

1 Scope:

This specification describes the general electrical requirements to be followed for the construction of RHIC magnets. These requirements are not all inclusive. Discrepancies between this document and any drawing requirements are to be brought to the attention of Brookhaven National Laboratory.

2 Applicable Documents:

The following documents of the issue in effect on the issue date of this procedure form a part of this procedure to the extent specified herein.

2.1 Military Specifications

MIL-W-22759 - Wire, Electric, Fluoropolymer Insulated, Copper or Copper Alloy

2.2 BNL Specifications

RHIC-MAG-M-7403 Rev.	___	Resistor Prequalification Testing
RHIC-MAG-R-7242 Rev.	___	Hypot Testing
RHIC-MAG-R-7227 Rev.	___	Electrical Resistance Measurements for Coils
RHIC-MAG-R-7228 Rev.	___	Magnet Coil Inductance and Q Measurements
RHIC-MAG-R-8554 Rev.	___	Soldering Base Specification

2.3 BNL Drawings

12010181 - Insulation, Polyimide Film
12010190 - Resistor
12010121 - Cord, Lacing and Tying

3 Requirements:

3.1 Electrical Components

3.1.1 Except where noted, all interconnect and instrumentation wiring shall use standard sizes and colors per MIL-W-22759/16 using extruded Tefzel (ETFE) insulation.

3.1.2 Voltage tap current limiting resistors to be 200 ohm, 5 watt Dale CW-5-5 MIL type RW-67 (BNL Dwg. No. 12010190) with pre-qualification liquid nitrogen dunk test per specification RHIC-MAG-M-7403.

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- 3.1.3 Cable and wire fastening (lacing) to be done with Kevlar braided cord (BNL Dwg. No. 12010121).
- 3.1.4 Except where noted, all insulation material shall be Kapton polyimide film per RHIC drawing No. 12010181.
- 3.2 Main and Quad Bus
- 3.2.1 Characteristics
- | | |
|---|---------------------|
| Dipole bus stabilization copper (in2) | .089 reference only |
| Quadrupole bus stabilization copper (in2) | .089 reference only |
- 3.2.2 During manufacturing procedures, it may be necessary to temporarily twist or bend superconductor material, copper stabilizer or bus work to facilitate assembly. This type of deformation must not exceed 900 either in twisting or bending.
- 3.2.3 Main bus conductor to be wrapped twice with 1 mil Kapton, 50% overlap, to yield 4 layers per cable face. Hypot test at 5kV between components.
- 3.3 Dielectric Strength (DC hypot maximum leakage current). For specific measurement techniques, refer to specification RHIC-MAG-R-7242.
- 3.3.1 Characteristics
- | | |
|--|-------|
| Corrector, all coils to yoke & end plates @ 2 kV | 50μA |
| Corrector, single coil to yoke & end plates @ 2 kV | 15μA |
| Dipole upper 1/2 coil to lower 1/2 coil @ 3 kV | 100μA |
| Dipole, all coils to yoke & end plates @ 5 kV | 100μA |
| Dipole, all coils to beam tube @ 5 kV | 100μA |
| Dipole, quad bus to adjacent bus @ 5 kV | 100μA |
| Dipole, quad bus to yoke @ 5 kV | 100μA |
| Quadrupole 1/4 coil to adjacent coils @ 3 kV | 100μA |
| Quadrupole, all coils to yoke & end plate @ 5 kV | 100μA |
| Sextupole 1/6 coil to adjacent coils @ 2 kV | 50μA |
| Sextupole, all coils to yoke & end plate @ 2 kV | 50μA |
| Trim bus to adjacent trim bus @ 5 kV | 100μA |
| Trim bus to yoke @ 5 kV | 100μA |
| Magnet warmup heaters @ 2.5 kV | 100μA |
- 3.3.2 Minimum creep path distance between exposed voltage terminals to be 0.200 inch.

3.4 Soldering Requirements

3.4.1 See RHIC-MAG-R-8554 soldering base specification for soldering procedures and flux requirements.

3.4.2 Main bus solder connections shall be fastened to prevent solder crack propagation due to temperature cycling motion.

3.4.3 Main bus superconductor splice connections shall overlap for 3 inches in length. Copper splice connections shall overlap 2 inches in length.

3.4.4 Soldered connections shall have no sharp or jagged points.

3.5 Quench Diode

Quench protection diode, max. energy (kJ) 140

Quench protection diode, max. reverse leakage current @ 1 kV (μ A) 500

Quench protection diode, 4.2 K forward voltage threshold @ 10 mA (V) 4.5

Quench protection diode cable contact tab to be 1-1.5 in²; contact pressure to be 400 psi or greater.

NOTE: Quench protection diode should be shorted using a jumper lead during all hypot testing.

3.6 Warm Up Heaters: (@21⁰C.)

Arc & D8 Dipole: power/heater (W) 938 reference only

Arc & D8 Dipole: resistance/heater (Ω) 1.52 reference only

D50 Insertion Dipole: resistance/heater (Ω) 1.40 reference only

D51 Insertion Dipole: resistance/heater (Ω) 1.11 reference only

D6 & D9 Insertion Dipole: resistance/heater (Ω) 0.47 reference only

4 Quality Assurance Provisions:

The quality assurance provisions of this specification require compliance with the procedural instructions specified herein.

5 Preparation for Delivery:

N/A