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M1Po3C-01: Design, fabrication, and testing of the quadrupole triplet magnet for the HRS project

Monday 19 May 2025 14:00 (2 hours)

The Facility for Rare Isotope Beams (FRIB) is a scientific user facility under the U.S. Department of Energy Office of Science (DOE-SC) and an independent scientific user organization of approximately 1,800 researchers. The High Rigidity Spectrometer (HRS) will be the centerpiece experimental tool of the FRIB fast-beam program, enabling experiments with the most exotic, neutron-rich nuclei available at FRIB. A discrete cosine theta quadrupole triplet was designed for the HRS project. This magnet, with a warm bore of 200 mm, 18.5 T/m quadrupole field gradient, and a total length exceeding 2 meters, lacks an iron yoke and thus weighs only one-third of a traditional iron-dominated quadrupole triplet, which can reduce cooldown time and reduce the helium requirement by a factor of 3-4. The newly designed magnet can improve mechanical behavior and operation efficiency by reducing secondary beam tuning time. A new protection circuit has also been designed to ensure the safe operation of superconducting magnets. This work will present the design, full-scale prototype fabrication, and testing of the quadrupole triplet magnet.

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