The Superferric Cyclotron Gas Stopper Magnet Design and Fabrication

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Abstract - The Facility for Rare Isotope Beams (FRIB) under construction and the existing National Superconducting Cyclotron Laboratory at Michigan State University (MSU) will provide exotic low energy rare isotope beams (KeV-MeV) by stopping relativistic fragments produced by projectile fragmentation at high energies (<50 MeV/u). The stopped radioactive ions using the cyclotron gas stopper magnet system will feed the existing program centered on precision mass measurements of exotic nuclei and laser spectroscopy. Later on stopped radioactive ions will be available as reaccelerated low energy beams (<15 MeV/u) using compact linear accelerator currently under construction. The cyclotron gas stopper magnet is a warm iron superconducting cyclotron sector dipole. The maximum field in the gap (0.18 m) is 2.75 T. The outer diameter of magnet yoke is 4.0 m, with a pole radius of 1.1 m and Br = 1.8 T m. The desired field shape is obtained by a pole profile. Each coil of the two halves is in a separate cryostat and connected in series through a warm electrical connection. The entire system is mounted on a high voltage platform, and will be cooled by six cryocoolers. This paper presents the magnet design and discusses various design aspects of the magnet.

Keywords - Cyclotron Magnet, Natural Convection Helium Cooling, Superconducting Coils, and Warm Iron Return Path.

IEEE/CSC & ESAS European Superconductivity News Forum (ESNF) No. 23 January 2013; Category 6.
The published version of this preprint appeared in *IEEE Transactions on Applied Superconductivity* 23, 4101805 (June 2013).