PROGRESS AND STATUS IN SNS MAGNET MEASUREMENTS AT ORNL

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Abstract

The Spallation Neutron Source (SNS) contains more than 600 magnets. Among them, about 400 magnets for the Linac and transfer lines are being measured on site at Oak Ridge National Laboratory. These magnets include Permanent Magnet Quadrupoles, Electromagnetic Quadrupoles, Dipoles and Correctors. The Permanent Magnet Quadrupoles are installed in the Drift Tube Linac (DTL) and are the only Permanent Magnets in the machine. These measurements are for magnets installed in the DTL, Coupled Cavity Linac (CCL), Superconducting Linac (SCL), High Energy Beam Transport (HEBT), and the Ring to Target Beam Transport (RTBT) line. All magnets have met specifications. Approximately three fourths of the magnets have so far been measured and installed. This presentation outlines the magnet measurements for SNS at ORNL and overviews the activities and accomplishments to date.

INTRODUCTION

The magnet measurement activity at ORNL is summarized in the chart below. Measurements are completed for the DTL, CCL, SCL and the HEBT. Measurements for RTBT magnets are underway.

For Quadrupoles, magnetic center is located using the measurement coil center. The magnet is then current cycled and then $G \times L$ vs. Current is measured. Harmonics vs. Current are determined from these measurements. During measurements, cooling flow and delta-P, inlet and outlet temperature are recorded. Magnet Voltage vs. current is recorded.

Each Quadrupole is fiducialized with respect to magnetic center. For Dipoles the situation is the same except that $B \times L$ vs. Current is measured. Correctors are the same as Dipoles but are not fiducialized.

All Quadrupoles and correctors were measured using “Halbach” style coils [1]. The HEBT Dipoles were mapped using a planer coil that moved in the horizontal direction. What follows are pictures and graphs that show results of these measurements starting with the DTL and continuing on through the RTBT.

DTL PMQ’s

DTL EMD’s

RTBT EMDC’s

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The above two graphs show the CCL Quad Transfer Functions vs. Current and the spread in Transfer Functions among all the magnets.

**SCL 8Q35 MEASUREMENTS**

The SCL magnets are composed of nine singlets, 28 doublets and one spare. The doublets match within 0.1% of each transfer function.
In the RTBT there will be three sets of four Quads and one set of three Quads. Each set will be on a common power supply. The Quads within each set have to be matched within 0.1%. In the above data, there are one set of four and one set of three matched to 0.1%.

The RTBT dipole will be mapped using the above rotating “Halbach” style planer coil. At the moment, this coil is being assembled here at SNS. The magnet will be mapped in-situ using the installed power supply.

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REFERENCE