Superferric 3T CIC Dipole

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We are beginning the construction of a 1.2 m model dipole. Construction is paced by available $. The support structure and the long-length CIC cable will be completed this fiscal year.
If it were feasible and affordable to make 6 T dipoles for the Ion Ring, Maximum c.m. energy would double; maximum luminosity would double. We have made several innovations that may make it feasible and affordable.
How to do it? Two options:

• Add wires to NbTi CIC cable, turns to layers:
  • 4 T using supercritical He
  • 6 T using superfluid He

  Short-sample $T_{\text{max}}$ @ 4 T = 6 K
  Short-sample $T_{\text{max}}$ @ 6 T = 3.5 K

• Replace NbTi CIC by new Nb$_3$Sn CIC developed for IR quads:
  • 4 T using supercritical He
  • 6 T using superfluid He
Beef up our NbTi cable, add a few turns, re-optimize fields
Payoff from Phase 1 SBIR to Hypertech: development of Nb$_3$Sn CIC for IR quads.

30 kA coil current @ 6 T bore field
The entire Ion Ring, IR, and detector would have to be re-assessed to provide for collider operation at 200 GeV

- RF, IBS, e-cooling, IR, ...
- The real question is – would the upgrades needed to increase collision energy be incremental as upgrades, or would they be start-from–scratch?
- In the case of the magnet ring, doubling the magnetic field is a start-from-scratch undertaking.
- The design shown here illustrates that we could modify the magnet design incrementally at the outset so that, in a later upgrade, superfluid helium cryogenics could be added and the magnets would operate at twice the field.