PREX Septum Magnet Test Plan

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I. INTRODUCTION

This document outlines a test plan for the PREX septum magnet. The magnet will be arriving from the manufacturers by early November 2009. We plan to set up the magnet in Hall C and test the magnet to 120% of operating power. We will also make a crude field map, first at low current and then at high current.

The parameters of the magnet are shown in the table. The magnet is pair of a room temperature dipoles designed to deflect the scattered electrons at 5° to match the HRS at 12°.

II. TEST PLAN

1. Check for shorts to ground with Ohmmeter.
2. Leak checks of water connections.
3. Megger test to check insulation to ground. Float the coil to 1 kV and measure leakage current to ground. To get to 1 kV ramp in steps of 50 V and pause one minute per step, making current measurements at each step.
4. The mechanical stability and location of the coils must be monitored with 2 mm accuracy. We need a simple jig to measure possible deflections of the coil.
5. The temperature of the coil should be measured at strategic locations.
6. Put 2 Amps in the coil, or enough to measure a non-zero B field.
7. Using a field probe, check the B field at several locations to verify the expected magnitude and direction. More on the required accuracy below.
8. Repeat the field probe measurements at 20 Amps.
9. Gradually ramp the current up to 120% of operating current. The steps should be 10 Amps with a pause of one minute at each step. The mechanical deflection and temperature should be monitored.
10. The ramp to 120% power should be repeated three times.
11. Let the magnet remain at 120% of current for 8 hours.
12. At the operating current, make a field map. We should check in about 20 locations at least, with a position accuracy of ~ 5 mm and a field accuracy of $\frac{dB}{B} \sim 5\%$.

TABLE I: **PREX Septum Magnet Parameters**

Parameter	**Value**
B Field	0.46 T
Voltage	108 V
Current	500 A
Power	54 kW
Water Flow	100 gpm

III. PERSONNEL

The following persons are responsible for executing this test plan. Paul Brindza (engineer), Bill Vulcan, John LeRose, and Robert Michaels (staff scientists), Ed Folts (Hall A work coordinator), plus technicians assigned by Ed Folts, and a graduate student Chun-Min Jen (aka Mindy).

IV. SAFETY ISSUES

1. The electrical and mechanical setup must be performed by qualified technicians only. Ed Folts is in charge of overseeing the setup.
2. The high current and high voltage (see table) are a life-threatening safety hazard. Precautions must be taken to ensure nobody can touch live power. For any work on the electrical parts, the power supply must be turned off and the coil shorted to ground before touching it.
3. Large internal forces exist when the magnet is operating at full current. As with any new magnet, there is a danger that the magnet could tear itself apart if it was not manufactured correctly. Hence, the magnet must be taken up slowly and monitored for mechanical deflection of its parts. Those involved in the test should stand at least 8 feet away during each incremental increase in current, and wear face protection.
4. Students involved in the field measurements must be given proper training on the safety hazards.