Solenoid Issues and Design

Neutrino Factory Feasibility Study II
Editors Meeting, LBNL
2 October 2000

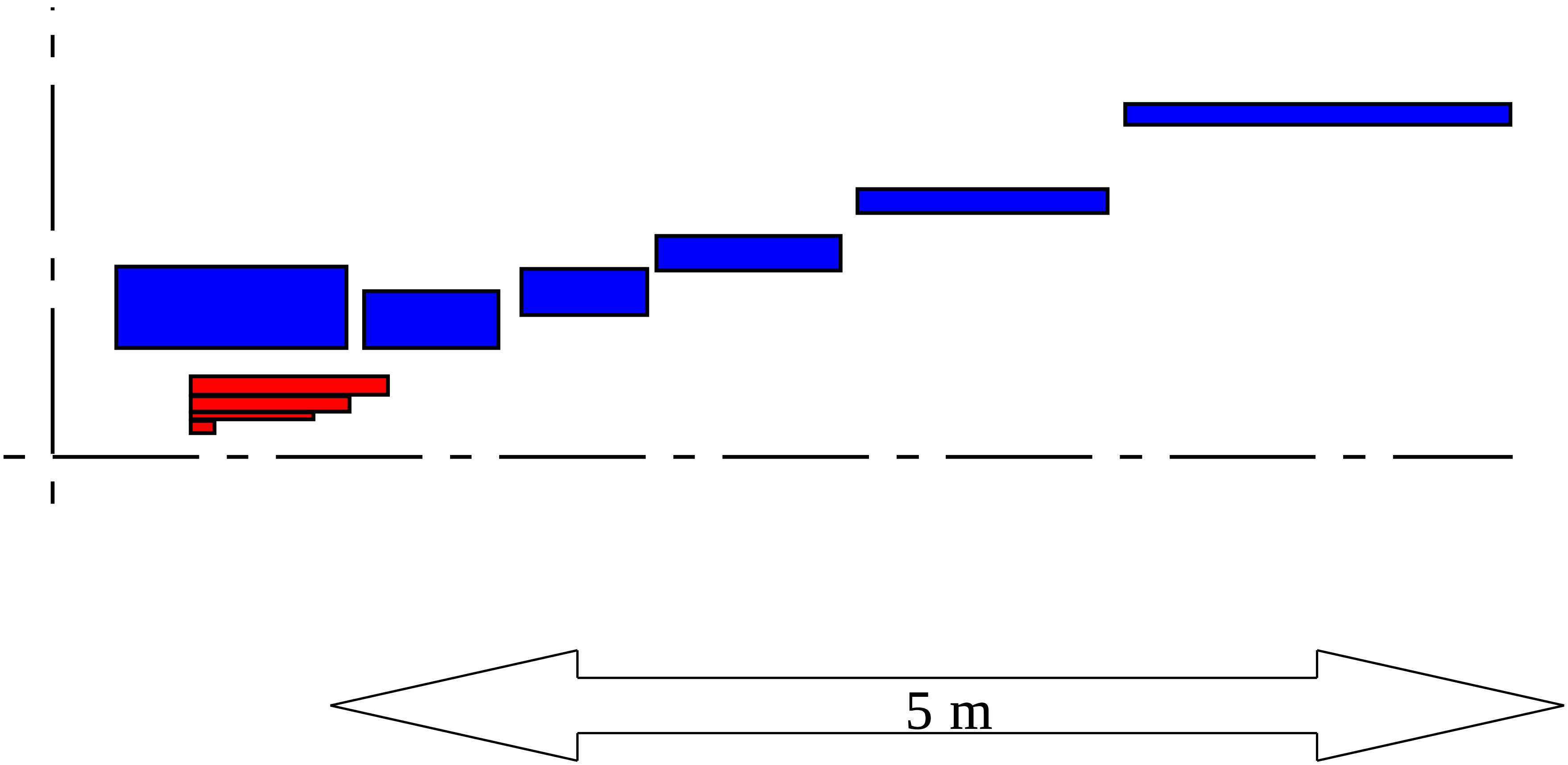
Target Solenoid System

- High fields (20 T combined)
- High radiation environment
  - heating
  - damage
- Remote maintenance requirement

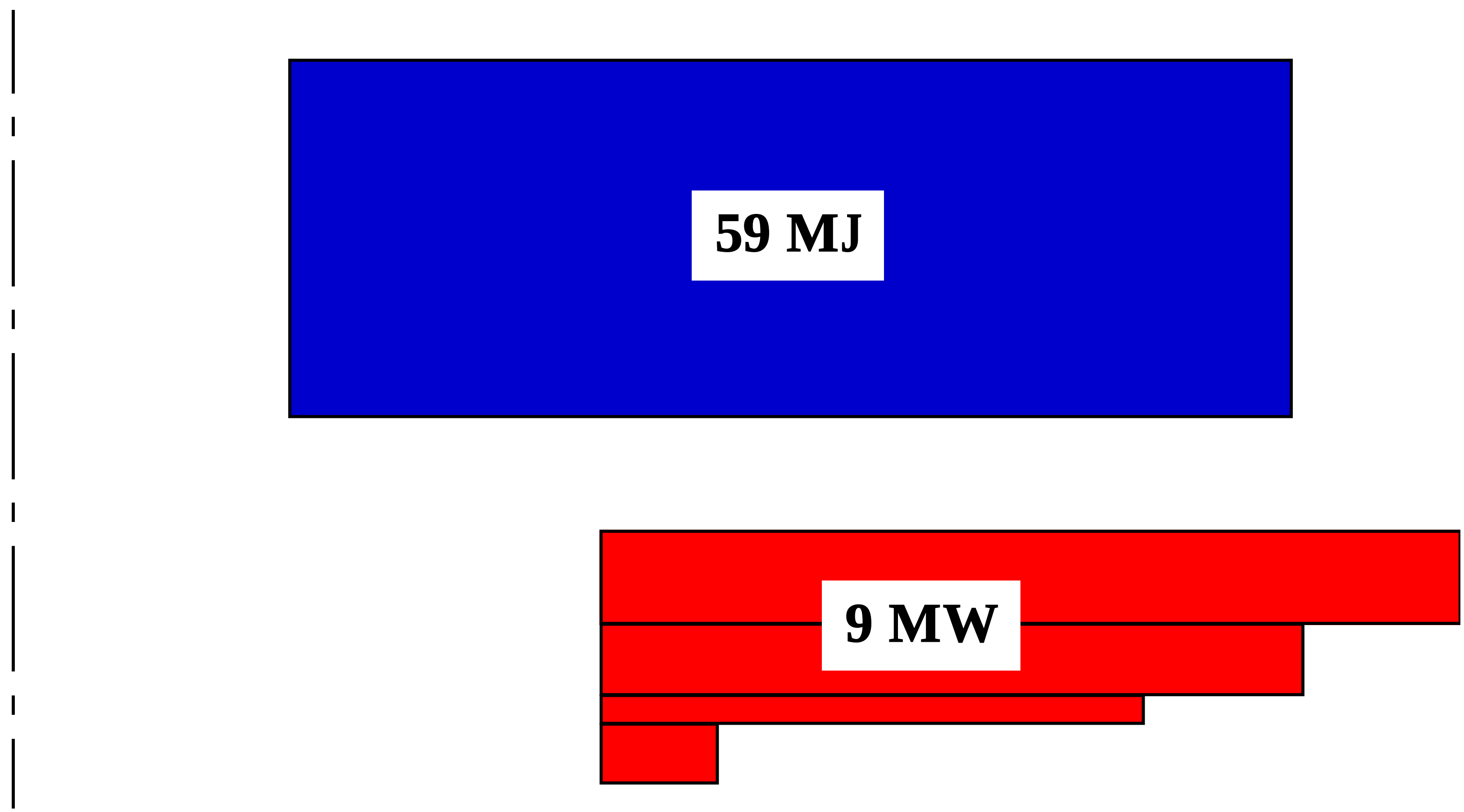
Resistive Insert Options

- Bitter-plate technology chosen for Study I
  - high J
  - short-lived but low-cost & easily replaceable
  - co-mingled conductor, insulation, & water
- Hollow-copper technology proposed for Study II
  - low J
  - long-lived but higher cost & difficult to replace
  - insulation separated from cooling water

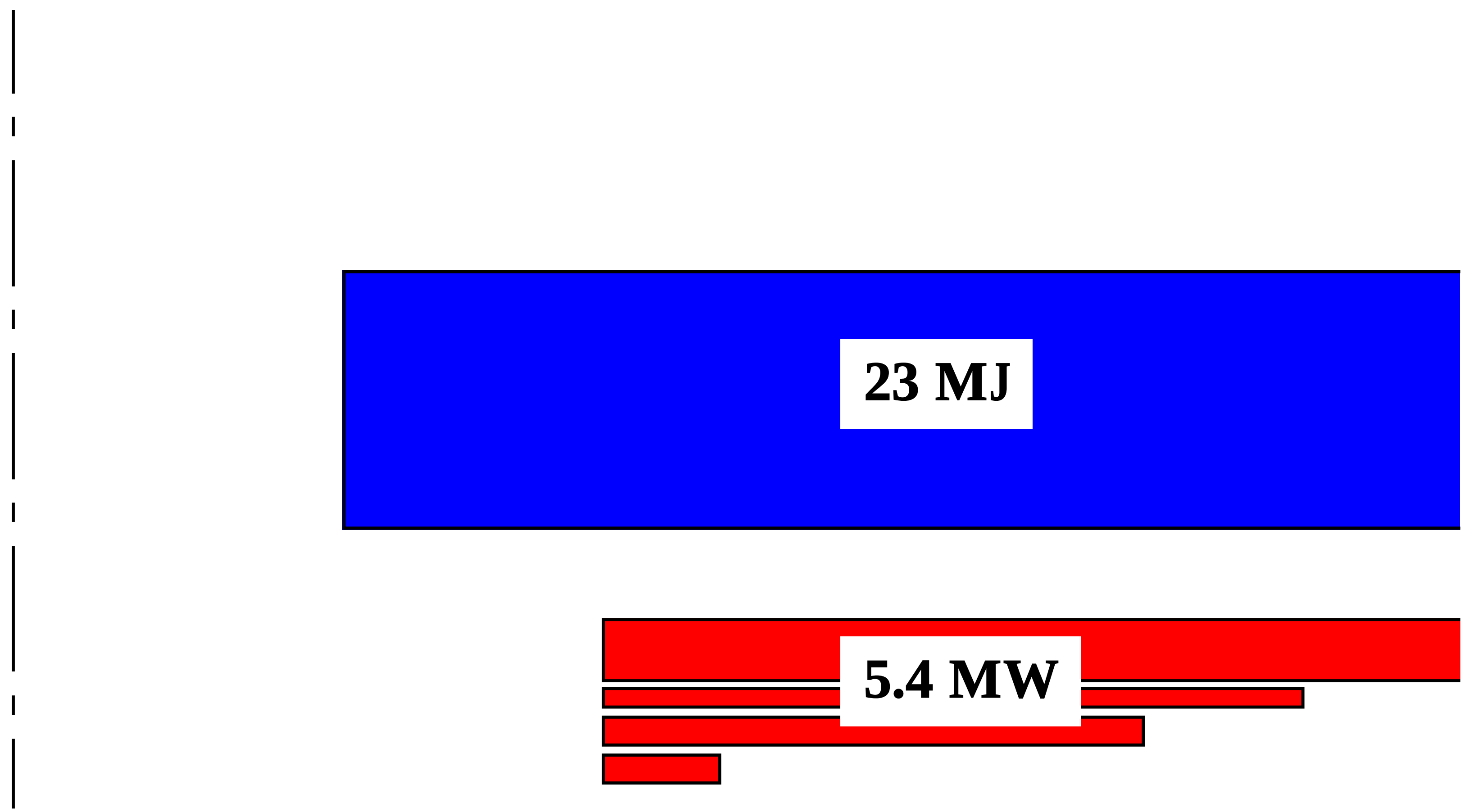
Study-II Target and Decay-Channel Solenoid System



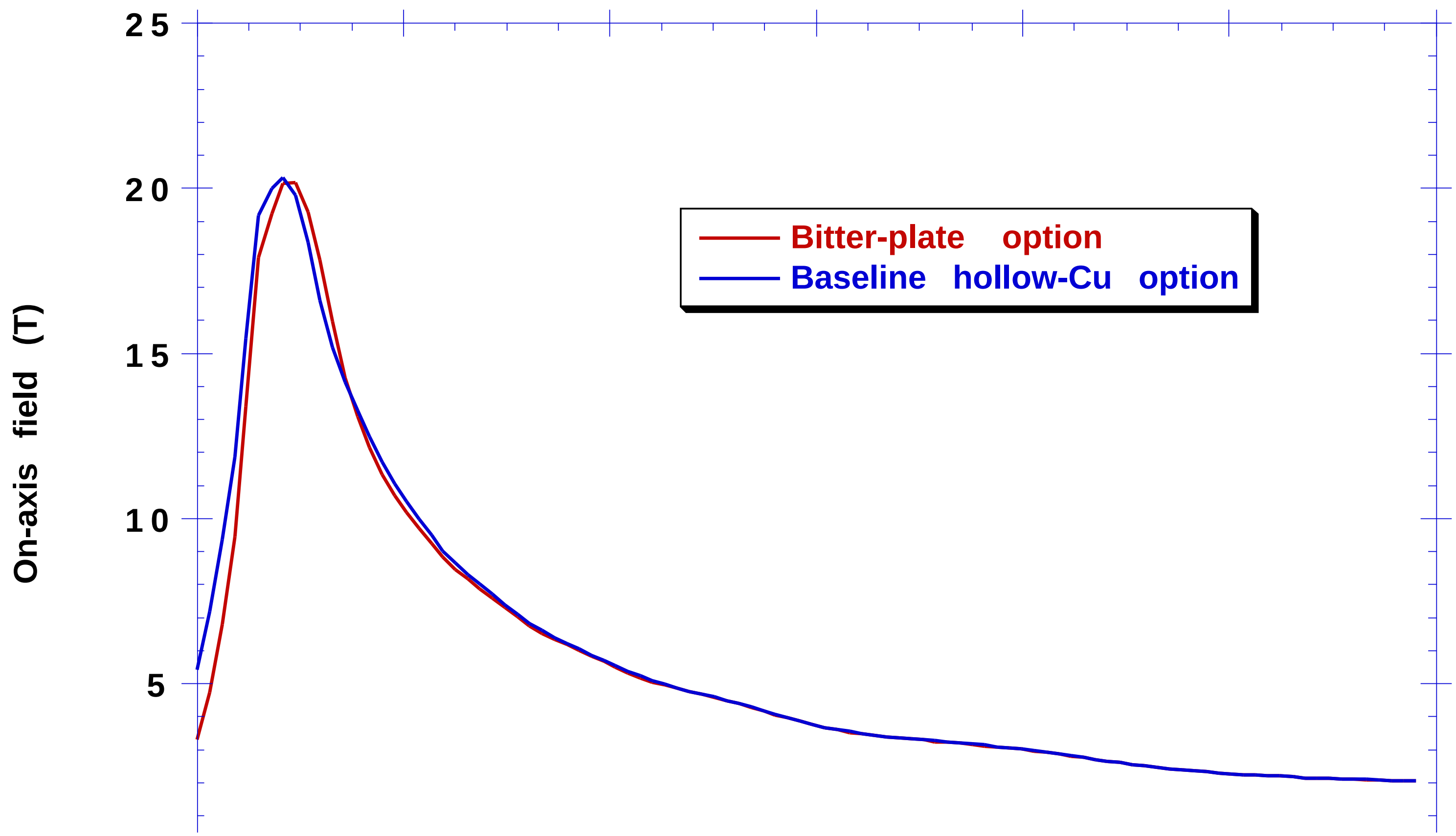
Baseline Hollow-Copper Option



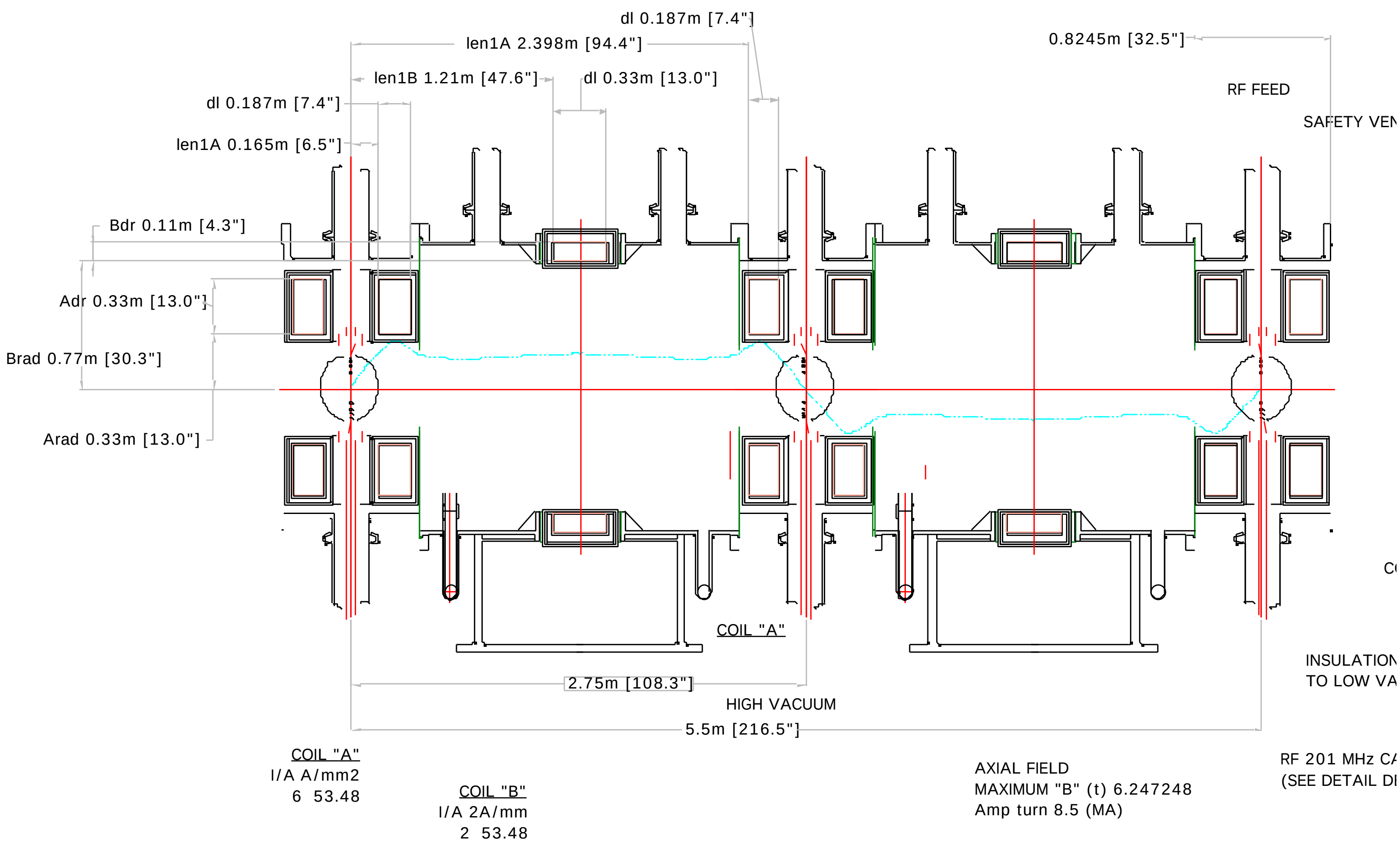
Alternative Bitter-Plate Option



Field on-axis, two options



Super FOFO Lattice



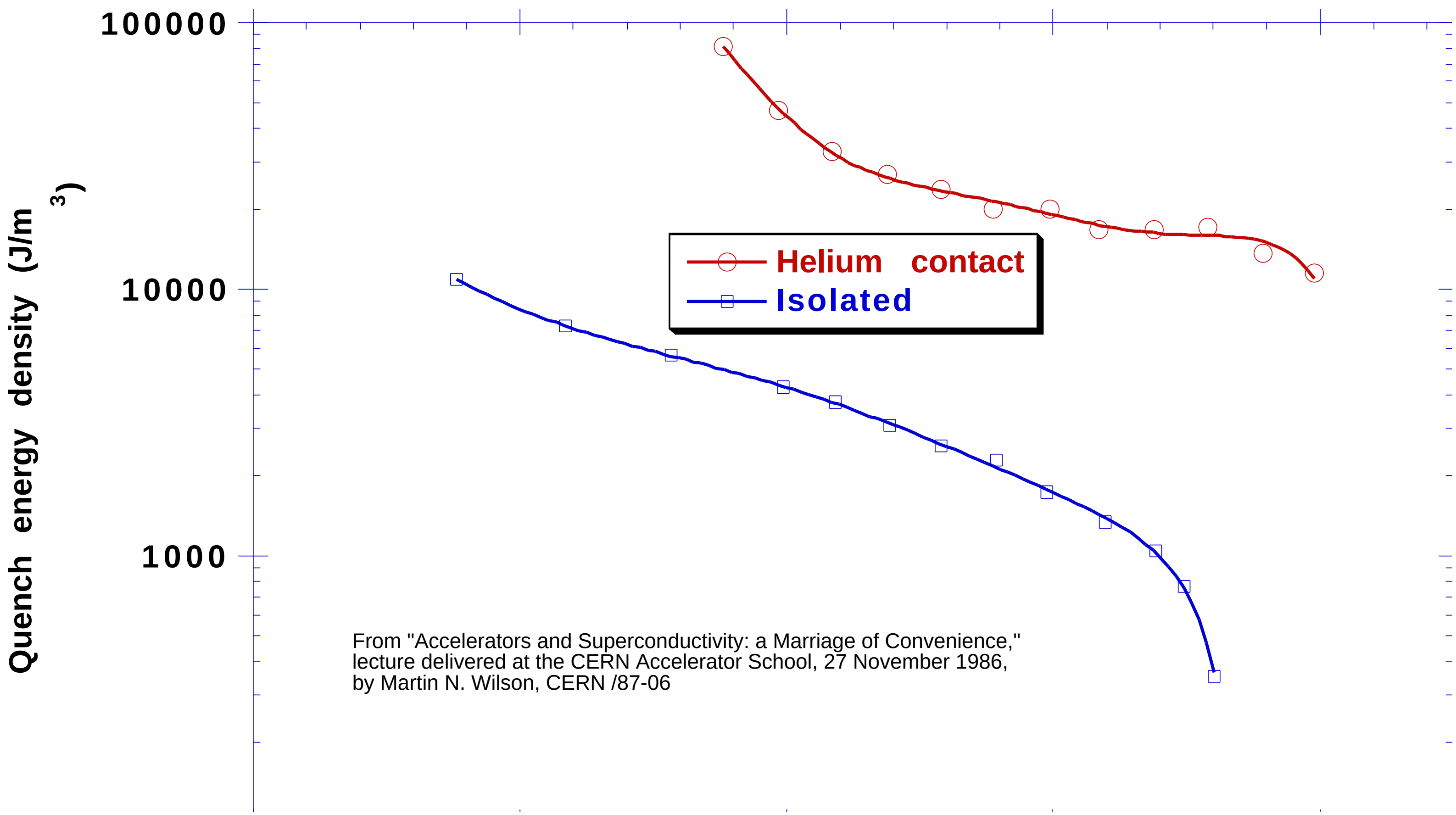
Issues for
Cooling-Channel Solenoids

- Modest fields (6 - 7 T)
- Modest internal winding stresses
- High inter-coil forces
- Large numbers to amplify per-unit costs

Winding-Pack Options

- Impregnated windings
  - highest current density
  - least stable
- Porous or ventilated windings
  - high current density
  - more stable
- Either option may require active protection to preclude high inter-coil forces

Benefit of helium for stability



General Approach

- Quantify options with regard to
  - Performance
  - Cost
  - Risk
- Identify R&D tasks that will reduce cost and risk
- Select a primary option and optimize it