HTS-based Quadrupoles

Ramesh Gupta (BNL)

Facility for Rare Isotope Beams (FRIB) requires magnets that can be subjected to very large heat loads (over 200 Watts) and survive an intense level of radiation (~10 MGy per year). High Temperature Superconductors (HTS) offer a unique solution as magnets made with them can remove these heat loads more efficiently at higher temperatures than magnets made with conventional superconductors operating at 4 K. After successfully demonstrating a magnet made with the first generation HTS to operate at ~30 K, BNL is now building a higher performance design with the second generation (2G) HTS which allows 50% higher gradient and operates at 40-50 K. All coils in the final support structure have tested at 77 K. In addition measurements performed at BNL show that 2G HTS is highly radiation tolerant. The goal of this program is to demonstrate the viability of HTS magnets operating in a real machine with a challenging environment. The technology developed here is expected to find an application in a number of other cases, as well.