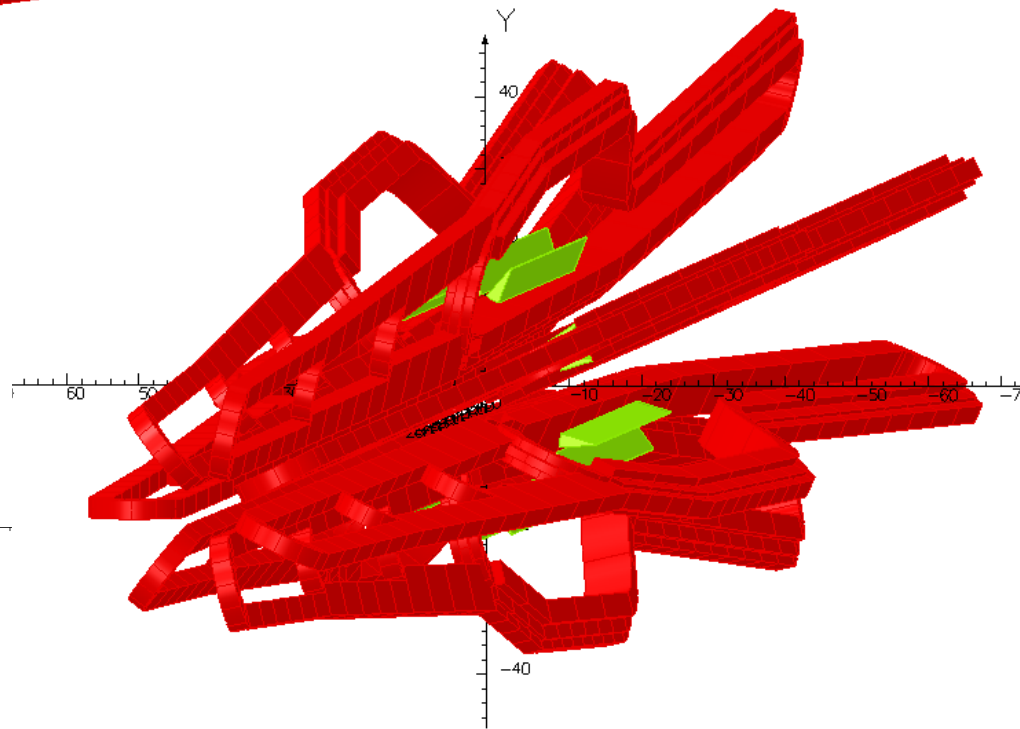
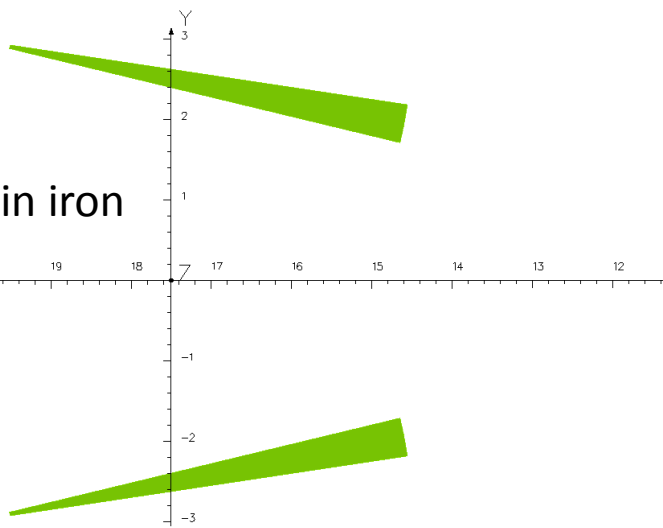


Iron design

thick iron



thin iron



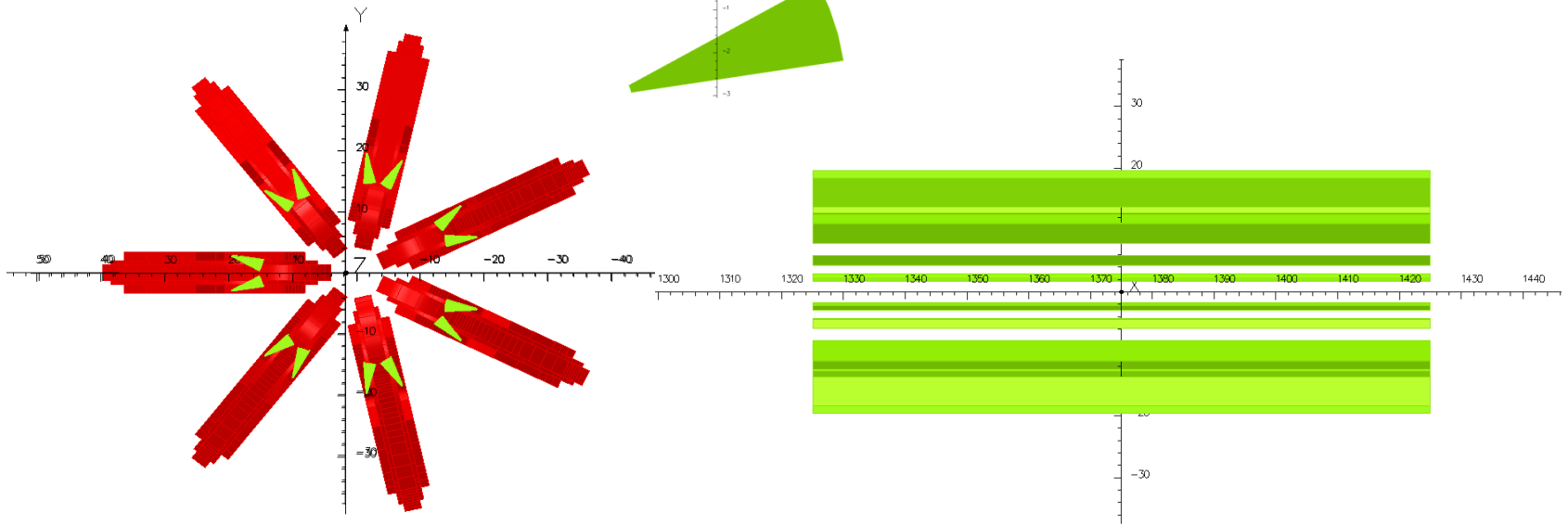
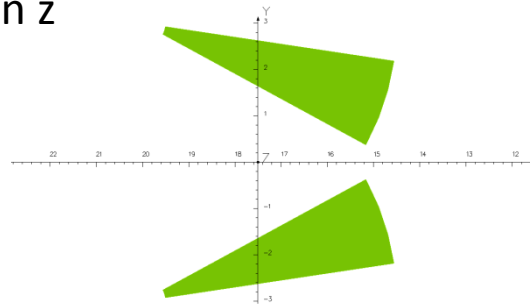
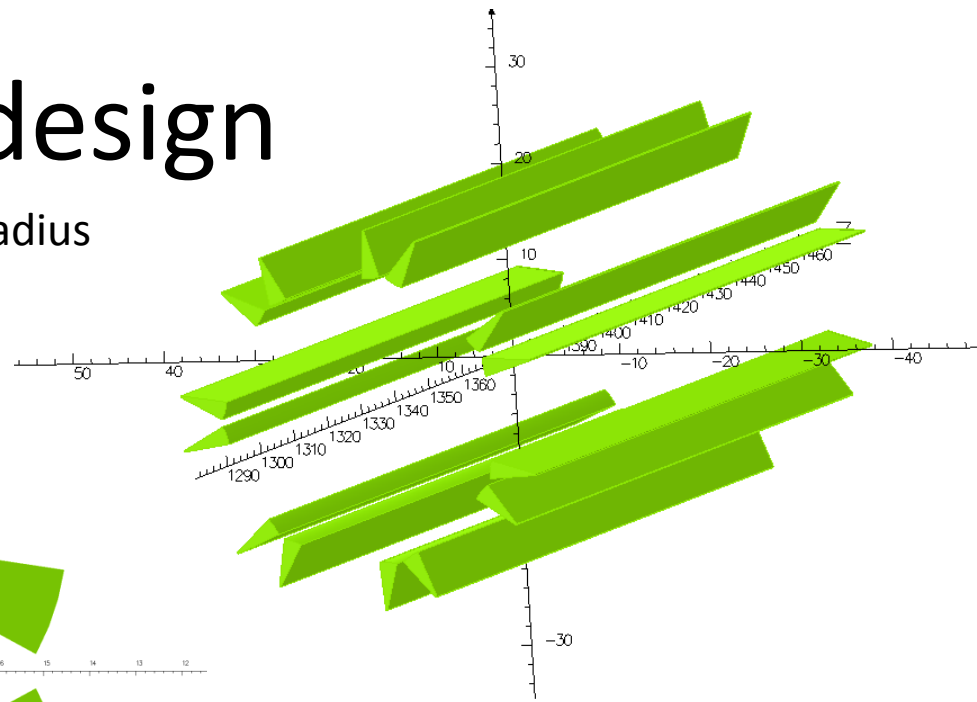
Iron design

1 m long, section of tube from 0.5 to 5.5 cm radius

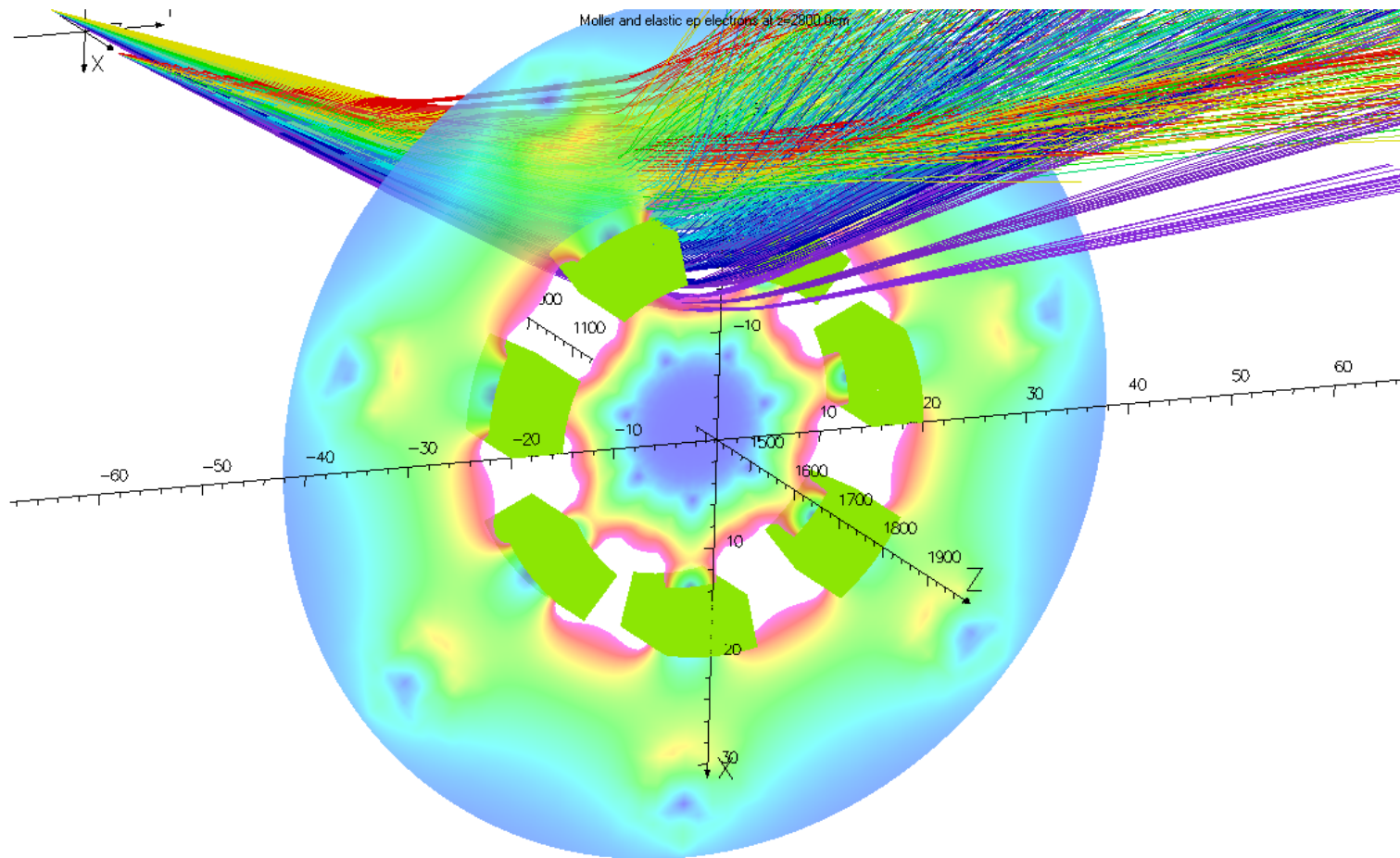
Opening angle, thin: 5 degrees

Opening angle, thick: 20 degrees

Placed radially from 5 – 20 cm
between 1325 and 1425 cm in z



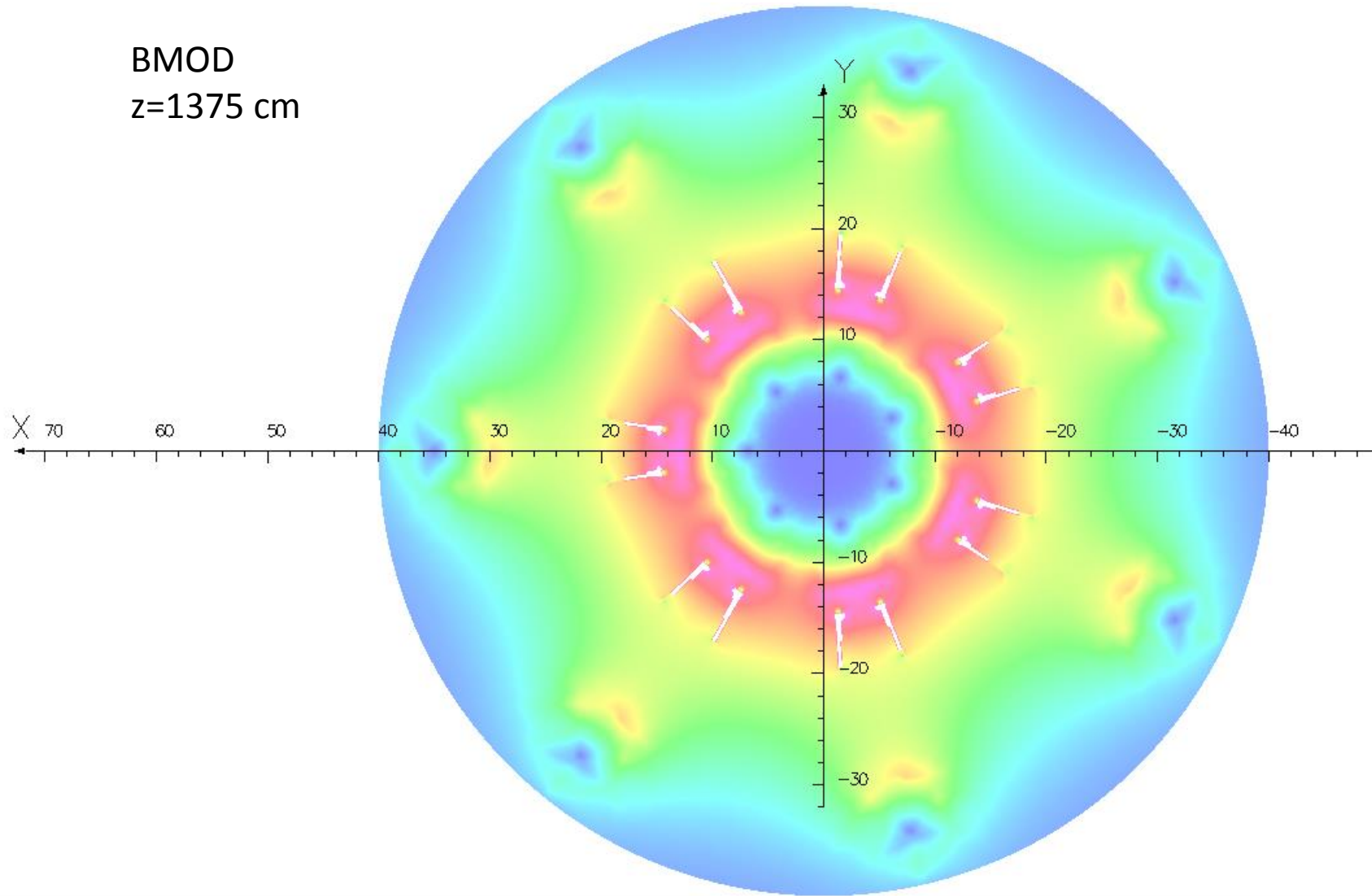
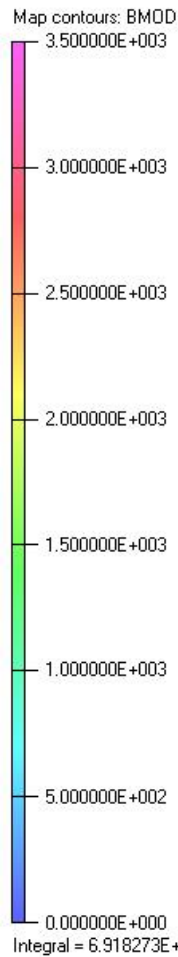
Map contours: BMOD
3.500000E+003
3.000000E+003
2.500000E+003
2.000000E+003
1.500000E+003
1.000000E+003
5.000000E+002
0.000000E+000
Integral = 9.605545E+006
Non-uniform axis scaling



Thin Iron w/ mesh

27/Aug/2013 10:18:47

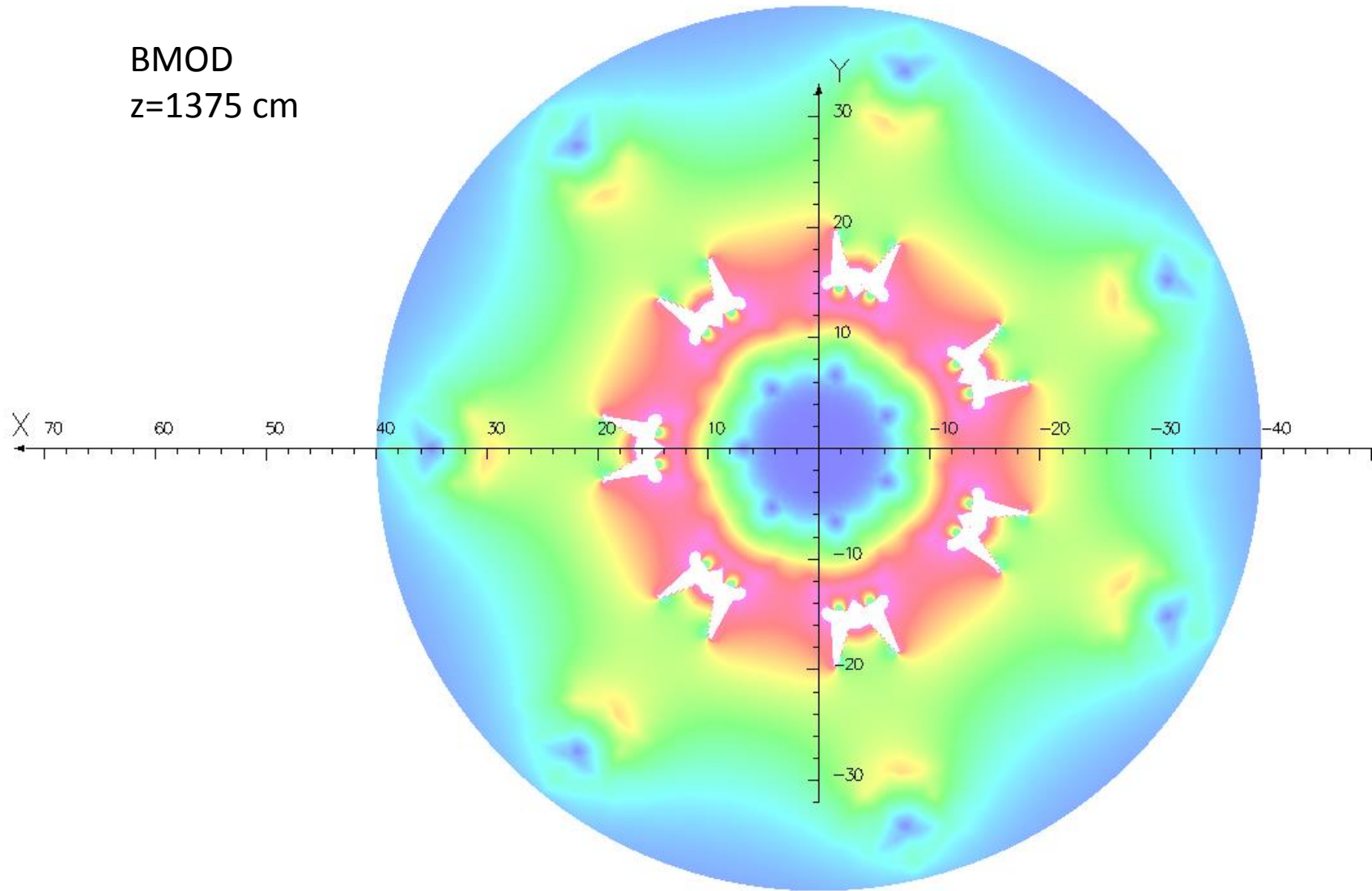
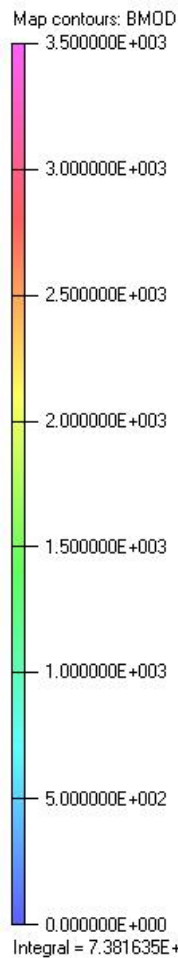
BMOD
z=1375 cm



Thick Iron w/ mesh

27/Aug/2013 10:24:18

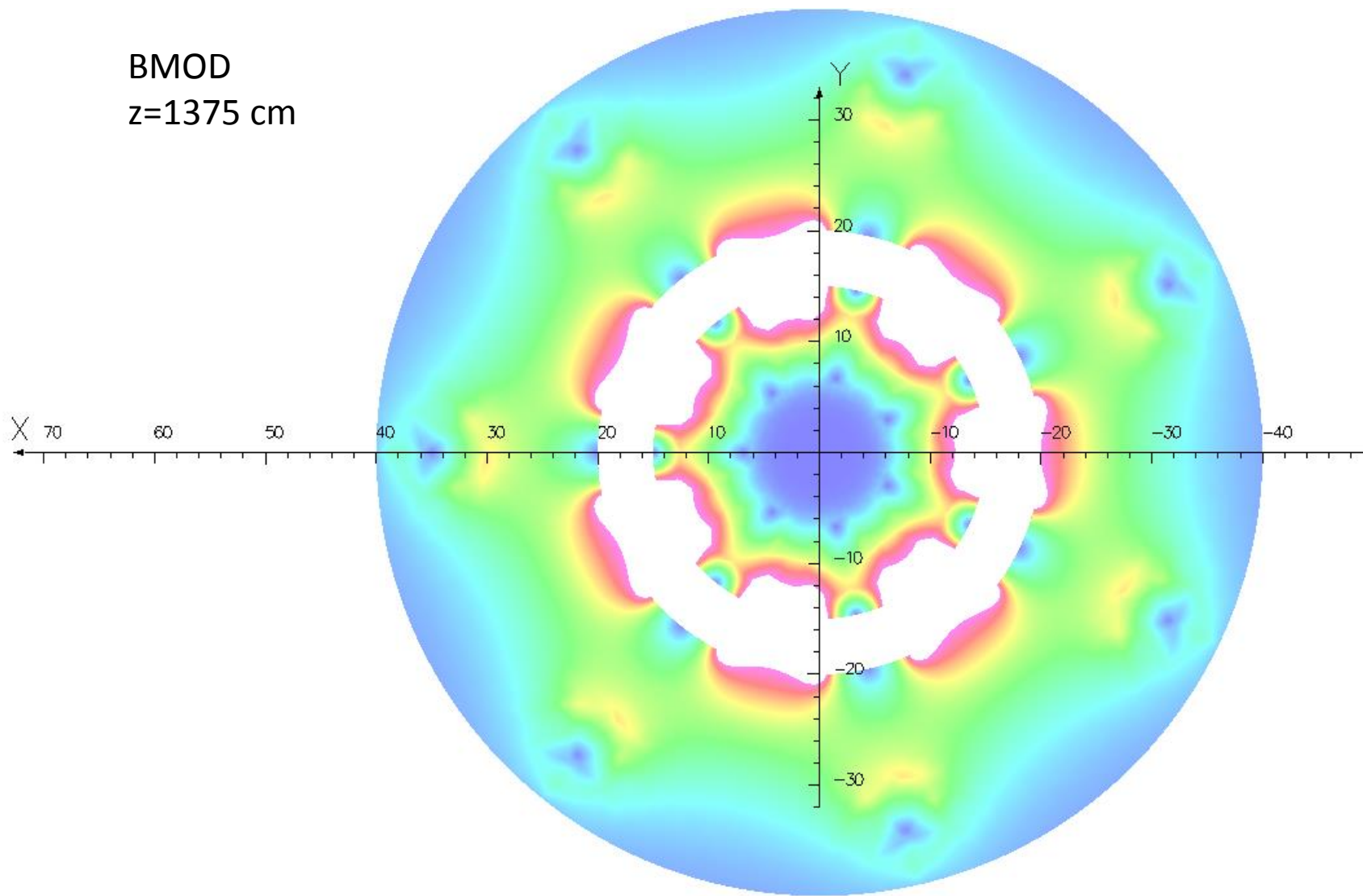
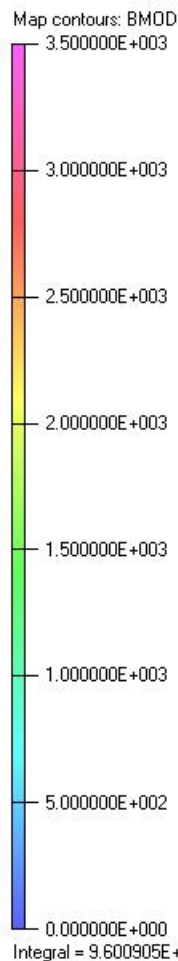
BMOD
z=1375 cm



Giant blocks of iron

30/Aug/2013 10:33:57

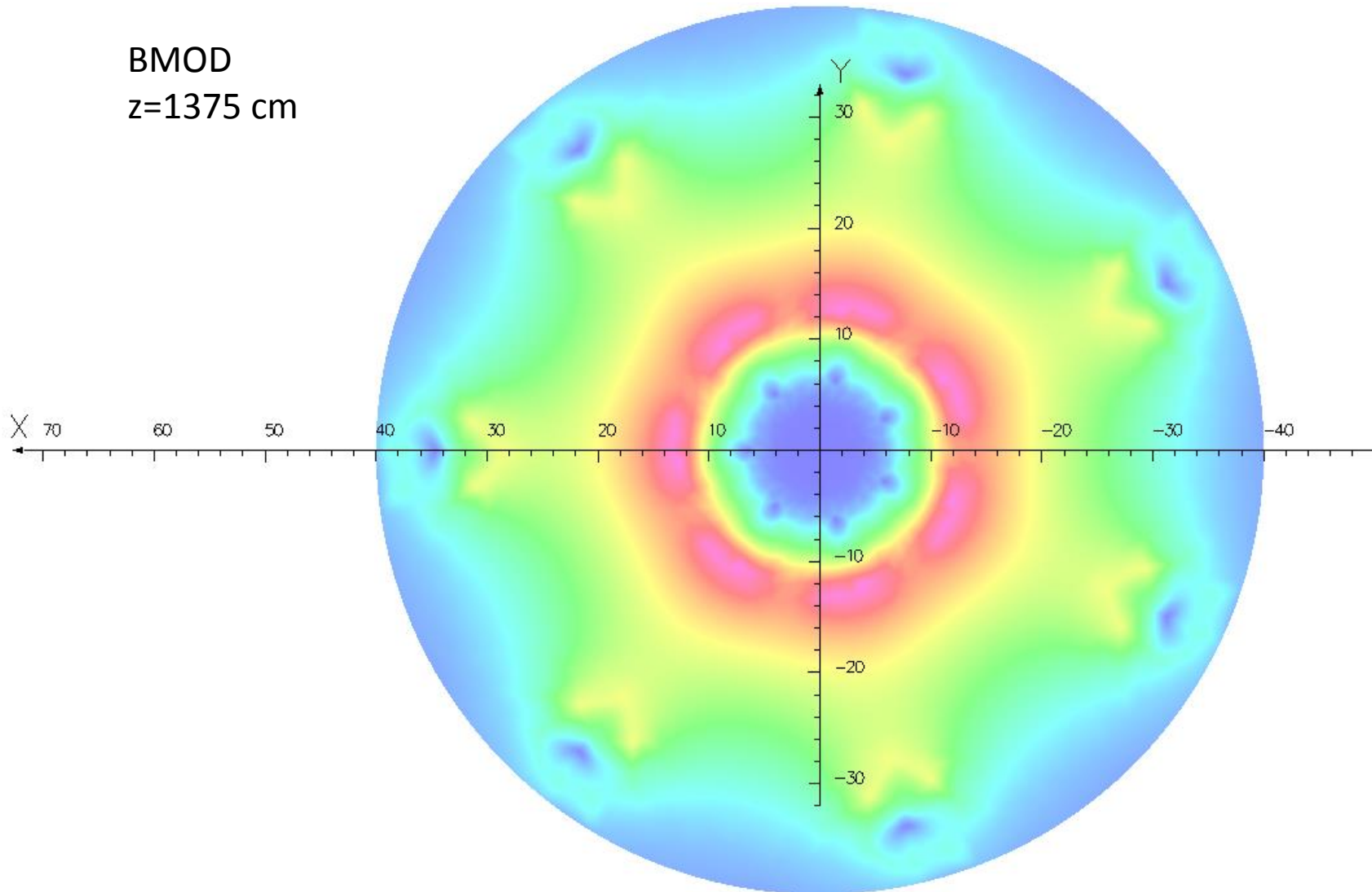
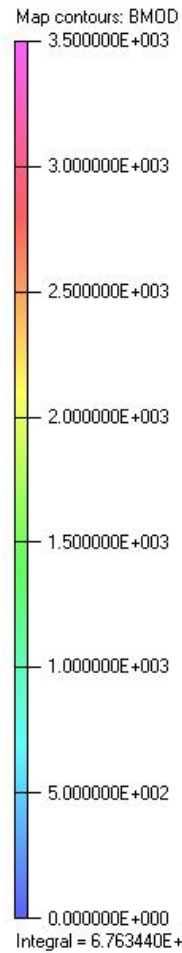
BMOD
z=1375 cm



No iron w/ mesh

27/Aug/2013 10:02:04

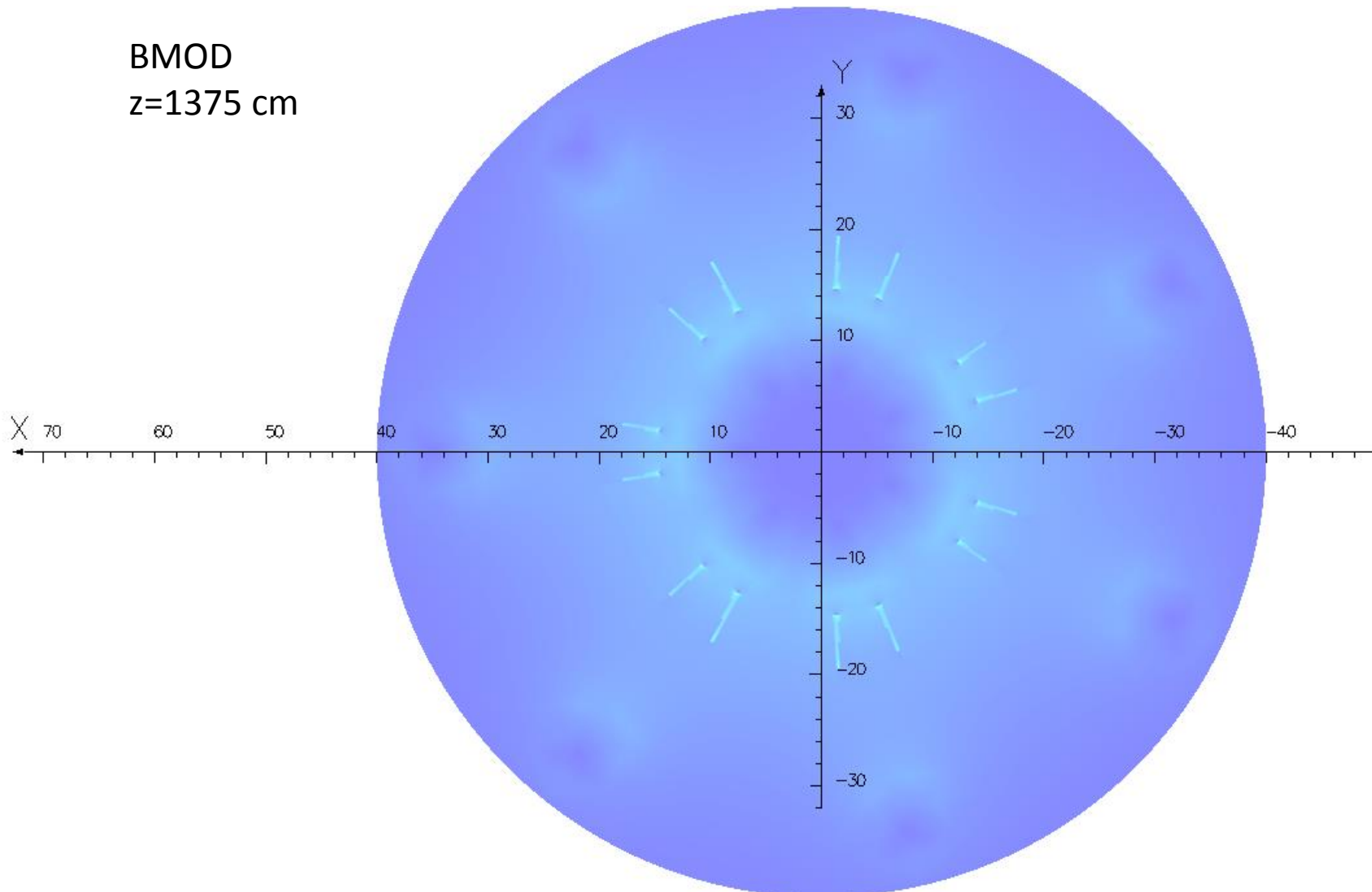
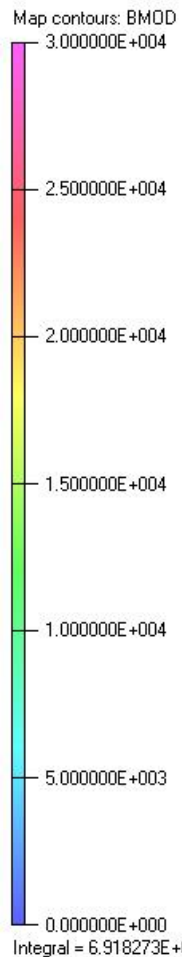
BMOD
z=1375 cm



Thin Iron w/ mesh

27/Aug/2013 10:20:47

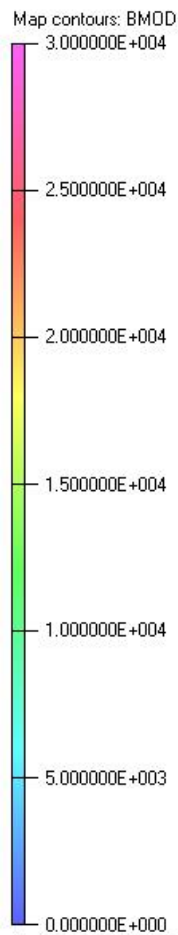
BMOD
z=1375 cm



Thick Iron w/ mesh

27/Aug/2013 10:23:00

BMOD
z=1375 cm



X

70

60

50

40

30

20

10

-10

-20

-30

-40

Y

30

20

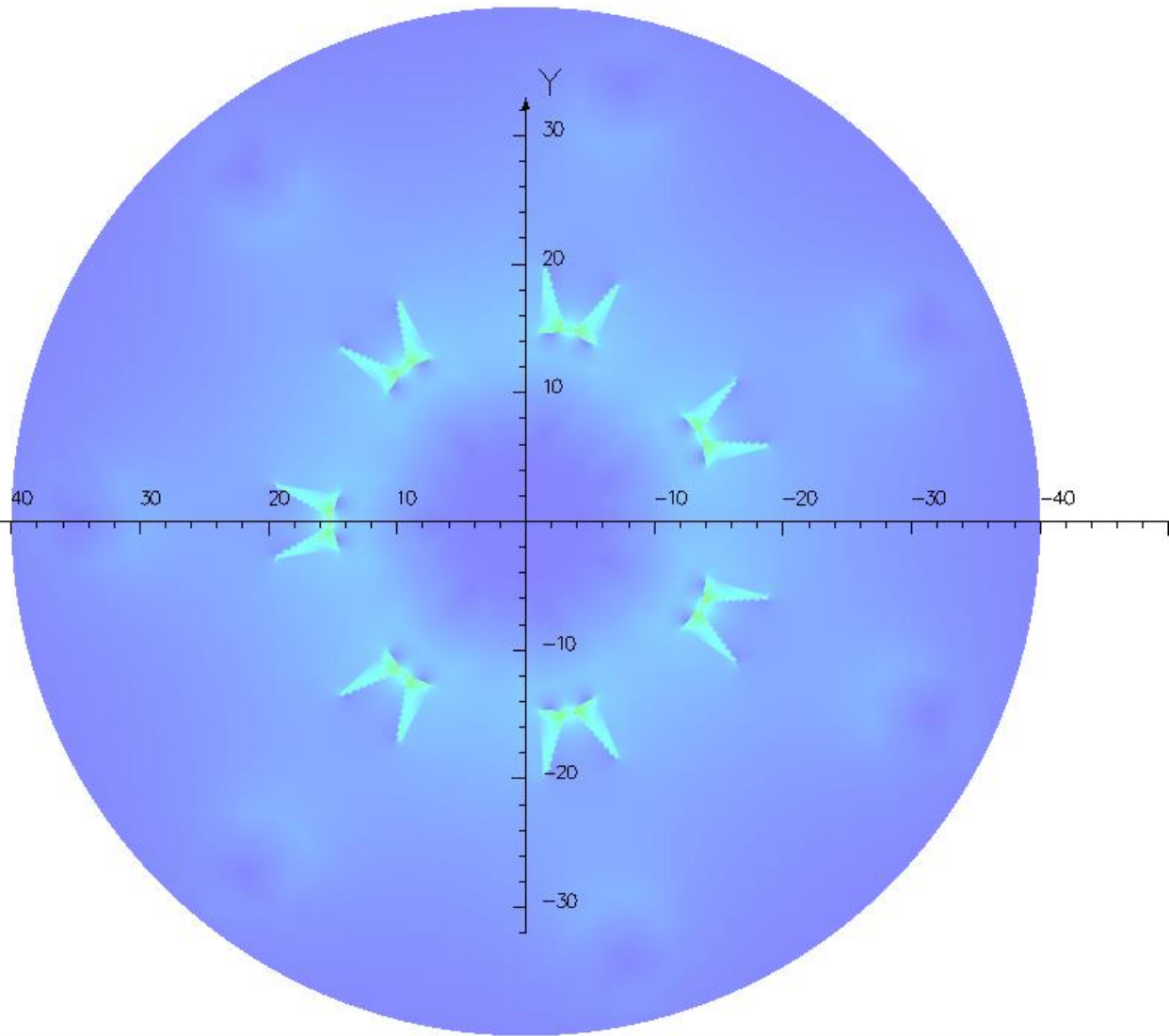
10

-10

-20

-30

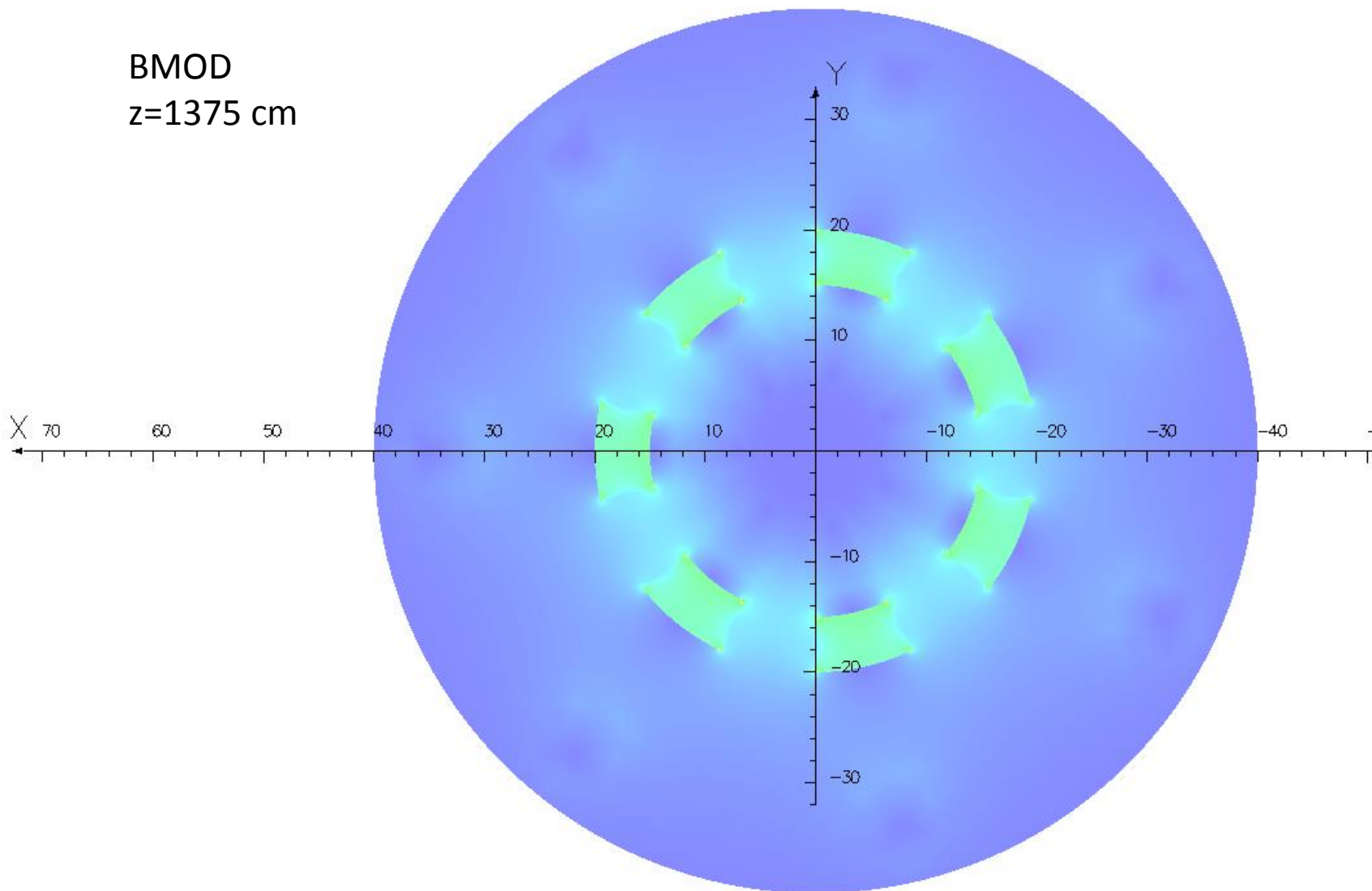
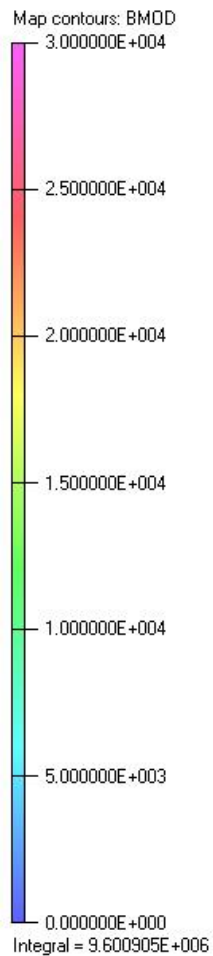
Integral = 7.381635E+006



Giant blocks of iron

30/Aug/2013 10:32:29

BMOD
z=1375 cm

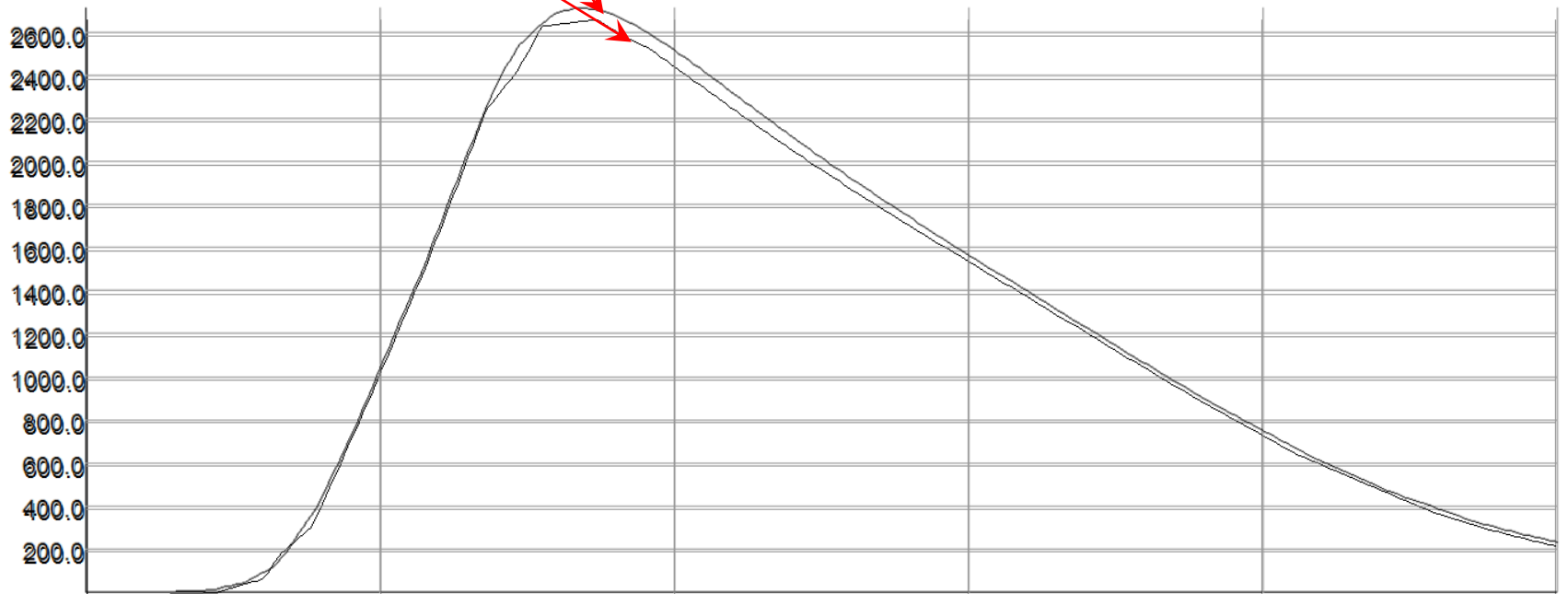


Middle of open sector

With thin iron

With no iron

BMOD



X coord	0.0	-8.0	-16.0	-24.0	-32.0	-40.0
Y coord	0.0	0.0	0.0	0.0	0.0	0.0
Z coord	1375.0	1375.0	1375.0	1375.0	1375.0	1375.0

Component: BMOD, from buffer: Line, Integral = 48648.03990788709

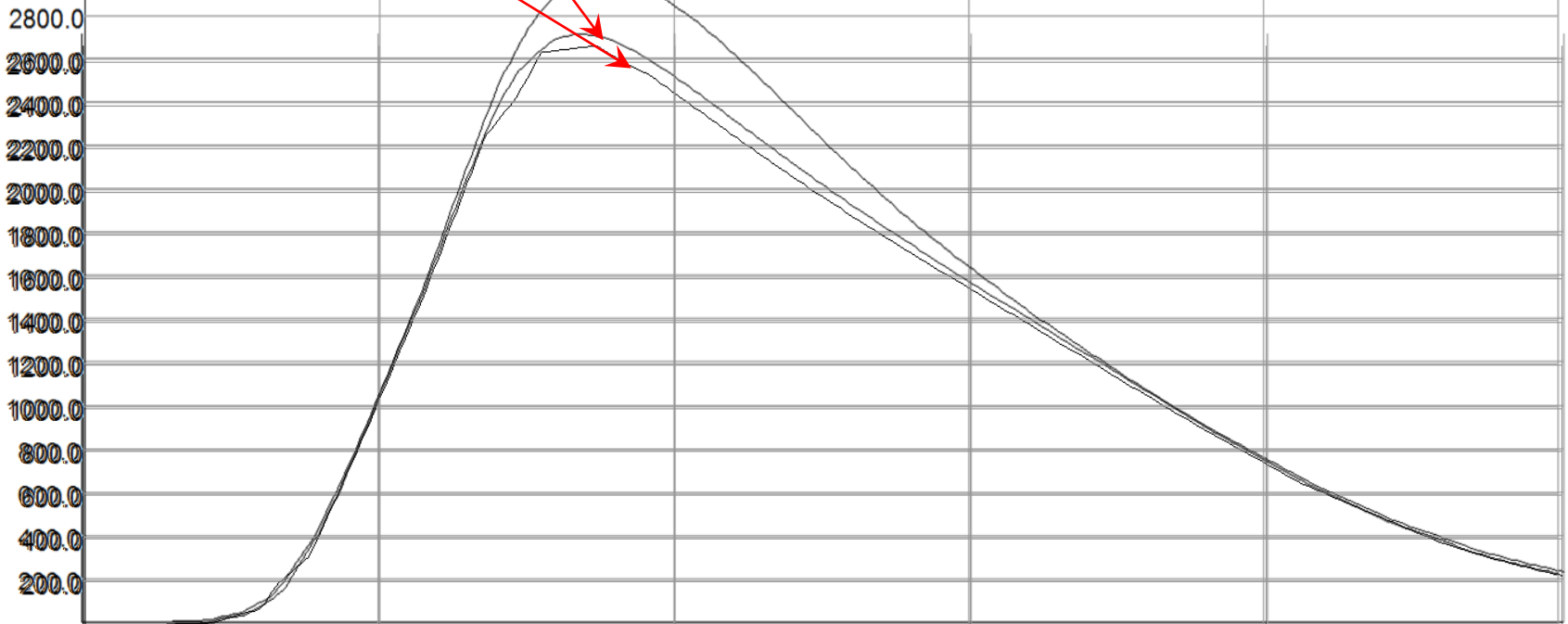
Middle of open sector

BMOD

With thin iron

With thick iron

With no iron



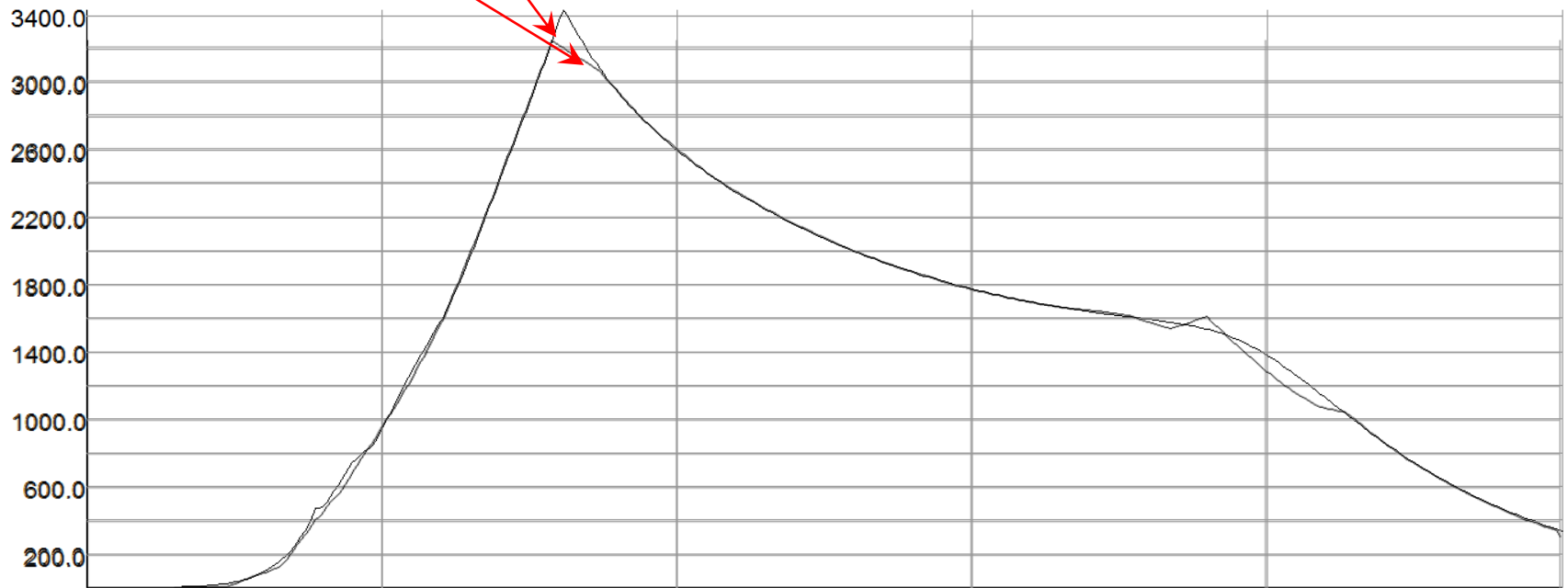
X coord 0.0 8.0 16.0 24.0 32.0 40.0
Y coord 0.0 0.0 0.0 0.0 0.0 0.0
Z coord 1375.0 1375.0 1375.0 1375.0 1375.0 1375.0
Component: BMOD, from buffer: Line, Integral = 51939.9884924549

Edge of open sector

With thin iron

BMOD

With no iron



X coord	0.0	-7.6641821	-15.328364	-22.992546	-30.656728	-38.320911
Y coord	0.0	-2.2935371	-4.5870742	-6.8806113	-9.1741484	-11.467685
Z coord	1375.0	1375.0	1375.0	1375.0	1375.0	1375.0

Component: BMOD, from buffer: Line, Integral = 50005.00002902801

Edge of open sector

26/Aug/2013 13:23:53

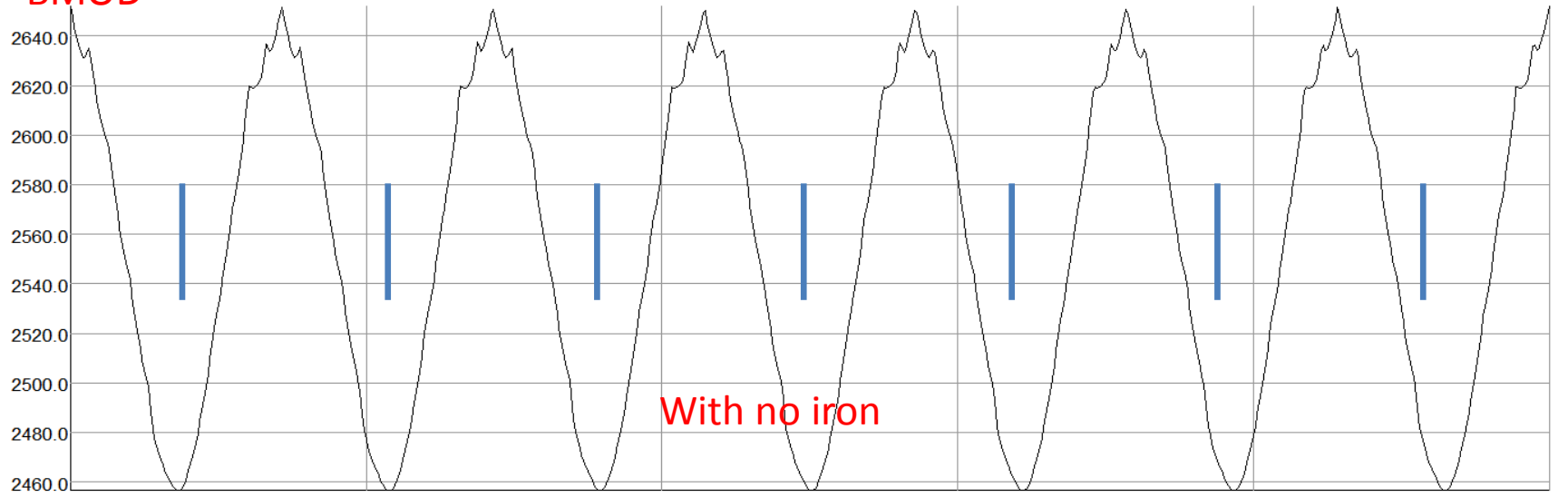


26/Aug/2013 11:39:16

26/Aug/2013 11:40:52

X coord	0.0	-7.6641821	-15.328364	-22.992546	-30.656728	-38.320911
Y coord	0.0	-2.0041871	-4.0083742	-6.0125613	-8.0167484	-10.0209355
Z coord	1076.0	-2.2935371	-4.5870742	-6.8806113	-9.1741484	-11.4676855
Component: BMOD, from buffer: Line, Integral = 50065.001029221975.0				1375.0	1375.0	1375.0
Component: BMOD, from buffer: Line, Integral = 61453.3733418753						

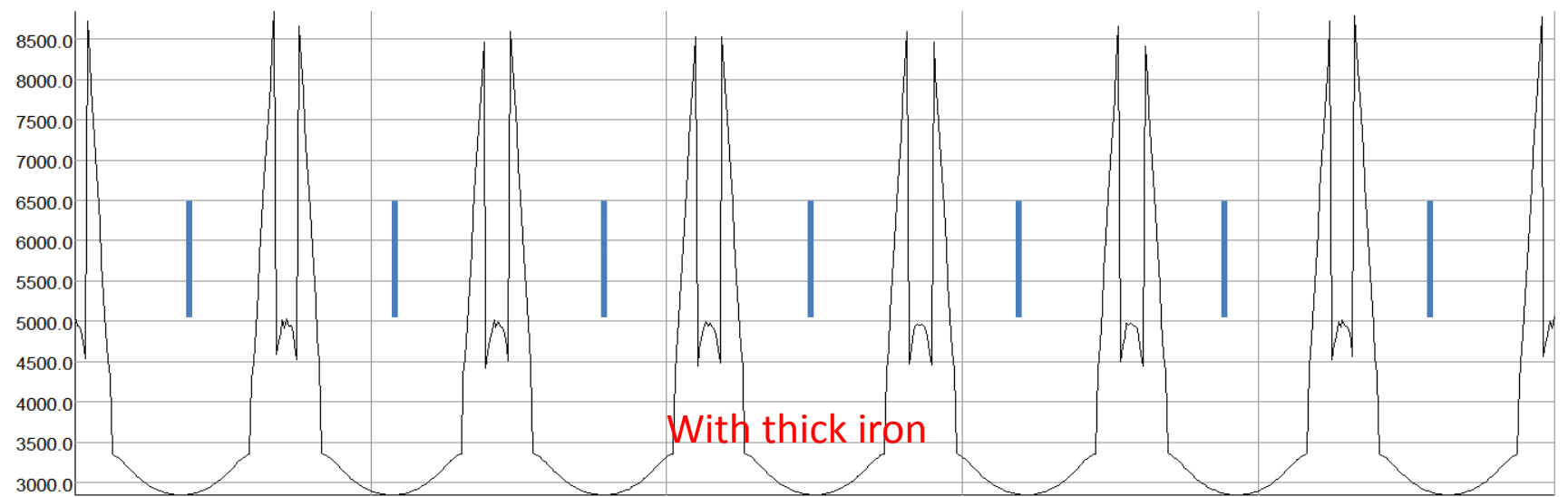
BMOD



X coord	16.0	4.94427191	-12.944272	-12.944272	4.94427191	16.0
Y coord	0.0	15.2169043	9.40456404	-9.404564	-15.216904	0.0
Z coord	1375.0	1375.0	1375.0	1375.0	1375.0	1375.0

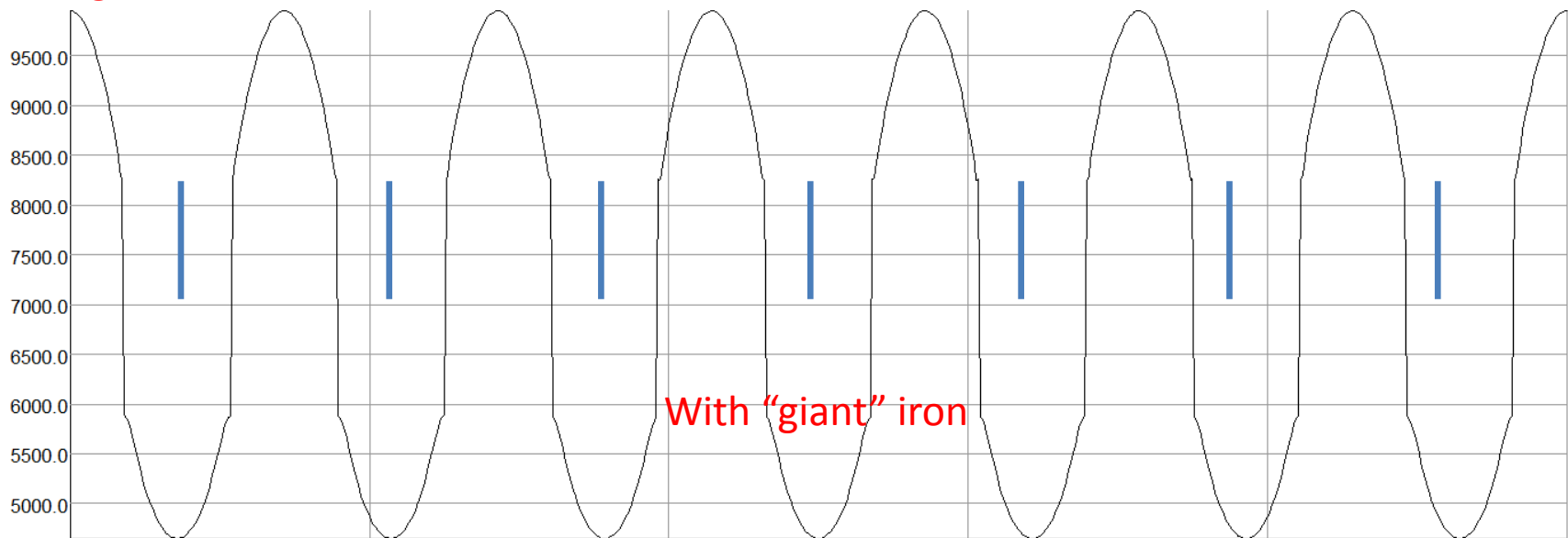
Component: BMOD, from buffer: Circle, Integral = 256796.321253348

Z=1375, r = 16.0 cm



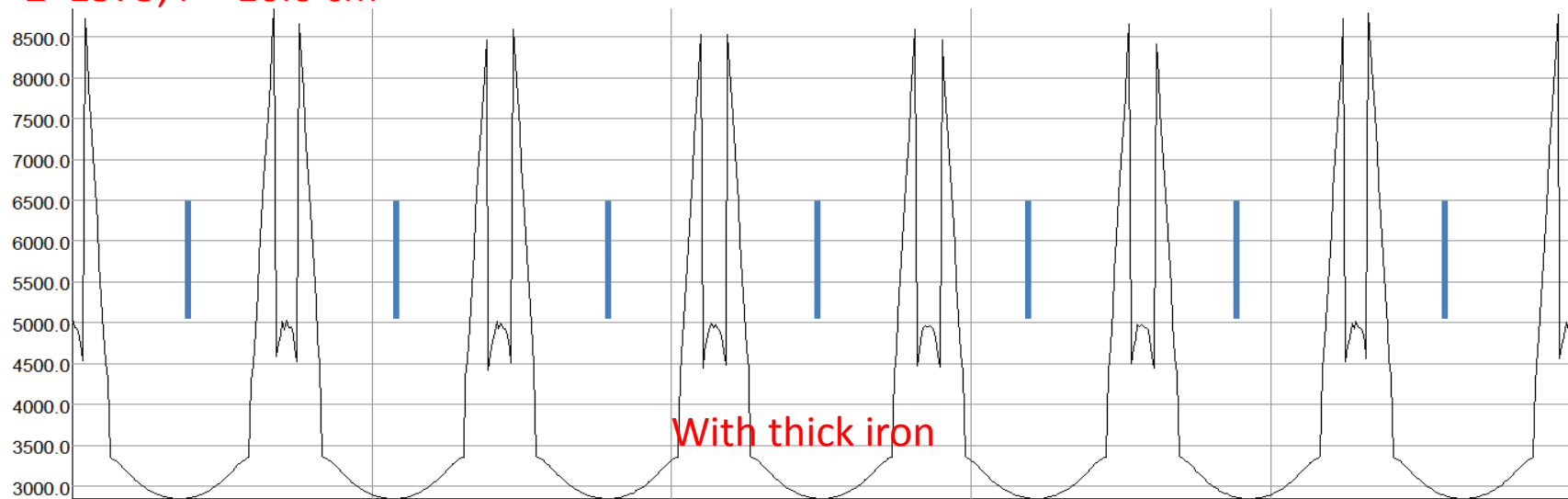
X coord	16.0	4.94427191	-12.944272	-12.944272	4.94427191	16.0
Y coord	0.0	15.2169043	9.40456404	-9.404564	-15.216904	0.0
Z coord	1375.0	1375.0	1375.0	1375.0	1375.0	1375.0

Component: BMOD, from buffer: Circle, Integral = 401223.451775802

BMOD

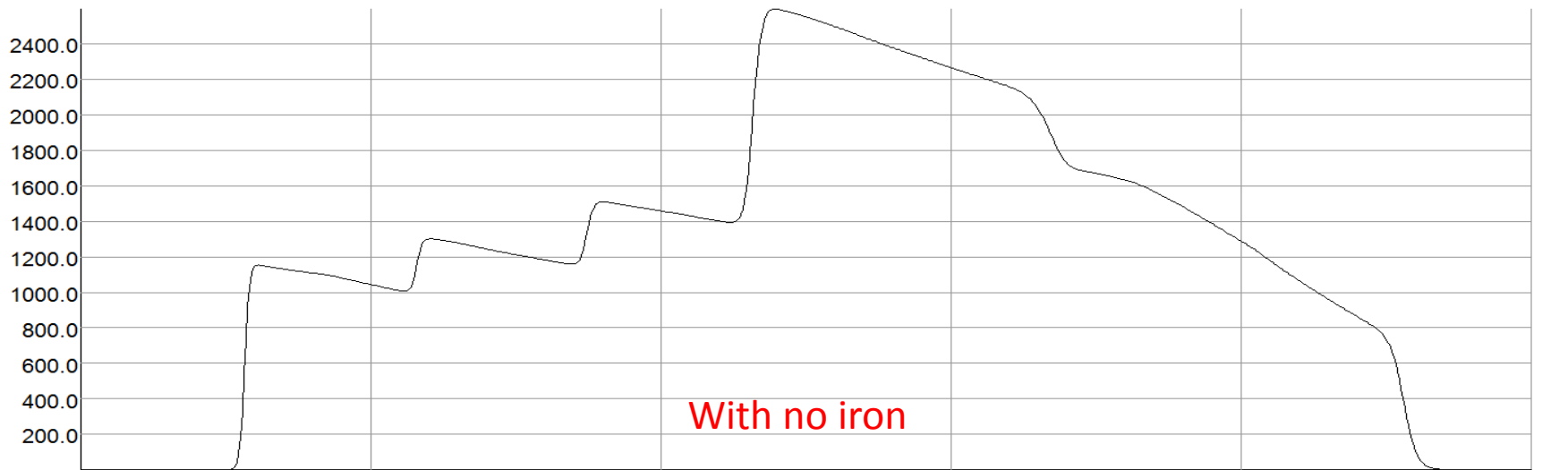
X coord	16.0	4.94427191	-12.944272	-12.944272	4.94427191	16.0
Y coord	0.0	15.2169043	9.40456404	-9.404564	-15.216904	0.0
Z coord	1375.0	1375.0	1375.0	1375.0	1375.0	1375.0

Component: BMOD, from buffer: Circle, Integral = 727135.14970877

Z=1375, r = 16.0 cm

X coord	16.0	4.94427191	-12.944272	-12.944272	4.94427191	16.0
Y coord	0.0	15.2169043	9.40456404	-9.404564	-15.216904	0.0
Z coord	1375.0	1375.0	1375.0	1375.0	1375.0	1375.0

Component: BMOD, from buffer: Circle, Integral = 401223.451775802



X coord	-6.0	-9.8	-13.6	-17.4	-21.2	-25.0
Y coord	0.0	0.0	0.0	0.0	0.0	0.0
Z coord	900.0	1070.0	1240.0	1410.0	1580.0	1750.0

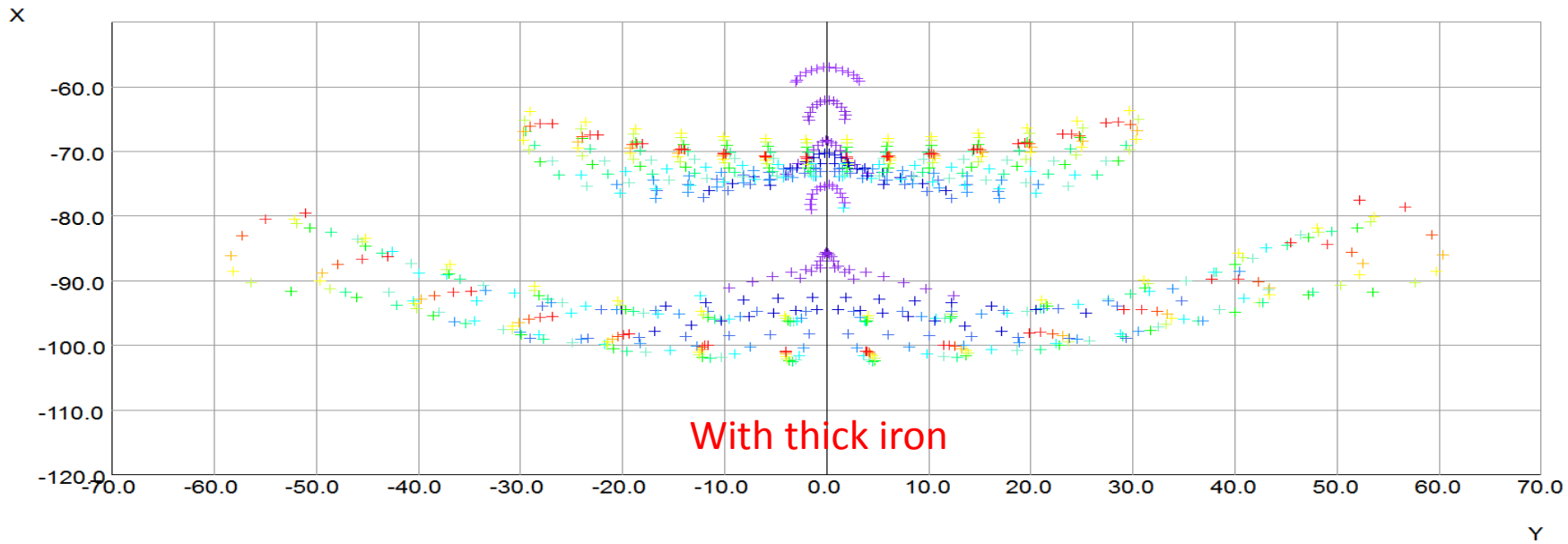
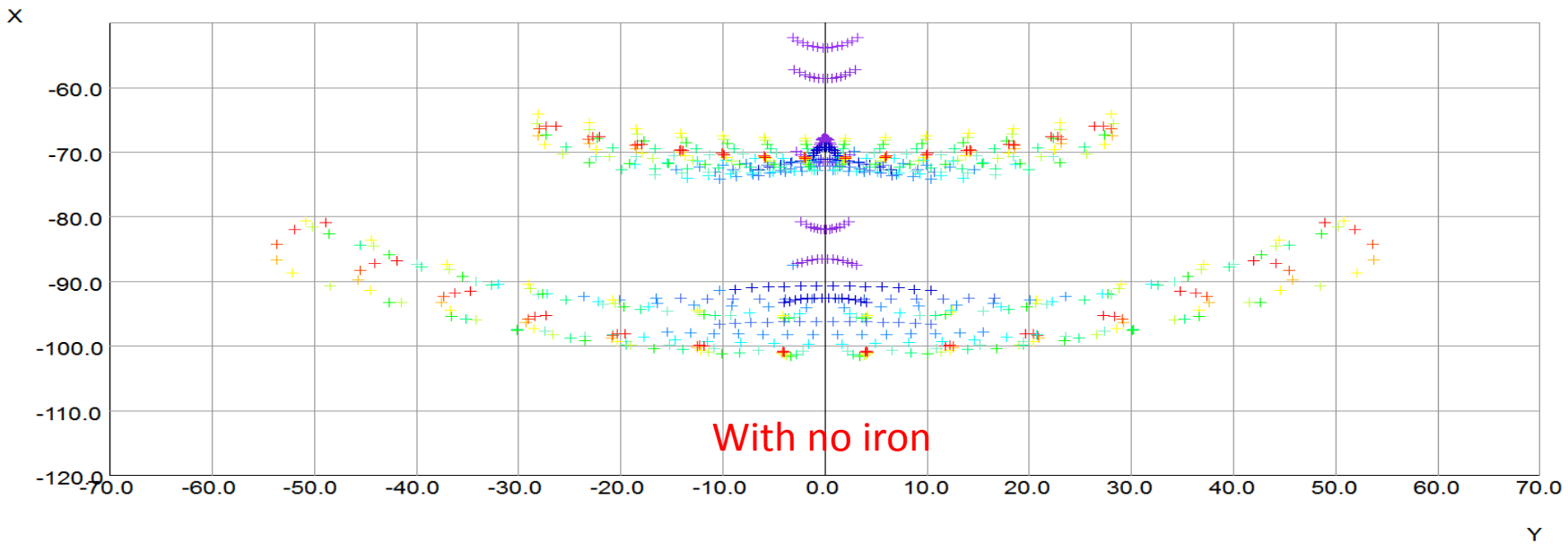
Component: BMOD, from buffer: Line, Integral = 1.05347079937223E+06

Along straight line approximation the track of the highest energy, lowest angle particle

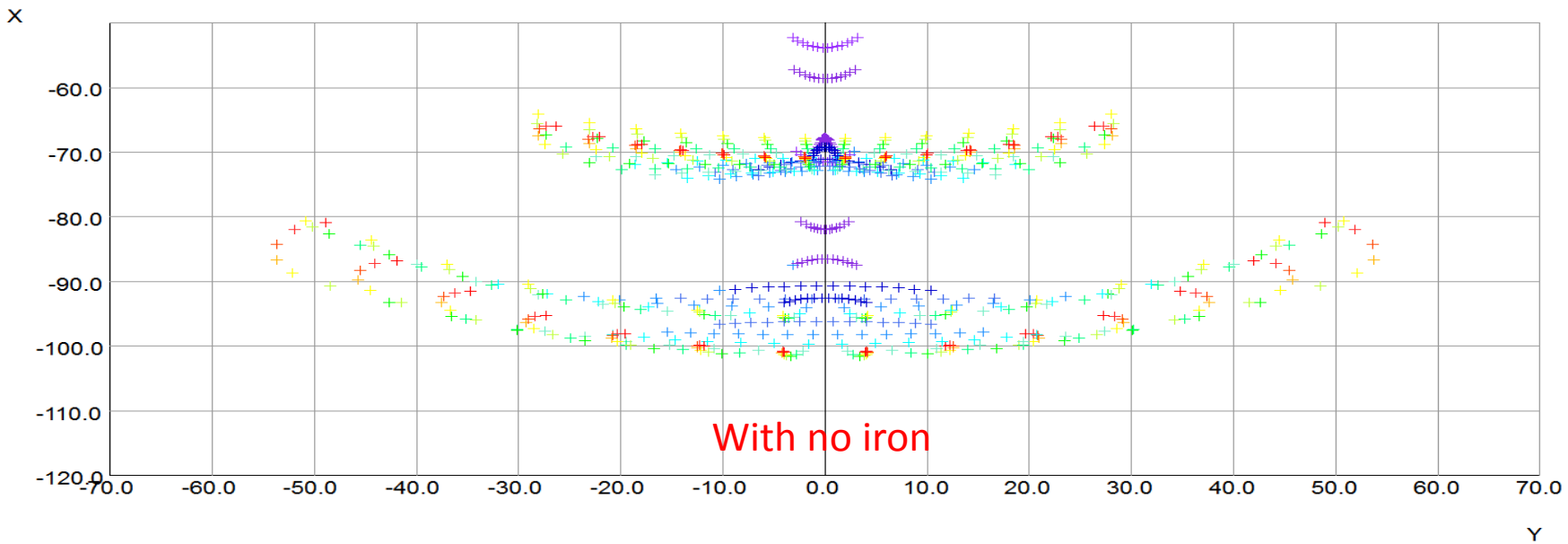


X coord	-6.0	-9.8	-13.6	-17.4	-21.2	-25.0
Y coord	0.0	0.0	0.0	0.0	0.0	0.0
Z coord	900.0	1070.0	1240.0	1410.0	1580.0	1750.0

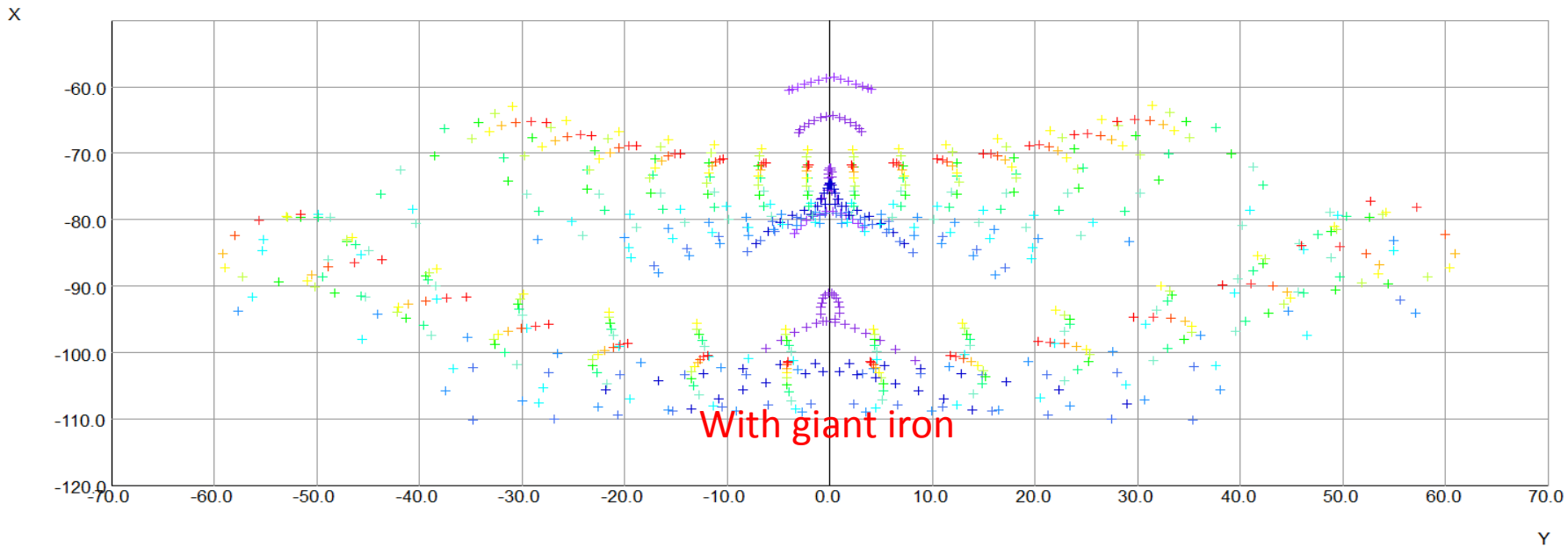
Component: BMOD, from buffer: Line, Integral = 1.27886397545727E+06

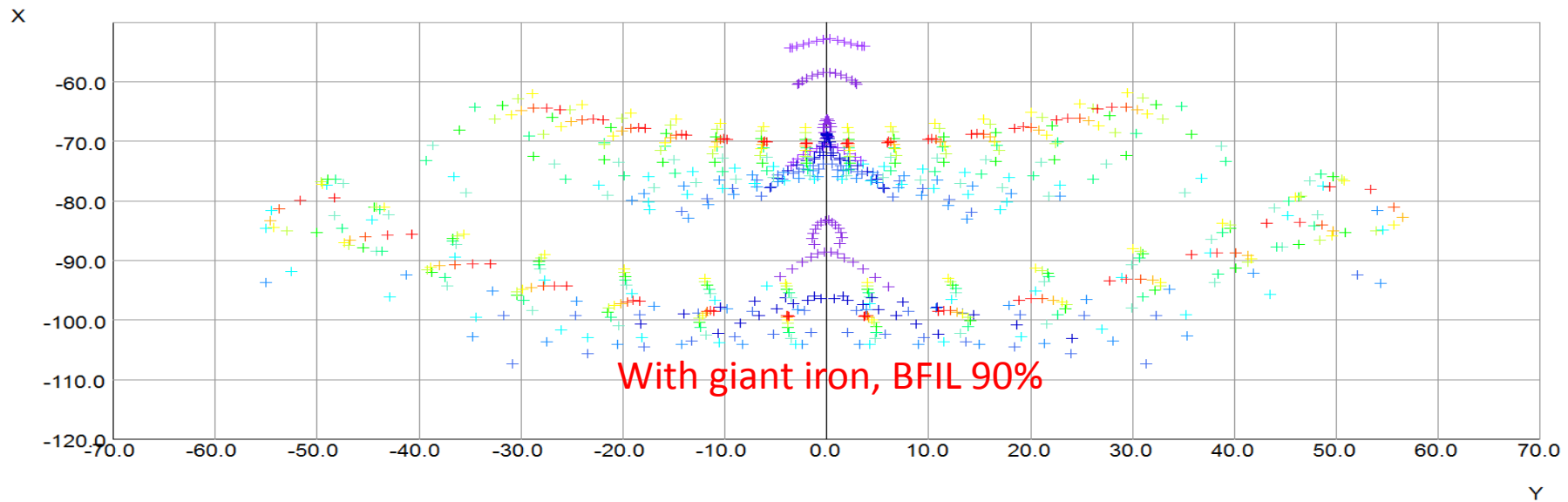
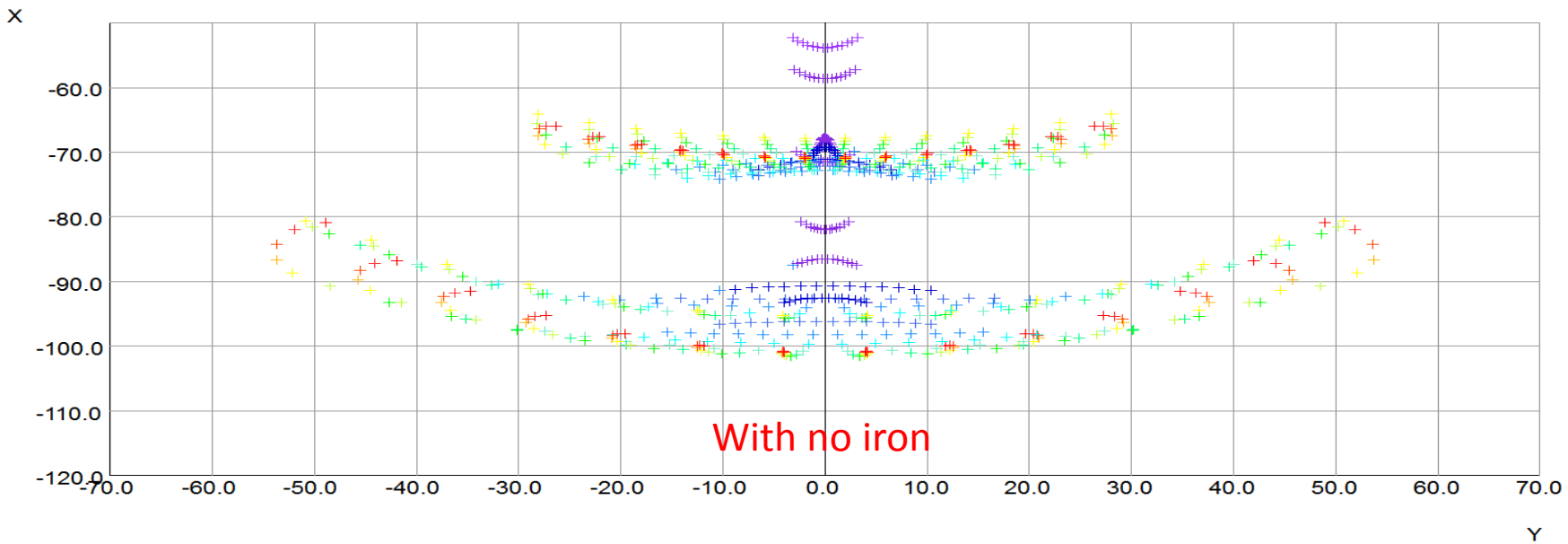


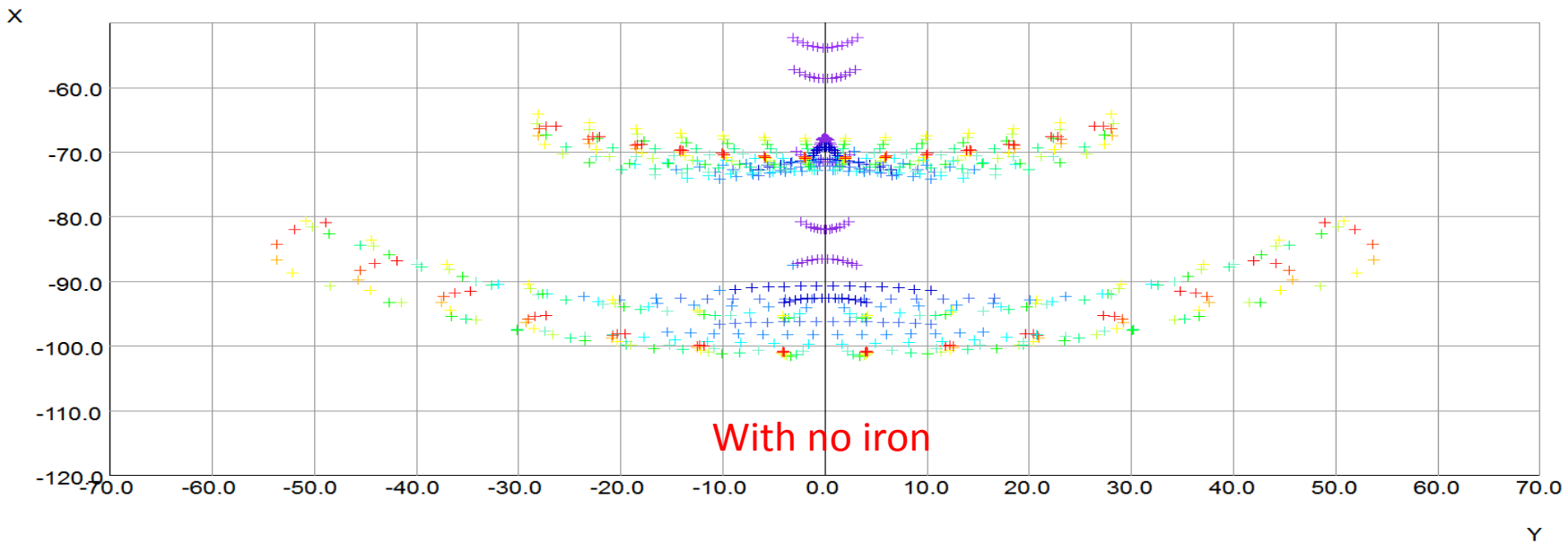
Moller and elastic ep electrons at z=2800.0cm



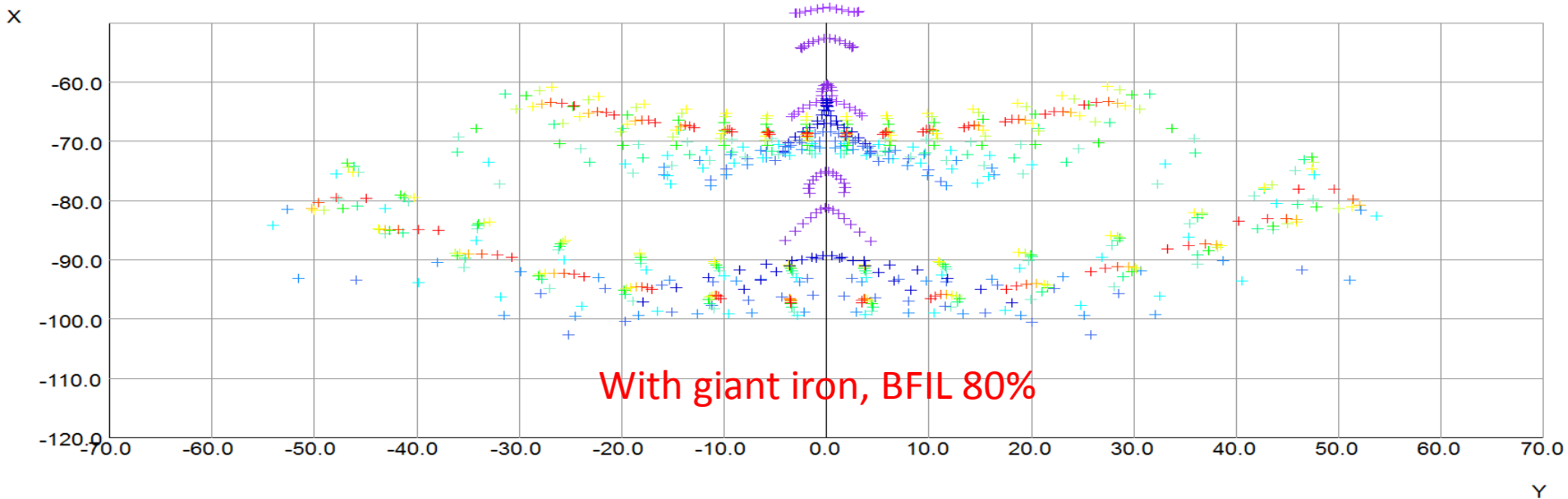
Moller and elastic ep electrons at z=2800.0cm







7/Oct/2013 08:14:37



Summary

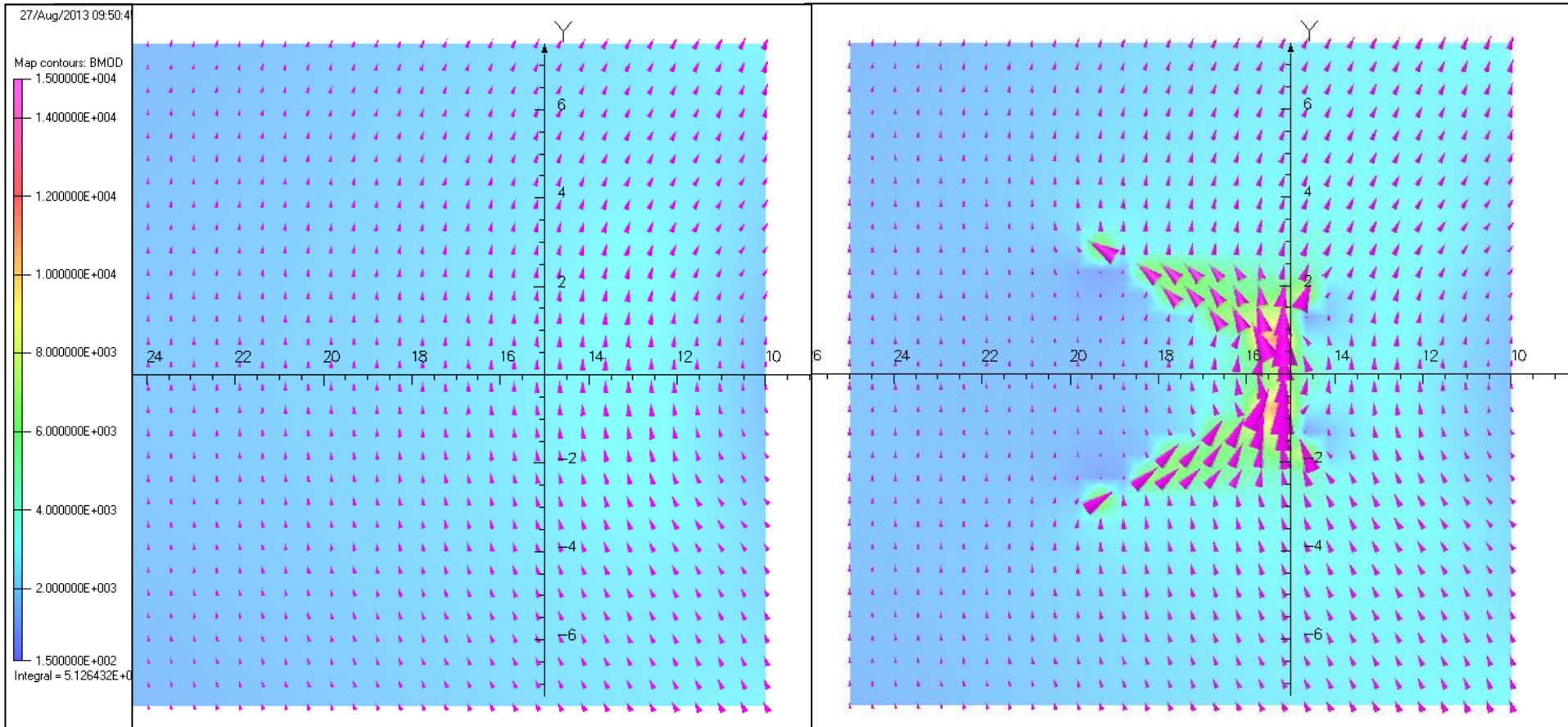
- No optimization of the iron was done
- According to this preliminary work, $\int B \cdot dl$ is 2% greater for the thick iron and about 28% greater for giant iron
- Lowest tracks radial position at detector plane increased 2 cm (from 90 cm) with the thick iron
- Lowest tracks radial position at detector plane increased 11 cm (from 90 cm) with the giant iron (same current density)
- Do NOT see a dramatic increase in the quality of the focus or size of the field
 - Radial focus may be a little better for transition and closed sectors
- Even with giant iron pieces, only reduce field (current density) by 20%

→ Not seen as a big enough gain to warrant using it

Extra slides

Vector plots

BMOD



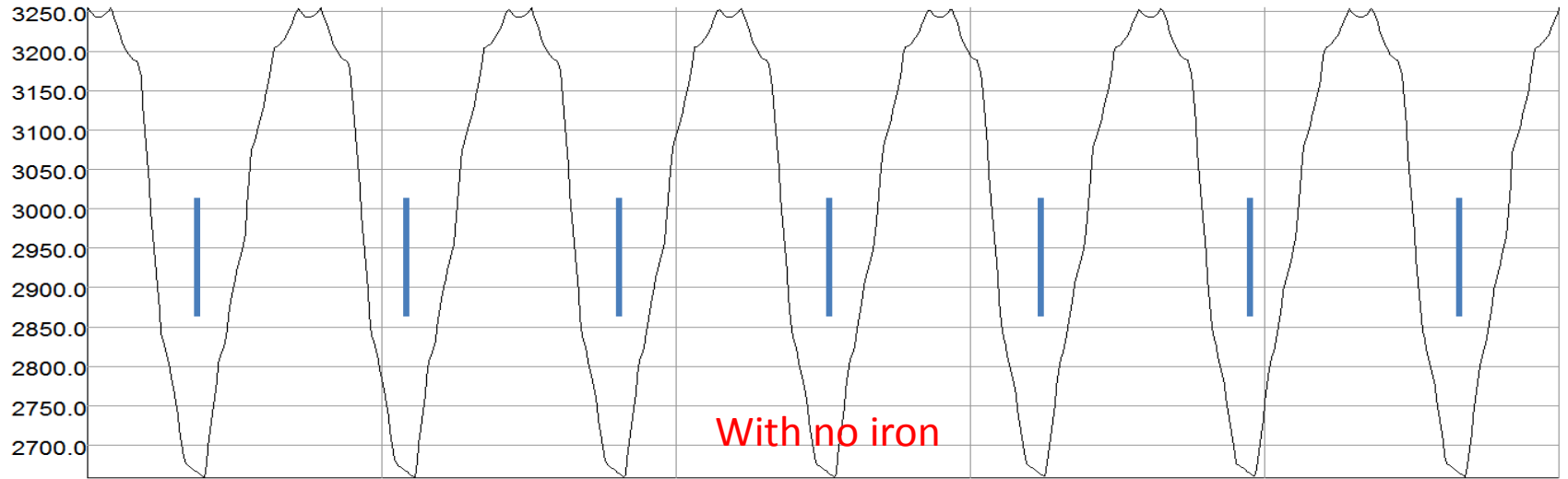
BMOD



X coord	13.5	4.17172942	-10.921729	-10.921729	4.17172942	13.5
Y coord	0.0	12.839263	7.93510091	-7.9351009	-12.839263	0.0
Z coord	1375.0	1375.0	1375.0	1375.0	1375.0	1375.0

Component: BMOD, from buffer: Circle, Integral = 257597.69103303

Z=1375, r = 13.5 cm



X coord	13.5	4.17172942	-10.921729	-10.921729	4.17172942	13.5
Y coord	0.0	12.839263	7.93510091	-7.9351009	-12.839263	0.0
Z coord	1375.0	1375.0	1375.0	1375.0	1375.0	1375.0

Component: BMOD, from buffer: Circle, Integral = 255104.305759947

BR

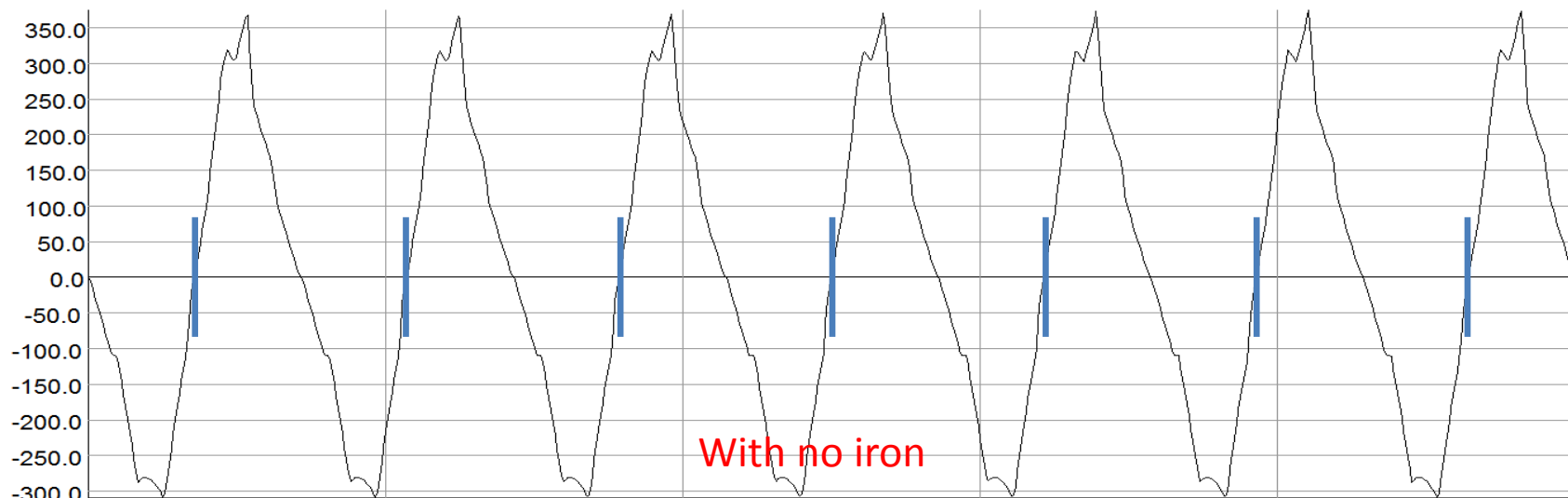


With thin iron

X coord	13.5	4.17172942	-10.921729	-10.921729	4.17172942	13.5
Y coord	0.0	12.839263	7.93510091	-7.9351009	-12.839263	0.0
Z coord	1375.0	1375.0	1375.0	1375.0	1375.0	1375.0

Component: #BR, from buffer: Circle, Integral = 103.477582466406

Z=1375, r = 13.5 cm



With no iron

X coord	13.5	4.17172942	-10.921729	-10.921729	4.17172942	13.5
Y coord	0.0	12.839263	7.93510091	-7.9351009	-12.839263	0.0
Z coord	1375.0	1375.0	1375.0	1375.0	1375.0	1375.0

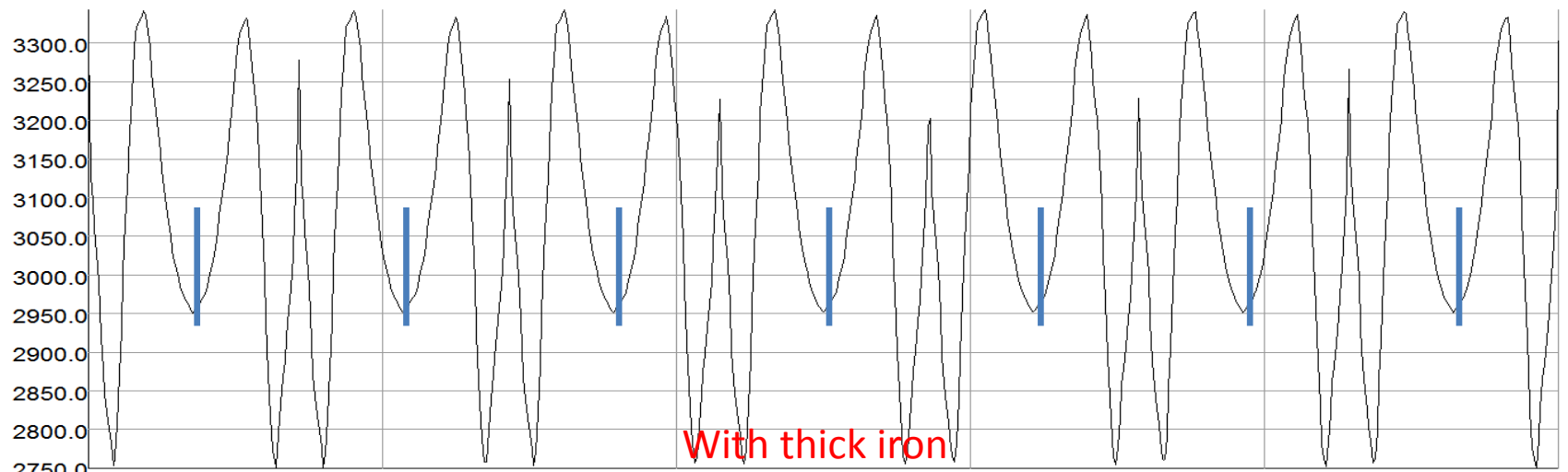
Component: #BR, from buffer: Circle, Integral = 349.561640090629

BMOD



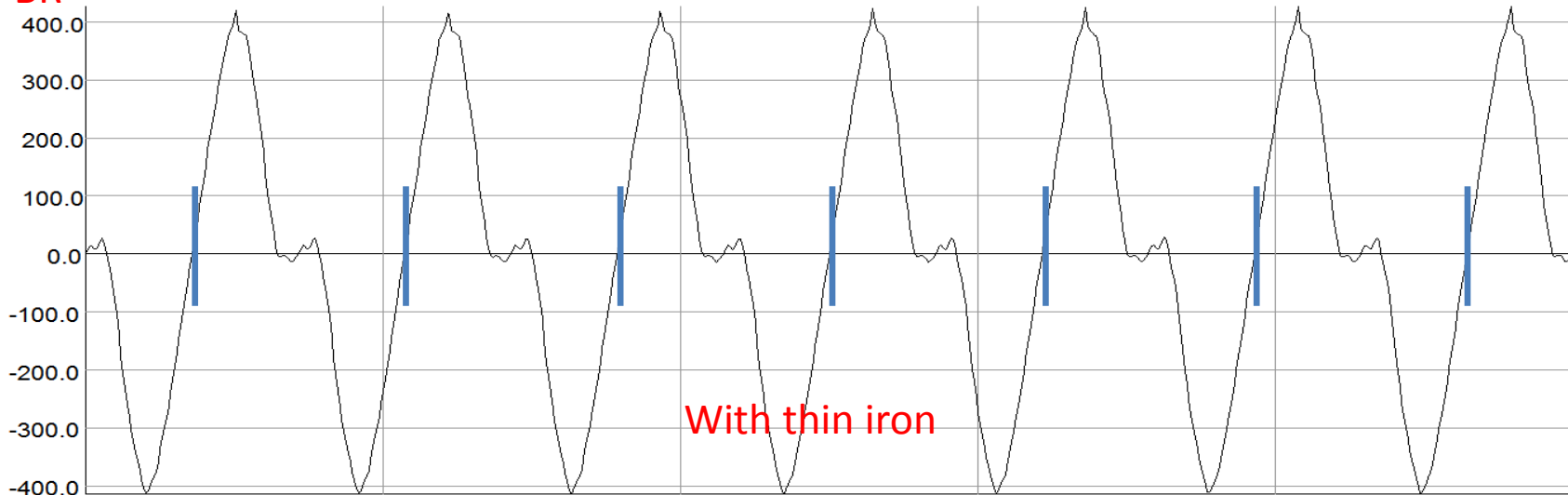
X coord 13.5 4.17172942 -10.921729 -10.921729 4.17172942 13.5
 Y coord 0.0 12.839263 7.93510091 -7.9351009 -12.839263 0.0
 Z coord 1375.0 1375.0 1375.0 1375.0 1375.0 1375.0
 Component: BMOD, from buffer: Circle, Integral = 257597.69103303

Z=1375, r = 13.5 cm



X coord 13.5 4.17172942 -10.921729 -10.921729 4.17172942 13.5
 Y coord 0.0 12.839263 7.93510091 -7.9351009 -12.839263 0.0
 Z coord 1375.0 1375.0 1375.0 1375.0 1375.0 1375.0
 Component: BMOD, from buffer: Circle, Integral = 259894.143714169

BR

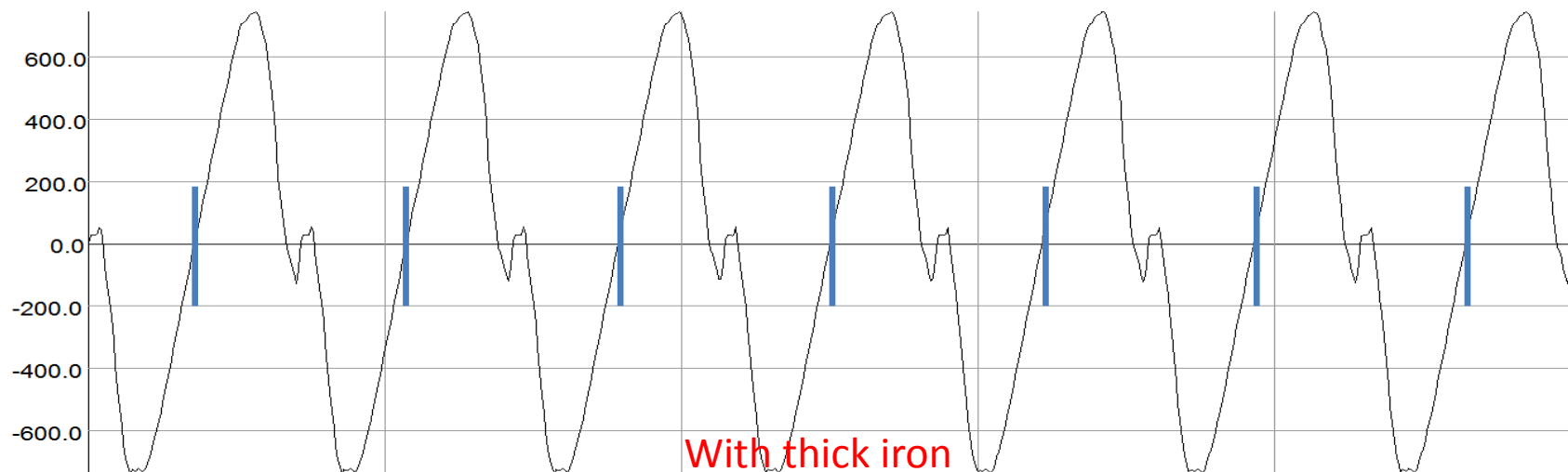


With thin iron

X coord	13.5	4.17172942	-10.921729	-10.921729	4.17172942	13.5
Y coord	0.0	12.839263	7.93510091	-7.9351009	-12.839263	0.0
Z coord	1375.0	1375.0	1375.0	1375.0	1375.0	1375.0

Component: #BR, from buffer: Circle, Integral = 103.477582466406

Z=1375, r = 13.5 cm



With thick iron

X coord	13.5	4.17172942	-10.921729	-10.921729	4.17172942	13.5
Y coord	0.0	12.839263	7.93510091	-7.9351009	-12.839263	0.0
Z coord	1375.0	1375.0	1375.0	1375.0	1375.0	1375.0

Component: #BR, from buffer: Circle, Integral = -187.049207387258