Corrector Designs for Superconducting Solenoid for e-lens

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Design Considerations for e-lens correctors

- Short correctors must create a dipole field of 0.02 T and long correctors 0.006+ T (both horizontal and vertical)

- Should have a minimum layers to minimize schedule and cost

- Should have low operating current to minimize heat load (more important for stand alone test)
Design Types for Conductor Dominated

Conventional Design
- Optimize end for field quality
- End takes significant space
- About 1 coil dia wasted in dipoles

Serpentine Design (B. Parker)
- Easy to bring leads out
- ~2-d design
- Used in most magnets (default)
- End takes space (relevant only in short magnets)

Optimum Integral
- Most optimum use of space
- Full length used at midplane
- Spacers in body and ends are modulated to obtain integral cosine theta distribution
- Leads do not come out easily in a single layer design
- Developed and used in AGS corrector (in helical magnet)
Optimum Integral Design

One layer each for horizontal and vertical dipole correctors

Desired Field is obtained at 9.4 A
Desired Field is obtained at 13.8 A (~50% more than optimum integral)
Optimum Integral Design (take 2)

Both horizontal and vertical dipole correctors are accommodated in a single layer

- Top & Bottom for Vertical
- Left & Right for Horizontal

Significantly cuts down on construction time and cost – the main motivation

Down side:
- Higher operating current
- Field Quality (not a major issue)
Iron Dominated Corrector Design

- Cut a slot in the iron and put corrector coil there
- There is still enough mu left in the iron to generate 0.02 T field

Benefits
- Lower current
- Possibly easier and cheaper
Field in Iron Dominated Corrector Design

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Two Designs – side by side
Topic for Discussions

• How do we construct iron dominated design

• Comparison of two designs