

# Magnetic Stray Fields in the Detector Hall

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ILC Infrastructure Mini-WS  
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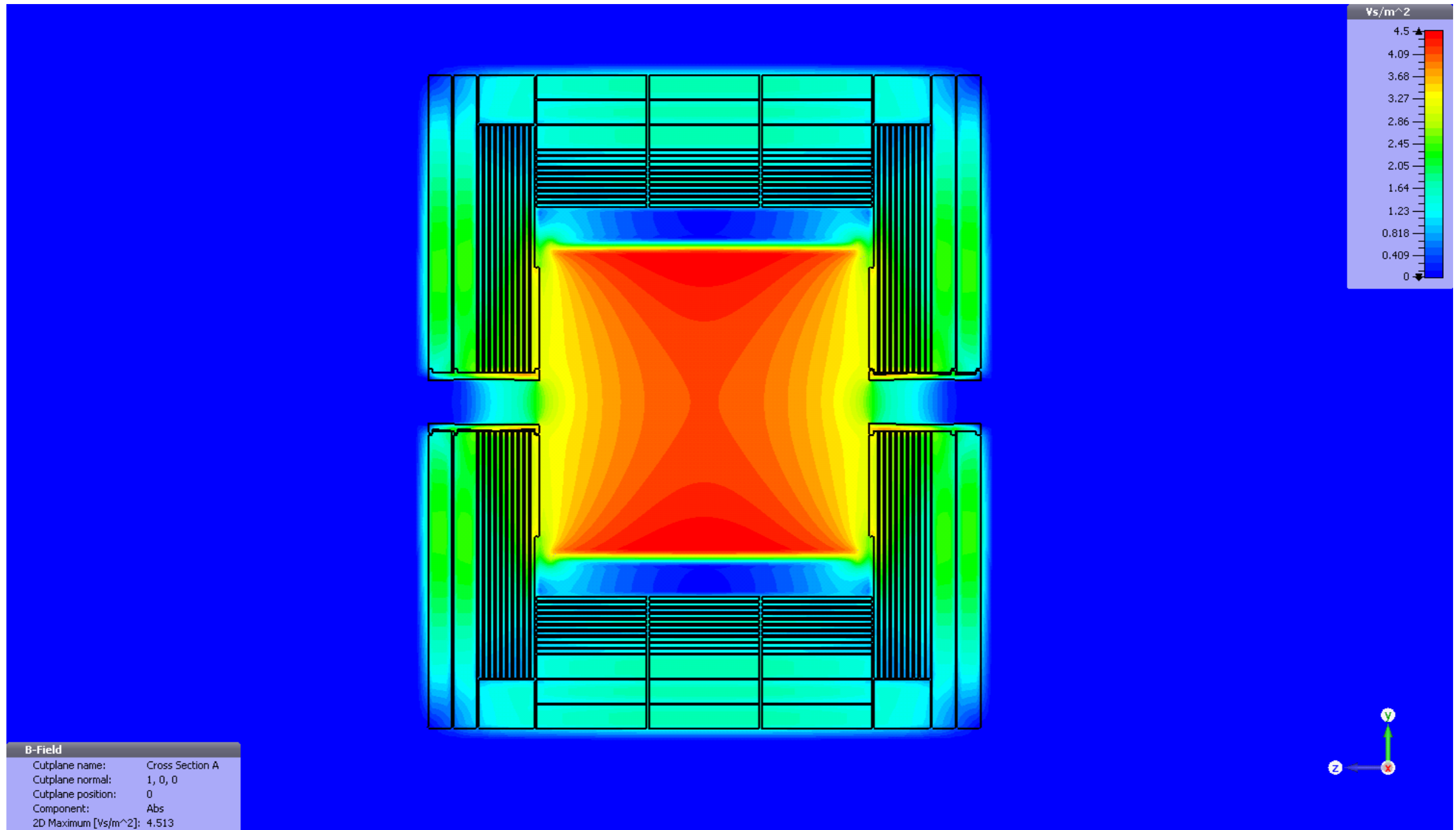


# Magnetic Stray Fields

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- In IR Interface Document (ILC-Note-2009-050):
  - limit of 50G in garage position of the non-operational detector
    - garage positions: 15 m from detector axis of operational detector
  - restrictions for areas closer to the operational magnet are not defined by MDI, but by each collaboration
    - typical human safety limit: 2 kG
- Discussed at SiD workshop in January:
  - how large are stray fields at the crane beams above the detectors
  - any other sensitive areas in the halls?
- All following results from CST EM Studio 2014, magnetostatic solvers

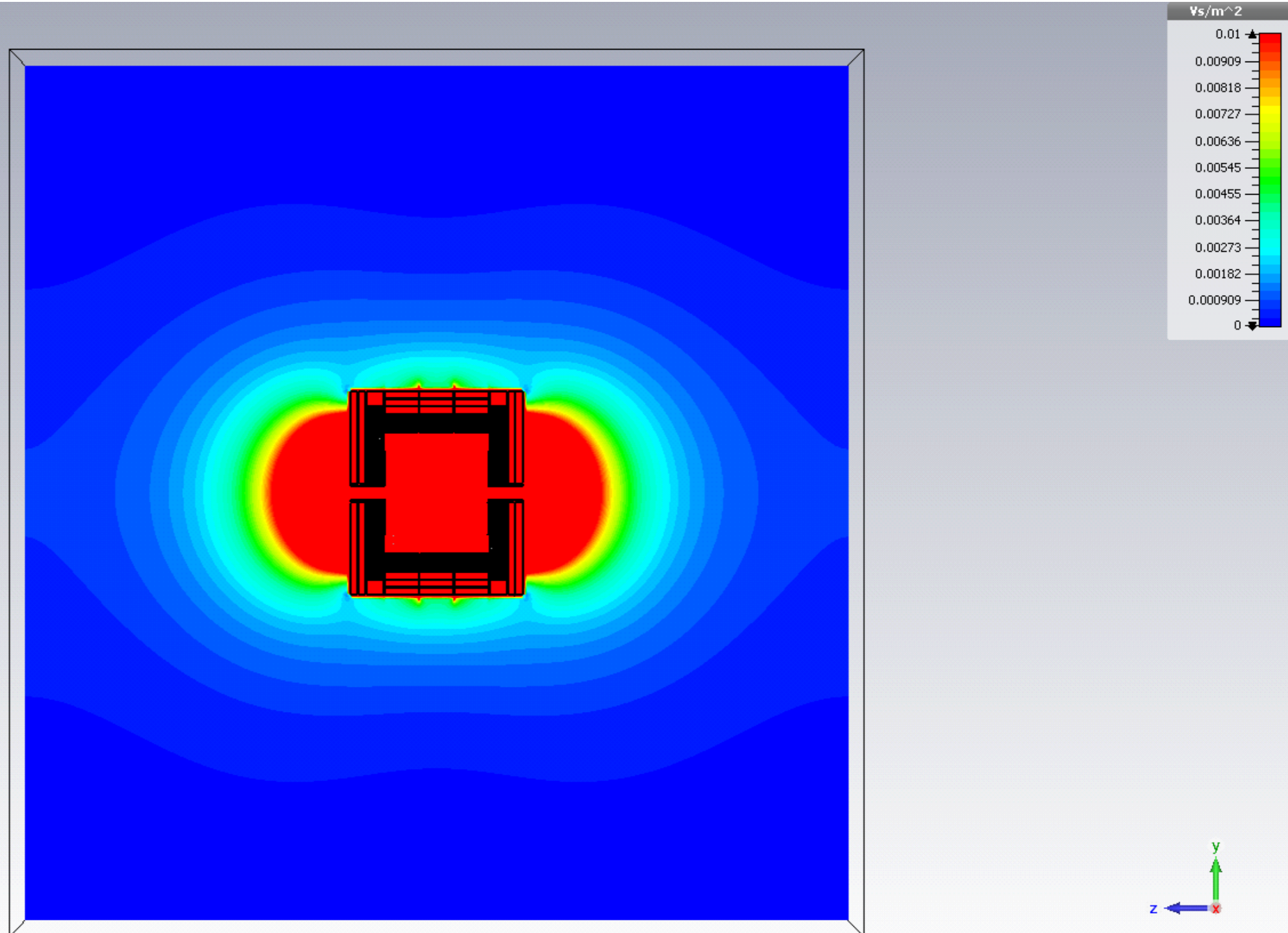
# ILD Magnetic Field



# ILD Stray Fields

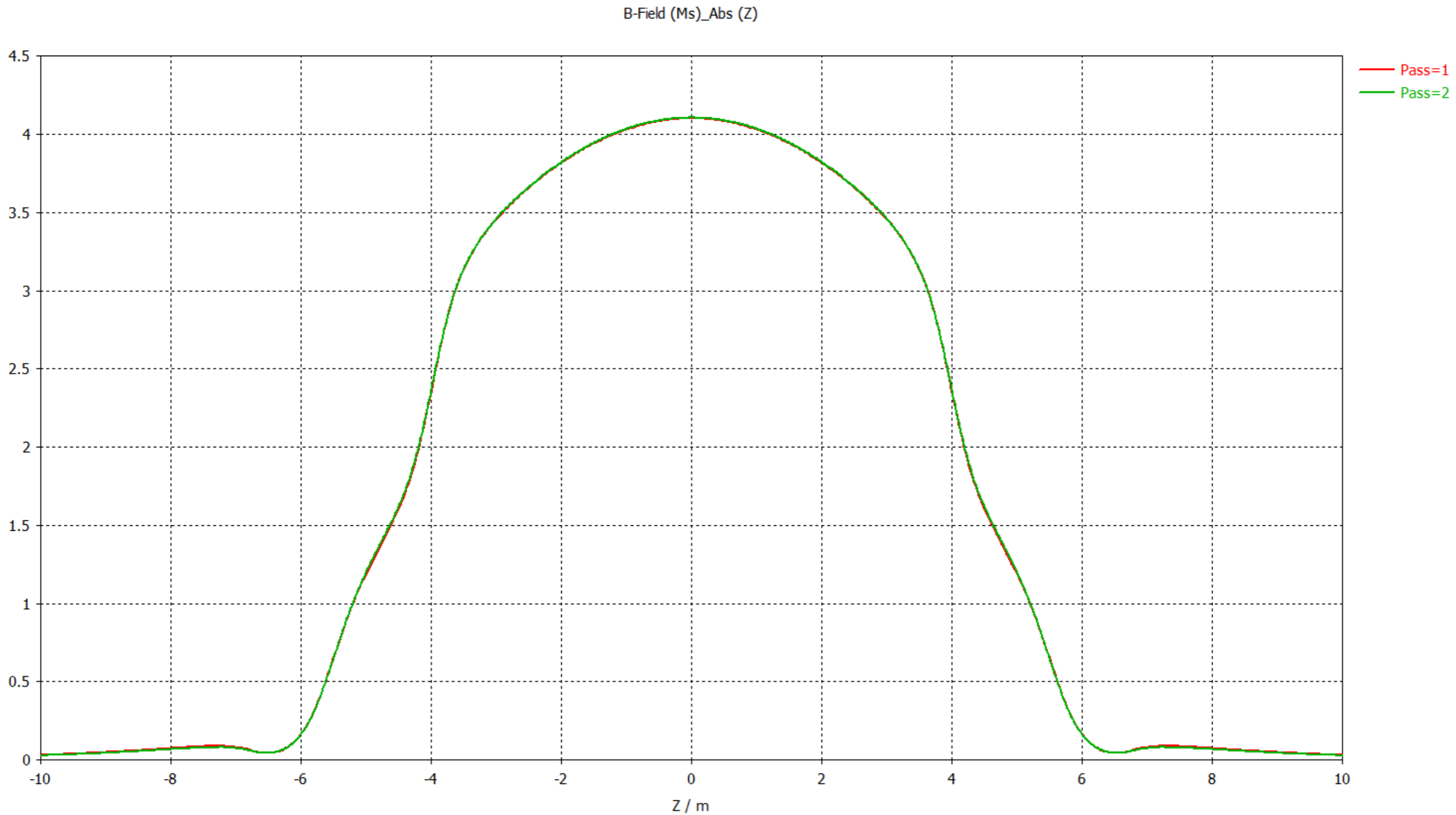


- Scale (red) limited to 100 G



**B-Field**  
Cutplane name: Cross Section A  
Cutplane normal: 1, 0, 0  
Cutplane position: 0  
Component: Abs  
2D Maximum [Vs/m<sup>2</sup>]: 4.513

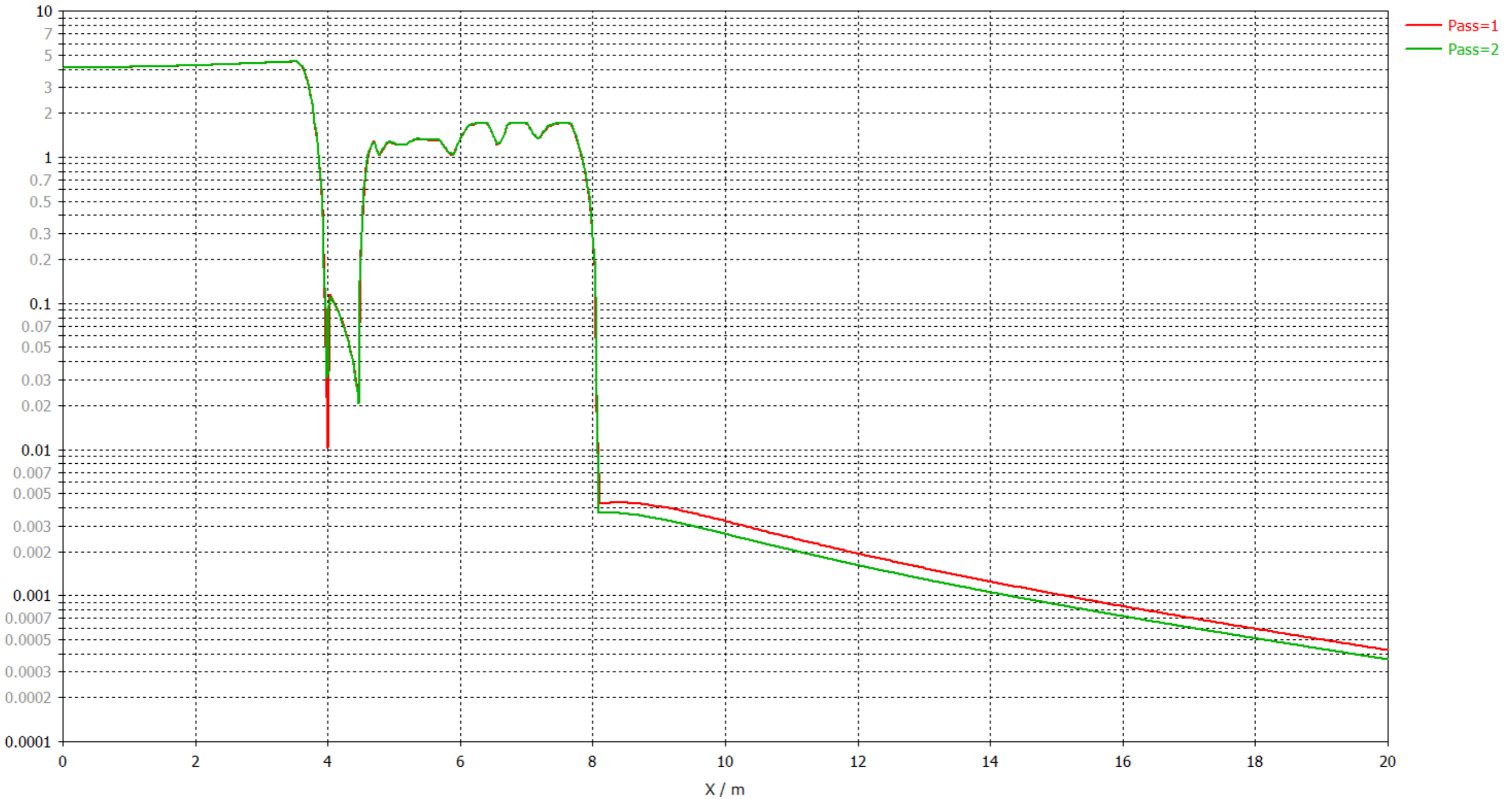
# ILD Magnetic Field - inner detector



# ILD Field - outside



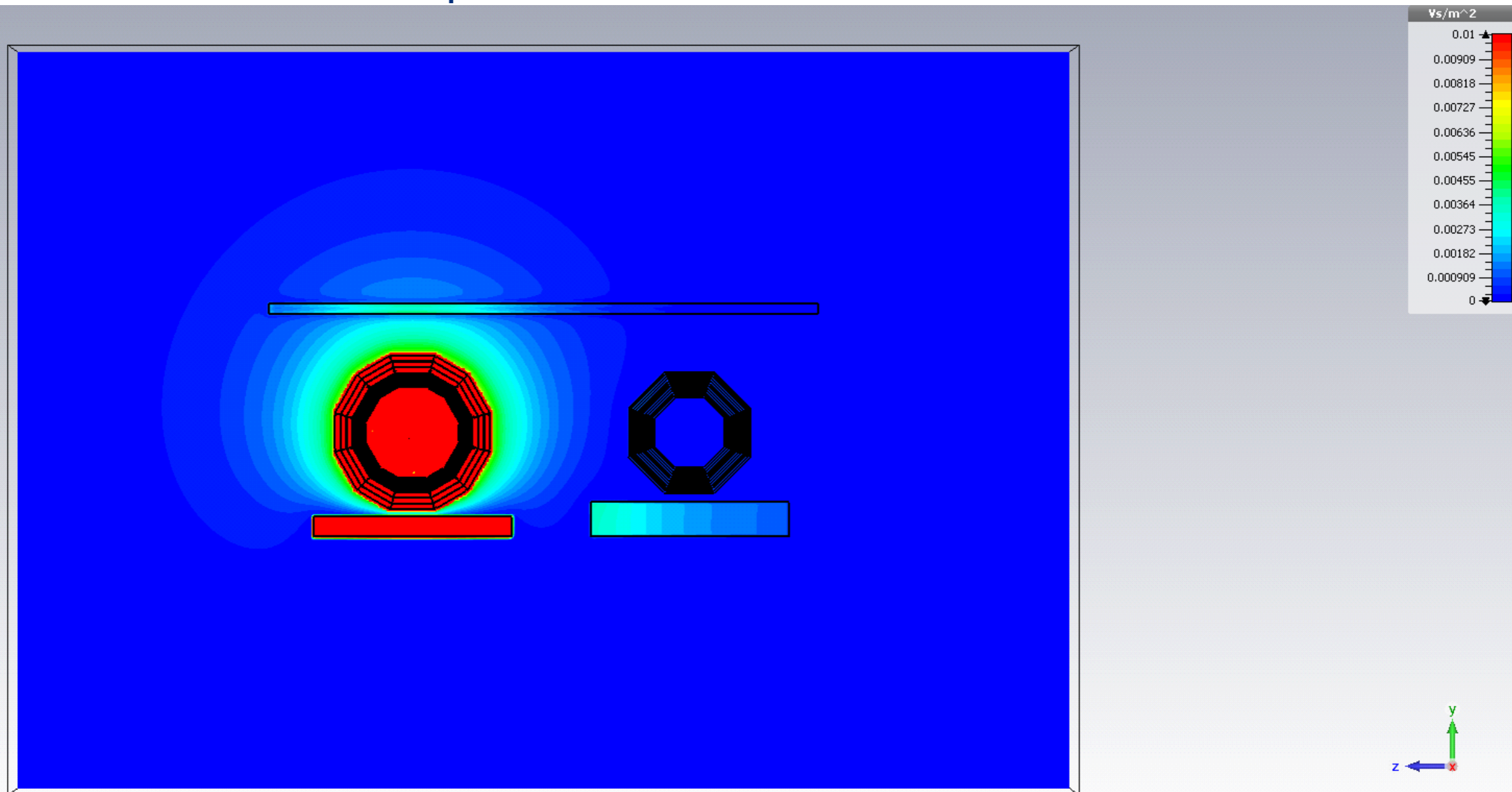
B-Field (Ms)\_Abs (X)



# ILD and SiD

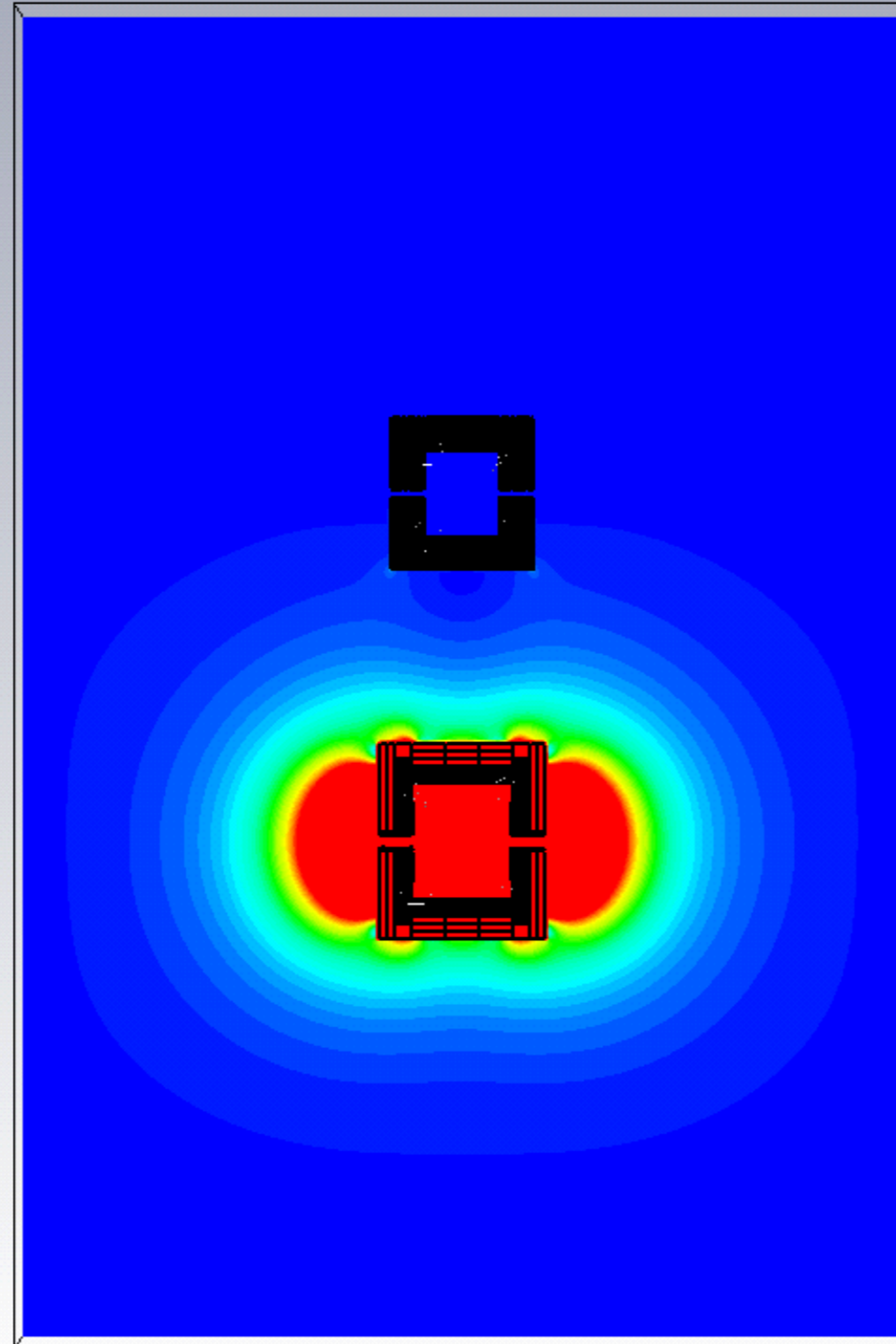


- ILD on, SiD off
  - crane beam and steel platform added



# ILD and SiD

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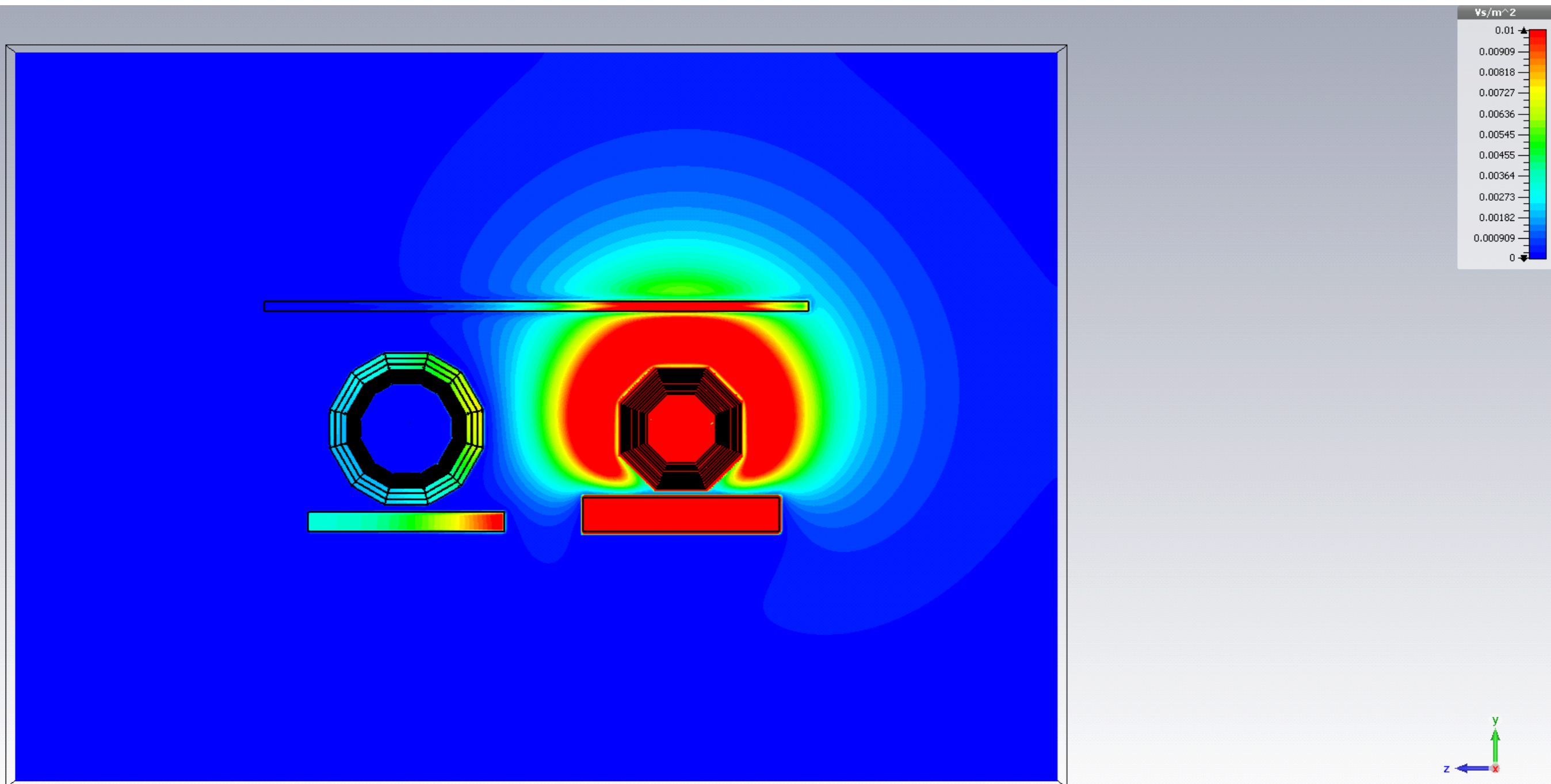


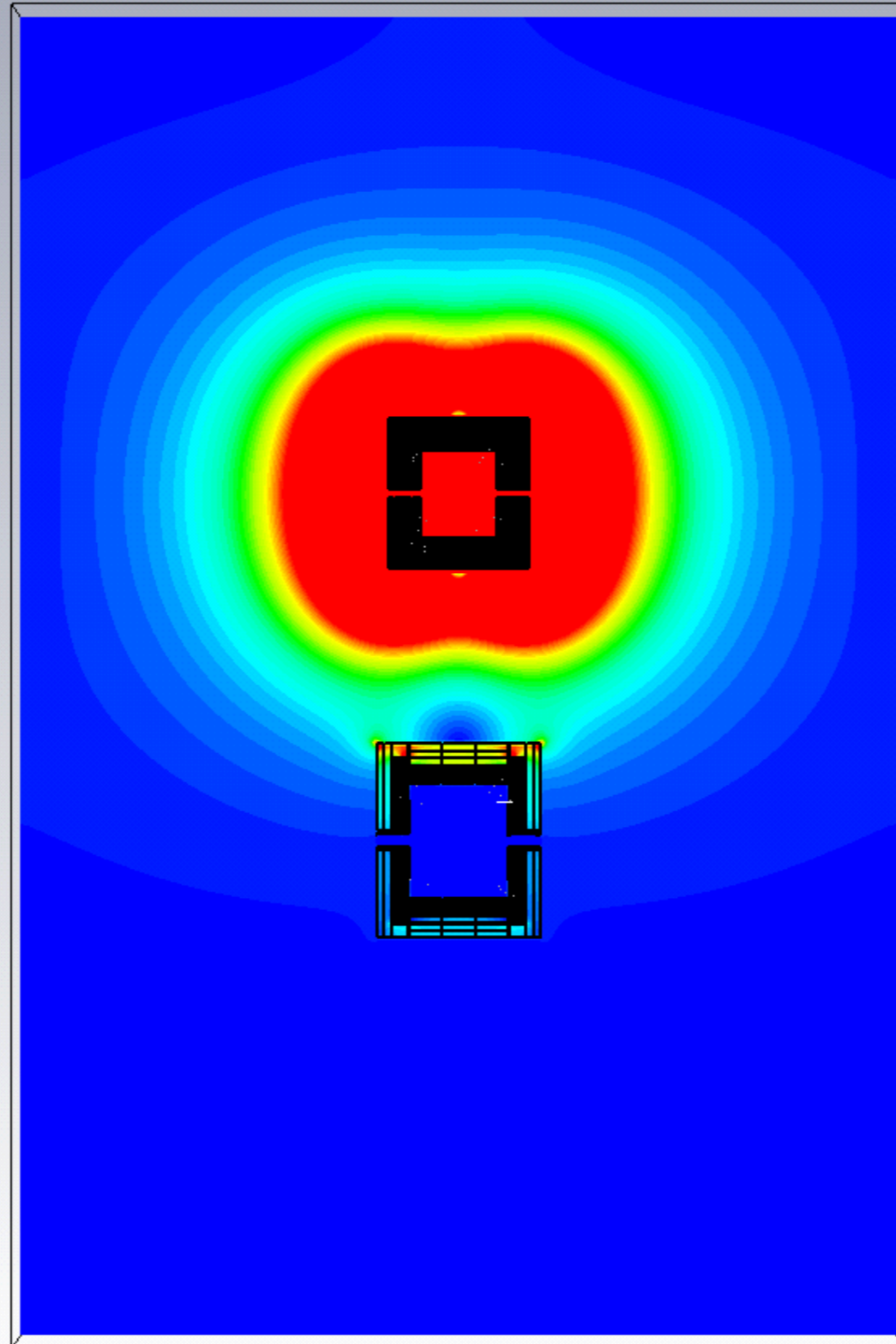


# ILD and SiD



- ILD off, SiD on

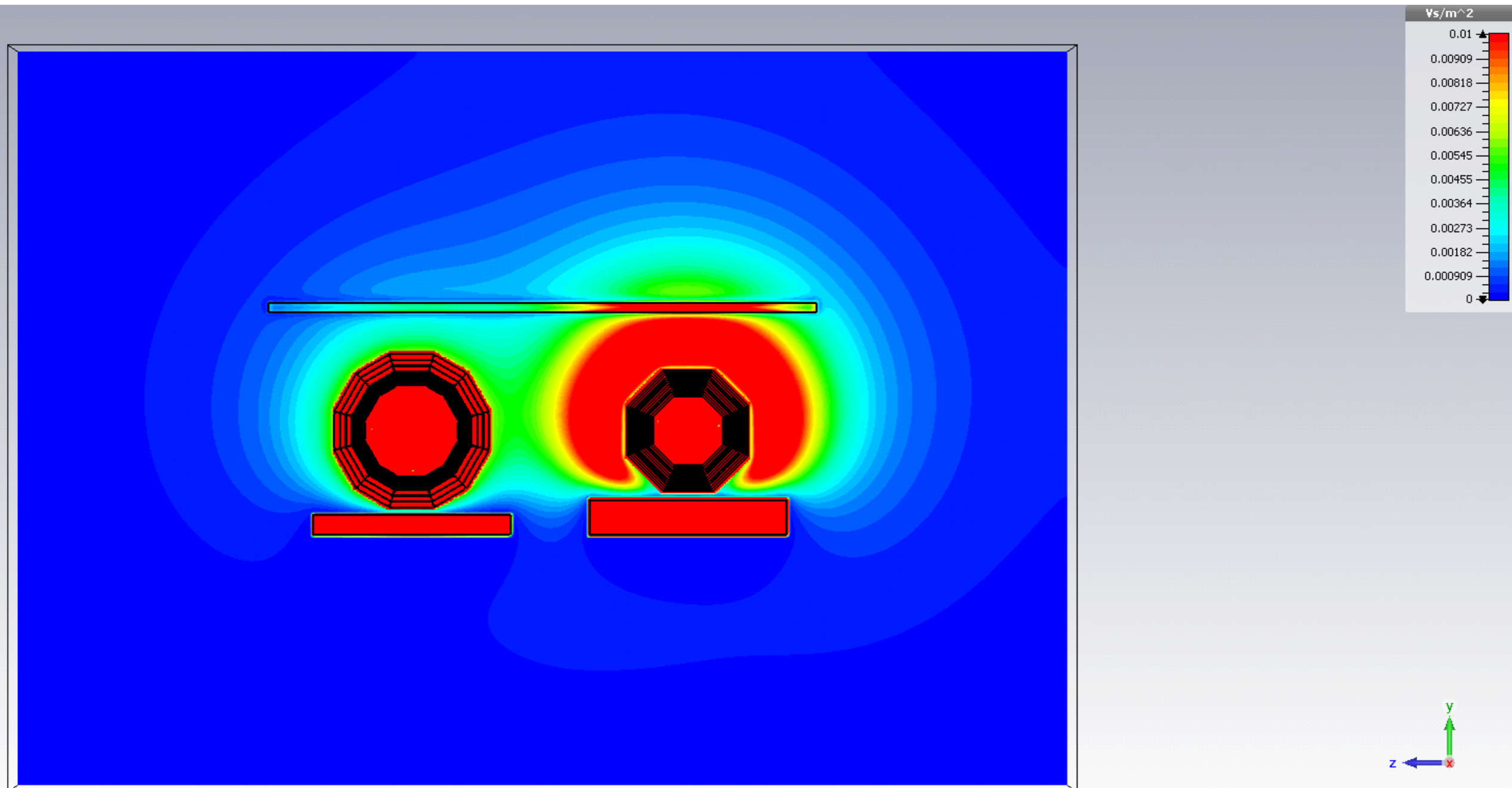




# ILD and SiD



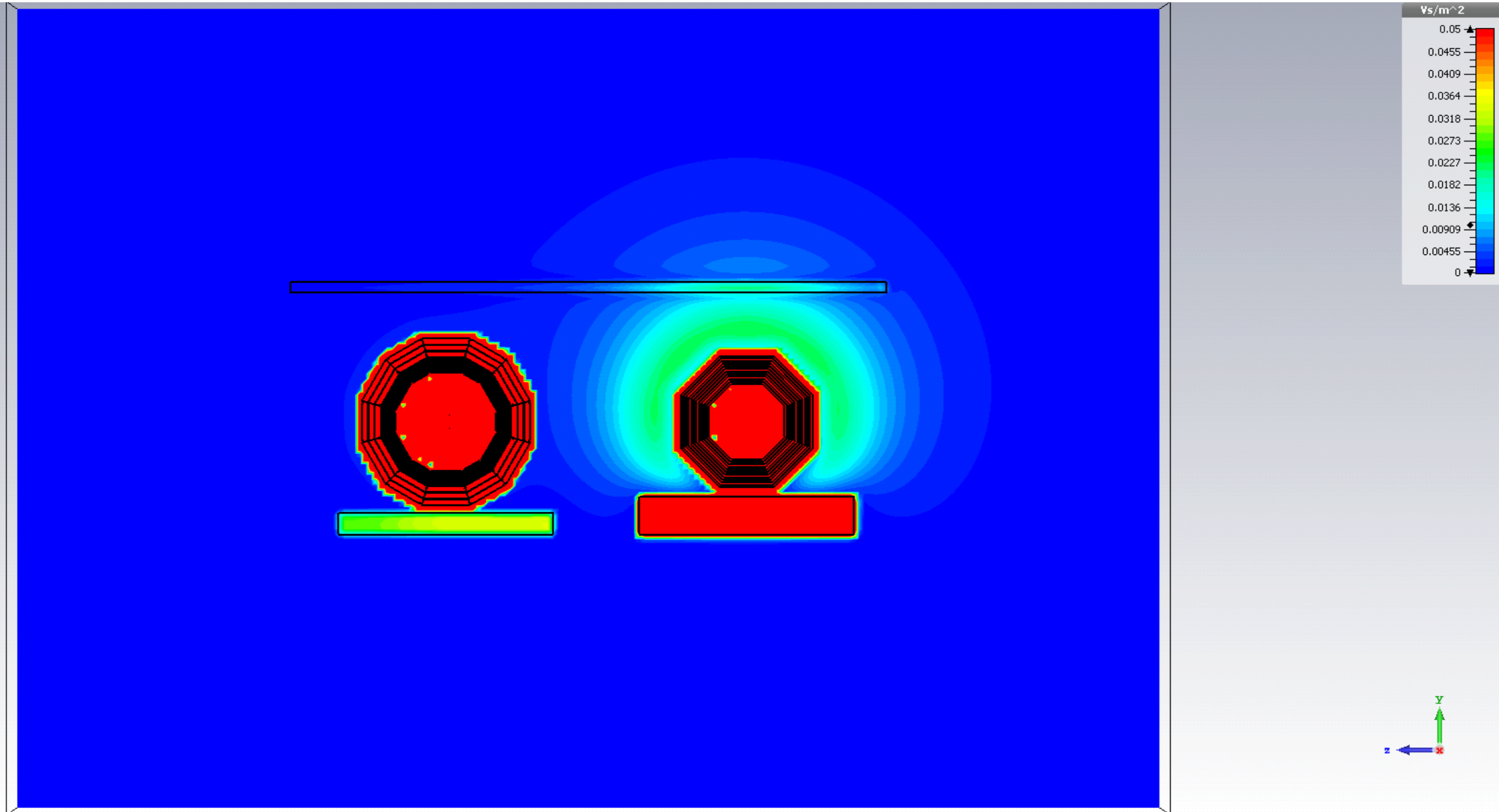
- ILD on, SiD on
  - stray fields in crane beam and platforms exceed 100G

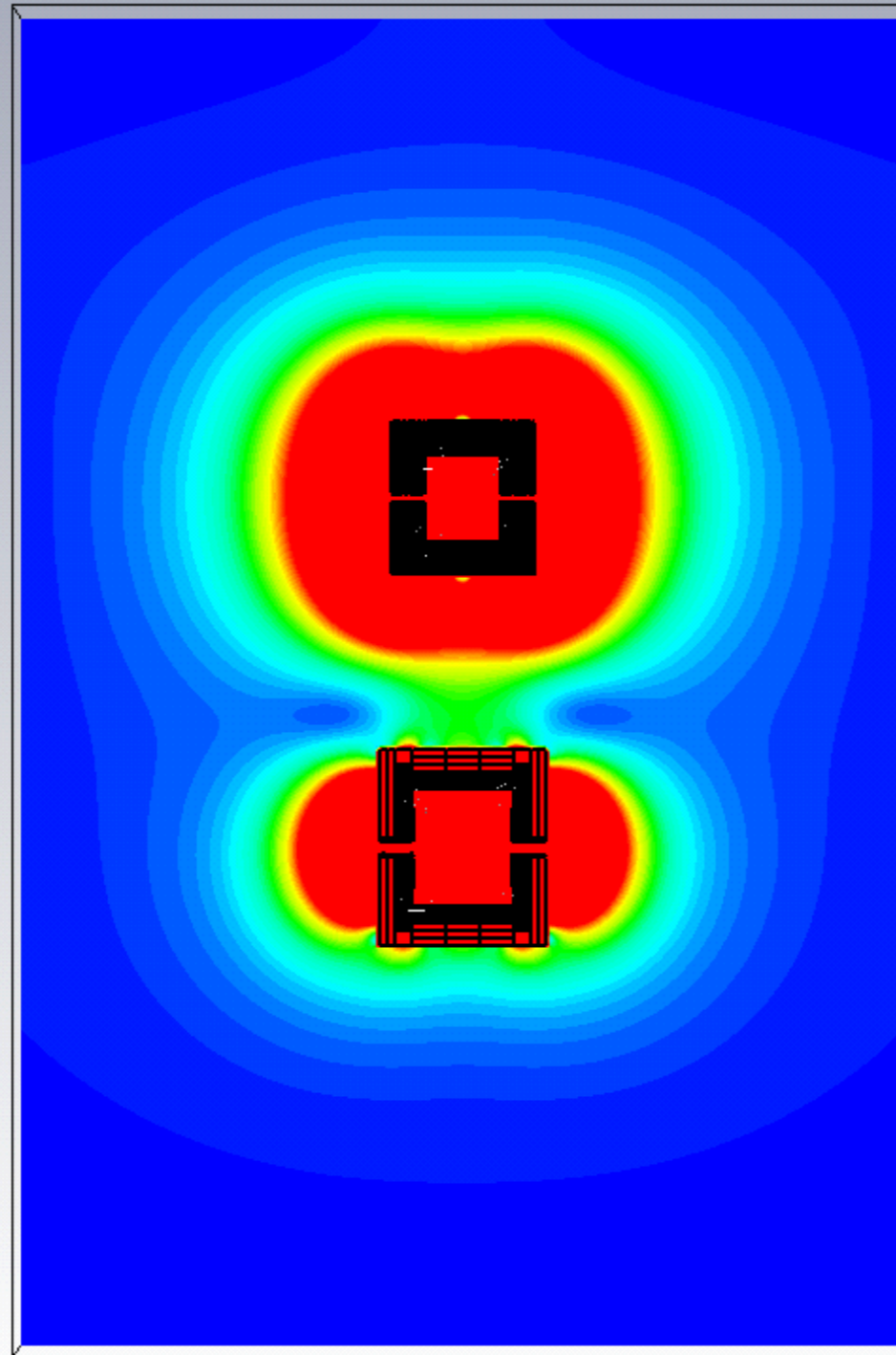


# ILD and SiD



- scale: red=500G

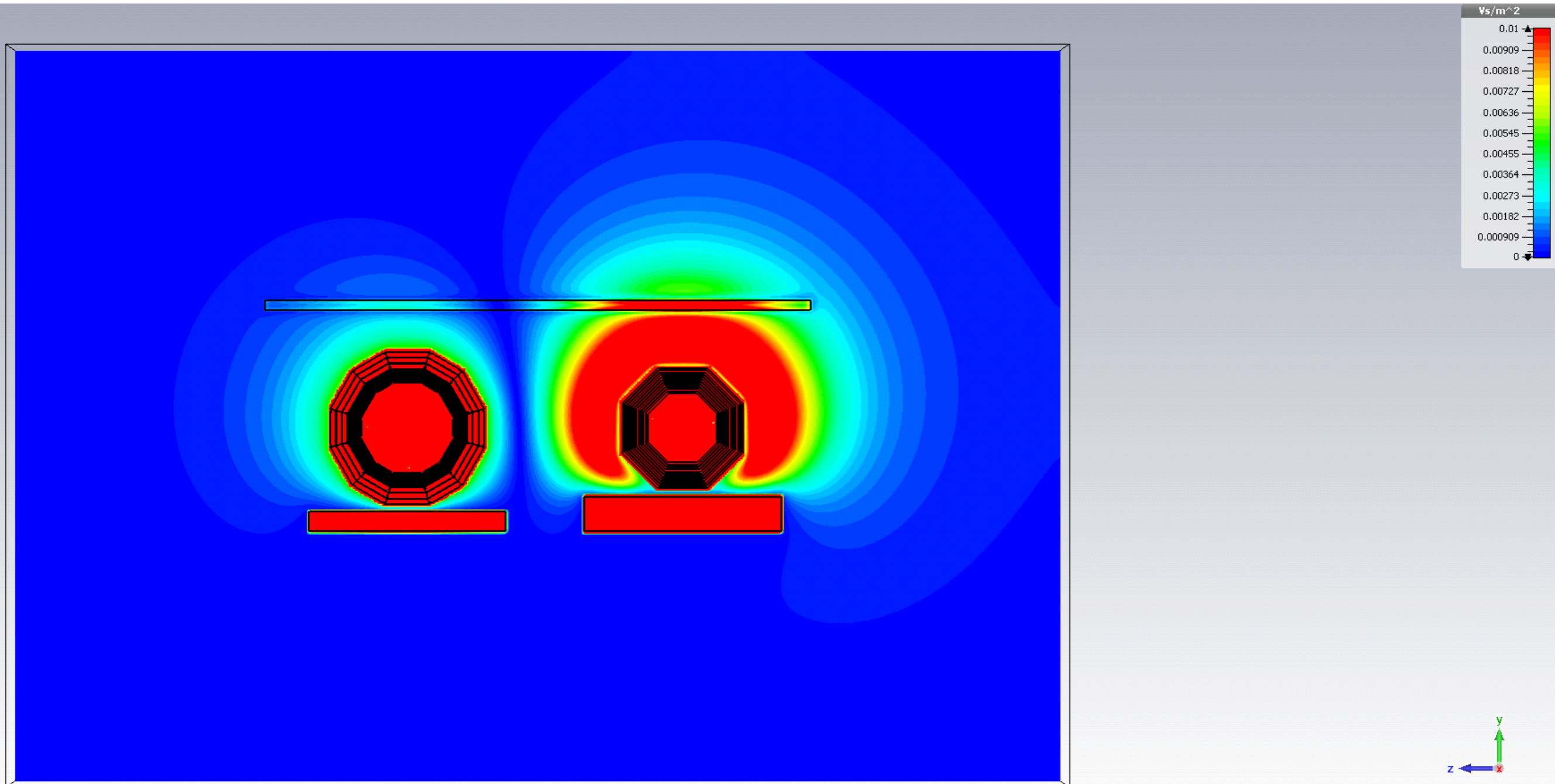


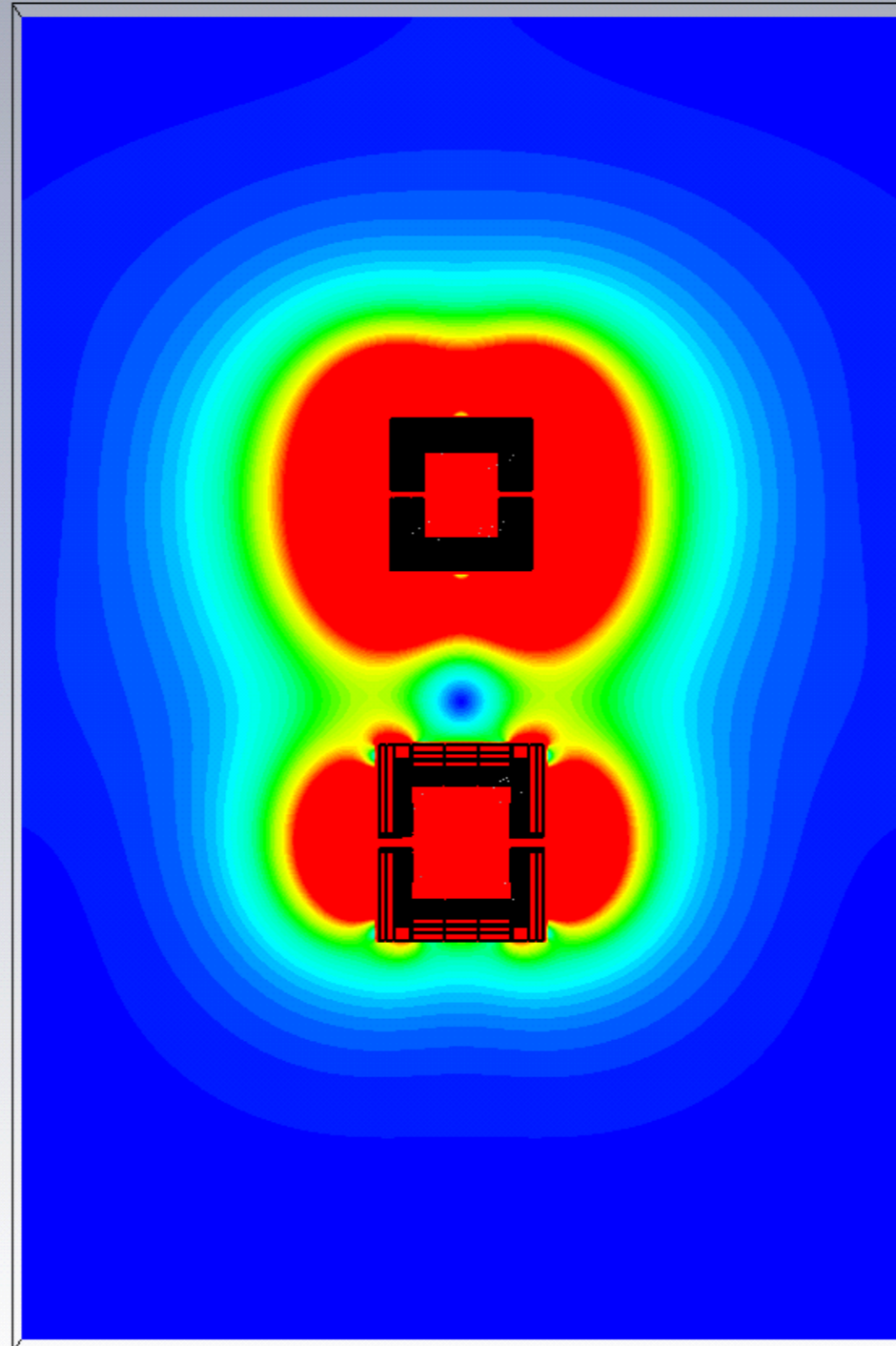


# ILD and SiD



- ILD on, SiD on
  - opposite polarities for the solenoids

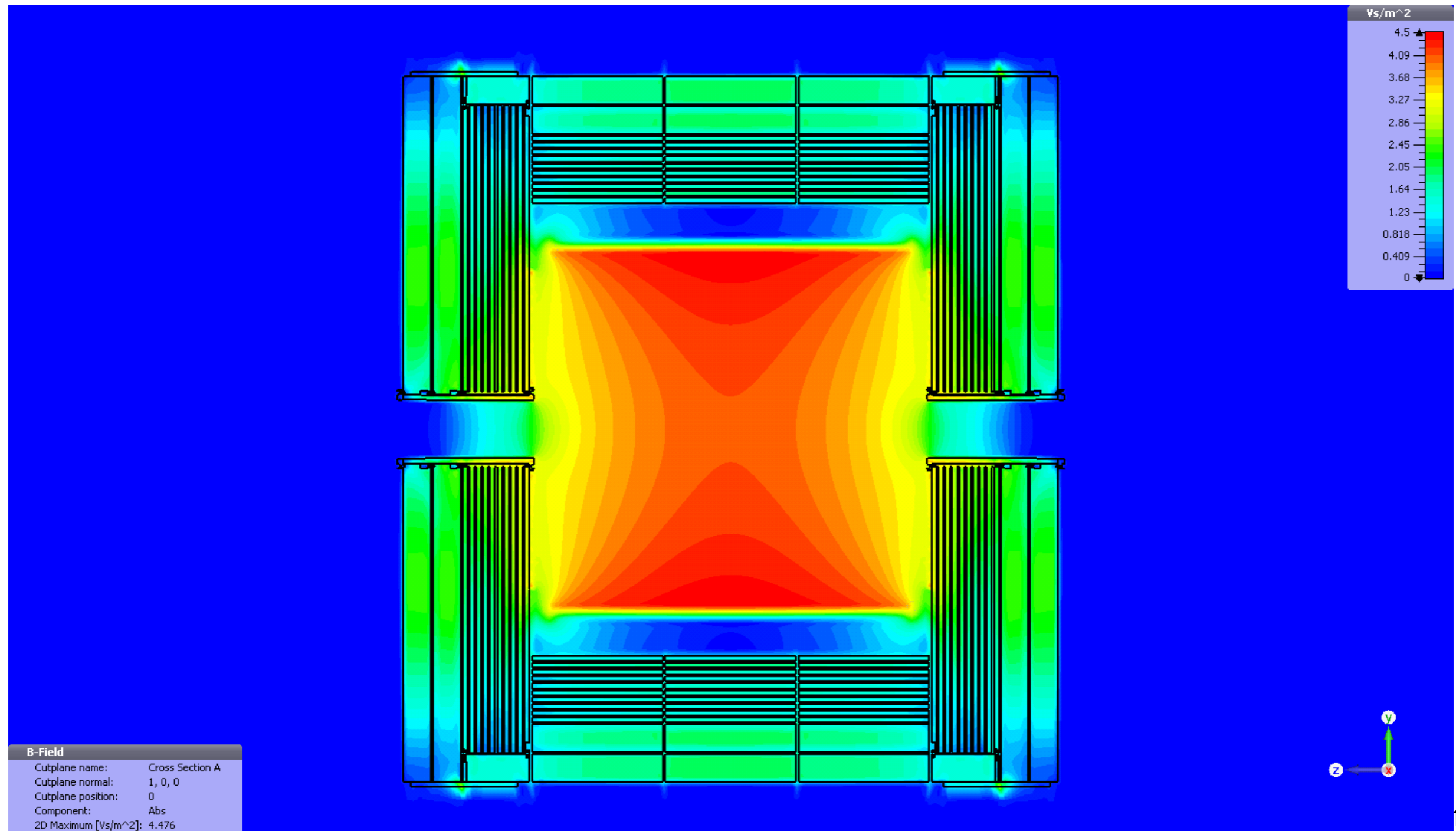






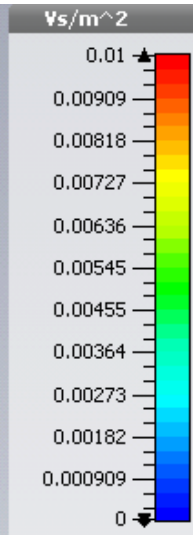
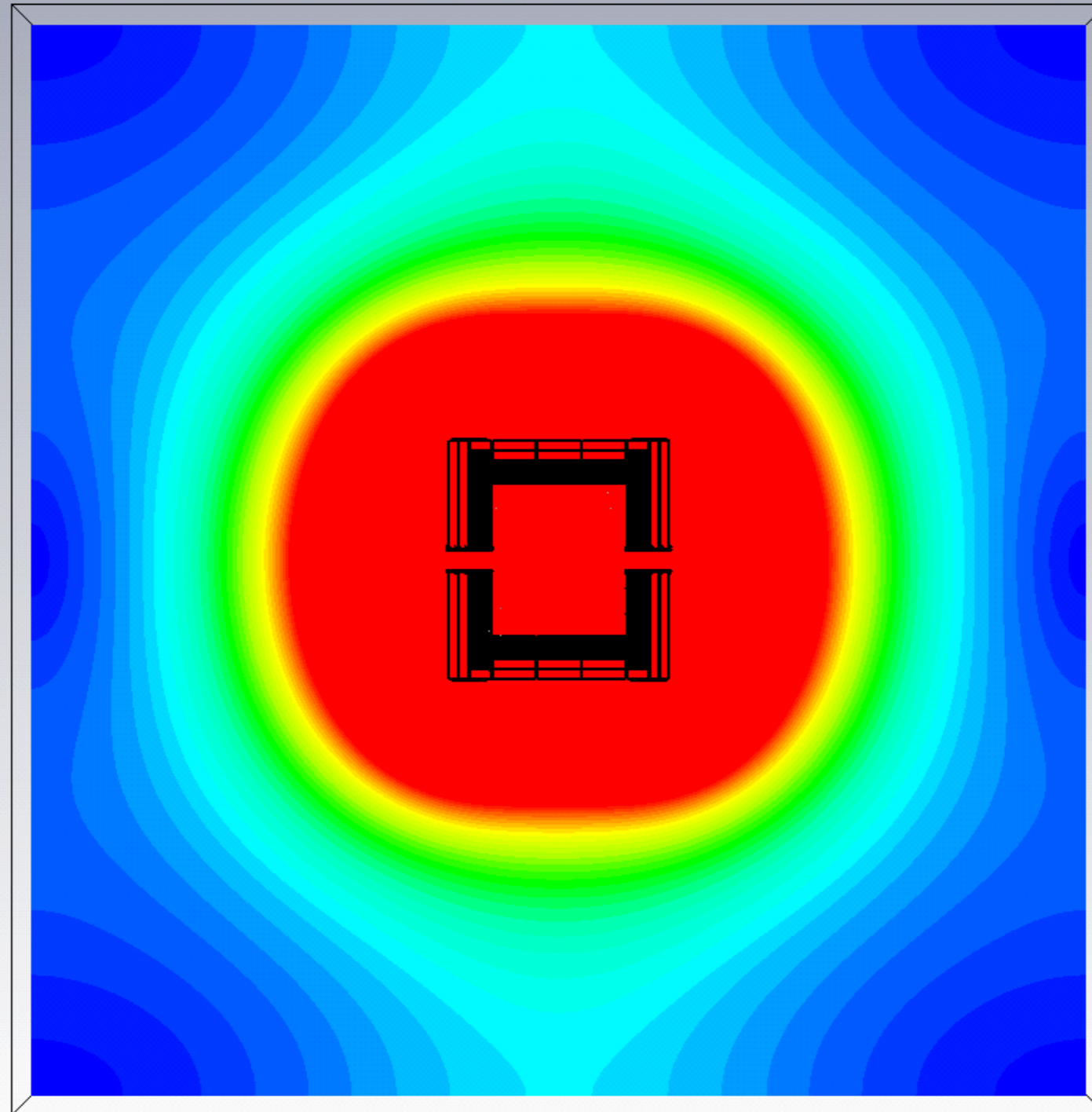
# Thinner ILD Yoke

- remove ~60cm of iron in barrel
  - save money, stray field similar as SiD





# Thinner ILD Yoke

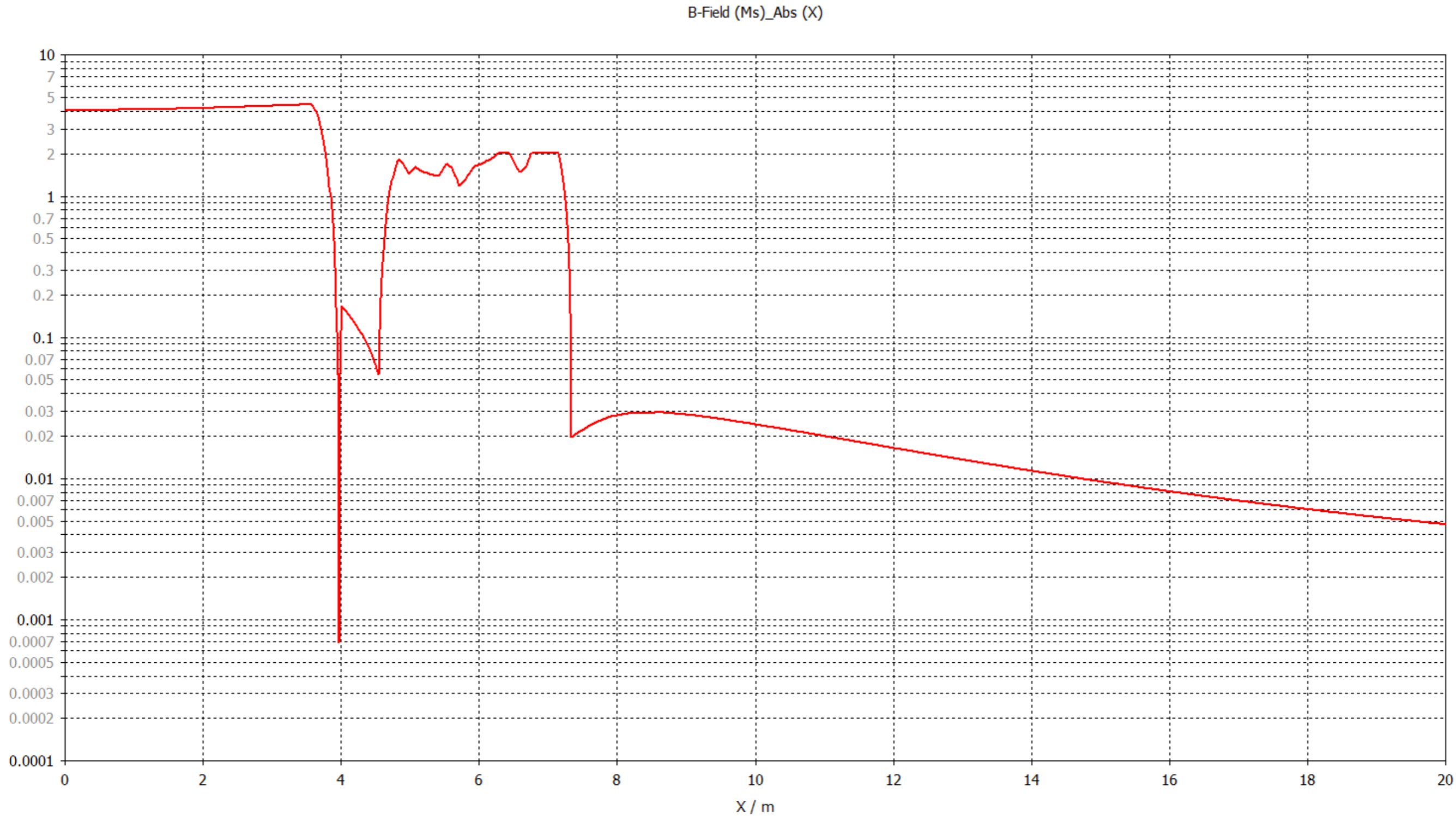


**B-Field**  
Cutplane name: Cross Section A  
Cutplane normal: 1, 0, 0  
Cutplane position: 0  
Component: Abs  
2D Maximum [Vs/m<sup>2</sup>]: 4.476

# Thinner ILD Yoke



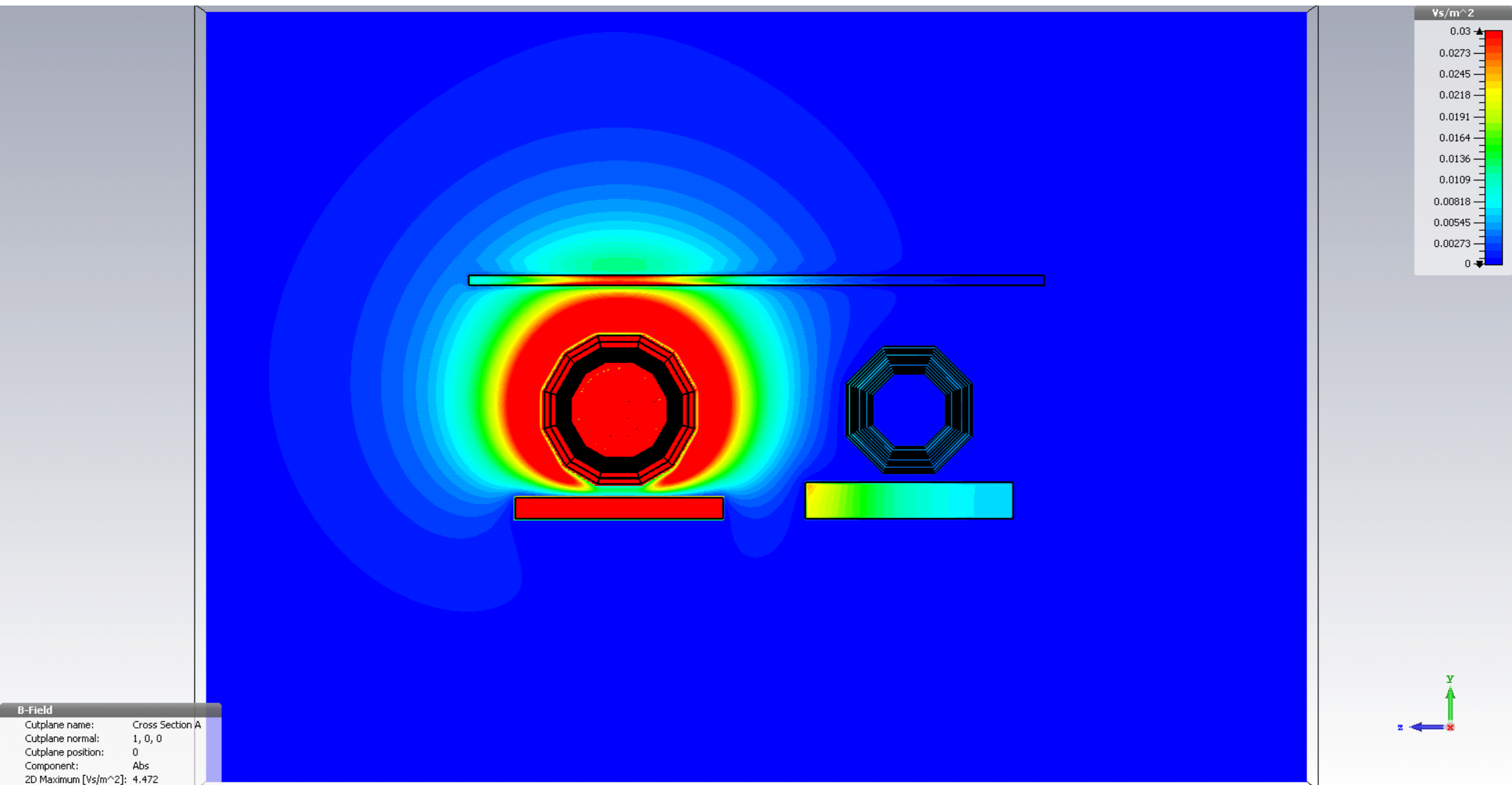
- 90G at 15m, 50G at ~19m





# ILD with thin yoke in hall

- scale: red = 300 G

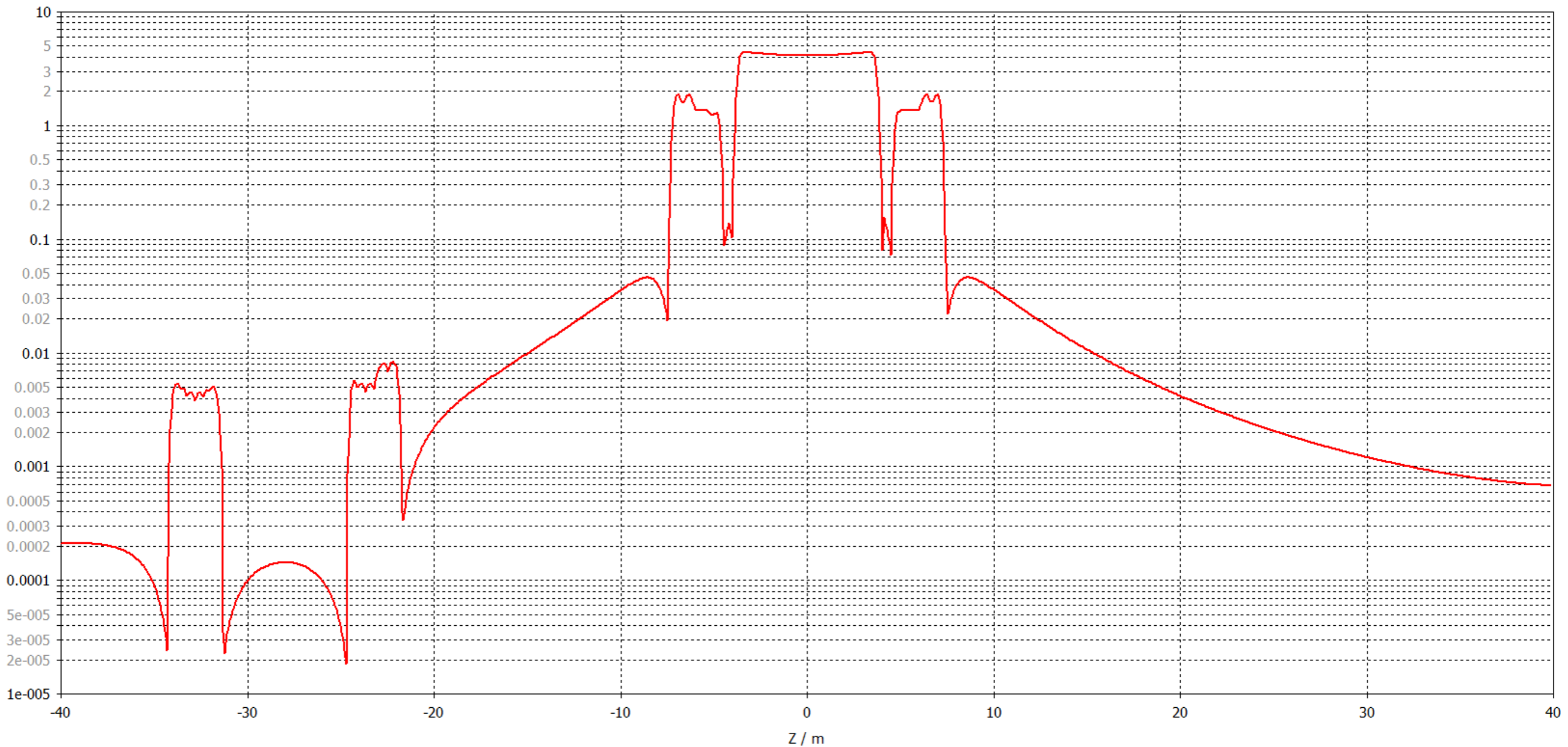




# ILD with thin yoke in hall

- ~100G at 15m

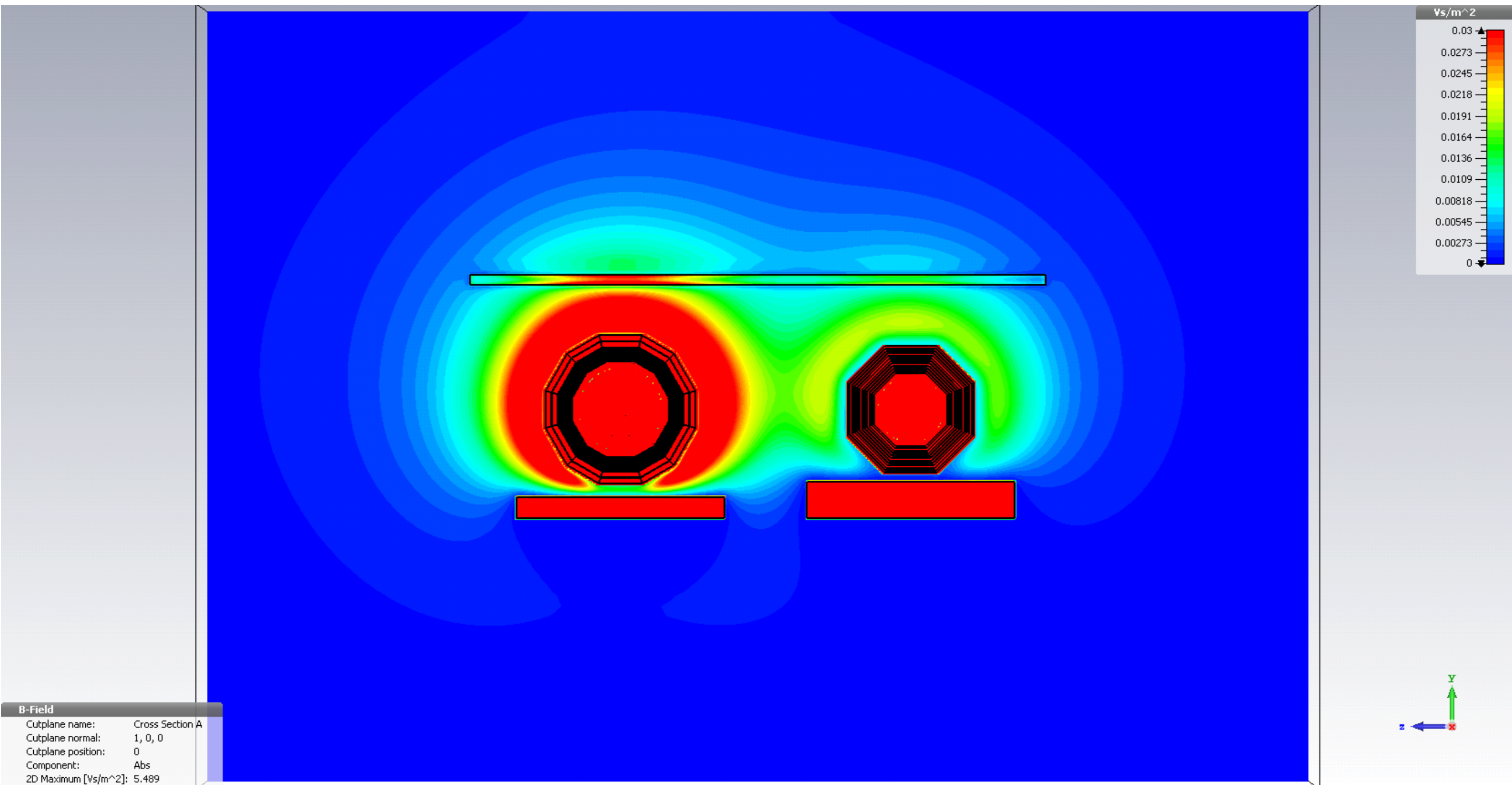
B-Field (Ms)\_Abs (Z)





# ILD with thin yoke in hall

- scale: red = 300G

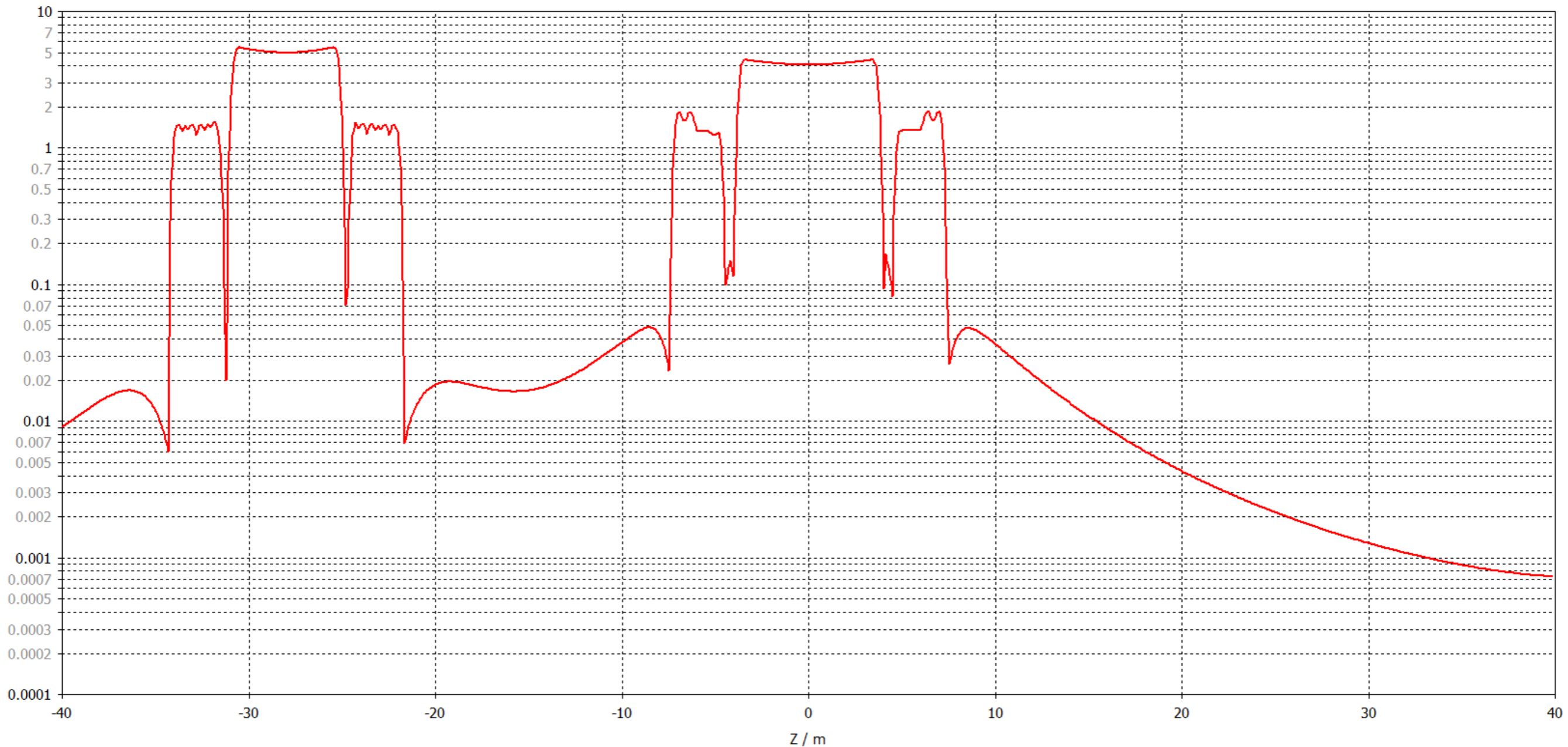




# ILD with thin yoke in hall

- ~180 G at 15m between ILD and SiD
- ~100G at 15m at other side

B-Field (Ms)\_Abs (Z)





# Conclusion

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- Have now model in CST EM Studio with current ILD and SiD yoke geometries
  - updates on simulations can be done rather easily
    - interface to CAD assemblies (step)
    - simple geometries can be built by hand
- Stray fields directly at yoke surface are very large ( $>1\text{T}$ )
- Stray fields can reach
  - 300G at crane position - is this a problem?
  - up to 1 kG in steel platforms
- DBD ILD with more realistic yoke model has low stray fields (few G at 15m)
- ILD with 60cm of iron less in the barrel would have stray fields that are similar as for SiD with the current yoke design
  - would save money for ILD
  - would bring platform thickness for SiD and ILD to similar levels