



1. Scope:

This test checks the turns ratio of the coils in the RHIC magnets. By comparing turn ratios, it is possible to check whether a coil has a shorted turn. The advantage of the method is that it is insensitive to temperature variations. Vendors may suggest an alternate method to check for shorted turns. Vendor selected test methods shall be submitted for BNL written approval prior to use.

2. Applicable Documents:

Data Sheet - RHIC Dipole Magnet Ratiometer Check  
RHIC Quadrupole Magnet Ratiometer Check

3. Requirements:

3.1 Required Equipment:

3.1.1 BNL Ratiometer and associated equipment

3.1.2 Alternate equipment

3.1.2.1 115V/6.3 Vac, 1 amp, 60 Hz filament transformer

3.1.2.2 RMS AC voltmeter, 1 mV resolution on 20 V scale

3.2 Procedure:

3.2.1 Operating Procedure for BNL Ratiometer:

3.2.1.1 Magnet Connections - Temporarily connect the main coils in series as in the final configuration.

3.2.1.2 Warm Up - Before any connections are made to the magnet under test or any calibration is attempted, put the function switch in one of the set positions, switch the power on, and allow for a 15-min. warm up.

3.2.1.3 Calibration:

3.2.1.3.1 Place the function switch to the "0.1 SET" position and adjust the "0.1 ADJ." pot until the digital meter (on the "AC Ratiometer") reads "0.1000".

3.2.1.3.2 Place the function switch to the "1.0 SET" position and adjust the "1.0 ADJ." pot until the digital meter (on the "AC Ratiometer") reads "1.0000".

3.2.1.3.3 Repeat steps 1 and 2 of calibration until a pot adjustment is no longer necessary to get the respective readings.

**The only official copy of this file is the one on-line on the Superconducting Magnet Division website. Before using a printed copy, verify that it is the most current version by checking the document issue date on the website.**

RHIC-MAG-R-7319A

Page 2 of 5

- 3.2.1.4      Operation:
  - 3.2.1.4.1      With the Function Switch in either of its "SET" positions, connect the output leads of the "AC Ratiometer" (double red and black) across the magnet under test (main leads). Then put the function switch in the "OPERATE" position.
  - 3.2.1.4.2      Connect the input lead (single green) of the "AC Ratiometer" to the respective test points 1 thru 3 (common reference) as indicated on the data sheet and read the digital voltmeter and record the value in the respective box on the data sheet.
  - 3.2.1.4.3      Calculate the differences between successive readings (Delta 1-2, 2-3, etc.) and record these differences below the boxes marked "Delta 1-2", etc.
  - 3.2.1.4.4      Subtract these calculated difference readings (Delta's) from the ideal values (0.5000) and record the values in the boxes below the boxes marked "Dev". These are coil ratio deviations.
  - 3.2.1.4.5      If any of these deviations exceed  $\pm 0.007$  there may be a shorted/wrong coil or improperly connected coil. Notify the cognizant engineer.
  - 3.2.1.4.6      Finally, add up all the Delta's and record the sum in the box marked "Total of Delta's". This value should be equal to reading #1, total magnet.
  - 3.2.1.4.7      Switch off power and disconnect all leads from the magnet under test.
- 3.2.1.5      Operation With Alternate Equipment - The above ratio test may be performed using a 6.3 VAC transformer connected across test points 1 & 3 (common reference) to excite the winding and by measuring the respective RMS AC voltages from test point 3 (common) to test points 1-3 and normalizing the readings by dividing them by the whole magnet voltage reading, 1 to 3. Then enter the normalized readings into the table as described in Section 3.2.1.4, above.

4.      Quality Assurance Provisions:

The Quality Assurance Provisions of this procedure requires compliance with the procedural instructions contained herein and the recording of test results on the attached data sheet.

5.      Preparation for Delivery:

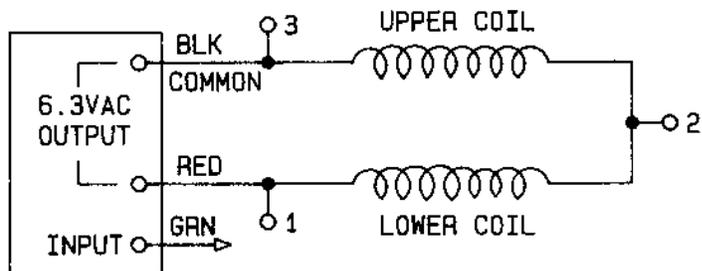
N/A

The only official copy of this file is the one on-line on the Superconducting Magnet Division website. Before using a printed copy, verify that it is the most current version by checking the document issue date on the website.

RHIC-MAG-R-7319A

Page 3 of 5

## RHIC RATIO METER CHECK



MAGNET NO. \_\_\_\_\_  
 +/- .007 MAX. DEV.

			1	2	3
DATE	CK'D BY	REMARKS	WHOLE MAGNET	UPPER HALF	TEST LEADS
		RECORD READINGS 1-3			
			DELTA 1-2	DELTA 2-3	
		CALC DIFFERENCES			
		CALC DEV'S FROM IDEAL 0.5000	DEV	DEV	
			TOTAL OF DELTA'S		

			1	2	3
		RECORD READINGS 1-5			
		CALC DIFFERENCES			
		CALC DEVIATIONS			
		TOTAL OF DELTA'S			
		REMARKS:			

			1	2	3
		RECORD READINGS 1-5			
		CALC DIFFERENCES			
		CALC DEVIATIONS			
		TOTAL OF DELTA'S			
		REMARKS:			

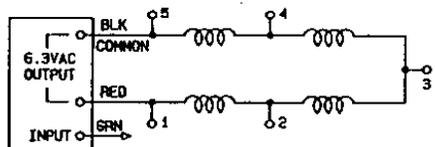
			1	2	3
		RECORD READINGS 1-5			
		CALC DIFFERENCES			
		CALC DEVIATIONS			
		TOTAL OF DELTA'S			
		REMARKS:			

The only official copy of this file is the one on-line on the Superconducting Magnet Division website. Before using a printed copy, verify that it is the most current version by checking the document issue date on the website.

RHIC-MAG-R-7319A

Page 4 of 5

RHIC QUADRUPOLE RATIO METER CHECK



RATIO GUIDE : IN  
: OUT  
MAX. DEV.

MAGNET NO. \_\_\_\_\_

1 2 3 4 5

DATE	CK'D BY	REMARKS						
		RECORD READINGS 1-5						
			DELTA 1-2	DELTA 2-3	DELTA 3-4	DELTA 4-5		
		CALC DIFFERENCES						
			DEV	DEV	DEV	DEV		
		CALC DEV'S FROM IDEAL						
			TOTAL OF DELTA'S					
			1	2	3	4	5	

		RECORD READINGS 1-5					
		CALC DIFFERENCES					
		CALC DEVIATIONS					
		TOTAL OF DELTA'S					
		REMARKS-					
			1	2	3	4	5

		RECORD READINGS 1-5					
		CALC DIFFERENCES					
		CALC DEVIATIONS					
		TOTAL OF DELTA'S					
		REMARKS-					
			1	2	3	4	5

		RECORD READINGS 1-5					
		CALC DIFFERENCES					
		CALC DEVIATIONS					
		TOTAL OF DELTA'S					
		REMARKS-					

The only official copy of this file is the one on-line on the Superconducting Magnet Division website. Before using a printed copy, verify that it is the most current version by checking the document issue date on the website.

RHIC-MAG-R-7319A

Page 5 of 5

DATA SHEET (Cont'd)

RHIC Ratiometer check

List of Equipment Used for Measurements

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