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Relativistic Heavy Ion Collider
Magnet Division Procedure

Proc. No.: RHIC-MAG-R-7320

Issue Date: May 22, 1989

Rev. No.: C

Rev. Date: March 17, 1993

Class: Electrical Testing
Title: RHIC Electrical Resistance Measurement for
Collared Individual Coils and Connected Coil Sets

- Prepared by: Signature on File
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- Q. A. Approval: Signature on File
- ES&H Review: Signature on File

REVISION RECORD

Rev. No.	Date	Page	Subject	Approval	QA	ES&H
A	5/15/92	Throughout	Added data sheet for			
			Quadrupole & typical values			
			for resistance.	On File		
B	9/15/92	3	Removed coil location			
			designations from			
			Quadrupole data sheet.			
			Reference as per SCR #416	On File		
C	3/17/93		Specification changes as per			
			SCR #468.	On File	On File	On File

1. Scope:

This procedure describes the method for measuring electrical resistance of a magnet coil, or group of series-connected coils, by measuring voltage drops with a 1.0 amp DC current applied through the coil(s). Some magnet coils require using a current source of 0.1 or 0.01 ampere because of their higher resistance.

2. Applicable Documents:

Data Sheet - RHIC Dipole Electrical Resistance Measurement for Collared Individual Coils and Connected Coil Sets

RHIC-MAG-R-7227 - RHIC Quadrupole Electrical Resistance Measurements

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 Equipment Required:

3.1.1 Digital multimeters with 0.01 mV (10 μ V) resolution.

3.1.2 DC constant current source, 1.0, 0.1, or 0.01 ampere, isolated from ground.

3.1.3 Thermometer capable of reading to $\pm 0.1^{\circ}\text{C}$. @ room temperature.

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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3.3 Procedure:

3.3.1 Record coil/magnet temperature on Data Sheet.

3.3.2 Connect the power supply to the two main leads of the series-connected coil(s) under test as shown on the Data Sheet. Apply a constant current of 1.0 (0.1, 0.01) amp DC through the coil. Record the voltage drops across each coil in the respective boxes on the Data Sheet. Typical values for RHIC magnet coil(s) are shown below.

3.3.3 Arc Dipole Magnet, 8 cm, 9.45 Meter.

- a) 1.60 Ω for an individual dipole coil
- b) 3.20 Ω for (2) series connected dipole coils

3.3.4 Arc Quadrupole Magnet, 8 cm, 1.13 Meter.

- a) 0.095 Ω for individual quadrupole coil
- b) 0.380 Ω for (4) series connected quad coils

3.3.5 Insertion Quadrupole Magnet, 13 cm, 1.44 Meter.

- a) 0.1842 Ω for individual quadrupole coil
- b) 0.7367 Ω for (4) series connected quad coils

3.3.6 Corrector Magnet, 8 cm, 0.5 Meter.

Note: use current of 0.01 amperes.

- a) 436 Ω for dipole, B0, coil
- b) 123 Ω for quadrupole, B1, coil
- c) 102 Ω for octupole, B3, coil
- d) 94 Ω for decapole, B4, coil

3.3.7 Sextupole Magnet, 8 cm, 0.75 Meter.

Note: use current of 0.1 amperes.

- a) 36.1 Ω for an individual sextupole coil
- b) 227.5 Ω for (6) series connected sextupole coils

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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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DATA SHEET

RHIC Dipole Electrical Resistance Measurement
for Collared Individual Coils and Connected Coil Sets

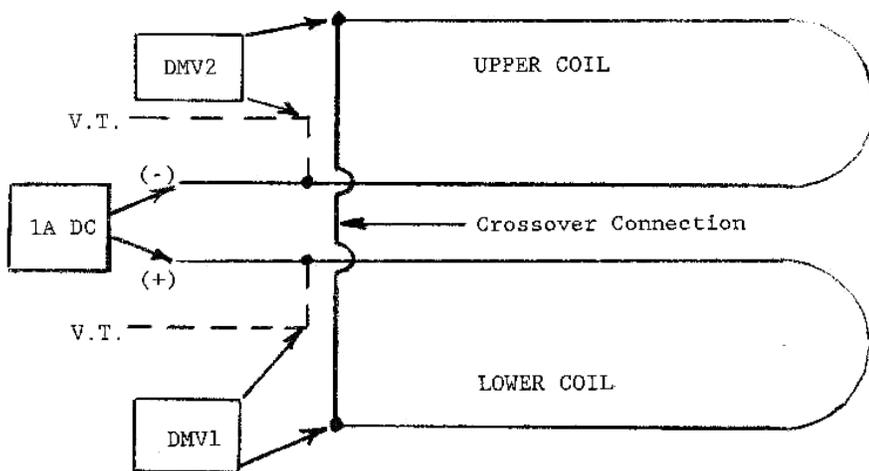
Magnet/Coil type, aperture, and length: _____
(example: Arc Dipole, 8 cm, 9.45 Meter)

Upper Coil Serial No.: _____ Magnet No.: _____

Lower Coil Serial No.: _____

Coil Temp.: _____ °C

Connect main coils in series as per final configuration, as shown below. Applying constant 1 amp DC to the coils, measure the voltage drop across each coil.



Coil (DVM No.)	Coil # _____ Lower Coil (1)	Coil # _____ Upper Coil (2)
Voltage	V	V

Comments: _____

Above work done by: _____

Name, Life No., Date

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DATA SHEET

Magnet No. _____

RHIC Quadrupole Electrical Resistance Measurement

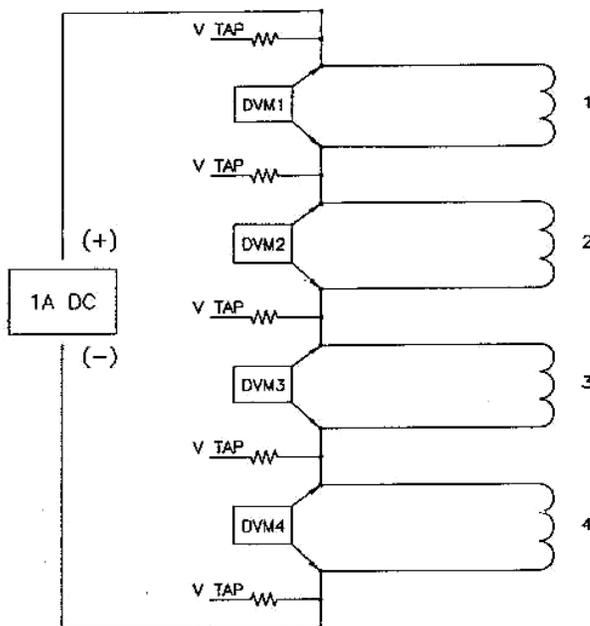
Magnet/Coil type, aperture, and length: _____
(example: Arc Quadrupole, 8 cm, 1.13 Meter)

Coil #1 Serial No.: _____ Coil #2 Serial No.: _____

Coil #3 Serial No.: _____ Coil #4 Serial No.: _____

Coil Temperature: _____ °C Magnet No.: _____

Connect main coils in series as per final configuration, as shown below. Applying constant 1 amp DC to the coils, measure the voltage drop across each coil.



Coil (DVM No.)	Coil # _____ Coil (1)	Coil # _____ Coil (2)	Coil # _____ Coil (3)	Coil # _____ Coil (4)
Voltage	V	V	V	V

Comments: _____

Done By: _____

Name & Life No., Date

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DATA SHEET (Cont'd)

RHIC Electrical Resistance Measurement
for Collared Individual Coils and Connected Coil Sets

List of Equipment Used for Measurements

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