STAR Note-0075
WBS 4.4.1

A PRELIMINARY SPECIFICATION FOR A ROOM TEMPERATURE SOLENOID MAGNET COIL FOR THE STAR EXPERIMENT

M. A. Green and R. Schlueter
Lawrence Berkeley Laboratory

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A conventional STAR warm solenoid coil package shall have the following characteristics:

1. The inside diameter of the finished solenoid coil shall be 5.4 meters. The current carrying length of the solenoid coil package shall be 6.1 meters at an average temperature of 45 C. The finished solenoid coil package length shall be no larger than 6.2 meters. Up to 0.25 meters at each end can be allotted for water cooling hoses cables and connectors. The coil package thickness shall be 0.35 meters.

2. The maximum design central induction within the space between the two shaped iron poles spaced about 6.2 meters apart is 0.50 tesla (H = 400000 A/m). The required solenoidal field uniformity within a cylindrical space 4.0 meters in diameter and 4.2 meters long about the magnet center is better than one part in one thousand. (If the coil is properly designed, the field uniformity will be determined by the shaped iron poles. The pole design is not the responsibility of the coil vendor.)

3. The packing fraction, the conductor cross-section over the overall coil cross-section which includes conductor, water channels and insulation shall be based on the vendor's experience in winding such coils. The solenoid coil conductors shall be evenly spaced over the coil cross section so that the field uniformity requirements can be met. The vendor may choose any reasonable coil current which allows that the magnet field uniformity requirement be met.

4. The coil shall be made from an aluminum conductor. The coil weight and the coil capital cost are important aspects in the magnet design.

5. Water inlet temperature is assumed to be 40 C; the water outlet temperature is assumed to be 50 C. The assumed water inlet pressure is 1.41 MPa (200 psig). The assumed exit pressure is 0.42 MPa (60 psig)