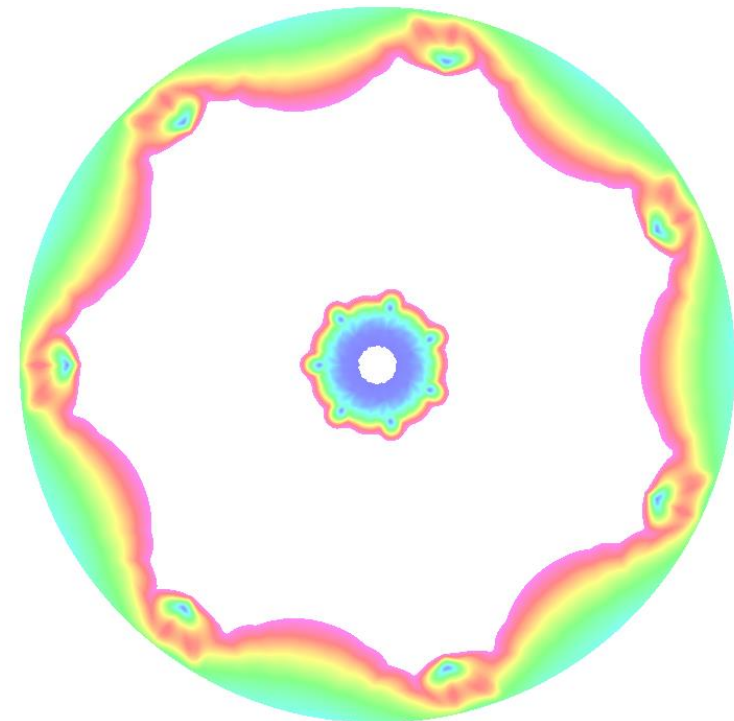# Outline

- 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 and thick iron

Note: op3 file names are:

no_iron_in_coils_test_ver2.op3 (smaller mesh size)
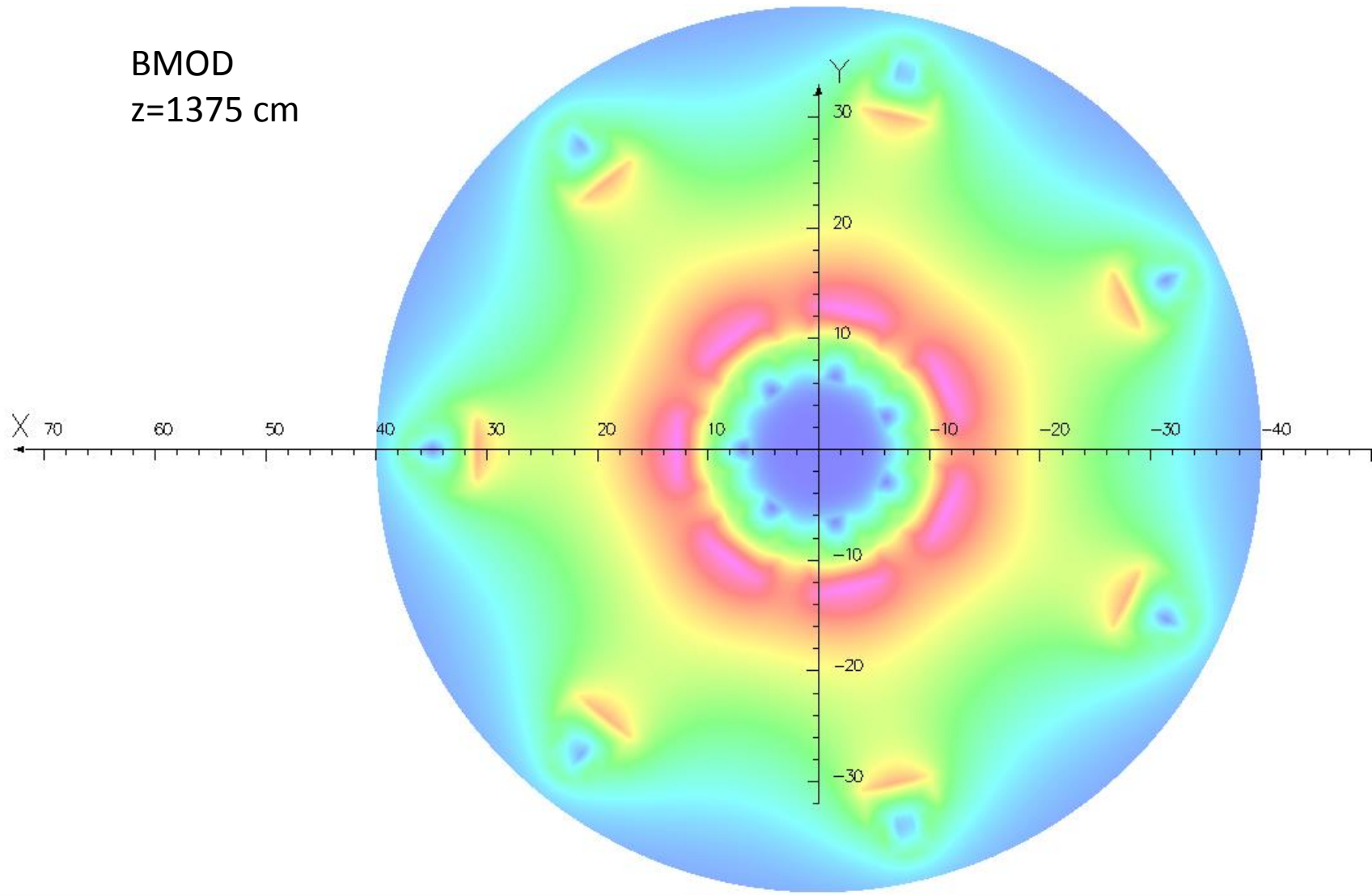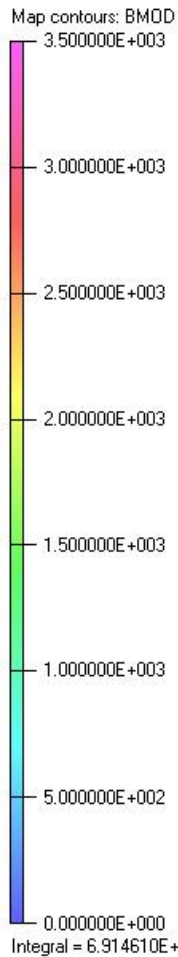iron_in_coils_ver3.op3 (thin)
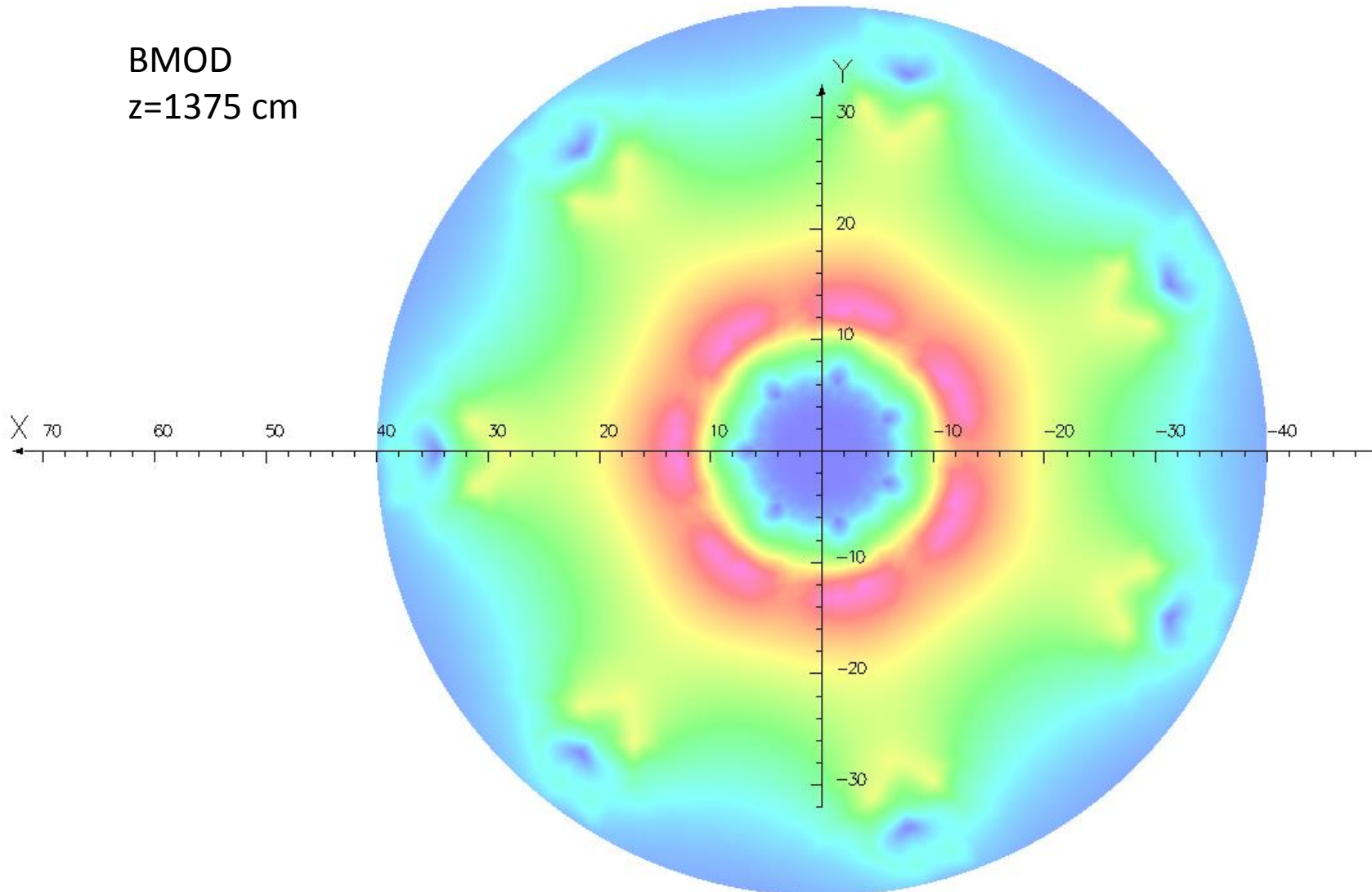iron_in_coils_ver4.op3 (thick)
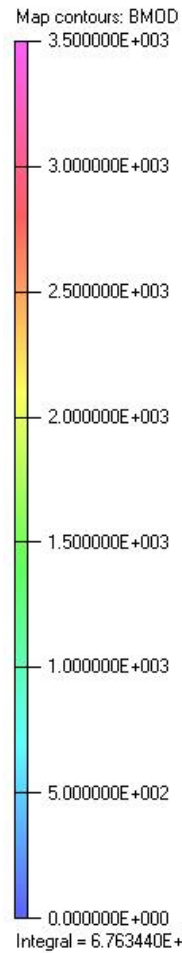
No iron, coils only

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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 = 6.914610E+006

BMOD
z=1375 cm

No iron w/ mesh

BMOD
z=1375 cm

Field on a line, middle of open sector

BMOD
z=1375 cm, y= 0 cm , 0 < x < -40 cm
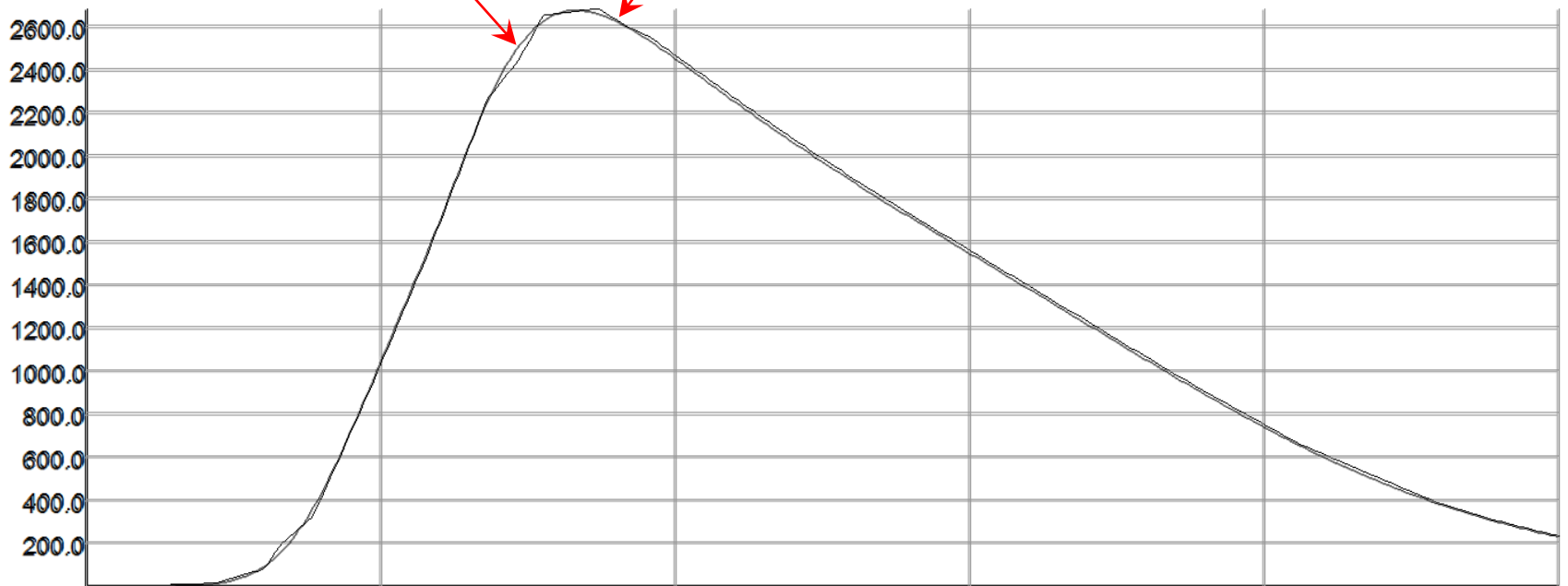
Model body in mesh
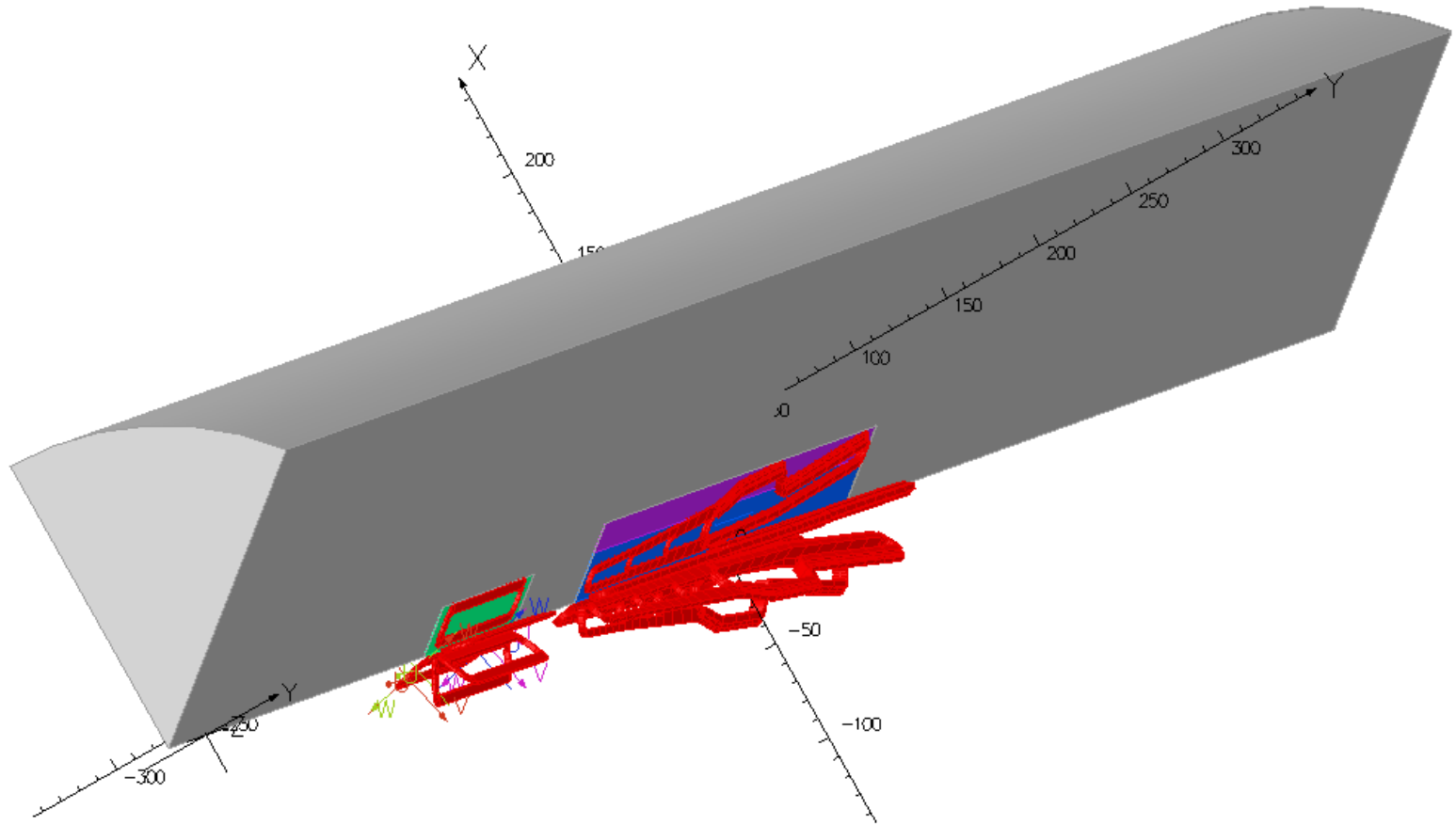
Iron design

thick iron
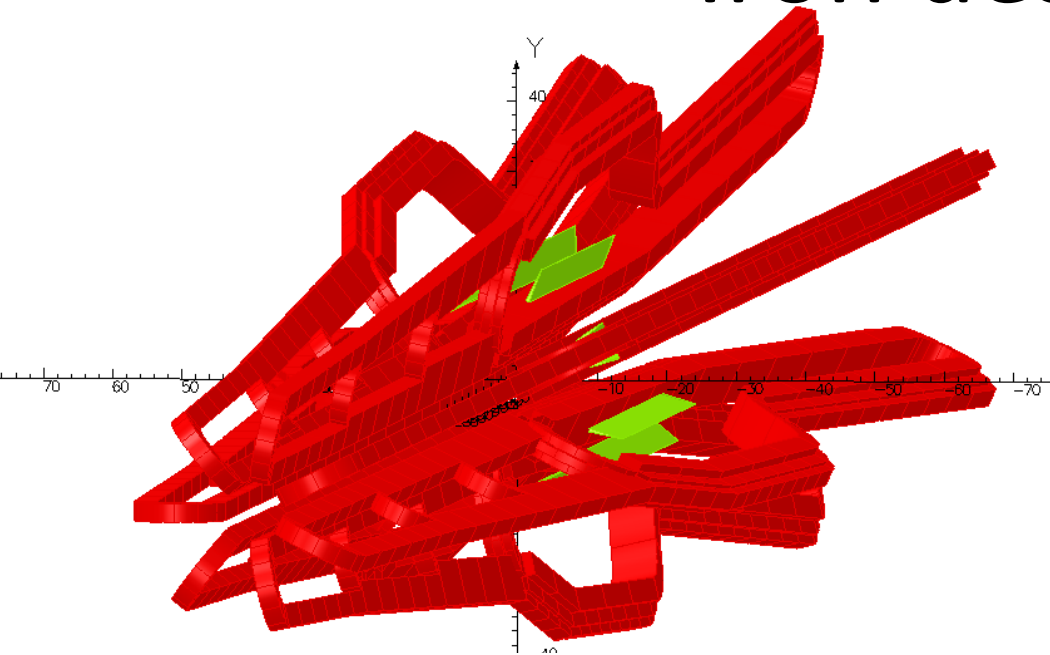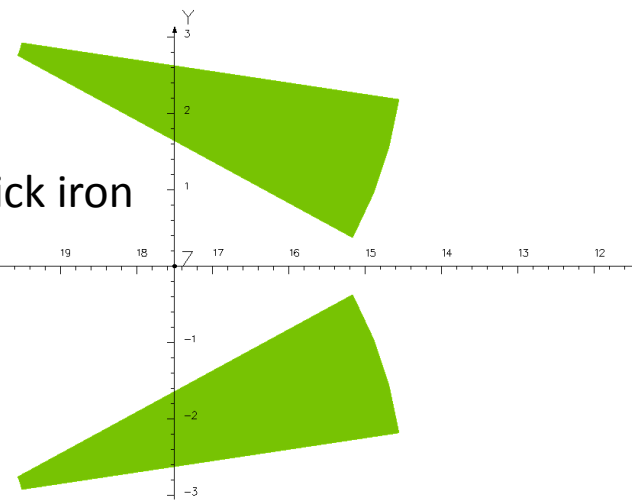
thin iron
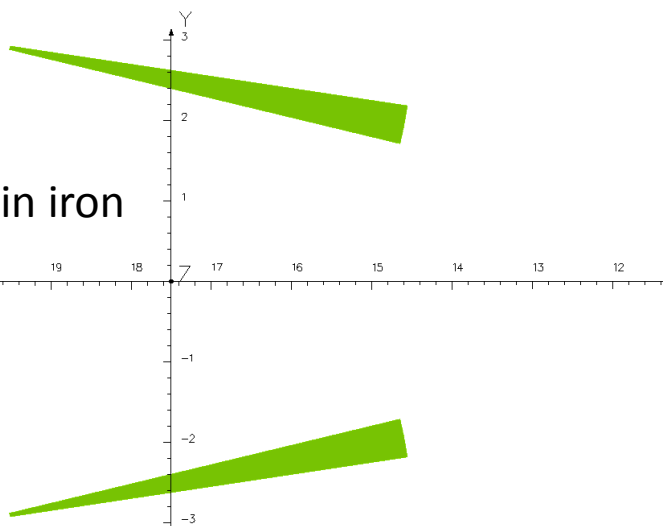
Iron design

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
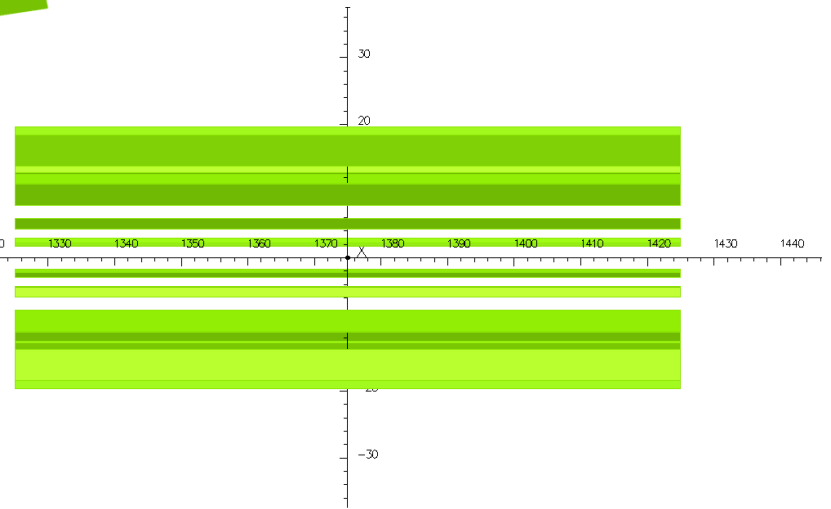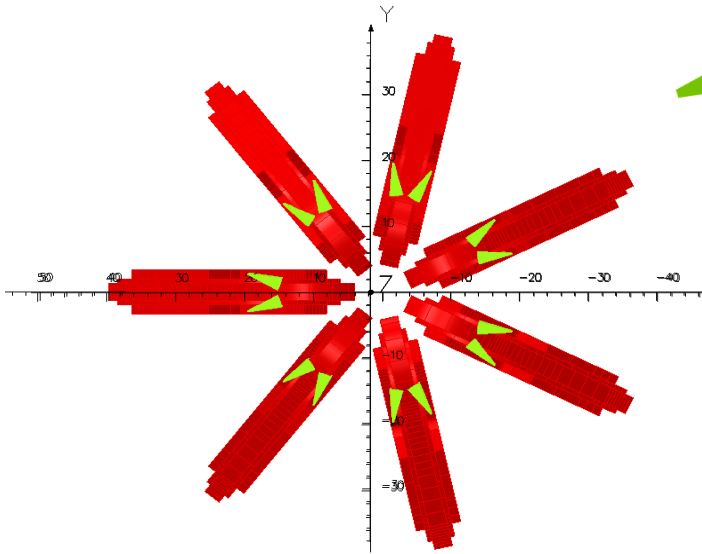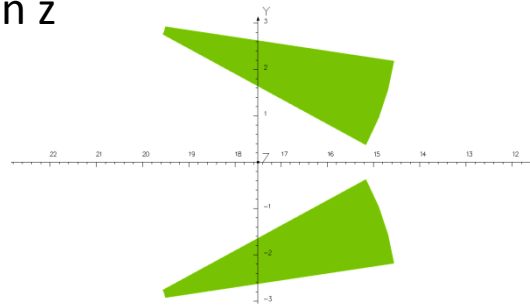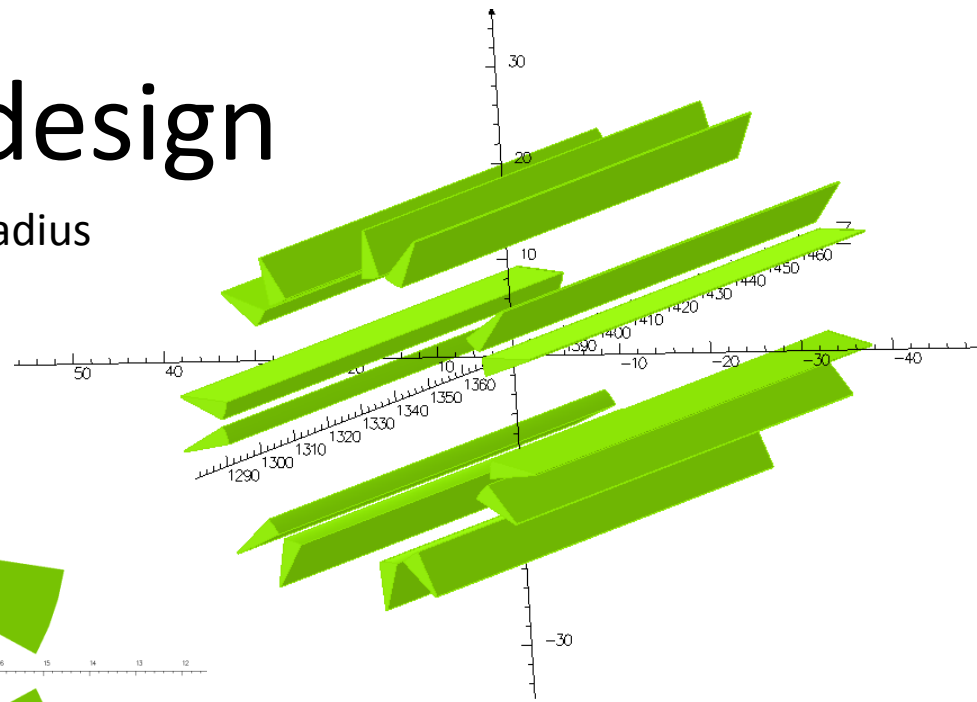
Thin Iron w/ mesh
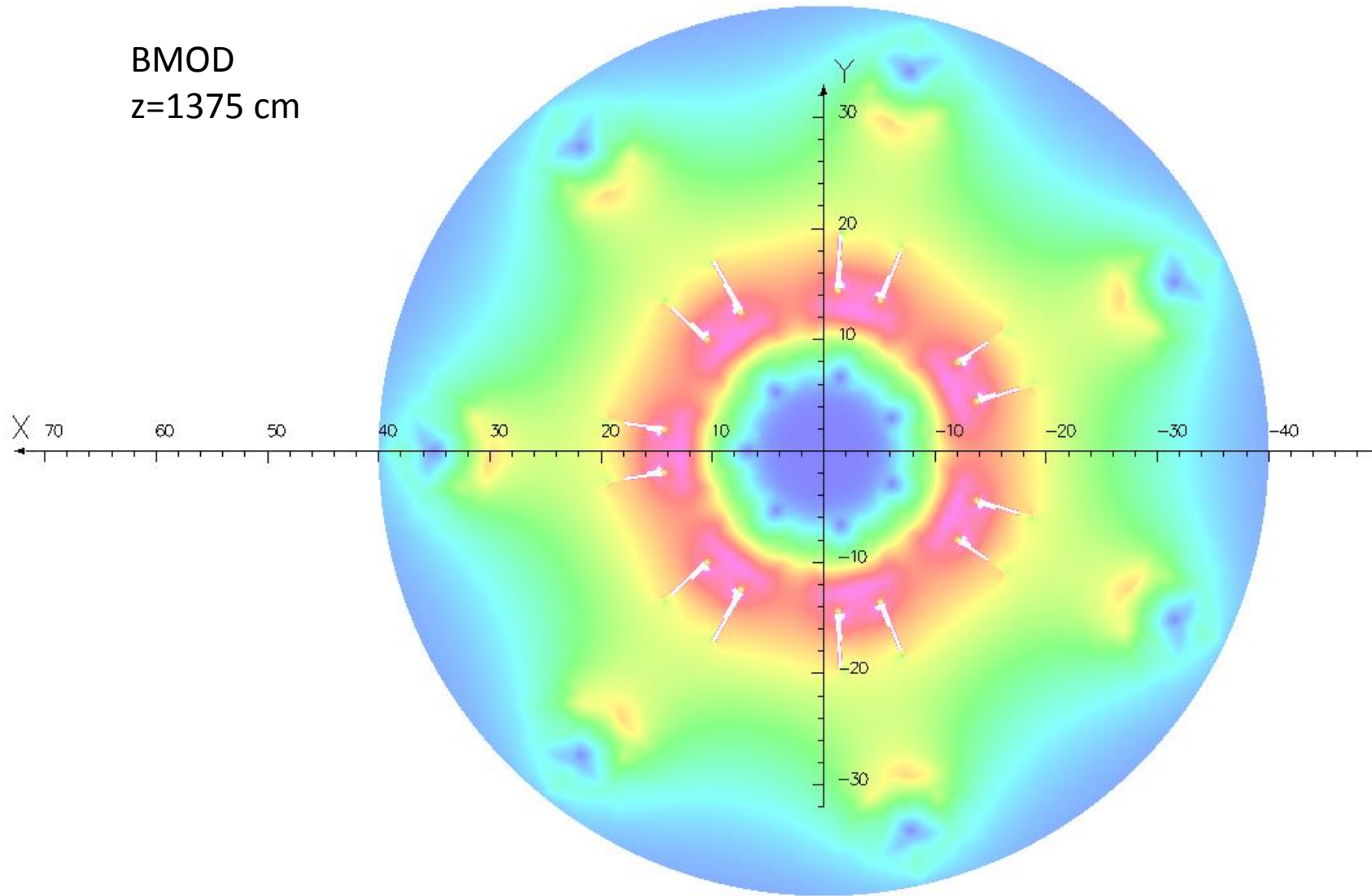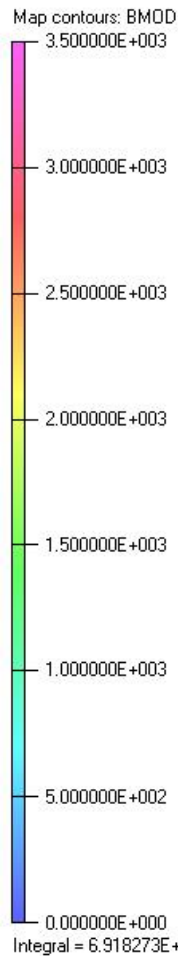
BMOD
z=1375 cm

Thick Iron w/ mesh
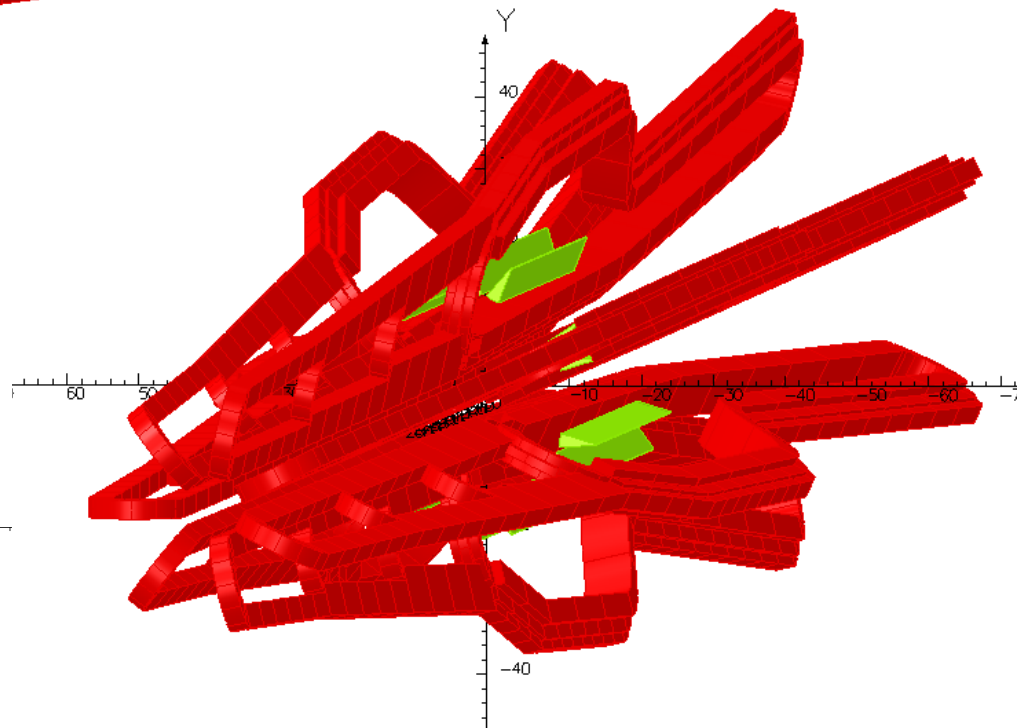

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Map contours: BMOD

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 = 7.381635E+006
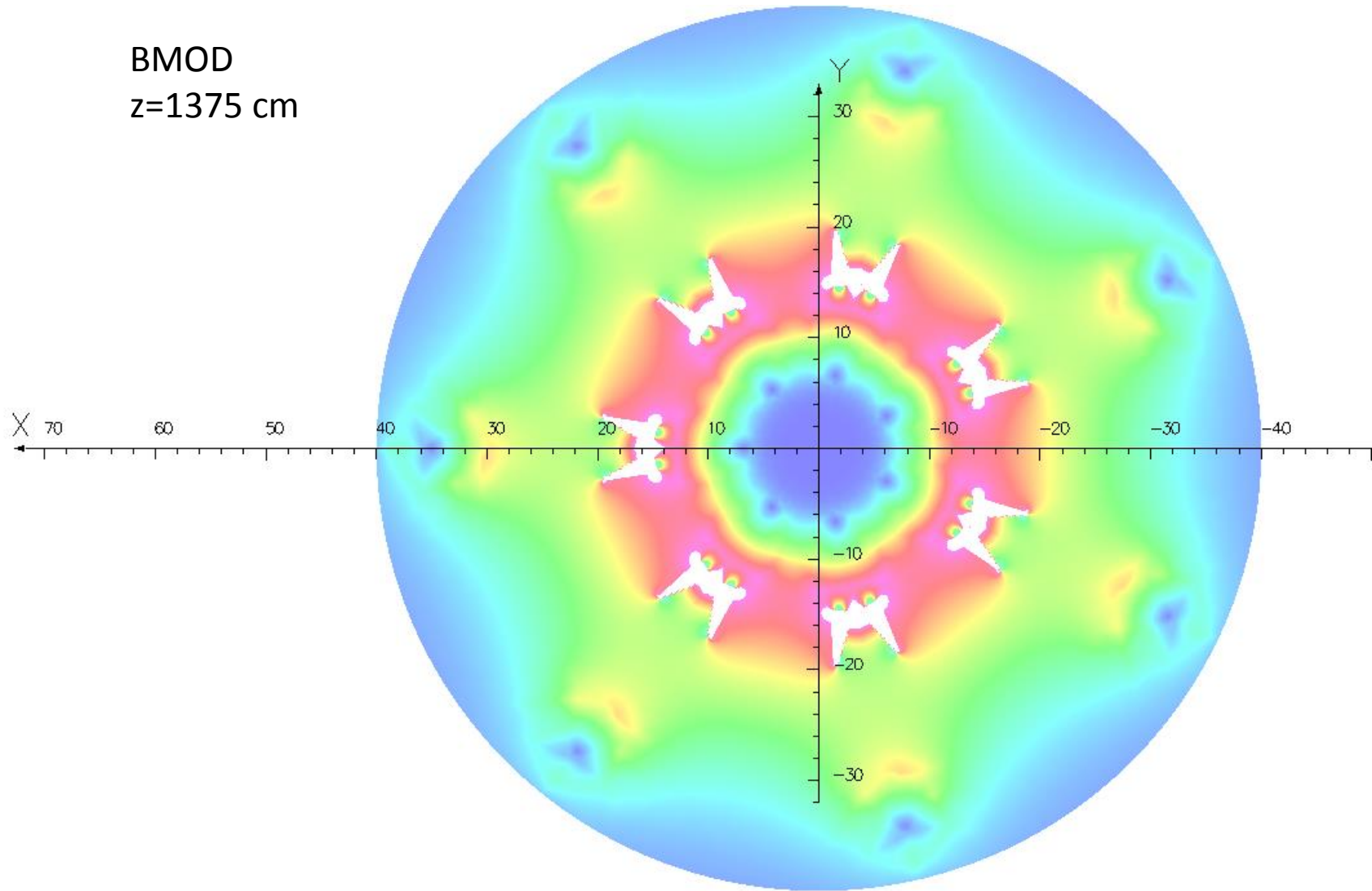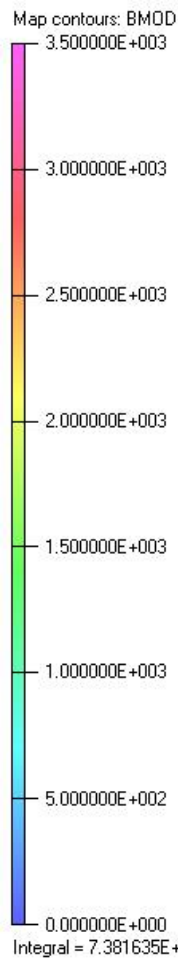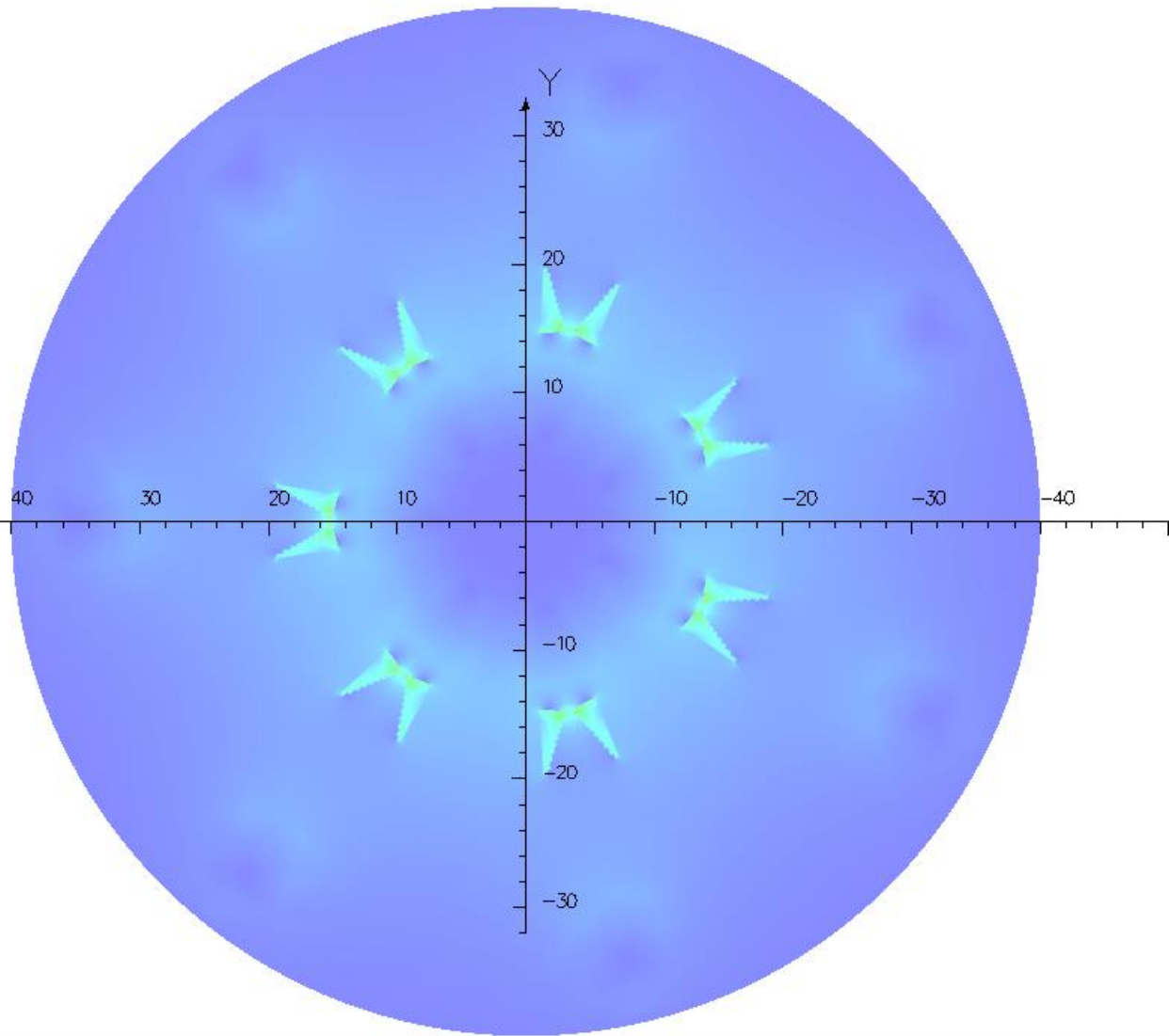
BMOD
z=1375 cm

Giant blocks of iron

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Map contours: BMOD

BMOD
z=1375 cm

No iron w/ mesh

Thin Iron w/ mesh

BMOD
z=1375 cm

Thick Iron w/ mesh

Giant blocks of iron
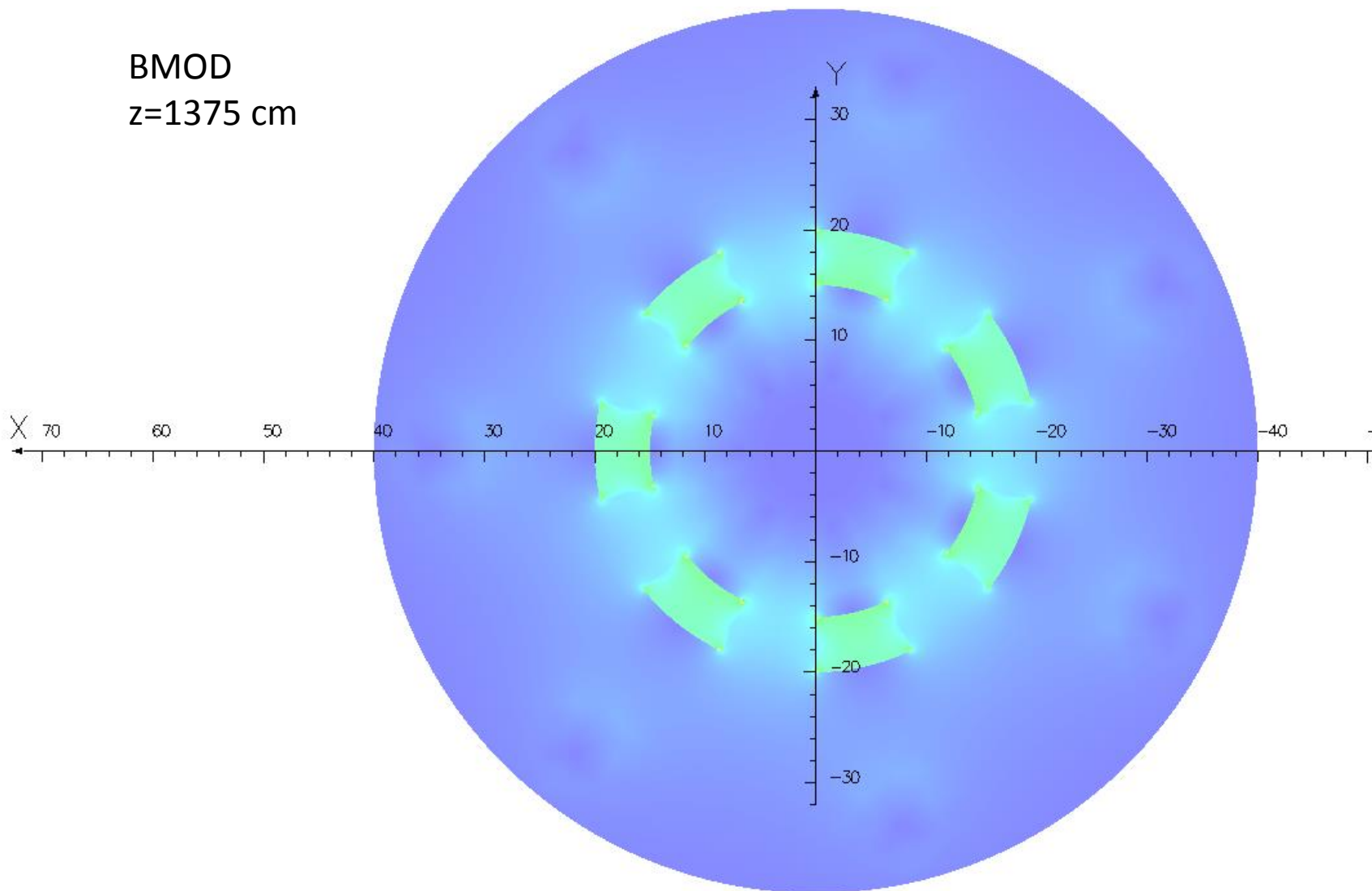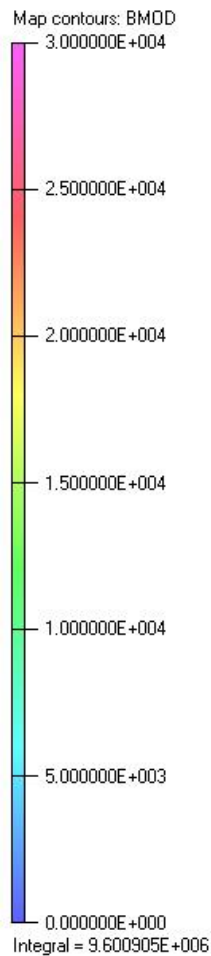
Vector plots

BMOD

Middle of open sector

Middle of open sector

Edge of open sector

Edge of open sector
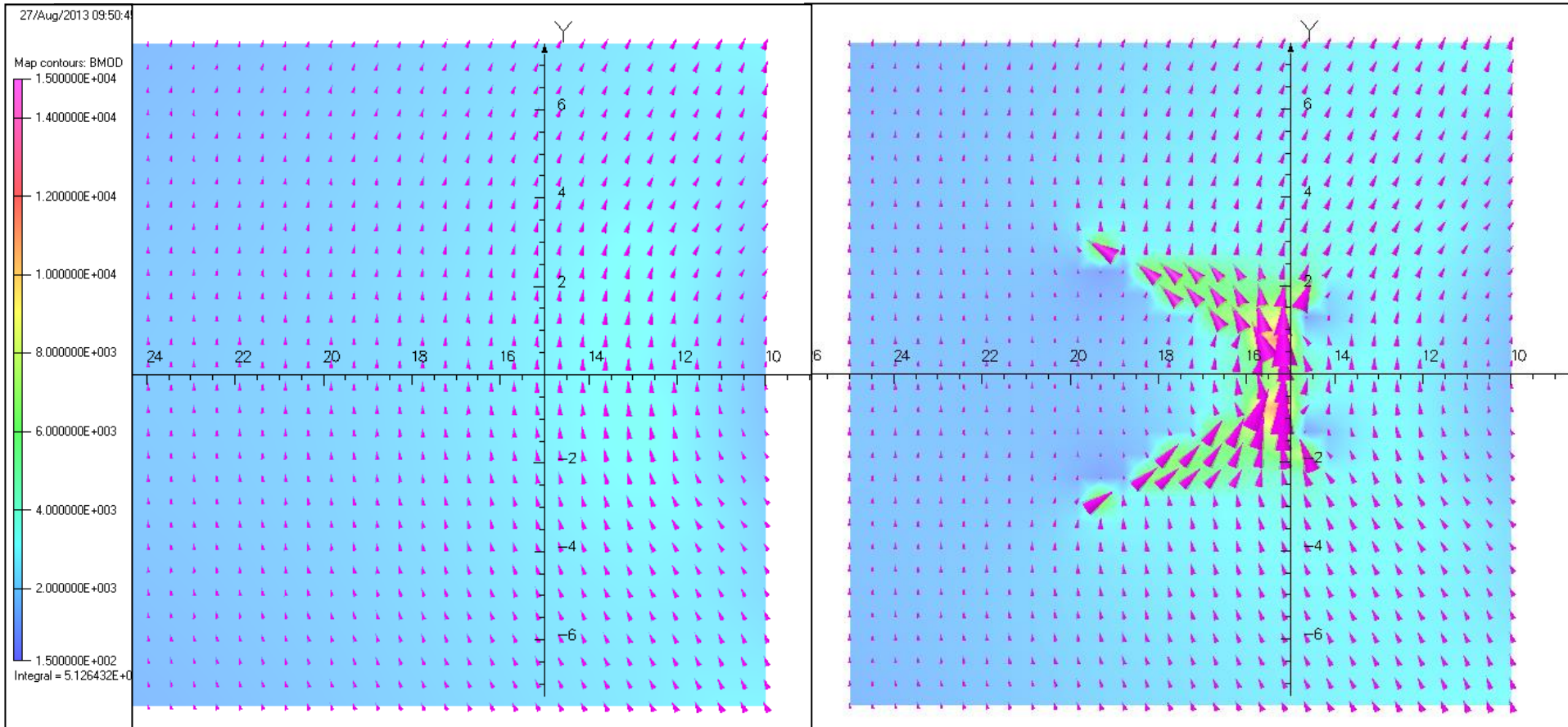
BMOD

Center of open sector

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: BMOD, from buffer: Circle, Integral = 257597.69103303

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: BMOD, from buffer: Circle, Integral = 255104.305759947

BR

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 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 = 349.561640090629

With no iron

BMOD

3300.0
3250.0
3200.0
3150.0
3100.0
3050.0
3000.0
2950.0
2900.0
2850.0
2800.0
2750.0

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: BMOD, from buffer: Circle, Integral = 257597.69103303

Z=1375, r = 13.5 cm

3300.0
3250.0
3200.0
3150.0
3100.0
3050.0
3000.0
2950.0
2900.0
2850.0
2800.0
2750.0

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: BMOD, from buffer: Circle, Integral = 259894.143714169

BR

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

With thin iron

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

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

With thick iron

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

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BMOD

With no iron

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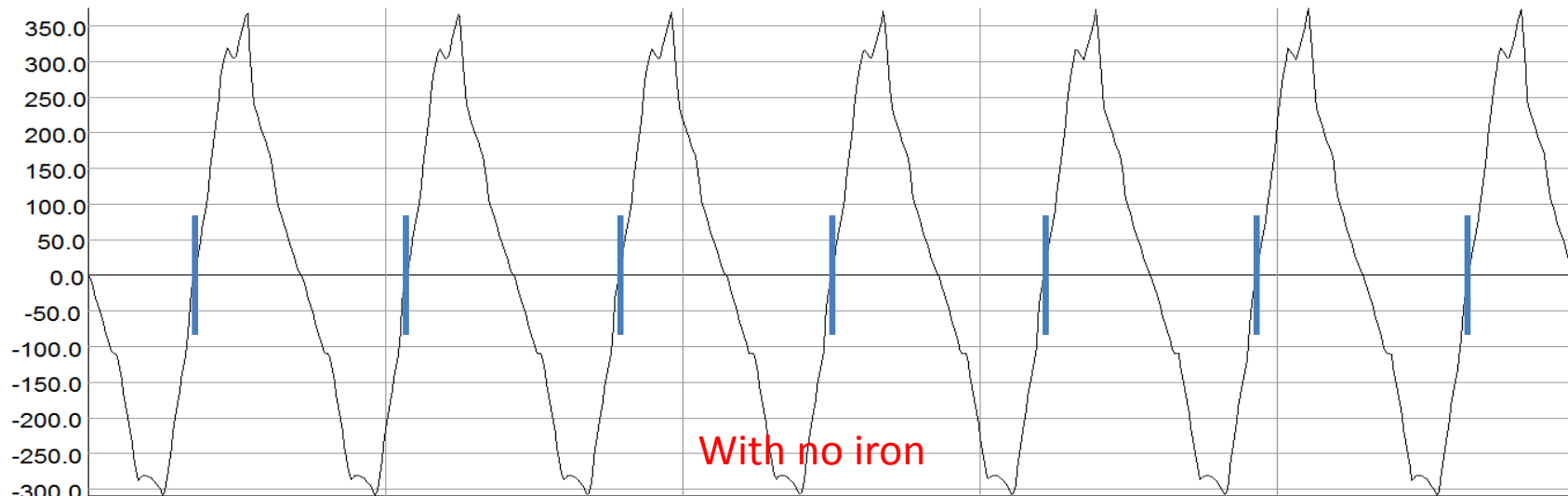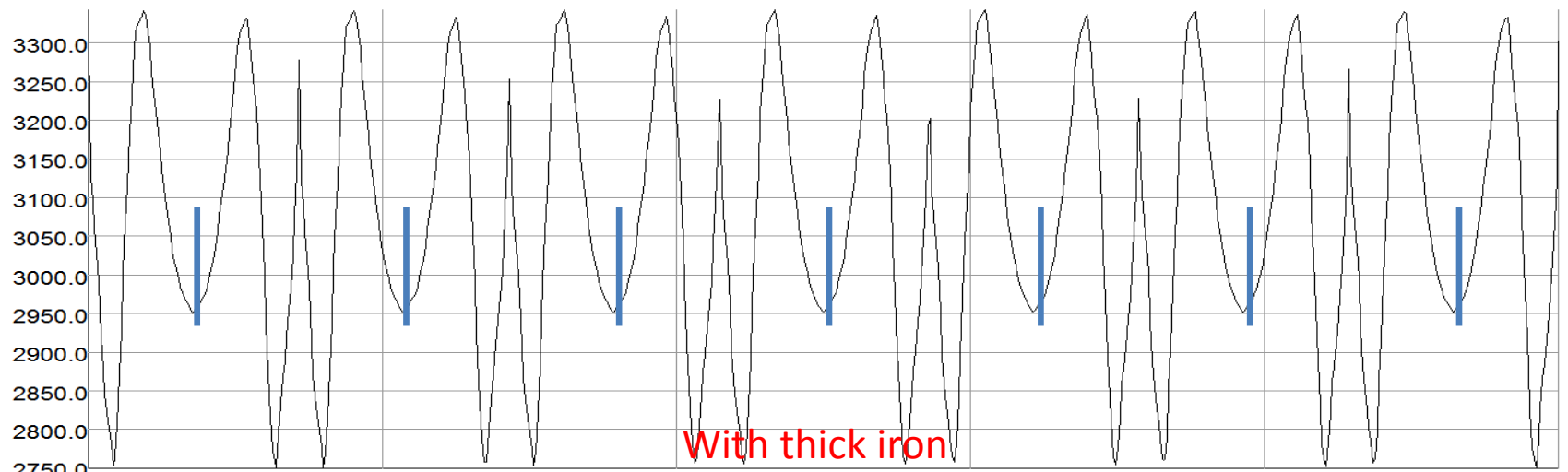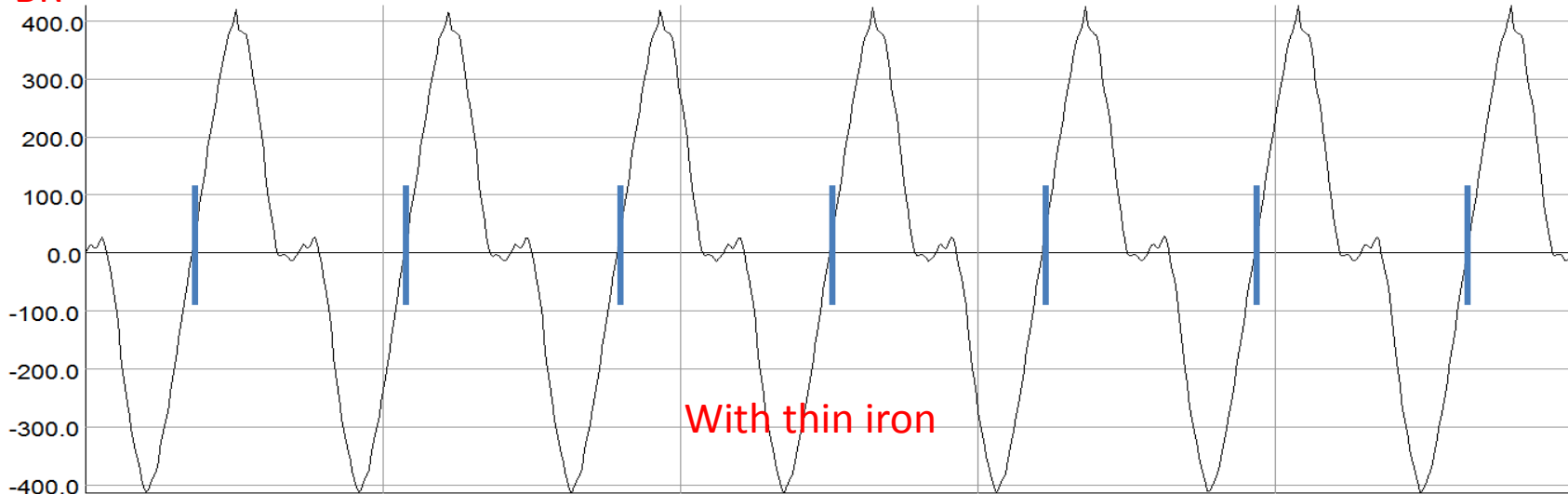Component: BMOD, from buffer: Circle, Integral = 256796.321253348

Z=1375, r = 16.0 cm

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With thick iron

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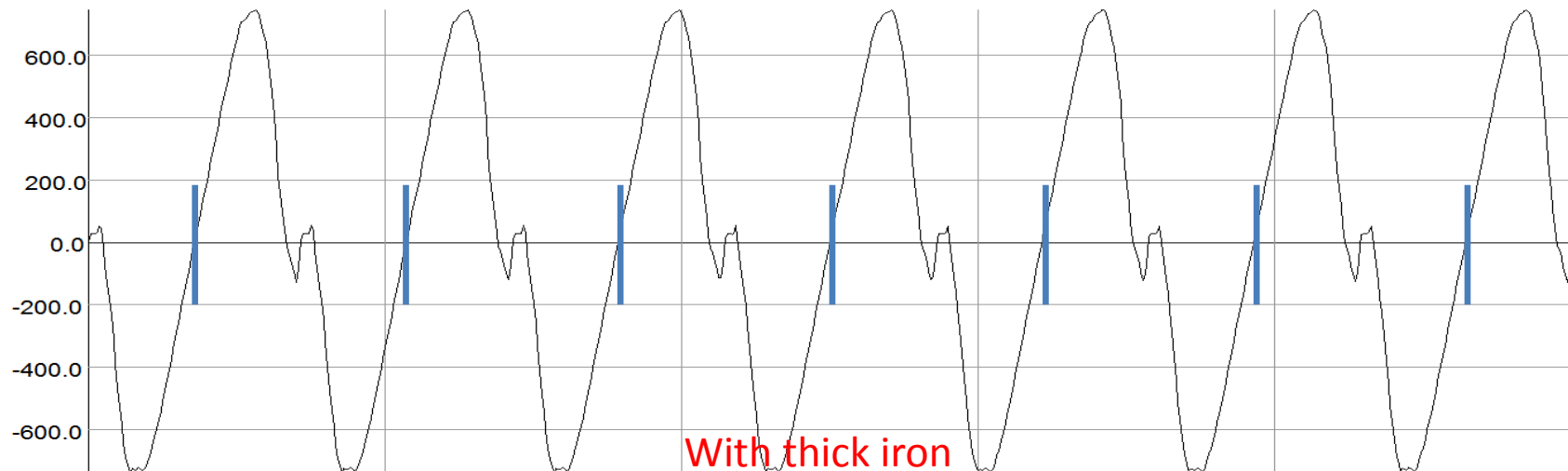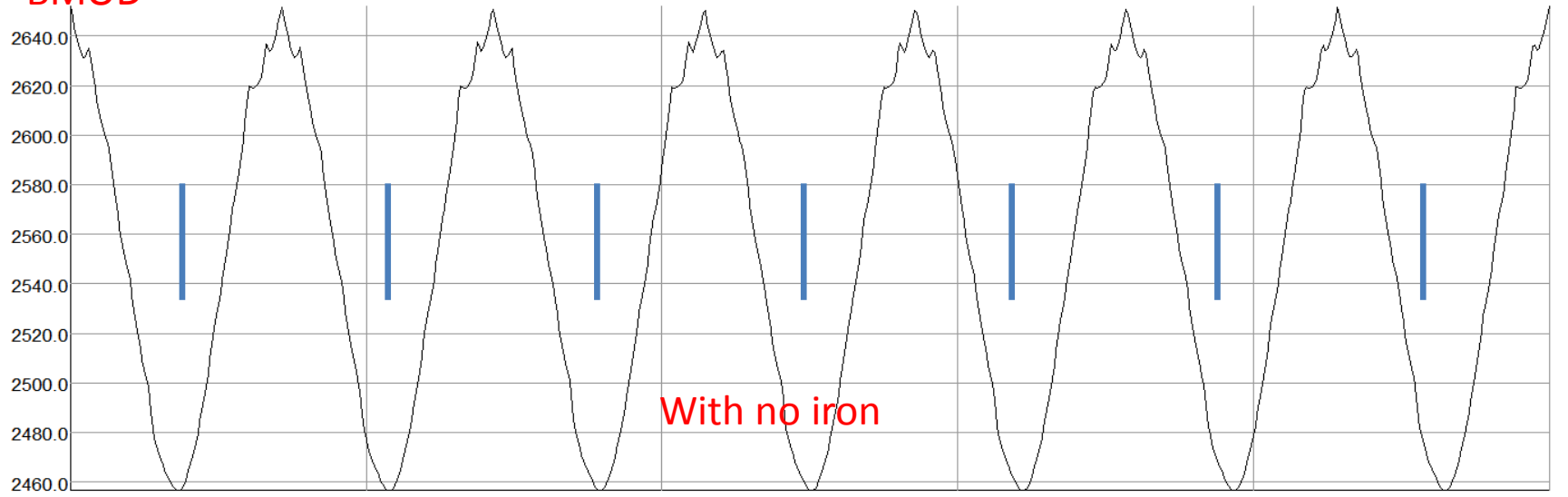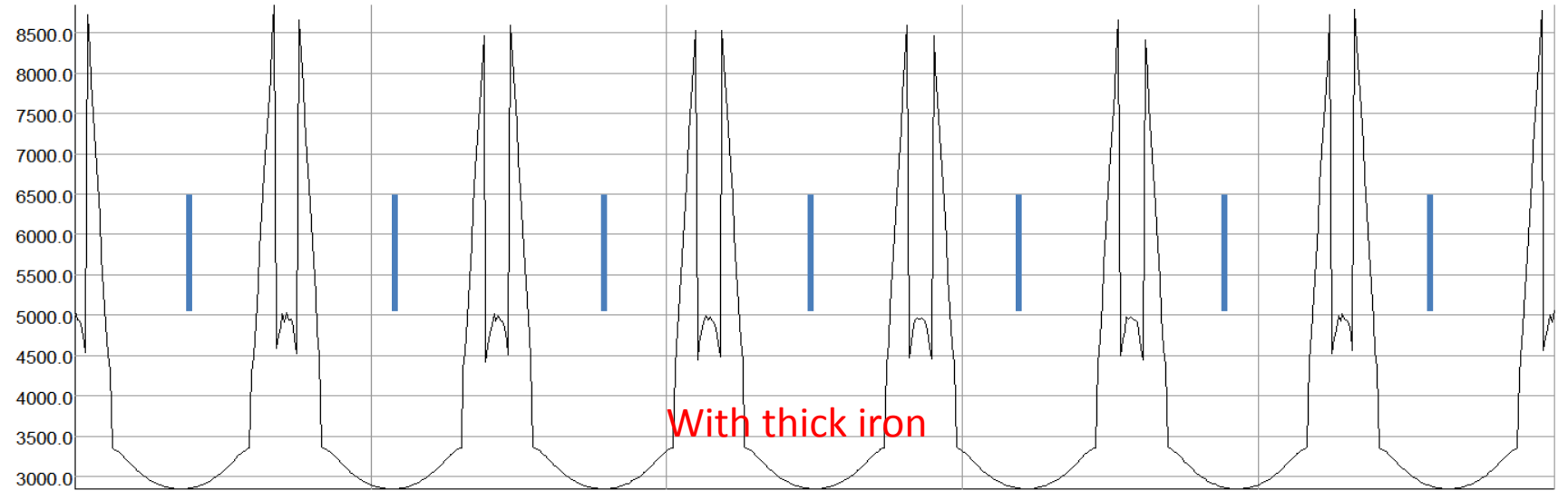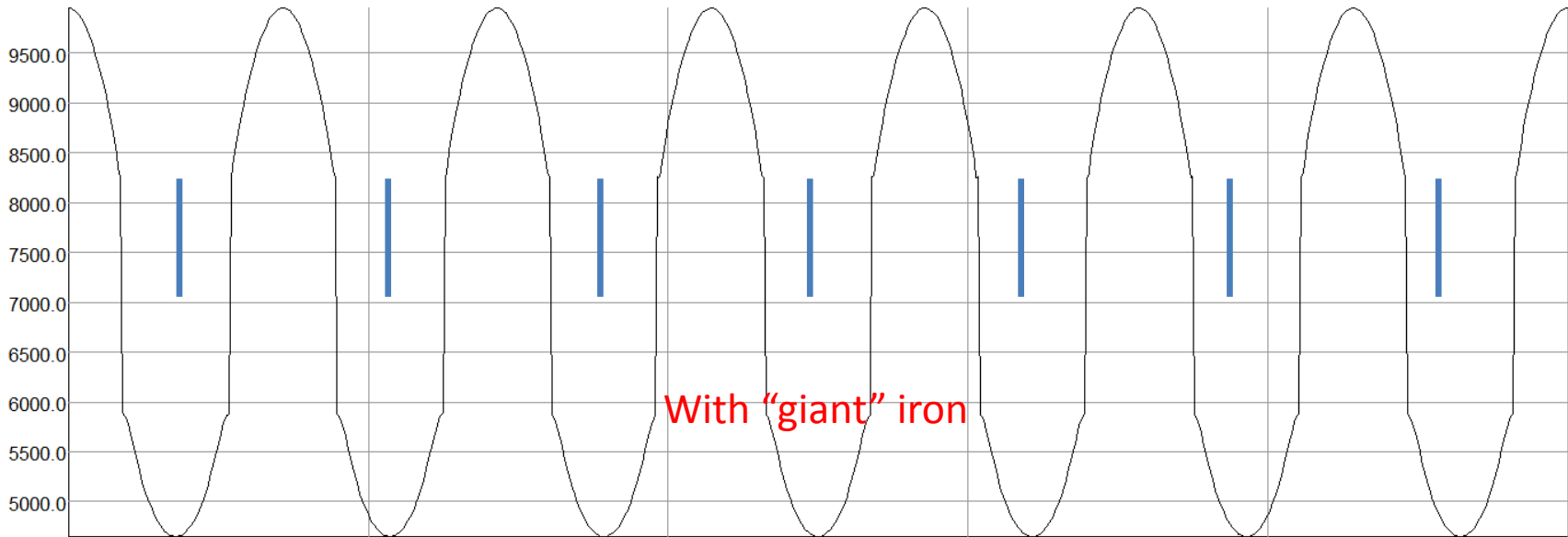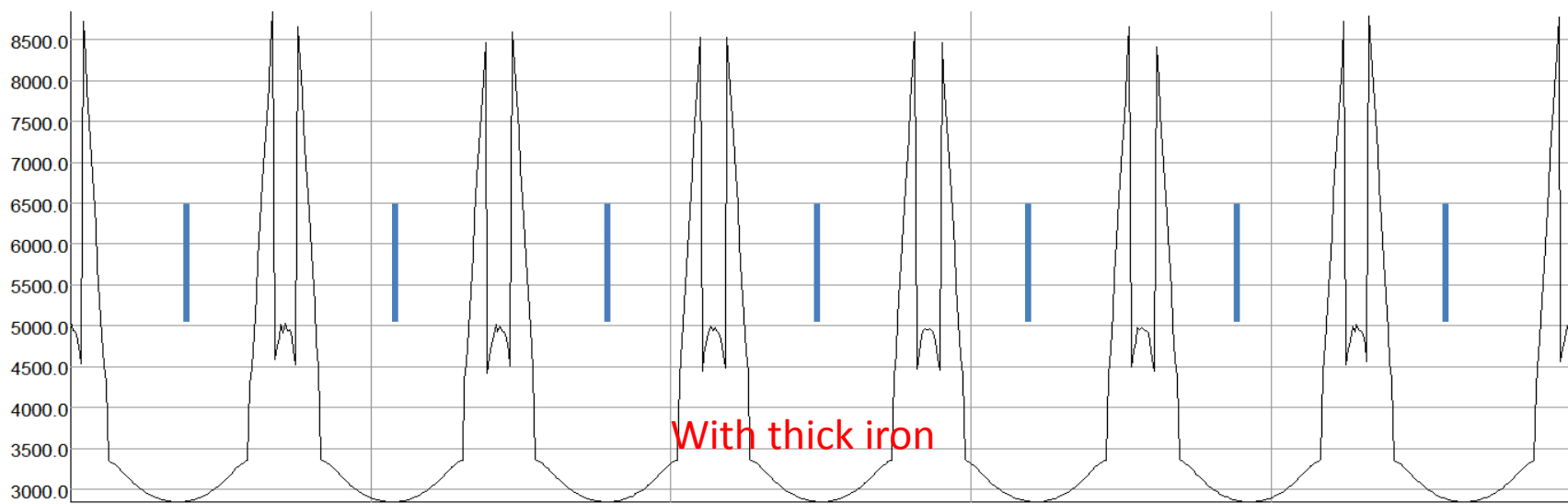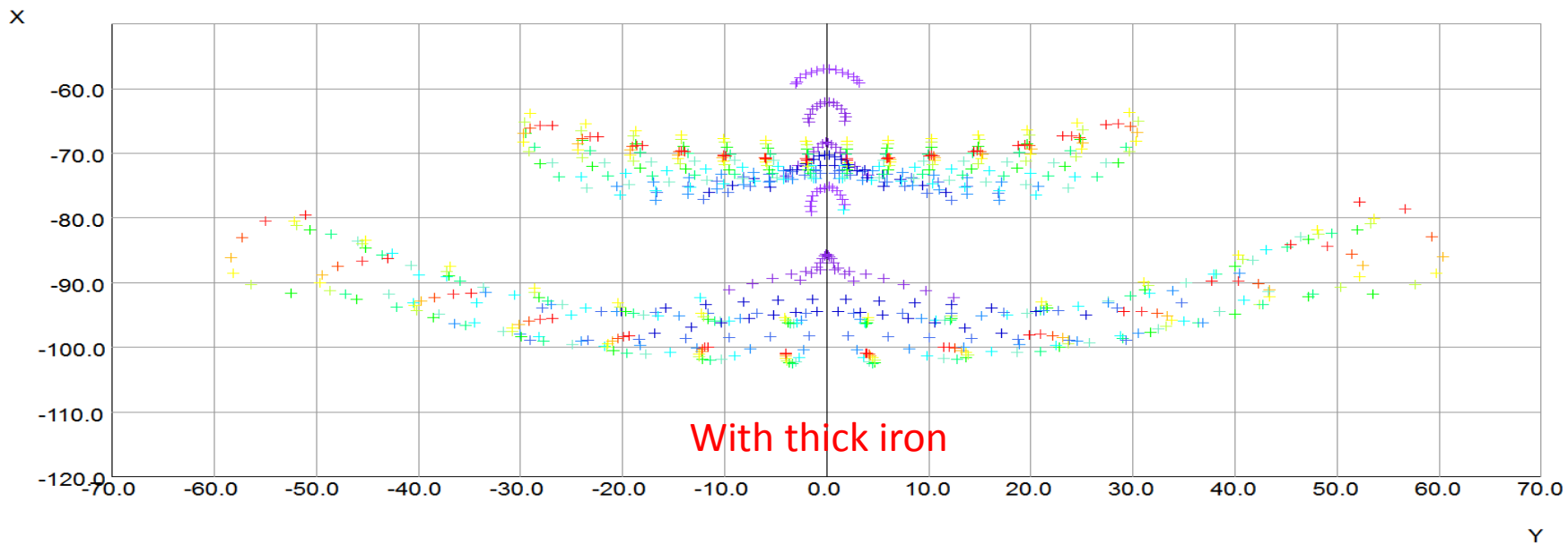Component: BMOD, from buffer: Circle, Integral = 401223.451775802

BMOD

With "giant" iron

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 = 727135.14970877

With thick iron

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

Moller and elastic ep electrons at z=2800.0cm

With no iron

Moller and elastic ep electrons at z=2800.0cm

With thick iron

Moller and elastic ep electrons at z=2800.0cm

With no iron

Moller and elastic ep electrons at z=2800.0cm

With giant iron

Moller and elastic ep electrons at z=2800.0cm

With no iron

Moller and elastic ep electrons at z=2800.0cm

With giant iron, BFIL 90%

Moller and elastic ep electrons at z=2800.0cm

With no iron

7/Oct/2013 08:14:37

Moller and elastic ep electrons at z=2800.0cm

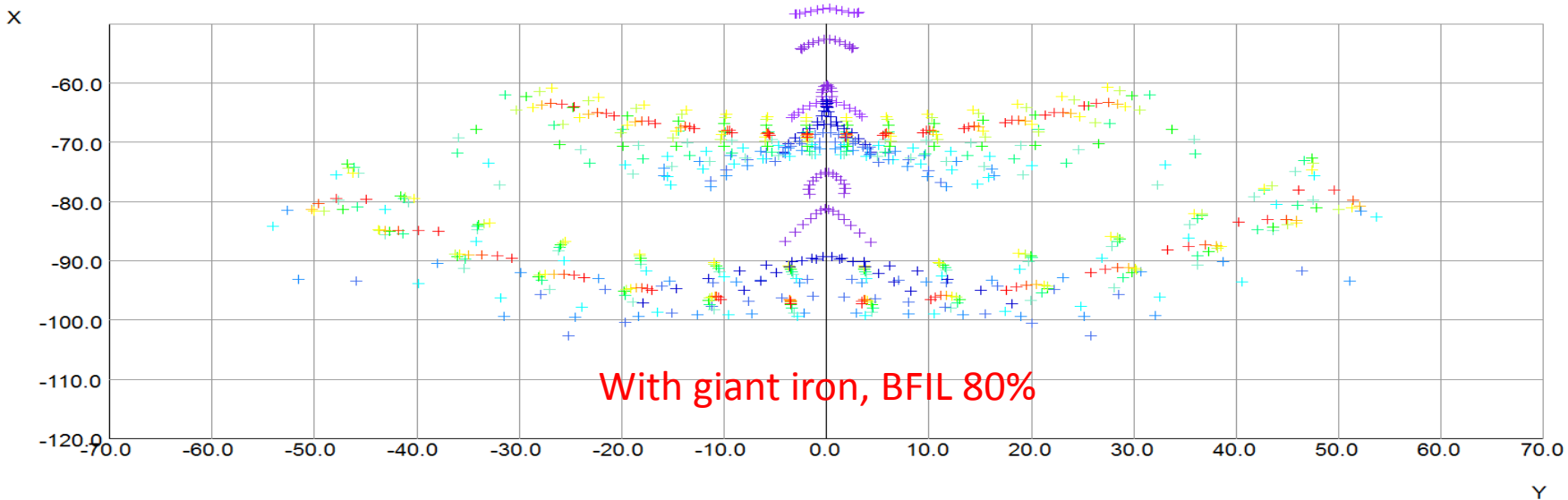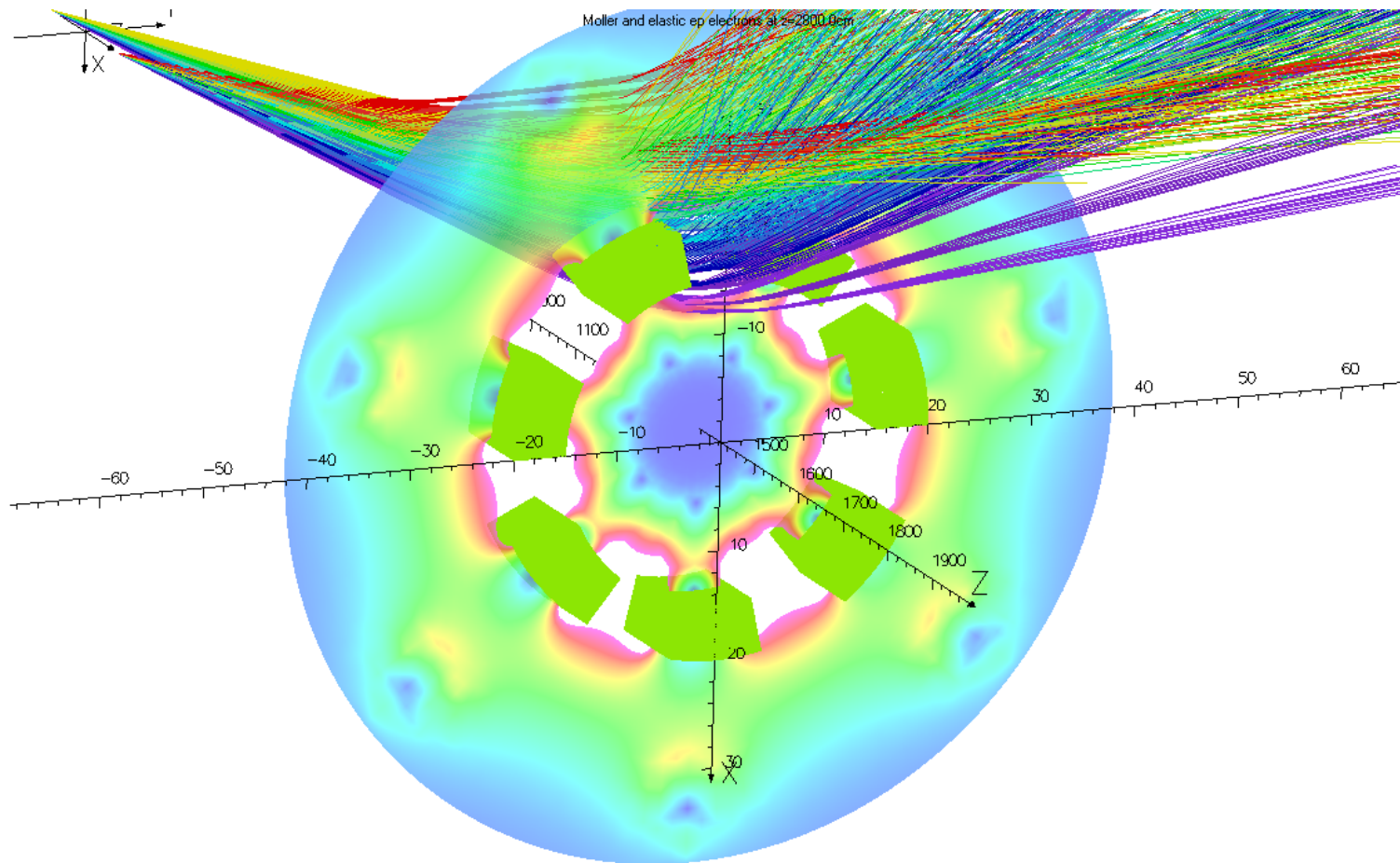With giant iron, BFIL 80%
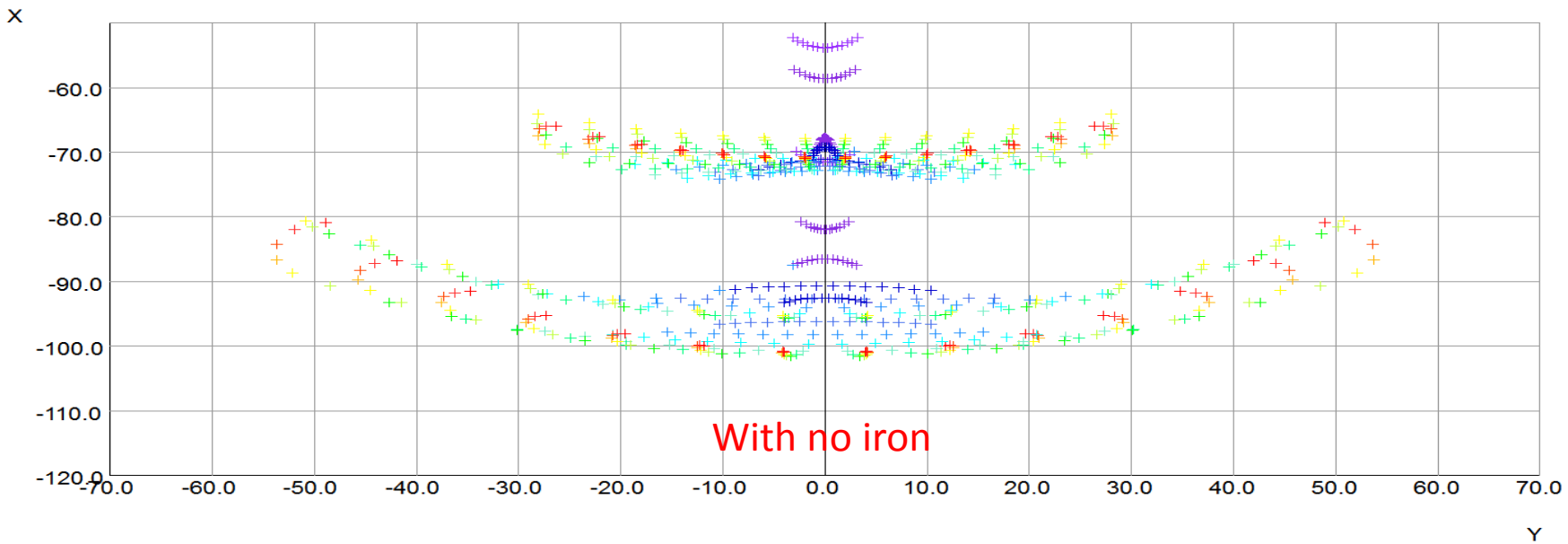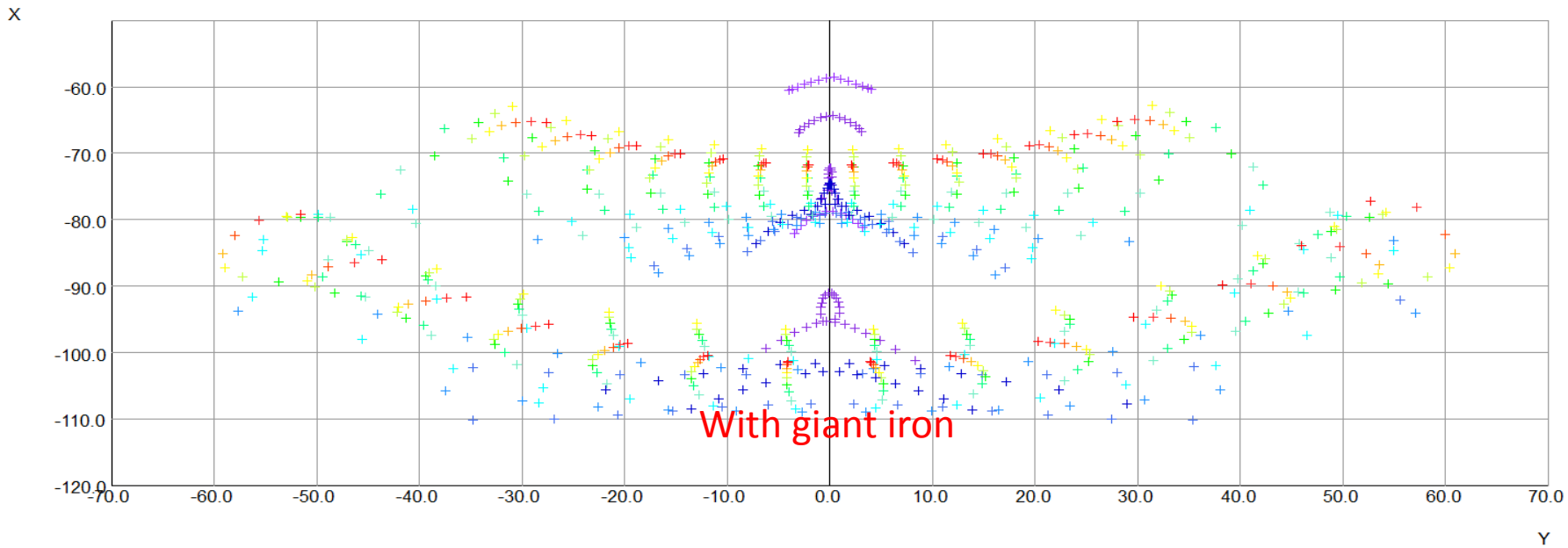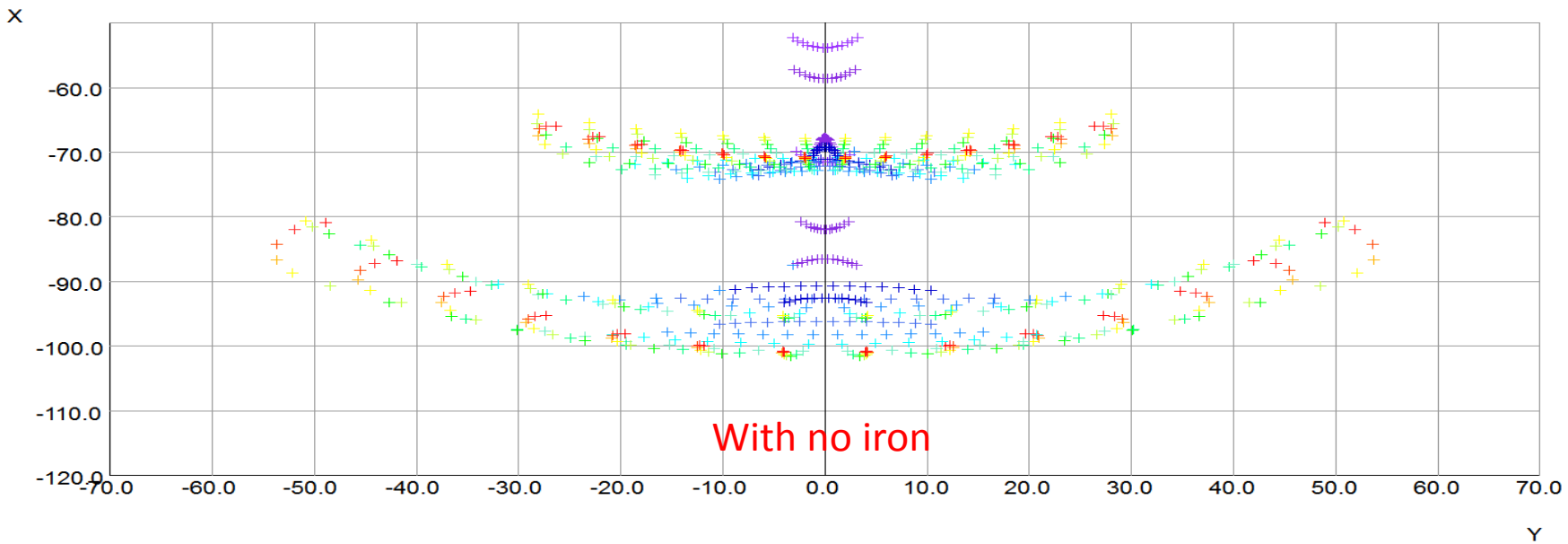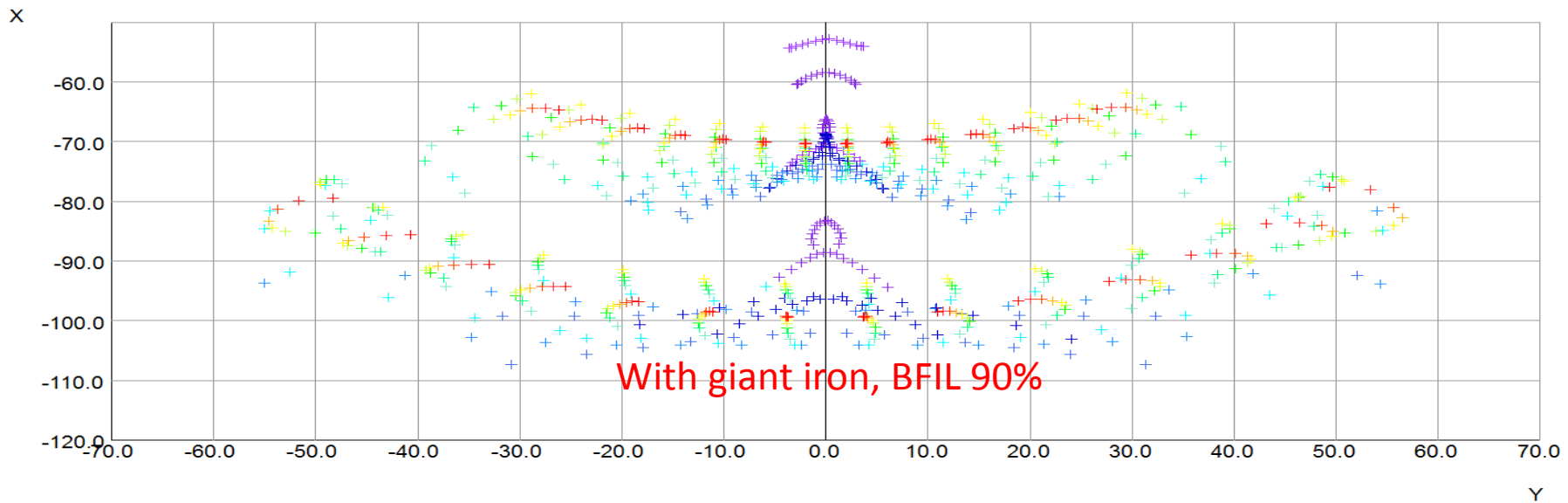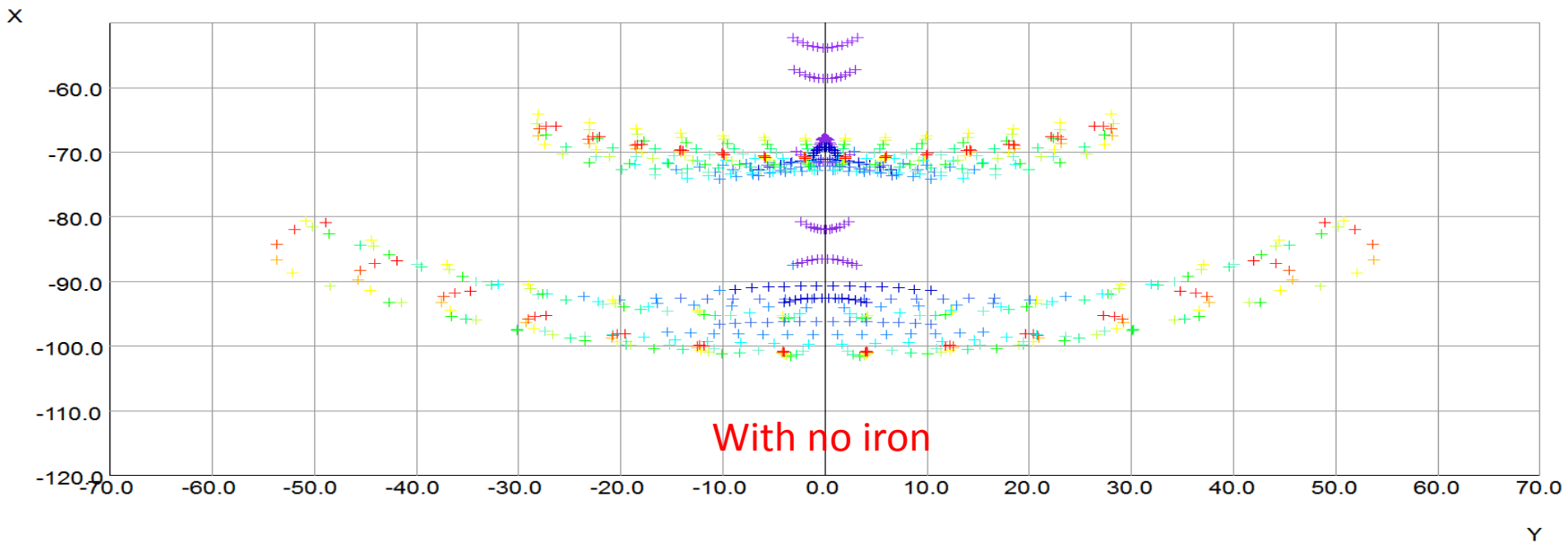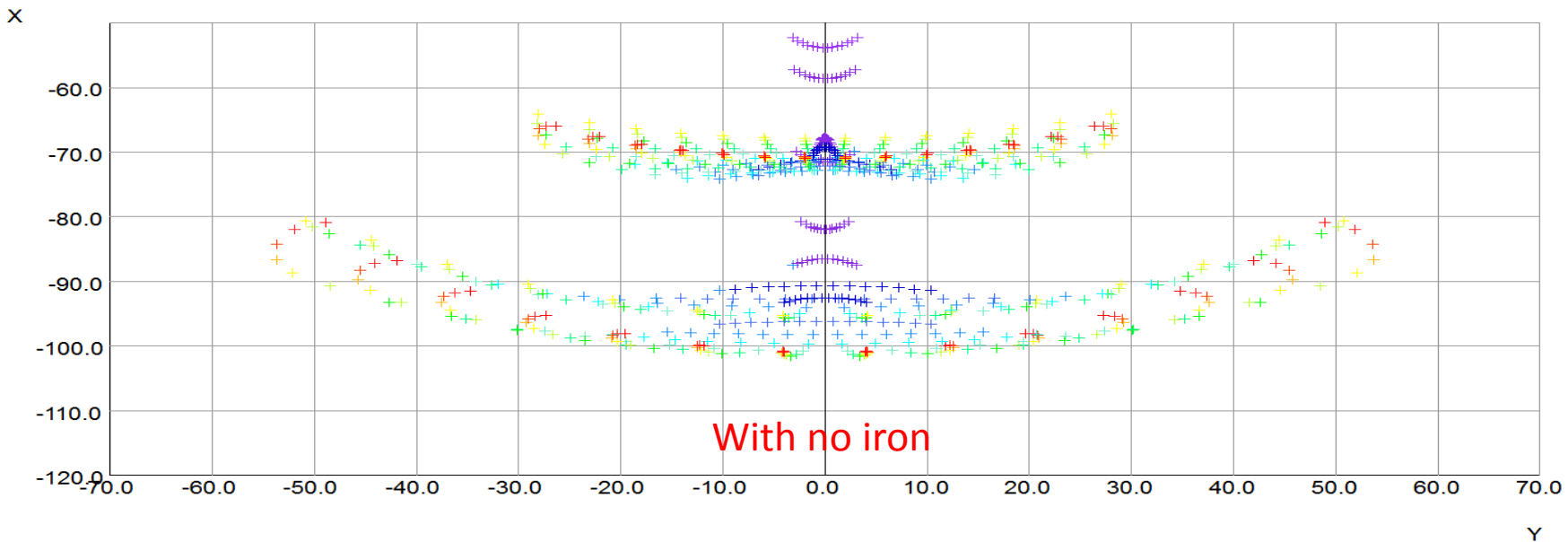
Map contours: BMOD

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

Moller and elastic ep electrons at z=2800.0cm

Summary

No optimization of the iron was done

According to this preliminary work, $\int B \cdot dl$ is 2% greater for the thick iron

$$1.11 \text{ T·m} \rightarrow 1.13\text{T} \cdot \text{m}$$

Lowest tracks radial position at detector plane increased 2 cm (compared to 90 cm)

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