Permanent Magnets Assemblies for Accelerator and NMR Applications

Robert R. Lown, Robert Mercurio, SABR Enterprises, LLC.

RLown@SABRLLC.net, RMercurio@SABRLLC.net

SABR Enterprises, LLC., the latest incarnation of Field Effects, Inc., has been in the design and fabrication of permanent magnet assemblies for accelerator and NMR applications business for over the past 40 years. The design of these assemblies requires an in-depth understanding of the magnetic and mechanical properties of commercially available materials. Design methods include proprietary codes based on analytical formulations to quickly optimize the assembly for performance and cost. Many assemblies have specifications that cannot be achieved with commercially available tolerances of the components alone, but must be 'tuned' after assembly. This requires the use of specialized measurement and test equipment along with proprietary computer codes. The 'tuning' method and range must be part of the overall magnetic and mechanical design. SABR has successfully built a wide range of Halbach Array assemblies; drift tube quadrupoles, beam line quadrupoles and dipoles, and NMR/MRI dipoles. These range in size from Ø5mm bore to whole body MRI systems. A wide array of hybrid (iron and PM material) assemblies have been built, most recently a temperature-compensated design for the recycler ring at Fermilab.