Some Comments on Muon Cooling Cryostats

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Design Assumption for the Magnet Cryostats

The large solenoid (Magnet B) over the RF cavity has a 1330-mm warm bore diameter. It is designed to fit over a 1200-mm diameter RF cavity with a clearance of 65 mm. The length of the solenoid coil is 300 -mm.

The design of the absorber gradient solenoid (Magnet A) is based on the following:

1) **The diameter of the absorber windows is set at 380 mm. The free space for beam clearance is 400 mm. The outside diameter of the absorber body is 560 mm. The length of the hydrogen absorber is 300 mm.**

2) **The magnet cryostat body is designed to clear the outside diameter of the absorber body. The inside diameter of the absorber shell is 600 mm.**

3) **The heat leak into the absorber from the ends is between 15 and 20 W. Heat leak also comes from leakage down the thin walled stainless steel cryostat walls that connect the absorber to the magnet cryostat.**

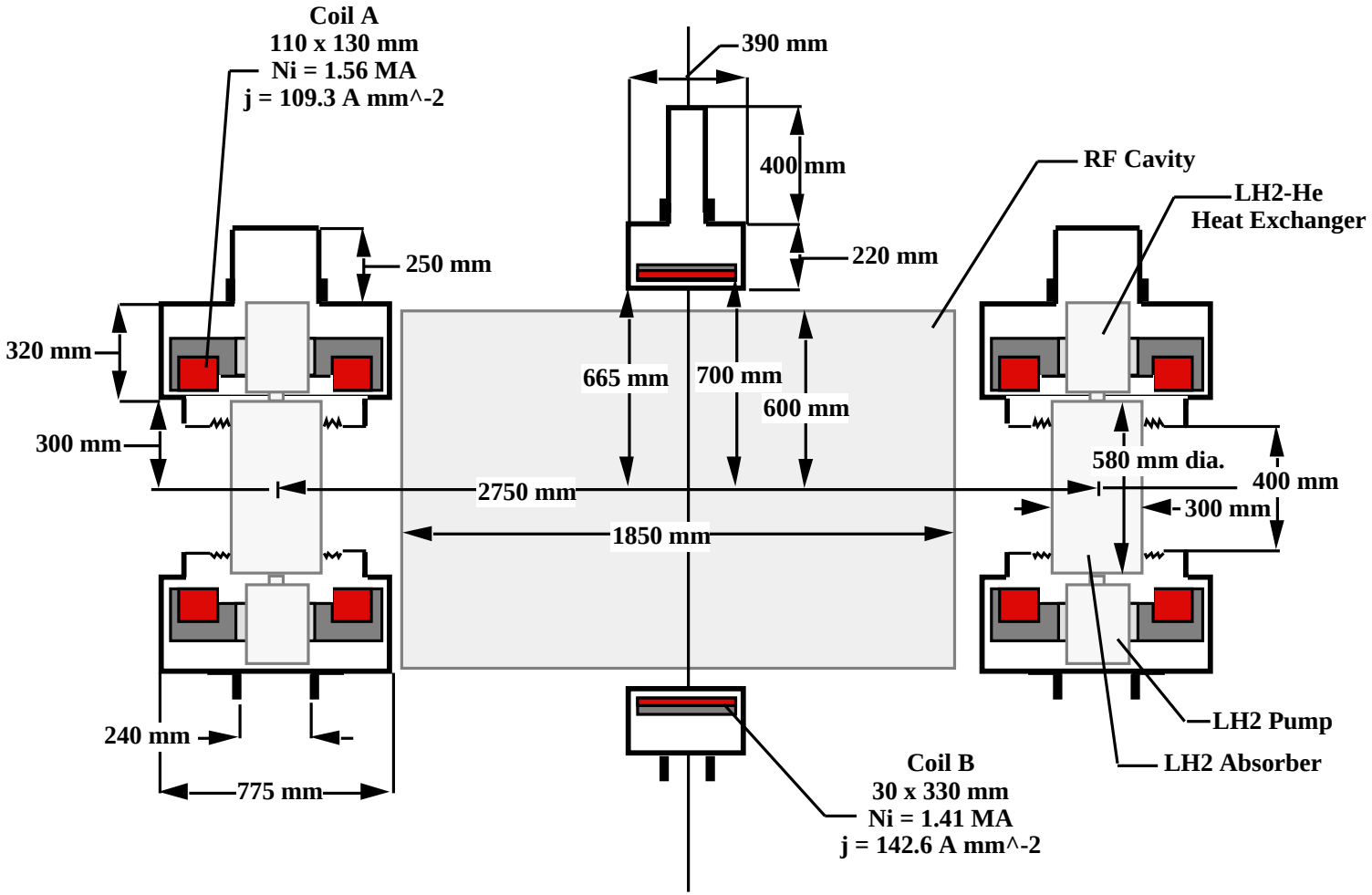
Design Assumptions continued

4) **The hydrogen absorber and the superconducting gradient magnet (magnet A) share a common cryostat vacuum vessel.**

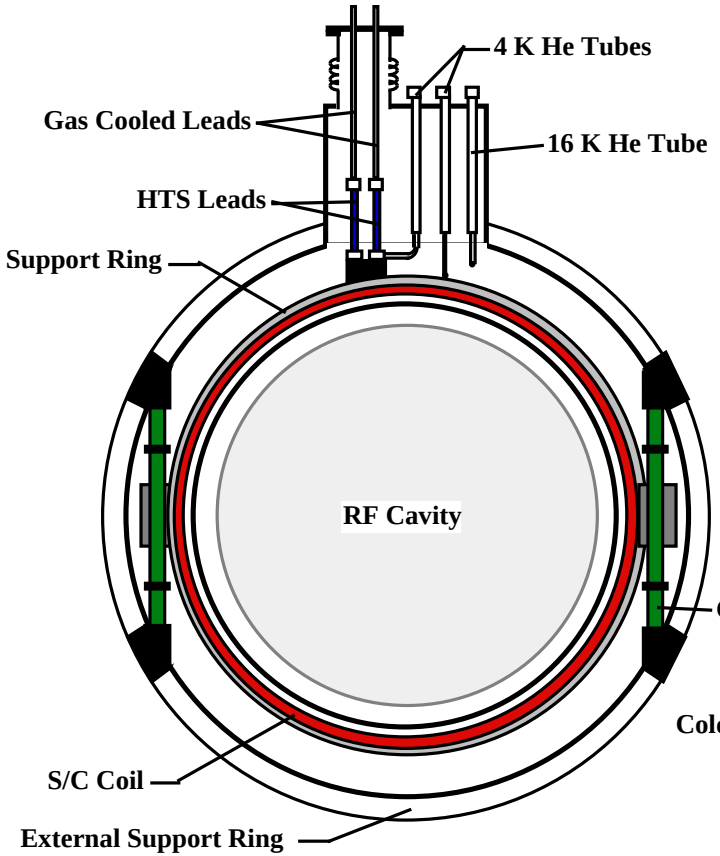
5) **The hydrogen absorber is cooled by helium gas at 16 K that comes from helium refrigerators. The hydrogen cooling gas leaves the absorber at about 19 K. The helium flow is adequate to prove about 140 W of cooling.**

6) **The helium used to cool the hydrogen for the absorber also cools the magnet shield and the gas cooled leads for the superconducting magnets (both coil A and coil B). The gas that cools the shield and the leads enters the shield at 16 K and leaves the leads at 300 K. This gas goes back to the compressor.**

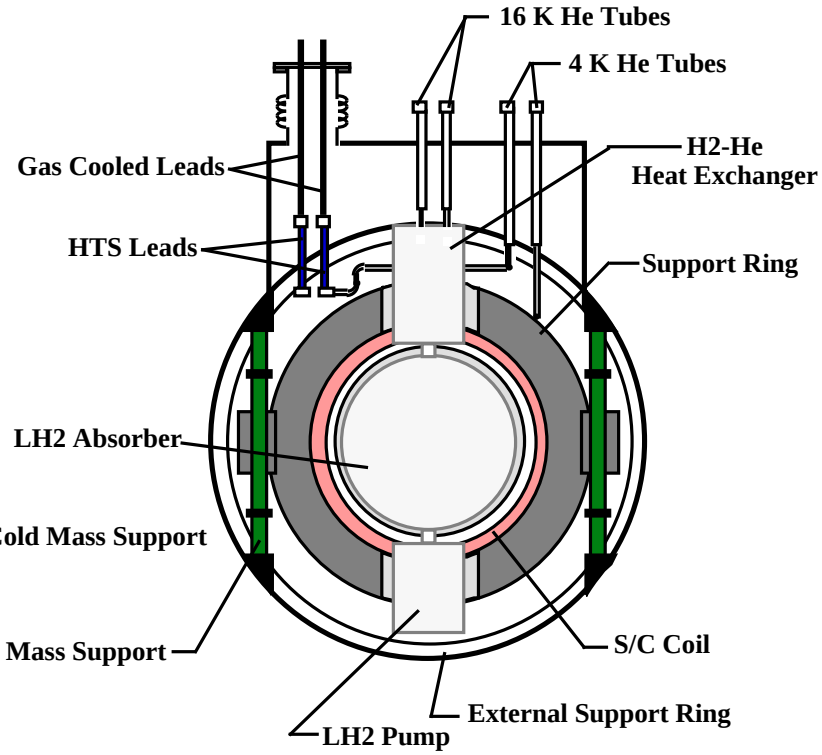
7) **The spacing between the coils in the gradient magnet is optimized to minimize the forces between the coils while achieving a high field gradient. The space between the coil equals the average radius of the coils. If the average diameter of the gradient coils can be made smaller, they can be closer together. For a cell length of 2.75 m, about 1.85 m can be RF cavity.**



Magnet And Cryostat Space for the Cooling Section



Coil B Cross-section



Coil A Cross-section

Magnet Cross-sections Perpendicular to the Axis Showing the Space for the RF Cavity and the Absorber