

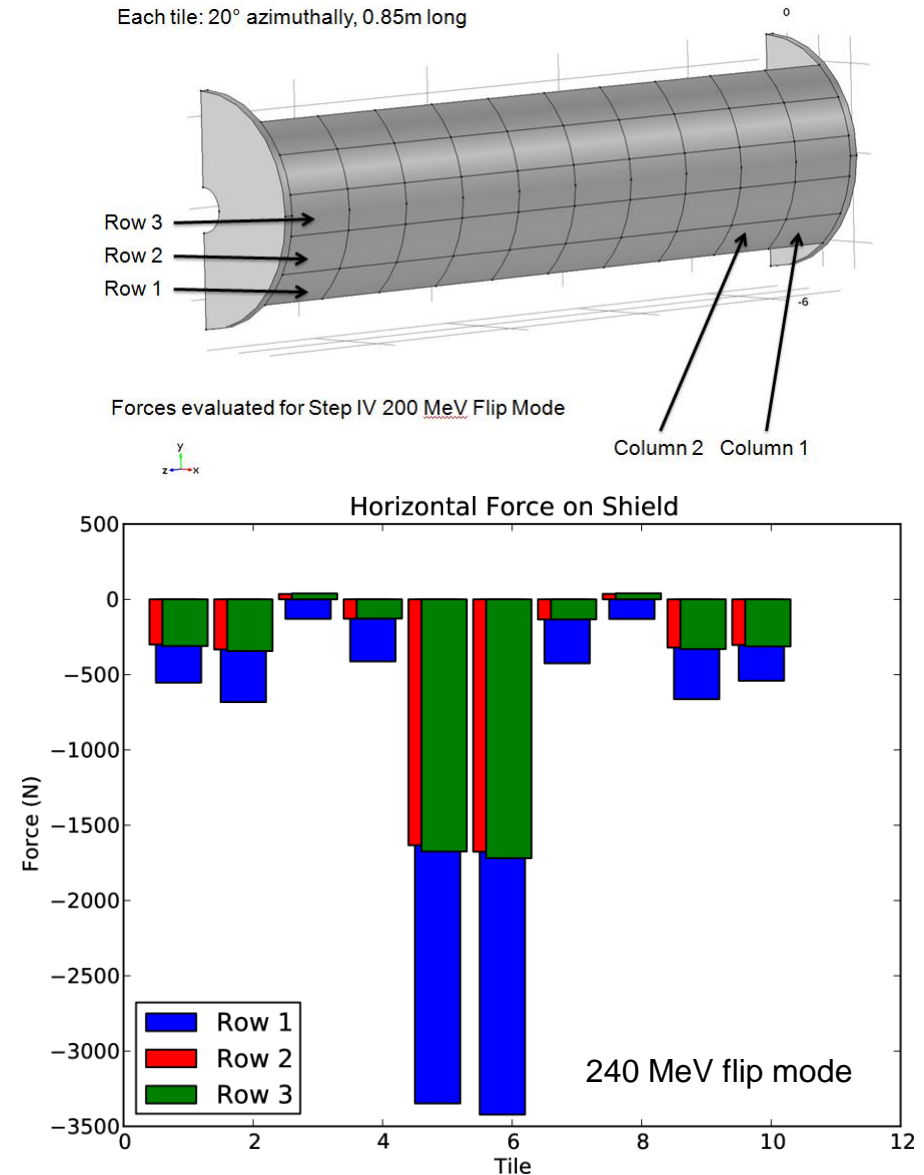
Update on Shield

Holger Witte
Brookhaven National Laboratory
Advanced Accelerator Group

- Update on forces
- Gaps in shield
- Field in ISIS plant room

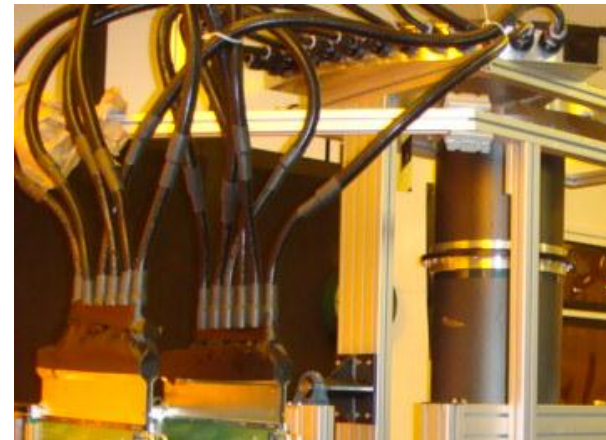
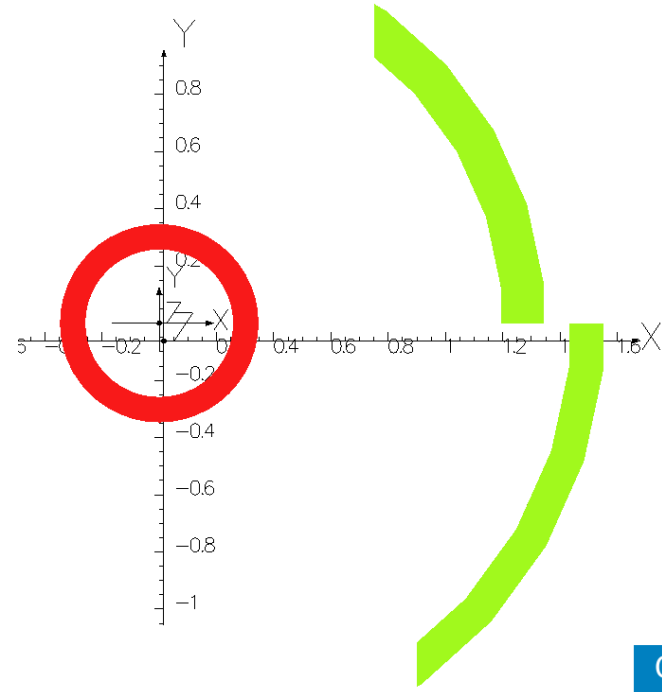
Forces on Shield

- Previously: forces evaluated for 200 MeV flip mode
 - Presentation 19.11.2012
- Update: all cases of Step IV
- Result:
 - Forces look very manageable
 - Peak 3.5 kN on 0.45x0.85 tile
 - Worst case is 240 MeV flip mode
 - Communicated to engineers

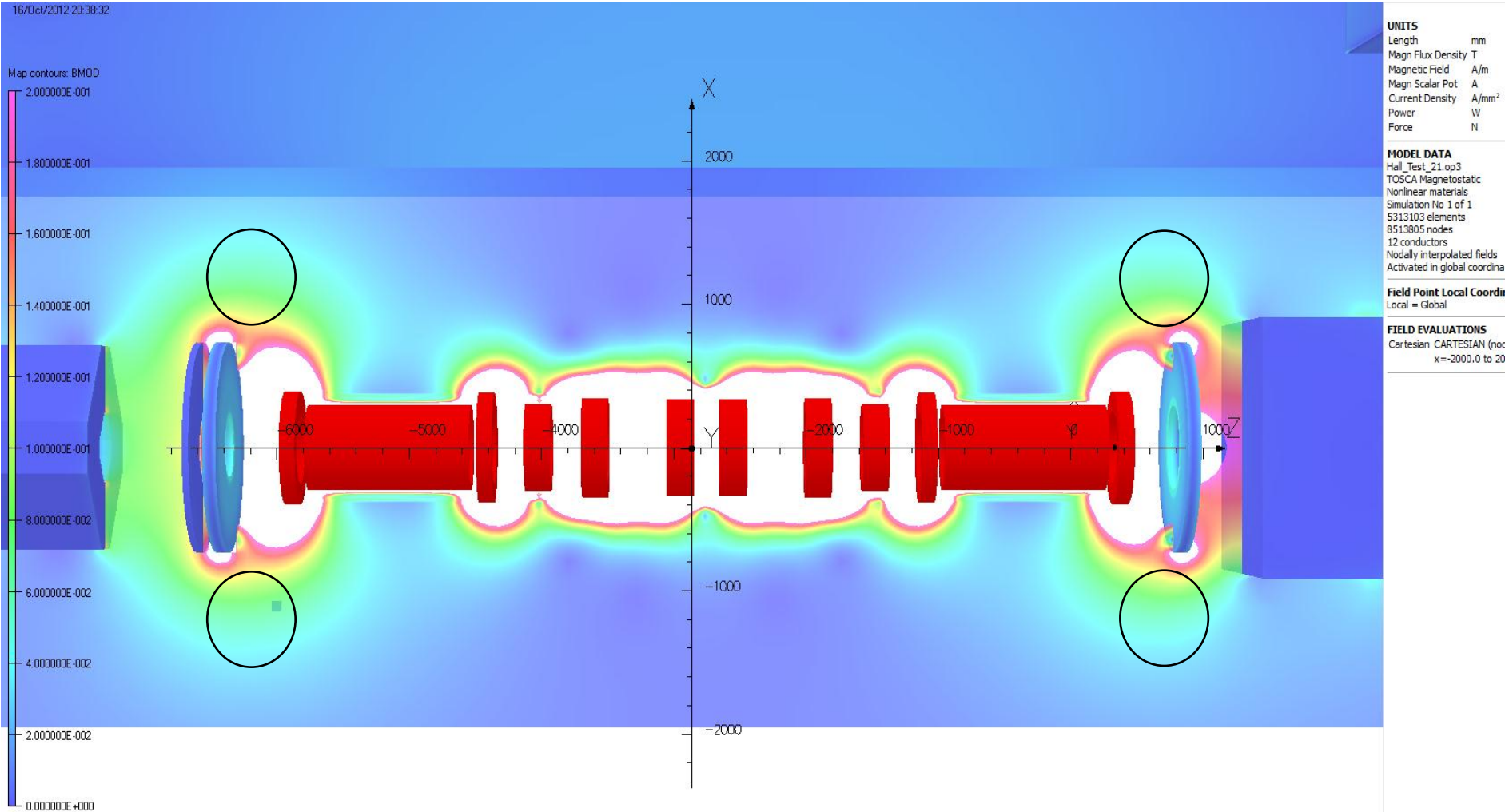


Gap Study

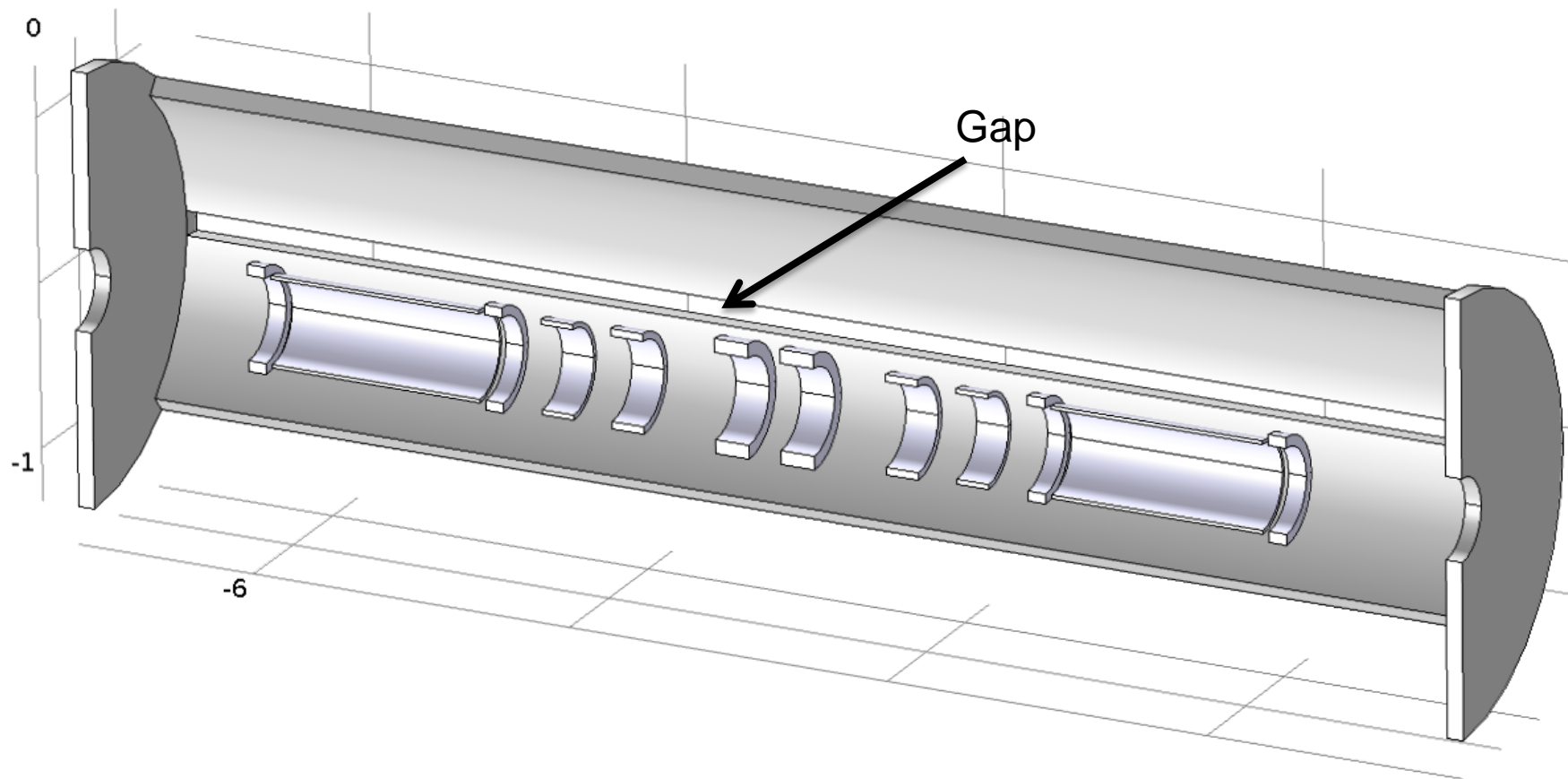
- Previous study showed that a longitudinal gap of 5 mm does not affect shielding performance
 - (engineering: joints)
- Study: what is the limit on this?
 - Tracker!



Tracker Issue



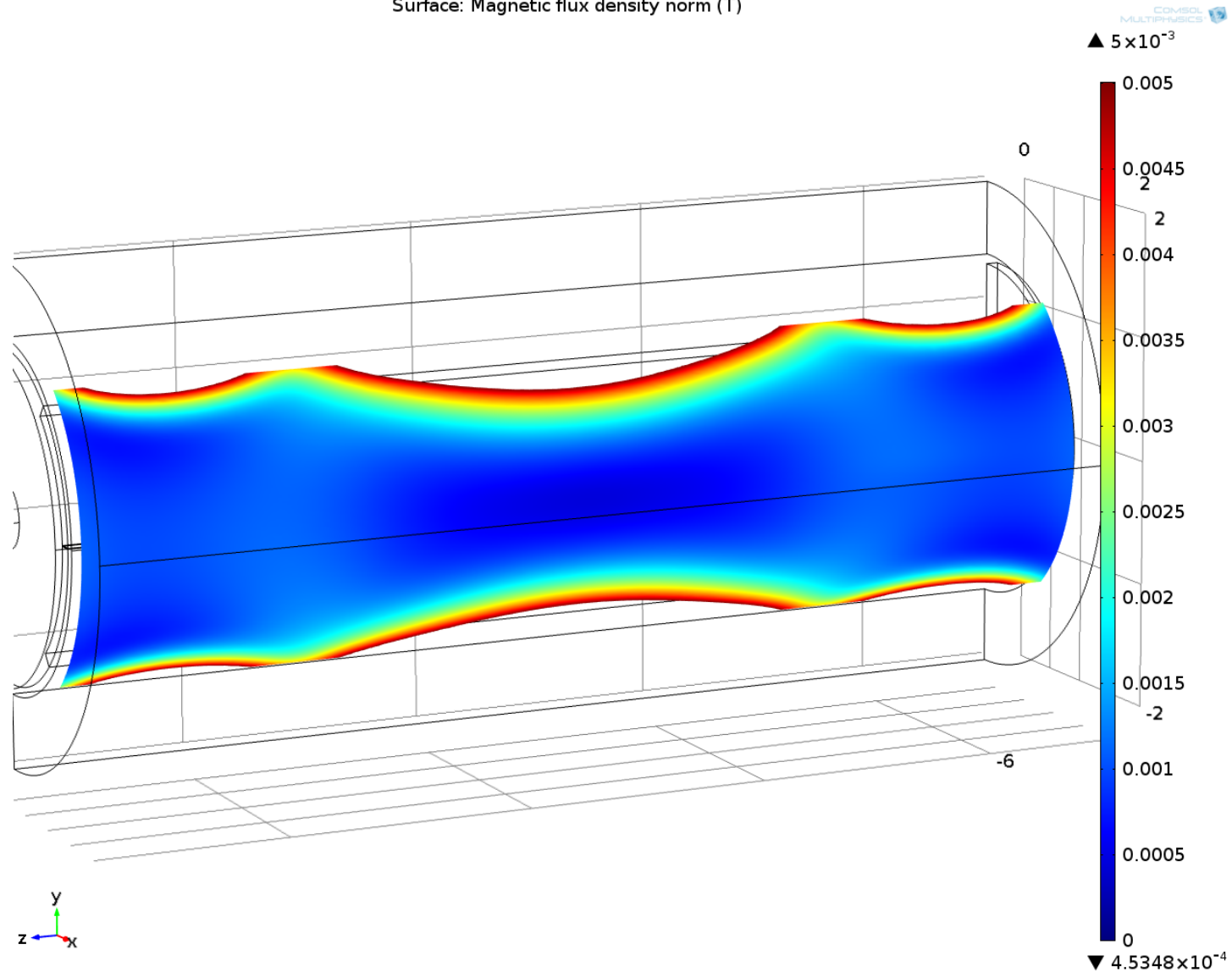
Courtesy of Craig Macwaters



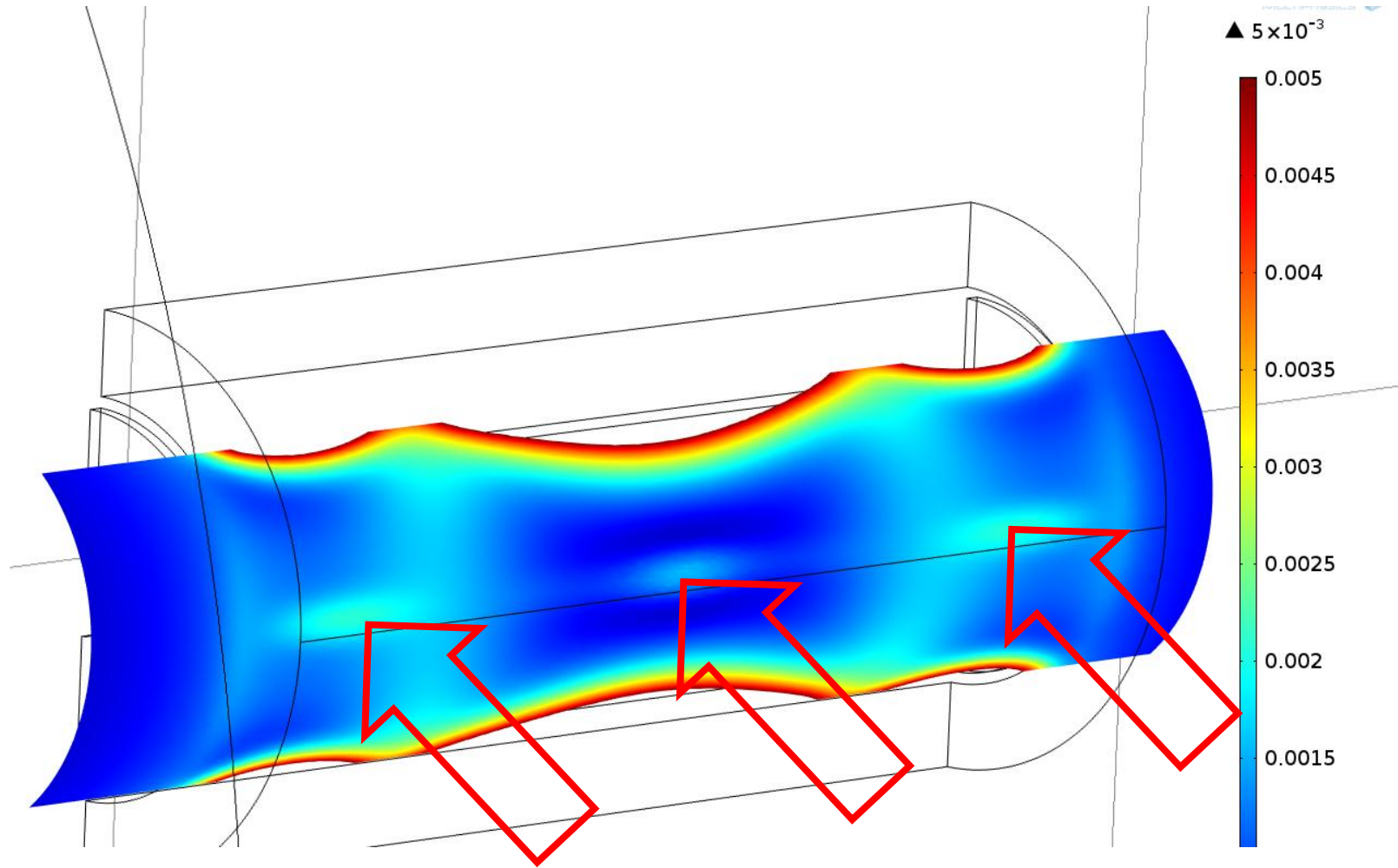
MICE Step IV, 200 MeV, Flip Mode
Thickness shield 12 cm

5 mm Gap

Surface: Magnetic flux density norm (T)



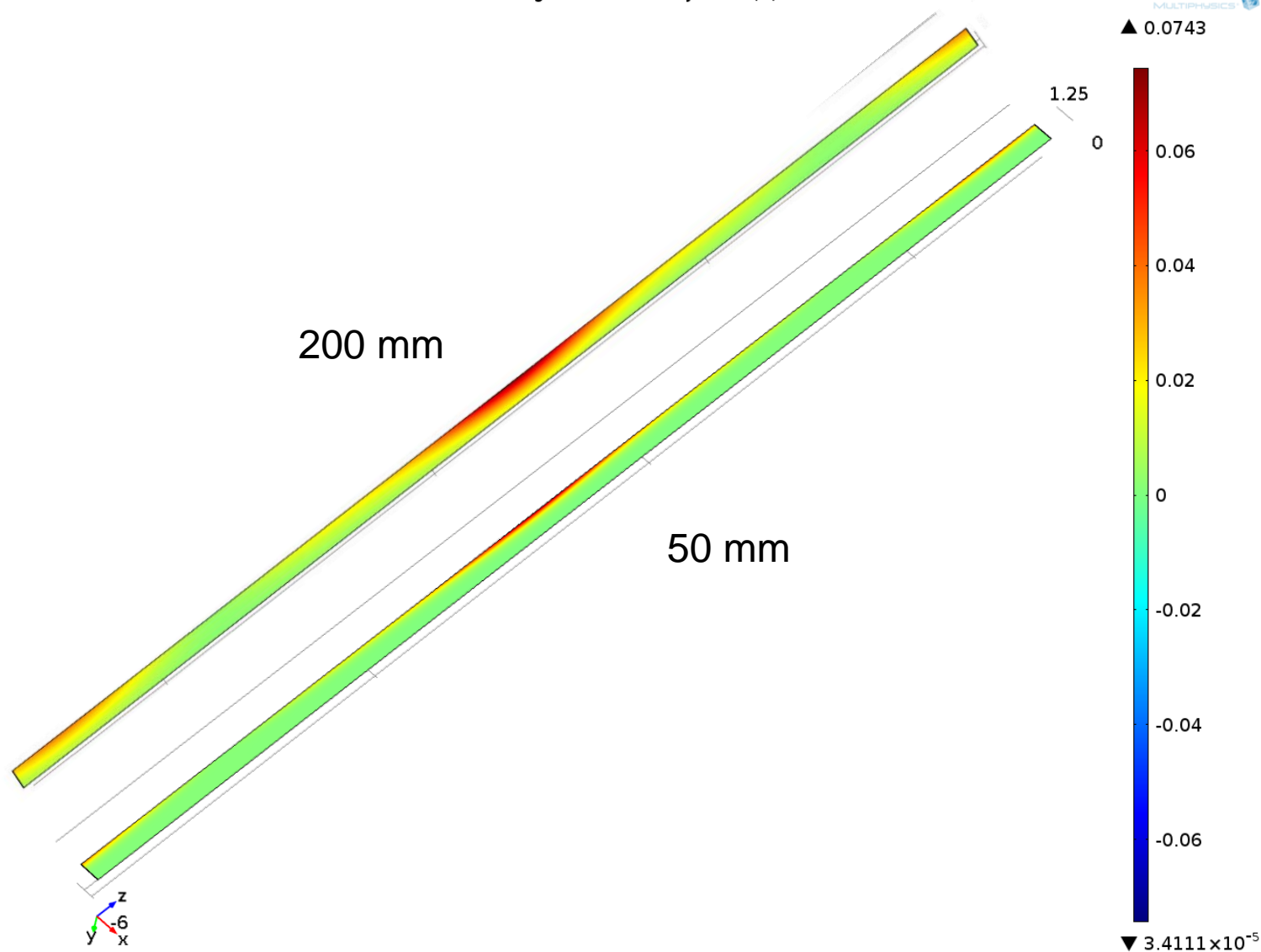
200 mm Gap



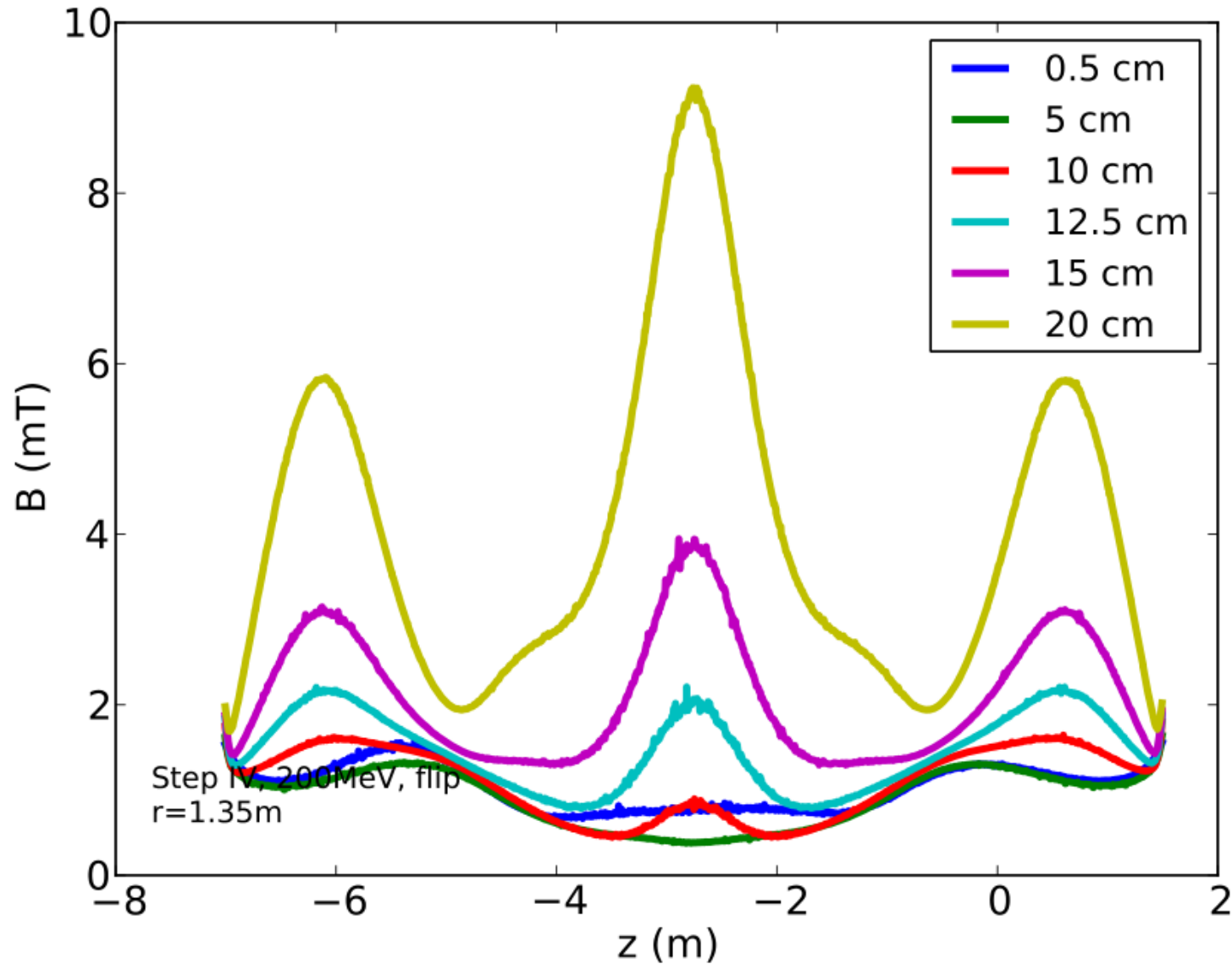
Field in Gap

Surface: Magnetic flux density norm (T)

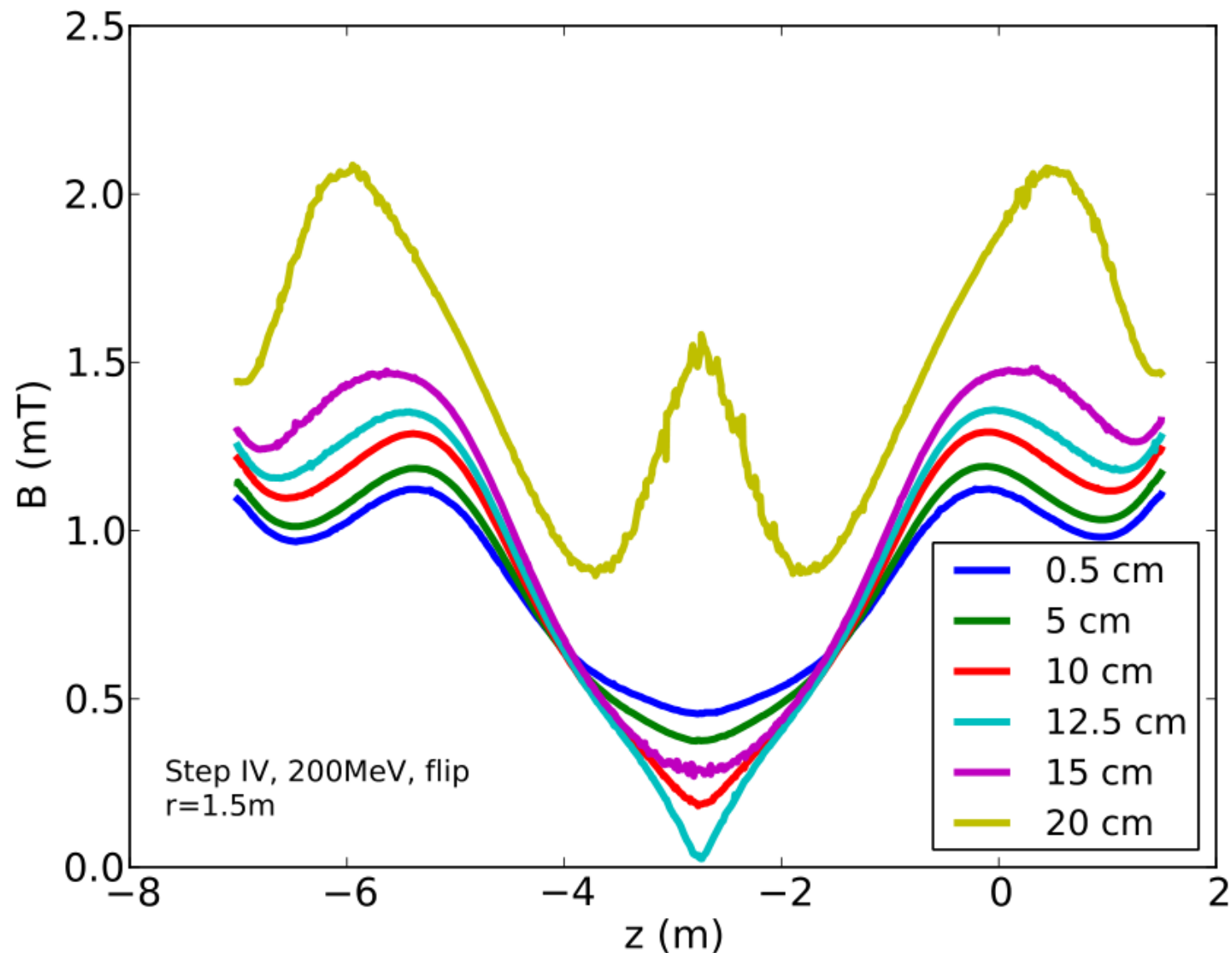
COMSOL
MULTIPHYSICS



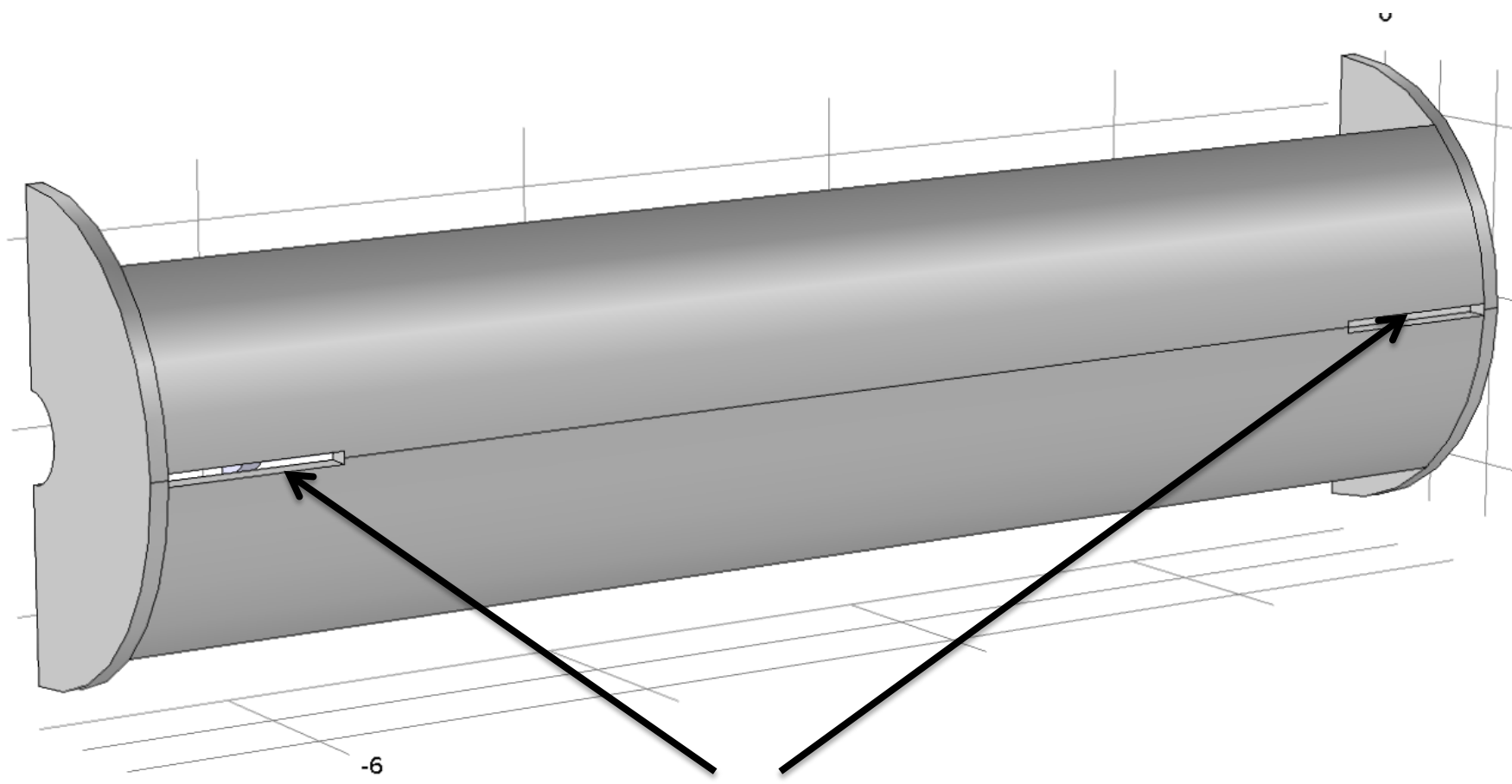
Field in Gap



Field Behind Shield



A Possible Geometry?



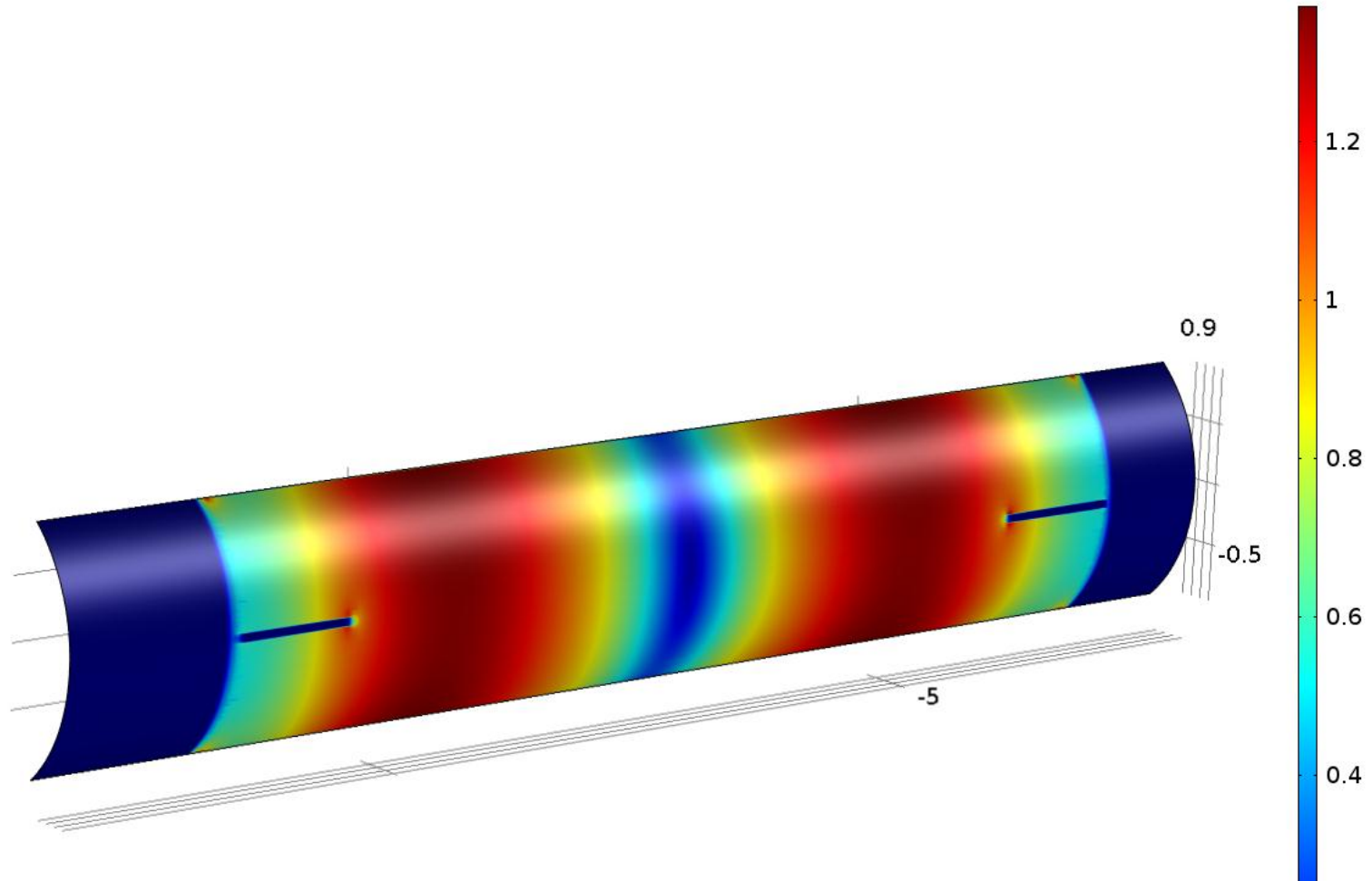
Gaps: 1 m long, 10 cm wide

Magnetization Shield

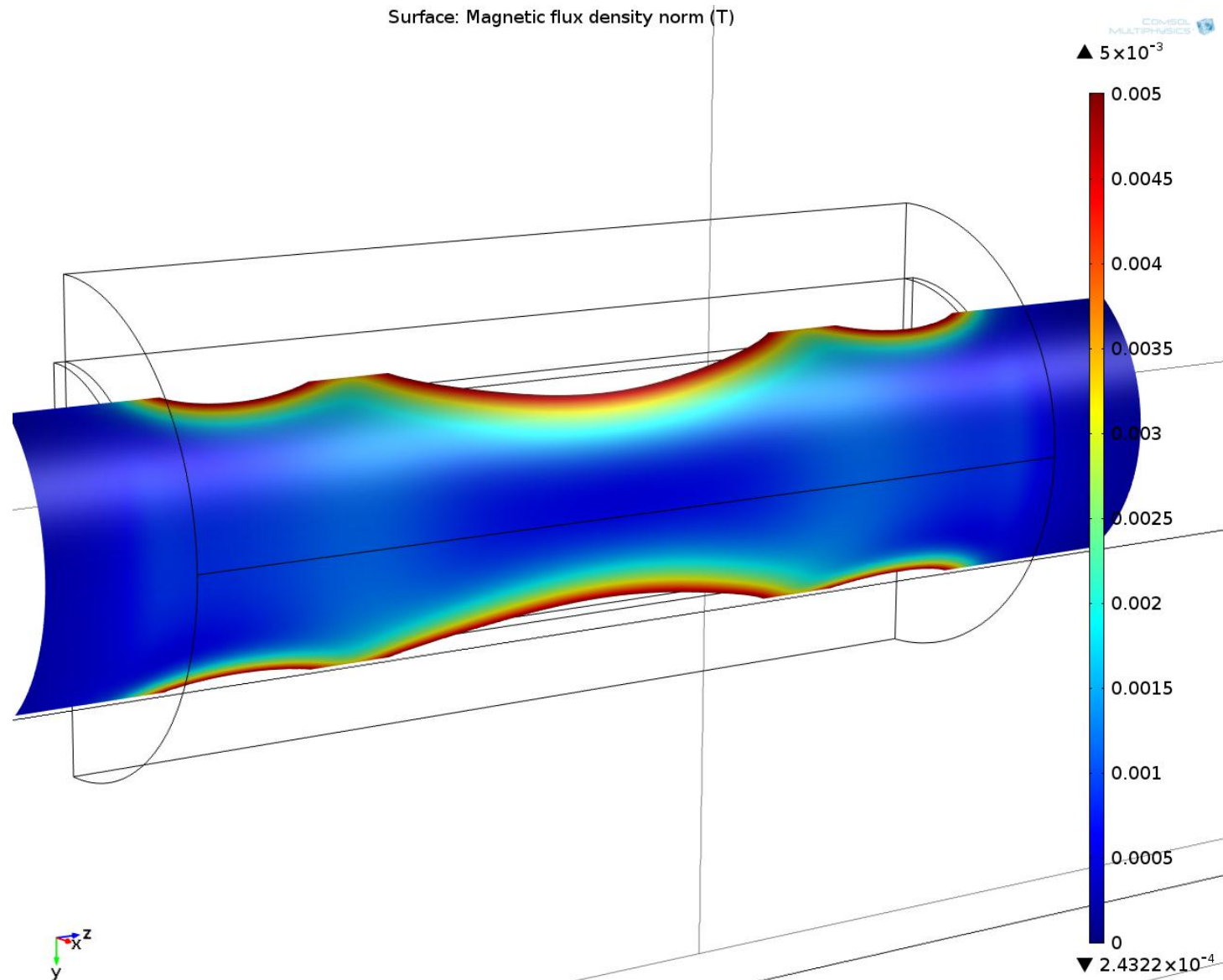
Surface: Magnetic flux density norm (T)

COMSOL
MULTIPHYSICS

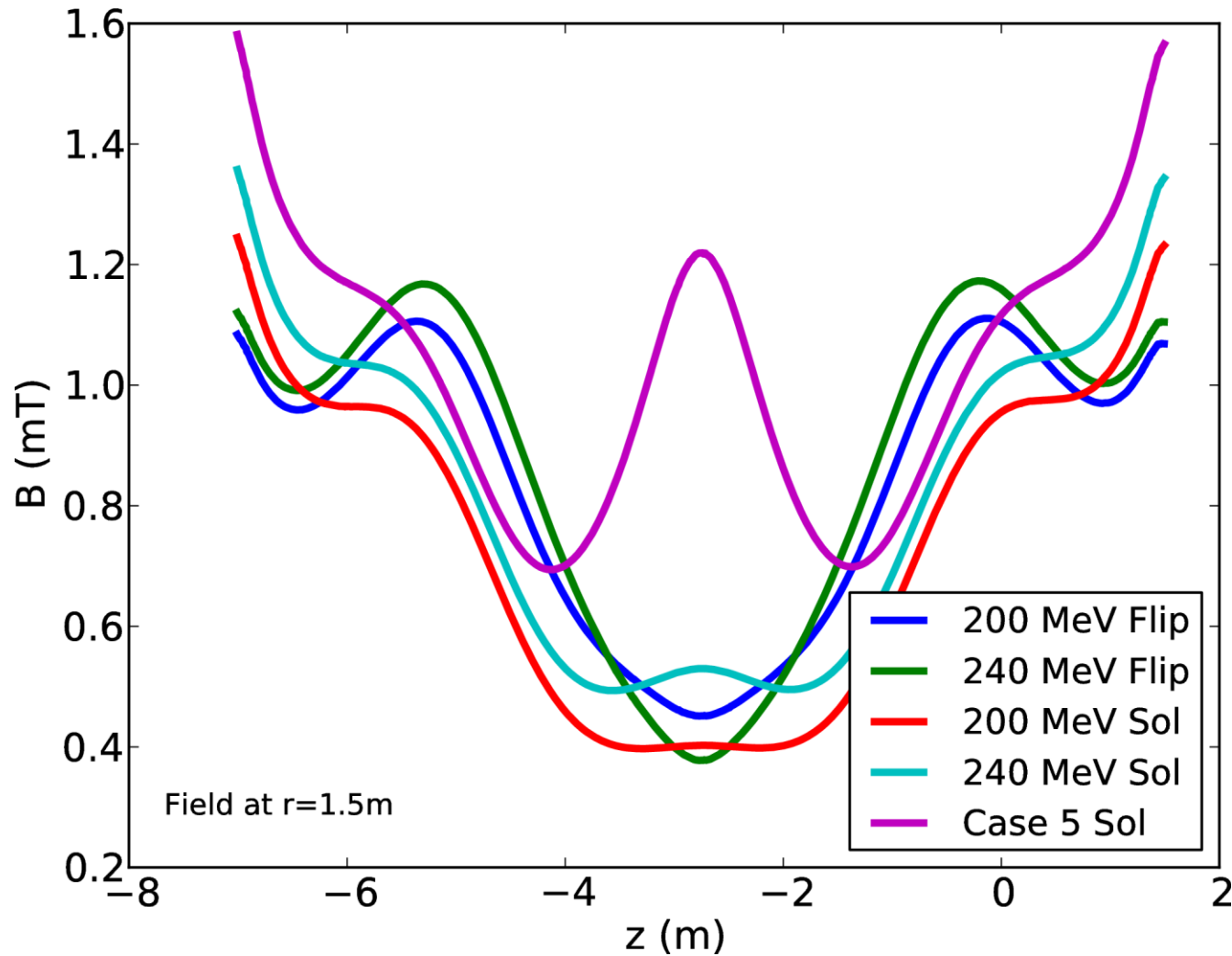
▲ 1.3696



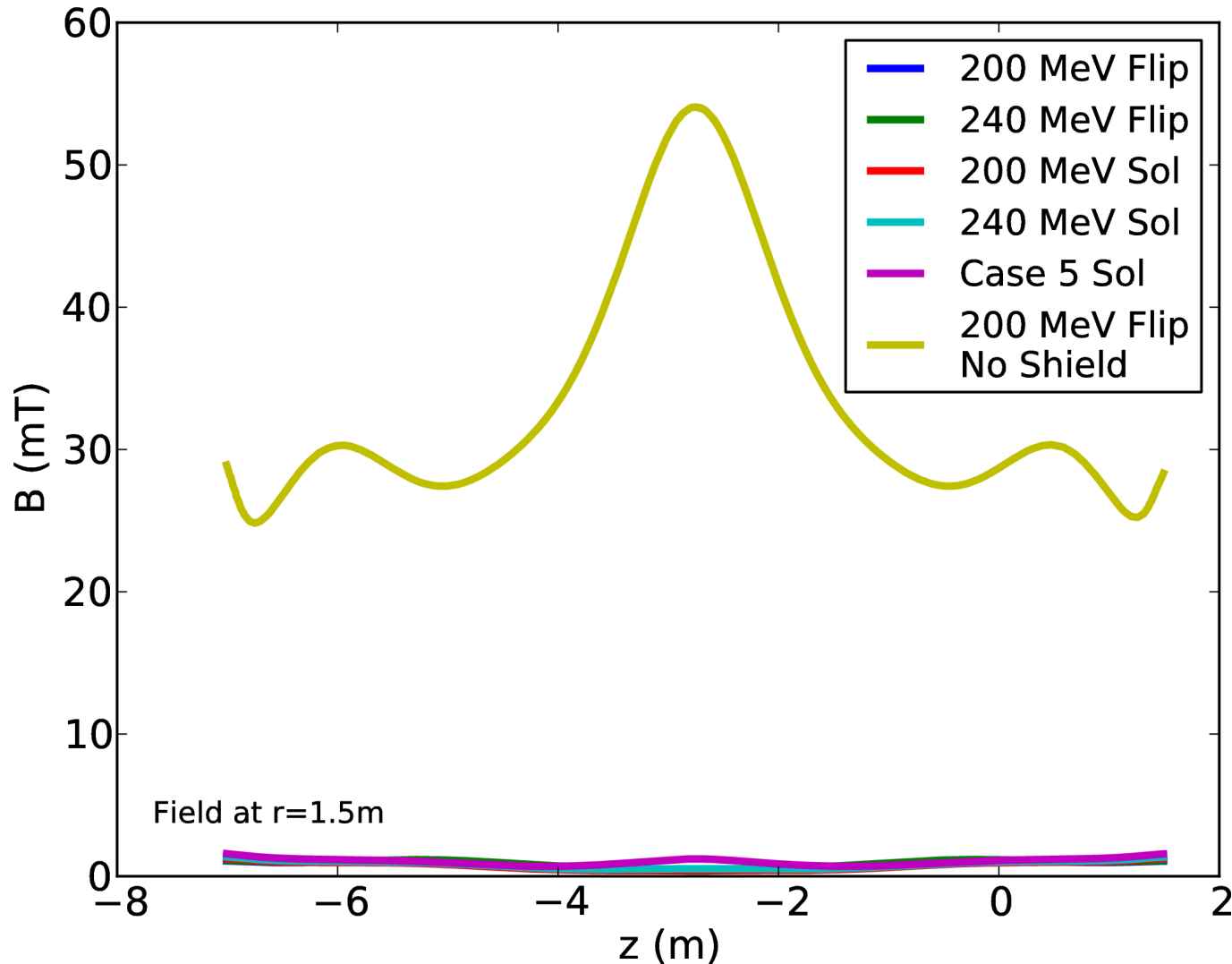
Field $r=1.5\text{m}$



MICE – Different Cases



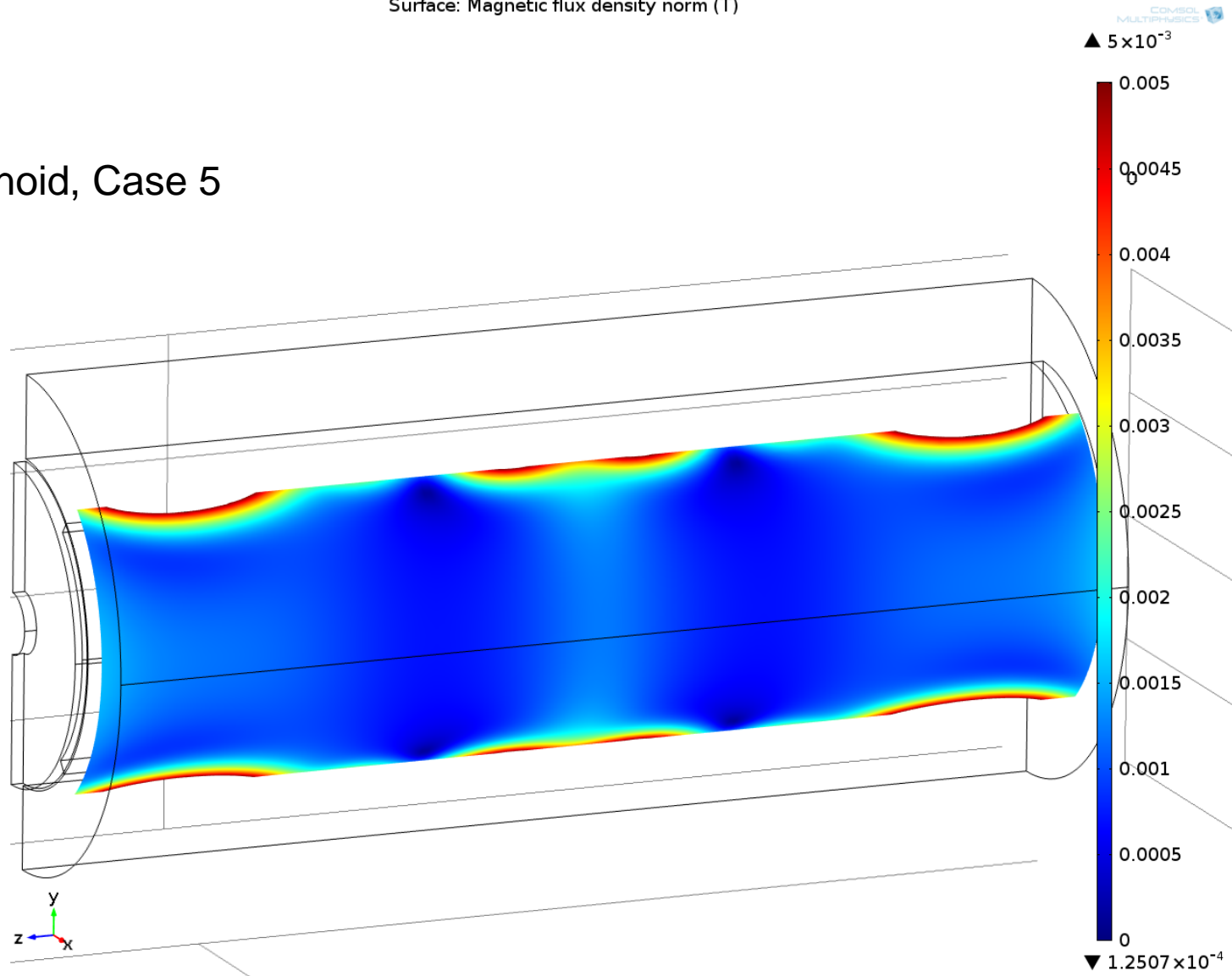
MICE – Comparison to No Shield



Spatial Distribution - Example

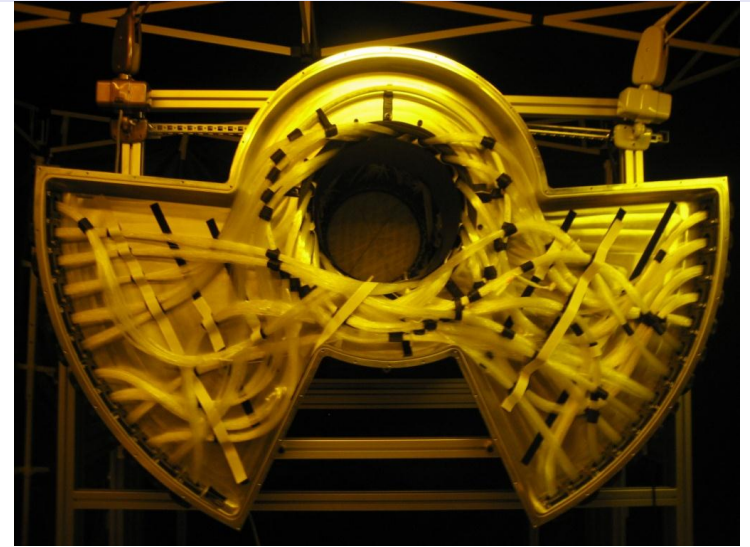
Surface: Magnetic flux density norm (T)

Solenoid, Case 5

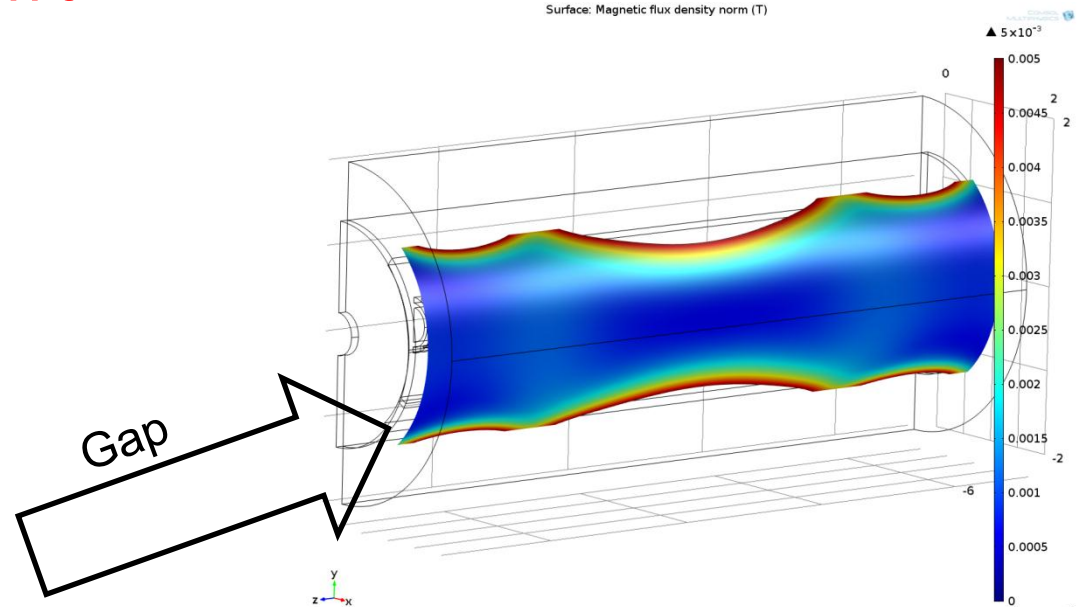


Things to do...

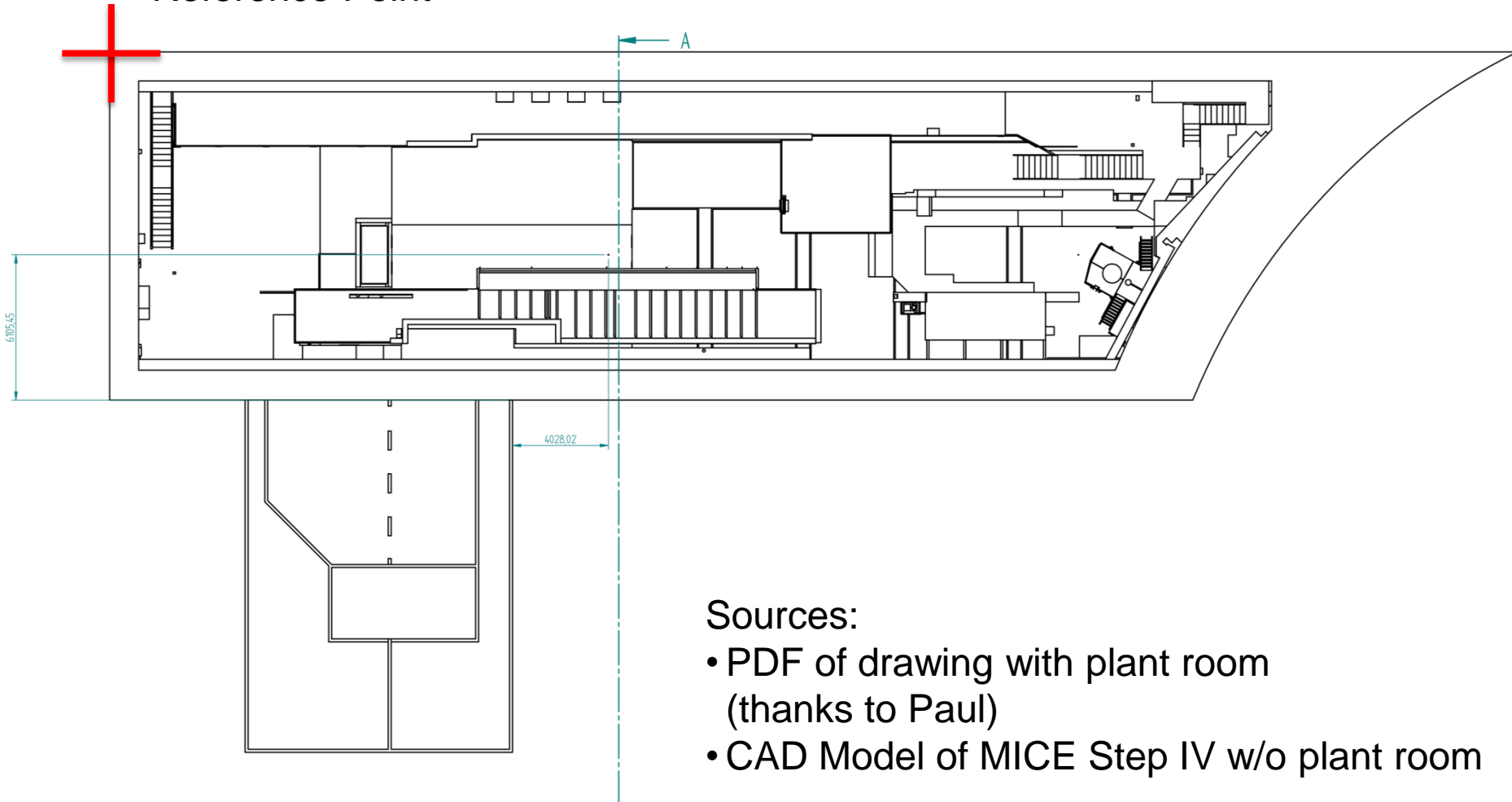
- Tracker fibres are fed out by 'butterfly'
- Move gap to appropriate position (-30 degrees?)
 - Done – result doesn't change



Surface: Magnetic flux density norm (T)



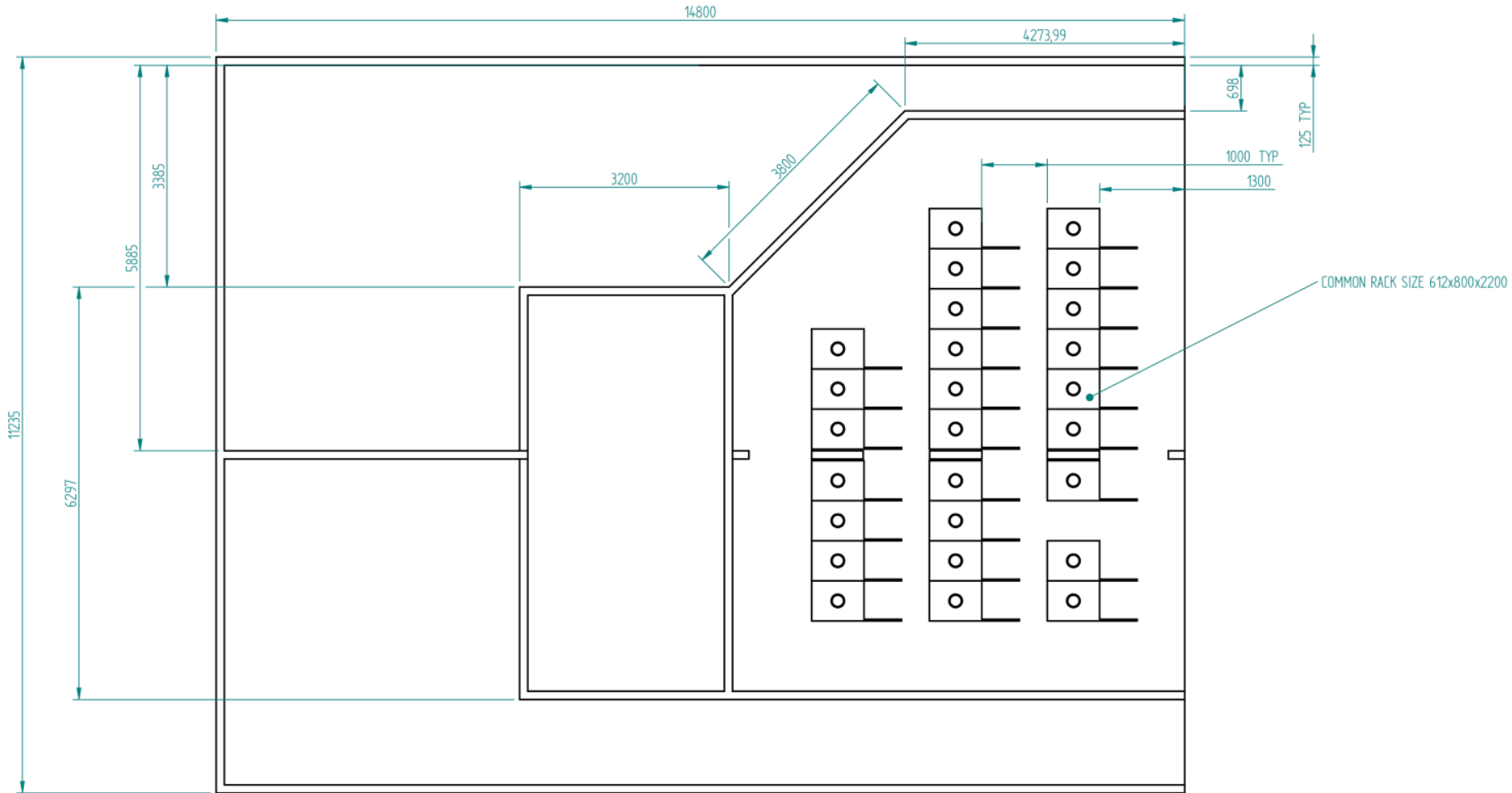
Reference Point



Sources:

- PDF of drawing with plant room (thanks to Paul)
- CAD Model of MICE Step IV w/o plant room

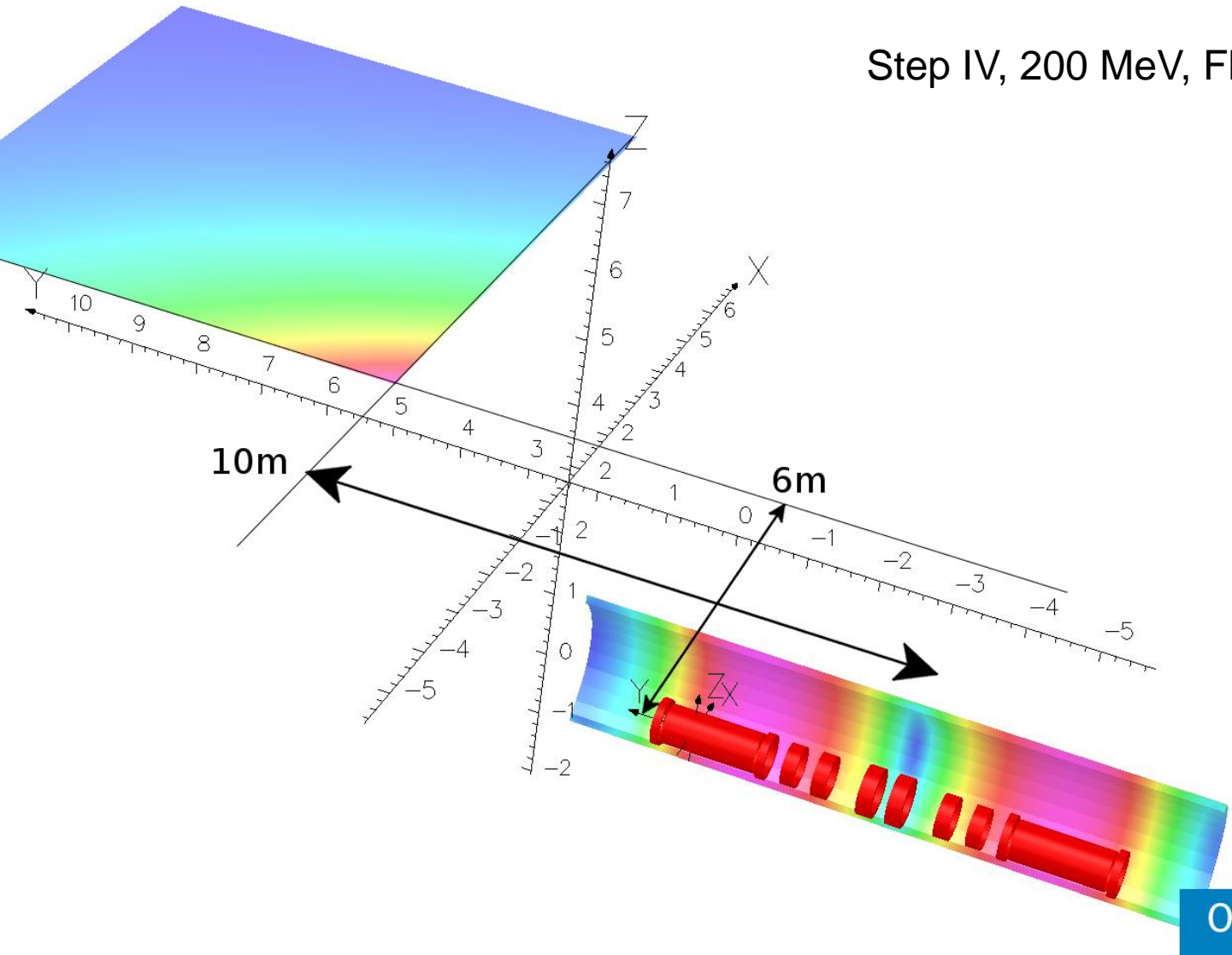
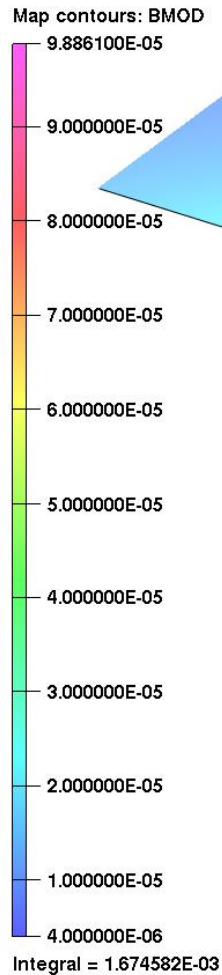
ISIS Plant Room



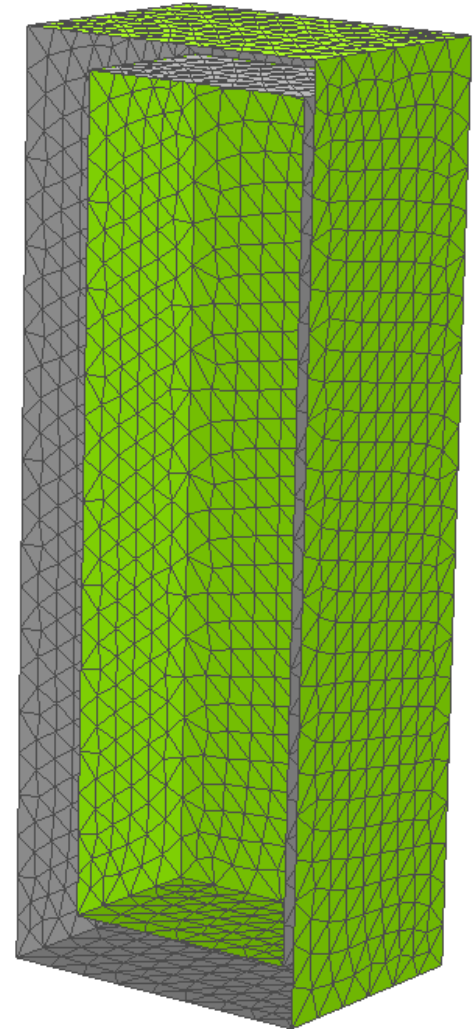
Field in ISIS Plant Room

26/Nov/2012 18:16:46

Step IV, 200 MeV, Flip



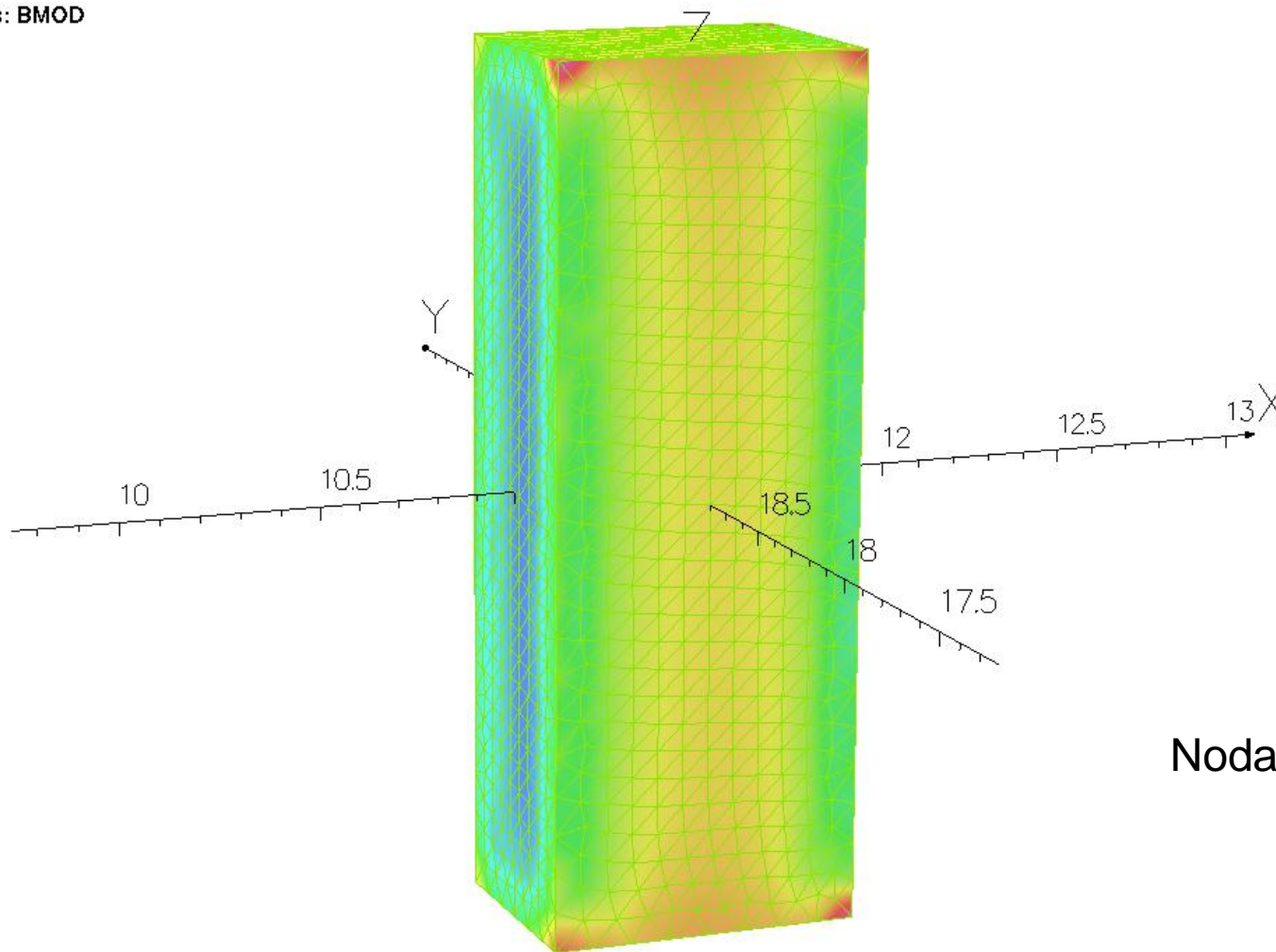
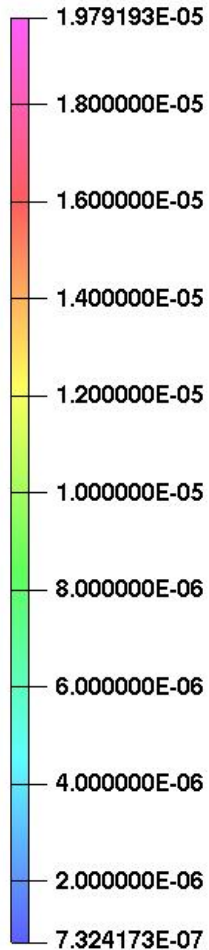
- Single rack in middle of plant room
 - Dimensions:
600x800x2200
 - $t=10\text{cm}$
 - Material: AISI 1010



Magnetization

27/Nov/2012 16:11:15

Surface contours: BMOD

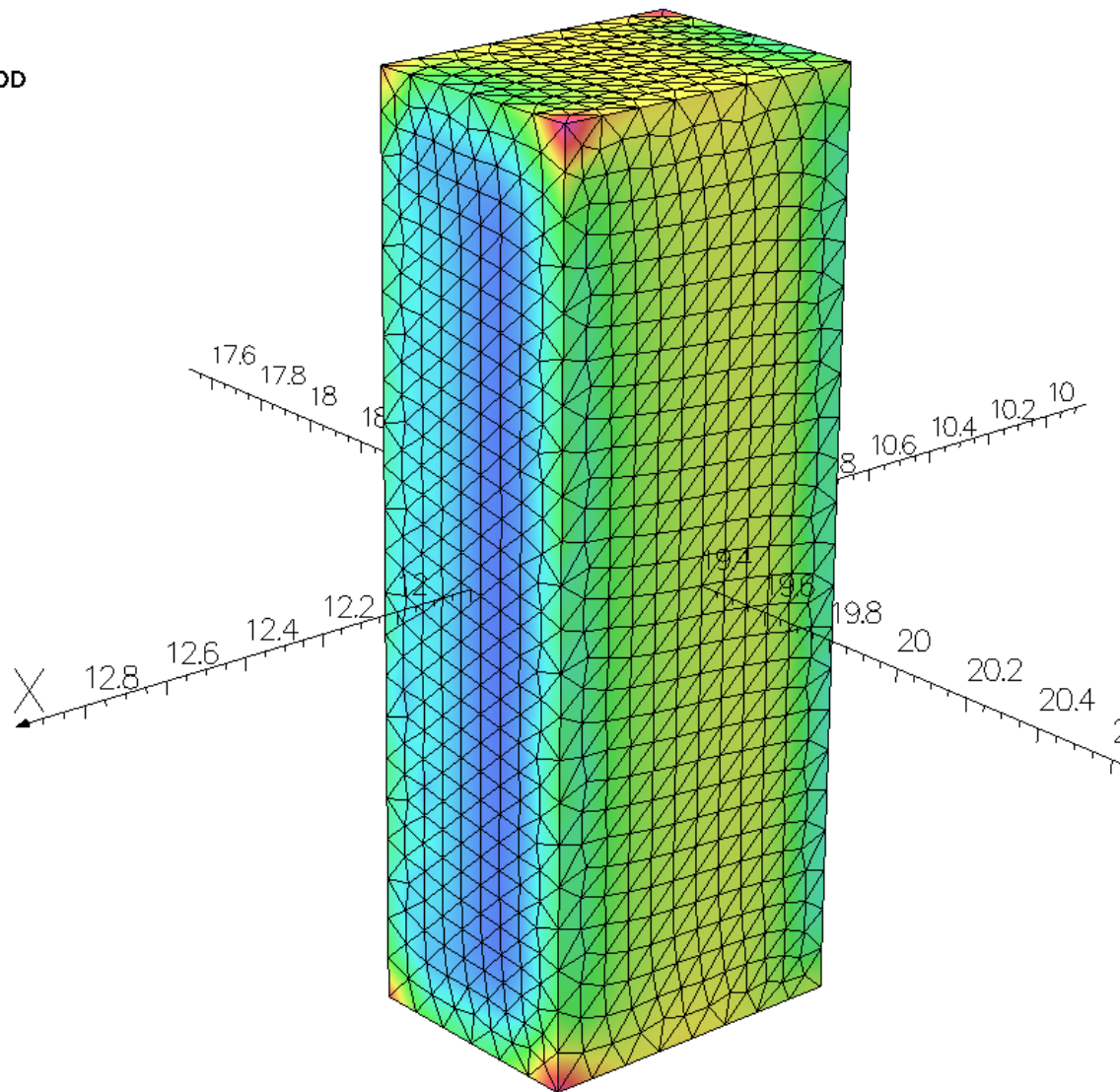
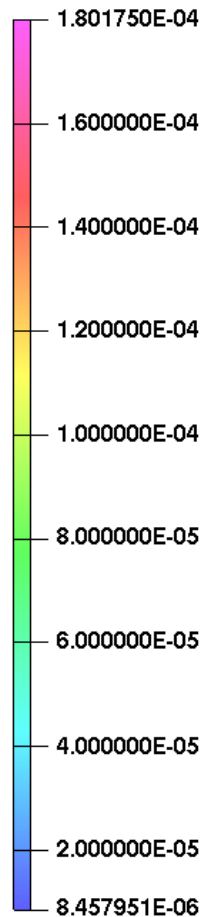


Nodal field

Magnetization – No Shield

27/Nov/2012 18:15:37

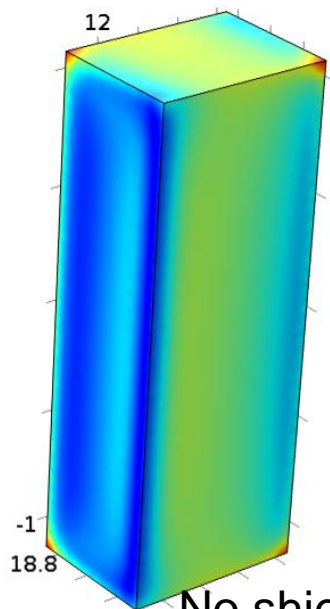
Surface contours: BMOD



Nodal field

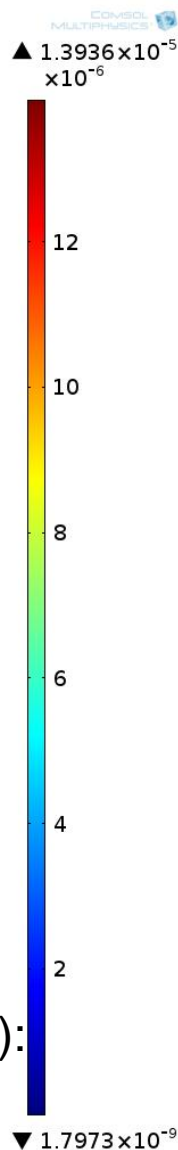
COMSOL Result

: Magnetic flux density norm (T)

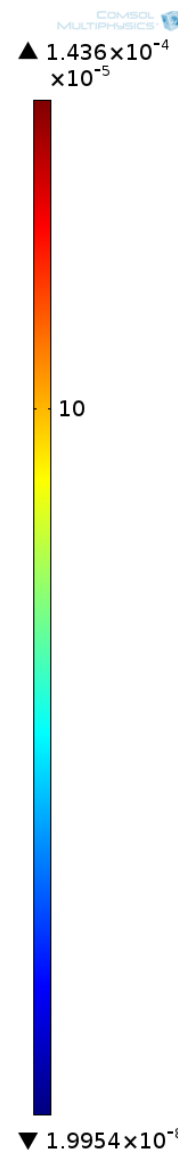
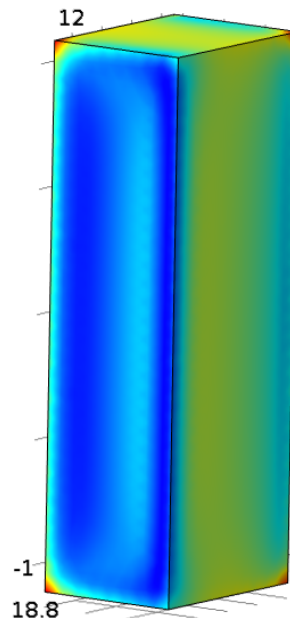


No shield: 0.144 mT
Shield: 0.014 mT

Opera (no Virostek Plate):
No shield: 0.18 mT
Shield: 0.019 mT



Magnetic flux density norm (T)



- Update on Forces
- Gaps in shield
 - Simulations indicate gaps 10-15cm possible without performance impact
 - Sufficient as feed-through for tracker fibres?
- ISIS plant room
 - so far return yoke seems to lower field in plant room effectively