



1. Scope:

This test provides a check of the insulation integrity between electrical components in a magnet. During magnet operation, these components may have a large voltage difference between them. This procedure describes the testing of coils or other components with insulation between them. The test determines the insulation integrity by measuring the DC leakage current at the required test voltage between the components. The test voltage is determined by doubling the expected voltage and adding one thousand volts as a conservative protection factor.

2. Applicable Documents:

Data Sheet	-	RHIC Hypot Testing
RHIC-MAG-R-7243	-	Low Precision Ohmmeter Insulation Test
RHIC-MAG-Q-1000	-	Magnet Division Procedure for Control of Measurement and Test Equipment
RHIC-MAG-Q-1004	-	Discrepancy Reporting Procedure

3. Requirements:

3.1 Required Equipment:

3.1.1 DC Hypot Equipment: Model No. 5205 - Associated Research Inc., Model 944i - Vitrek Inc., or approved instrument (designated as "Hypot").

3.2 Safety Precautions:

3.2.1 The technicians shall be qualified by their cognizant technical supervisor in the operation of the required test equipment and these electrical testing procedures. They shall be familiar with the latest revision of the applicable documents referenced in section 2. In addition, some of these tests require the technician to have special training. A list of qualified personnel shall be maintained with the RHIC ES&H Coordinator and the RHIC Training Coordinator.

3.2.2 Some of these electrical test procedures have specific safety requirements. The technicians performing these specific tests shall rigorously follow all the safety requirements listed as well as those prescribed by the BNL ES&H Standard.

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RHIC-MAG-R-7242B

Page 2 of 4

3.2.3 This testing poses a Class "C" electrocution hazard. At least two properly trained technicians must be present to perform this testing. When testing, a trained technician shall be stationed at any point where the item under test is accessible to unauthorized people, and barriers shall be set up. Signs shall be posted reading "DANGER HIGH VOLTAGE" and warning lights shall be turned on.

3.3 Procedure:

3.3.1 Prior to making a hypot test, check that the electrical resistance between components being tested has a minimum value of 20 megohms. This check is included as a separate test in each of the process procedures and is described in document RHIC-MAG-R-7243.

3.3.2 Make sure the power ON-OFF switch is in the OFF position, that the high voltage ON-OFF switch is in the OFF position, and that the voltage control is turned fully counter-clockwise to the zero voltage position.

3.3.3 Connect a grounding cable from the safety ground stud of the "Hypot" to a good electrical ground, and make sure the connection is secure at both ends.

**CAUTION: Be sure the "Hypot" is grounded at all times. Failure to observe this caution may result in electrocution.**

3.3.4 Connect the return line from the item under test to the Metered Return binding post of the "Hypot" and be sure the grounding switch on the "Hypot" panel is in the Metered Return position.

3.3.5 Connect the High Voltage lead of the "Hypot" to the item under test.

3.3.6 Turn the Microampere Range Switch to the highest range (2000  $\mu$ a). Put the Kilovolt Range switch to Low.

NOTE: The Microampere Range may be changed while the test is in progress.)

3.3.7 Put the power ON-OFF switch to the ON position and put the HIGH VOLTAGE ON-OFF switch to the ON position.

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RHIC-MAG-R-7242B

Page 3 of 4

- 3.3.8 Rotate the voltage control clockwise until the required voltage is indicated on the Kilovoltmeter or until "arcing" takes place, in which case the voltage control should be rotated counter-clockwise until arcing just stops. (Note: Arcing must be kept to a minimum and must not be allowed to occur more than a few times.) The test voltage, shall remain for 60 seconds prior to reading leakage current. If other than the required voltage is used for the test, as above, it must be recorded with the reason why under "Comments" on the data sheet.
- 3.3.9 Read and record the leakage current indicated on the Micrometer. If greater sensitivity is desired for the Micrometer, select a lower range with the Microampere Selector Switch.
- 3.3.10 After the test is completed, rotate the Voltage control fully counter-clockwise, put the HIGH VOLTAGE OFF-ON switch to the OFF position and put the power ON-OFF switch in the OFF position.
- 3.3.11 With the "Hypot" still connected to the electrical ground, connect a grounding cable from the "Hypot" safety ground stud to the "Hypot" High Voltage Lead (the clip end, still connected to the test item) for 60 seconds to discharge any stored charge.
- 3.3.12 Disconnect all "Hypot" leads from the test item.

4. Quality Assurance Provisions:

- 4.1 The quality assurance provisions of this procedure requires that the technician shall be responsible for performing all inspections and tests in compliance with the procedural instructions contained herein and the recording of test results on the data sheet(s) and/or on the production traveler.
- 4.2 The technician is responsible for verifying that the test and measurement equipment used in this procedure has been calibrated and that the calibration sticker (date) has not expired as per RHIC-MAG-Q-1000.
- 4.3 The technician is responsible for notifying the technical supervisor and/or the cognizant engineer of any discrepancies occurring during the performance of this procedure. All discrepancies shall be identified and reported as per RHIC-MAG-Q-1004.

5. Preparation for Delivery:

N/A

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RHIC-MAG-R-7242B

Page 4 of 4

DATA SHEET

RHIC Hypot Testing

Magnet/Coil type, aperture, and length: \_\_\_\_\_  
 (example: Arc Quadrupole, 8 cm, 1.13 Meter)

Coil Serial Number: \_\_\_\_\_ or Magnet Serial No. \_\_\_\_\_

Hypot Test Between: \_\_\_\_\_

Required Hypot Test Voltage \_\_\_\_\_ volts

Did it reach the test voltage: \_\_\_\_\_ yes \_\_\_\_\_ no

If yes, give leakage current. \_\_\_\_\_ amps

If no, give breakdown voltage. \_\_\_\_\_ volts

If no, give leakage current. \_\_\_\_\_ amps

Comments: \_\_\_\_\_

Above work done by: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
 Name & Life No., Date

\_\_\_\_\_

List of Equipment Used for Measurements

Nomenclature	Manufacturer	Model	Serial No.	BNL Bar Code
Remarks: _____				