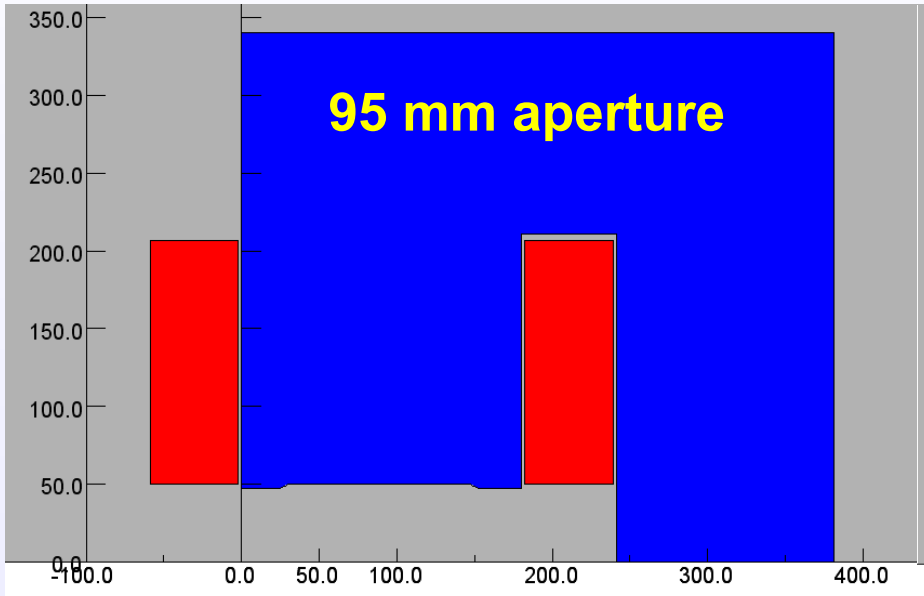
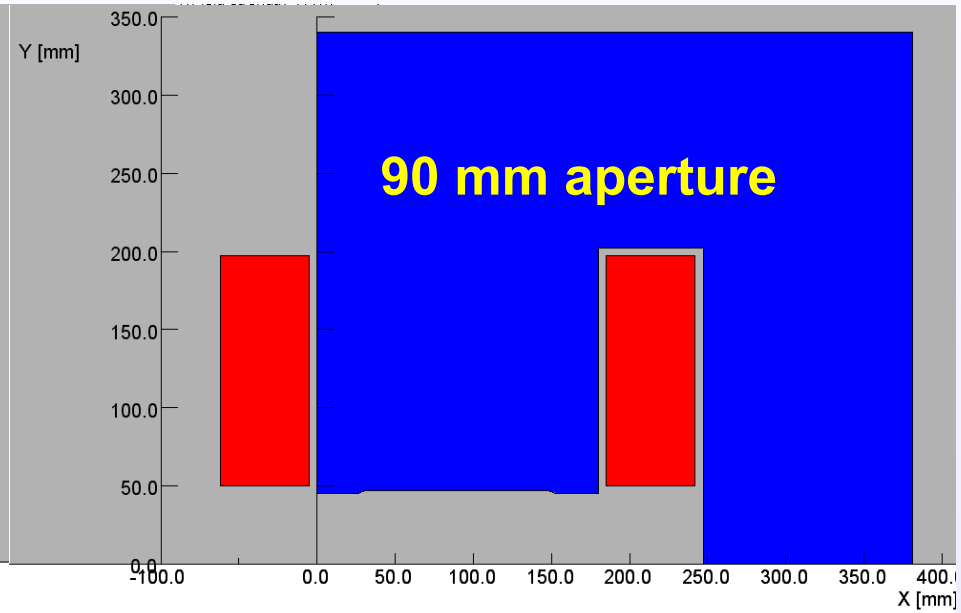
# Preliminary 2-d Design and 3-d Investigation of 95 mm Dipole

Ramesh Gupta

# New 95 mm Aperture Dipole (earlier design was for 90 mm)



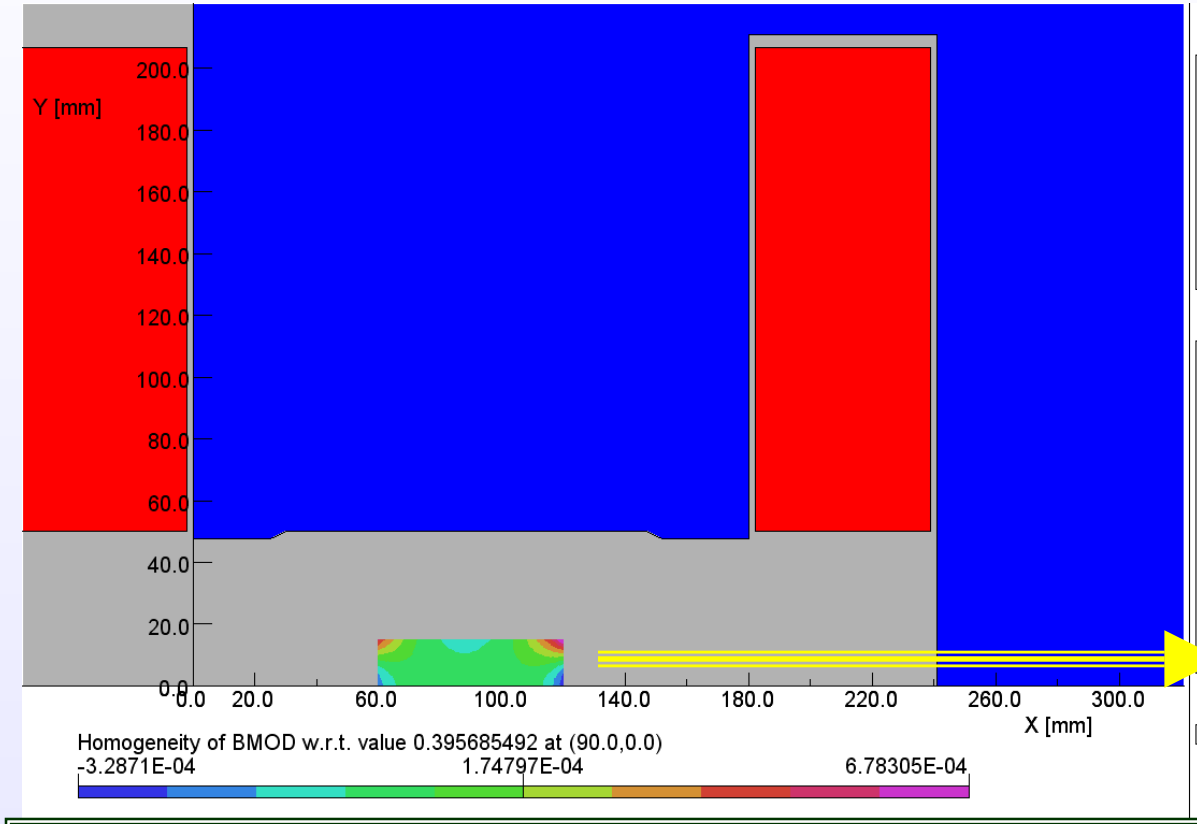



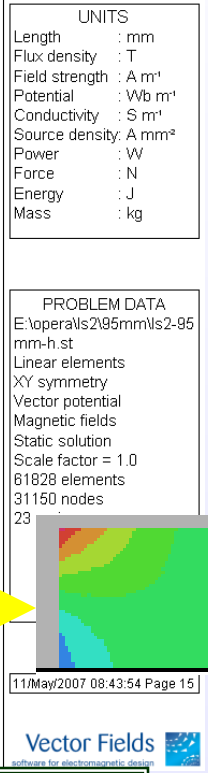

Note: 95 mm (minimum pole gap) is the nominal aperture of the dipole.

Adjust aperture to match transfer function in case the same power supply is used for both magnets.

- Same conductor is chosen for 35 mm and 95 mm aperture dipoles.
- Number of turns are adjusted - 16 turns (4 X 4) in 35 mm aperture case and 44 turns (4 X 11) in 95 mm aperture case (it was 40 turn for 90 mm).
- Transfer function of the two dipoles is similar (goal is to match integral field to ~1%).
- These constraints will not be applicable if two magnets use different power supplies.

# Preliminary 2-d Design of ~95 mm Aperture Dipole




Note: 95 mm is the minimum pole gap. The pole gap is 100 mm at the center of the magnet.

**The design meets the following stated requirements:**

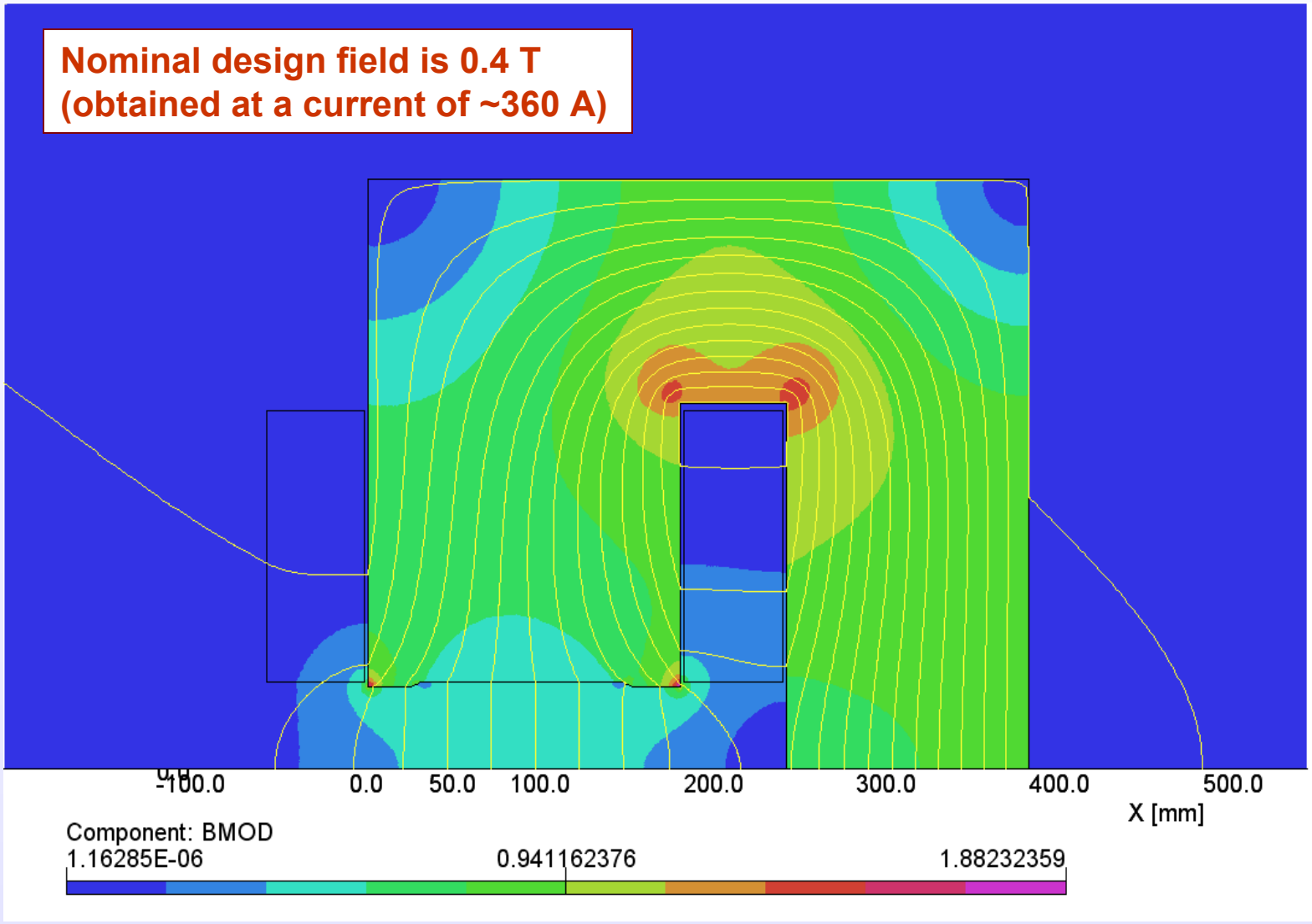
- Nominal Field – Bo = 0.40 T (upgradeable to 0.48 T)
- Field Homogeneity BX,BY=1x10-4
- Good field region BX +/- 20mm, BY +/- 10mm
- Nominal Current density in the coil cross section 2 Amps/mm$^2$

Field harmonics are < 1 part in $10^4$.

More discussion to follow with AP friends.

# Iron Saturation at Design Field

**Nominal design field is 0.4 T (obtained at a current of ~360 A)**




UNITS

| | |
|---|---|
| Length | : mm |
| Flux density | : T |
| Field strength | : A m$^{-1}$ |
| Potential | : Wb m$^{-1}$ |
| Conductivity | : S m$^{-1}$ |
| Source density | : A mm$^{-2}$ |
| Power | : W |
| Force | : N |
| Energy | : J |
| Mass | : kg |

PROBLEM DATA
E:\opera\ls2\95mm\ls2-95 mm-h.st
Linear elements
XY symmetry
Vector potential
Magnetic fields
Static solution
Scale factor = 1.0
61828 elements
31150 nodes
23 regions

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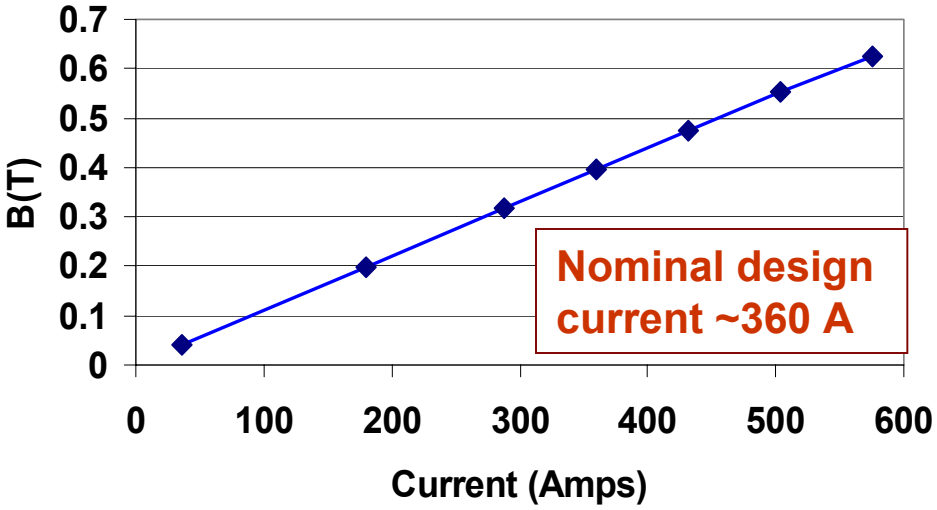
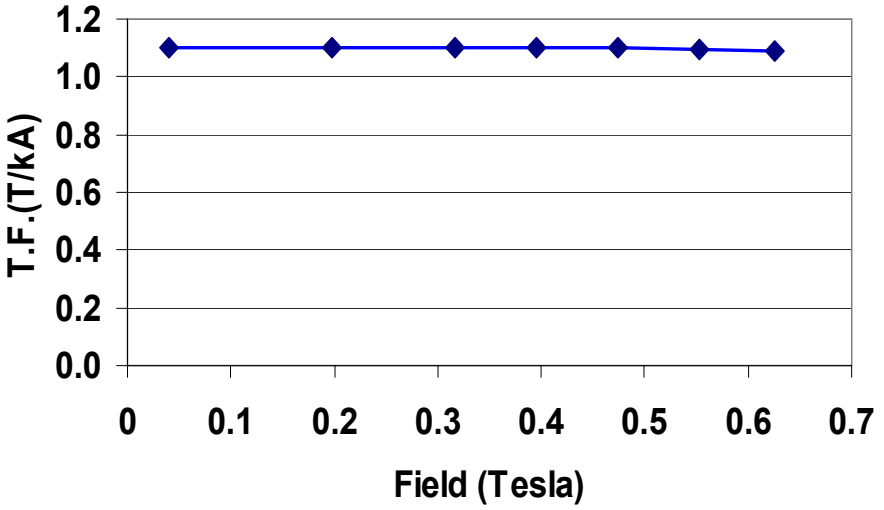
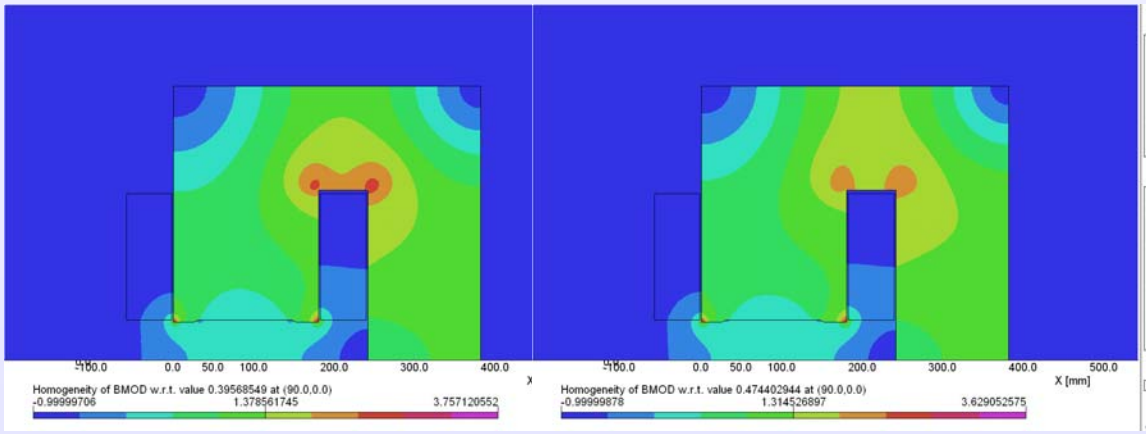
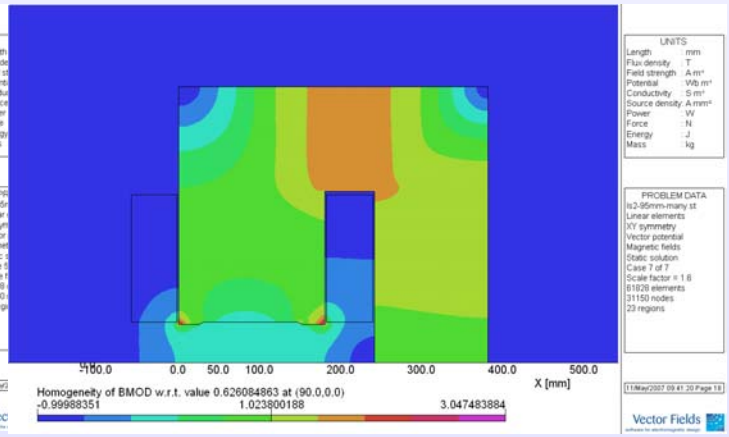
Vector Fields
software for electromagnetic design

# Iron Saturation in 95 mm Aperture Dipole



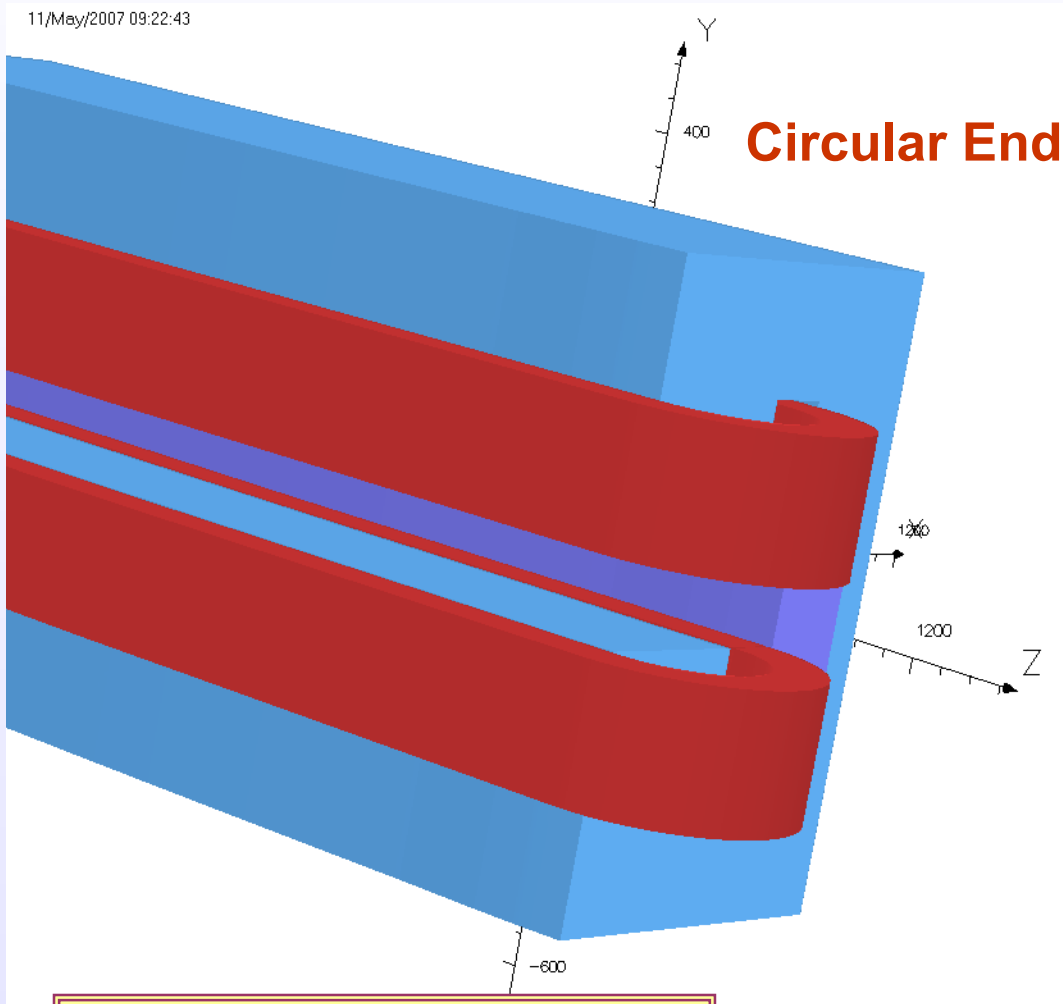



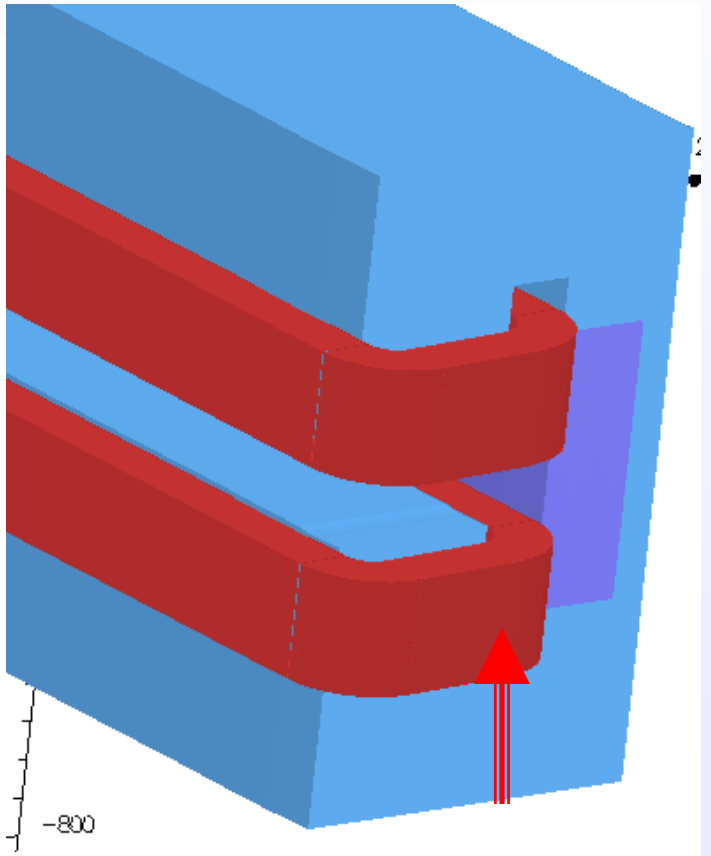




**Design field** | **20% over the design field** | **60% over the design field**

# Preliminary 3-d Investigation of ~95 mm Aperture Dipole




Circular Ends




Racetrack Ends

(to reduce mechanical length of the coil/magnet)

**Work in progress**

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