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C-A OPERATIONS PROCEDURES MANUAL

15.3.2.2 Procedure for Hipotting the Booster Main Ring Magnets

(Booster/AGS Ring Power Supply Systems Group Procedure EPS-B-002)

Note: This document was formerly a C-A Group Procedure. The content of the group procedure was reviewed by the Technical Supervisor. All approvals and/or issue dates of the original group procedure are maintained for present use.

Hand Processed Changes

<u>HPC No.</u>	<u>Date</u>	<u>Page Nos.</u>	<u>Initials</u>
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Approved: \_\_\_\_\_  
*Signature on File*  
Collider-Accelerator Department Chairman \_\_\_\_\_  
 Date

M. Bannon

Booster/AGS Ring Power Supply Systems  
Group Procedure EPS-B-002  
Original Revision Date 07/25/2003  
Revision A

# **CA OPERATIONS PROCEDURE FOR HIPOTTING THE BOOSTER MAIN MAGNETS**

## Procedure for Hipotting the Booster Main Ring Magnets

1. Introduction
  - 1.1 This procedure is to determine the integrity of the main magnet electrical insulation.
2. Responsibility
  - 2.1 The Booster Ring must be in a “Controlled Access LOTO” condition.
  - 2.2 The MCR shall be informed that Hipotting of the ring is to be performed.
  - 2.3 The MCR coordinator shall initial the check off list understanding that no one is allowed in the ring while hipotting is going on except the technicians who are doing the test.
  - 2.4 The technicians performing the hipotting shall install their lock on the Booster Token Lockout Box located in Bldg. 914. This box insures that all power supplies that are on the “Controlled Access LOTO” list are locked out so no induced voltage can be induced back on the main magnet bus.
  - 2.5 The 95 switch doors in Bldg 930A (Sta. I & II) can then be opened. The main bus then must be shimmed so they are no longer grounded.
  - 2.6 The water conductivity must be checked and recorded on the Booster test sheets. ( Main magnet water, Transport water, RF water)
  - 2.7 Main magnets shall be Meggered first at 500vdc, 1000vdc, 2500vdc and 5000vdc and then record the resistance on the test sheets.
  - 2.8 If the megger test went well then hipot the ring by shorting Sta.I and Sta. II + and – together using Hipot wire. Then Hipot the ring as per sheets up to 3000 VDC.
  - 2.9 The second test to be performed is the main ring magnet resistance check. Using the Biddle low resistance meter, measure the magnet resistance from Sta. I (+) to Sta. II (-) and record the Sta. I (-) to Sta. II (+) and record.

**AGS OPERATIONS PROCEDURE  
FOR HIPOTTING THE BOOSTER MAIN MAGNETS**

**ATTACHMENT A**

**CHECKLIST BEFORE HIPOTTING BEGINS.**

- |  | <b><u>Initial</u></b> |
|--|-----------------------|
| 1. MCR coordinator has verified that the Booster is in “Controlled Access LOTO” state.   | _____                 |
| 2. MCR coordinator understands that Hipotting is underway in the Booster ring and no one is allowed access except members of the Hipotting team. | _____                 |
| 3. The Hipot team has install their lock on the Booster Token Lock Box in Bldg 914.  | _____                 |

**CHECKLIST AFTER HIPOTTING COMPLETE**

- |   |       |
|---|-------|
| 4. The Hipotting has been completed and the Hipot team has Removed their lock on the Booster Token box.                                       | _____ |
| 5. The MCR coordinator has been informed that the Hipotting is Complete.  | _____ |
| 6. Booster is now on standard “Controlled Access LOTO” and the 95 switches have been verified that they are again grounding the main magnets. | _____ |

**AGS OPERATIONS PROCEDURE  
FOR HIPOTTING THE BOOSTER MAIN MAGNETS**

**ATTACHMENT B**

Date : \_\_\_\_\_

Performed By: \_\_\_\_\_

**1. EQUIPMENT NEEDED**

- A. Fluke -77 or 87 Multimeter
- B. 500 VDC megger
- C. 5000 VDC megger
- D. Low Resistance Biddle Meter
- E. Spellman 15KV @ 33 MA DC Hipot.
- F. High voltage gloves, safety glasses, and grounding stick.
- G. Temp/Humidity Meter

**2. Record the water resistance of the following water systems:**

- A. Main Magnet Water in Bldg 914 Basement \_\_\_\_\_
- B. NSRL Water in Bldg 957 \_\_\_\_\_

**NOTE: Booster Main Magnet Water** conductivity is controlled automatically it is maintained between **800K OHMS to 1.5 MEG OHMS**. If lower than 800K OHMS notify pump room. Normal resistance of **NSRL Water** is approx. **800 K OHMS** (contact Pump Rm for assistance in where to take reading from in Bldg 957)

**3. Before Hipotting the ring begins, make sure the MCR Coordinator has check off step 1 & 2 on Attachment A, and the Hipot Team has installed their lock on the token lockout box in Bldg. 914.** \_\_\_\_\_

**4. Open the front doors of 95 switches (Sta. I & II) and slide the insulating glastic material between the main magnet bus and ground. (two places in each switch.)**

- A. Short the + & - Main Magnet bus together in each switch \_\_\_\_\_
- B. Close the door on 95 Sta. II switch and lock

- C. Using the fluke 77 meter measure the resistance from bus to ground in 95 switch Sta. I and record \_\_\_\_\_
- D. Using the 500 VDC megger measure the resistance from bus to ground in 95 switch Sta. I and record \_\_\_\_\_
- E. Using the 5000 VDC megger measure the resistance from bus to ground in 95 switch Sta. I and record.
  - @1000 VDC \_\_\_\_\_
  - @ 2500 VDC \_\_\_\_\_
  - @ 5000 VDC \_\_\_\_\_

**Note:** Megger check should be better than 275k ohms. AGS operations procedure for Hipotting the booster main magnets

- 5. Record the temp and humidity when Hipotting begins
  - Temp. \_\_\_\_\_
  - Humidity\_\_\_\_\_

- 6. Hipot the ring using the Spellman 15KVDC @ 33ma power supply. Each reading is to be taken for 1 min and record the current at the start of the min and when the min. is up.

VOLTAGE	CURRENT	CURRENTAFTER 1 MIN.
1000 VDC	_____	_____
2000 VDC	_____	_____
3000 VDC	_____	_____

- 7. If during Hipot the ring fails, then it may be necessary to separate the ring into 2 halves. This is done by taking the bare wire that was used in step 4A to short 95 switch Sta. I & II (+ & -) off the switch and now that has separated the ring into two halves.

- 7.1 Hipot from Sta. I (+) to ground first and see if you can reach 3000VDC ( this checks magnet from Sta. I (+) to Sta. II (-)

VOLTAGE	CURRENT	CURRENTAFTER 1 MIN.
1000 VDC	_____	_____
2000 VDC	_____	_____
3000 VDC	_____	_____

7.2 Then Hipot from Sta. I (-) to ground and see if you can reach 3000VDC (this checks magnet from Sta. I (-) to Sta. II (+))

<b>VOLTAGE</b>	<b>CURRENT</b>	<b>CURRENTAFTER 1 MIN.</b>
1000 VDC	_____	_____
2000 VDC	_____	_____
3000 VDC	_____	_____

Record any troubles found:

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8. Check the resistance of each half of the ring and record

From Sta. I (+) to Sta. II (-) \_\_\_\_\_Milliohms.  
From Sta. I (-) to Sta. II (+) \_\_\_\_\_Milliohms

9. After all testing is complete return the 95 switches back to the grounded state and remove your lock off the token lockout box and notify MCR that the Hipot test is completed.

**BOOSTER RING IS BEING**

**HIPOTTED**

**“NO ADMITTANCE”**

**DATE: \_\_\_\_\_**

**CONTACT:**

**NAME: \_\_\_\_\_ PAGER # \_\_\_\_\_**

**NAME: \_\_\_\_\_ PAGER # \_\_\_\_\_**

**NAME: \_\_\_\_\_ PAGER # \_\_\_\_\_**

**OR**

**MCR ext. 4662**