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An Actively Shielded 1.5T MgB_2 MRI Magnet Design[1] MICHAEL MARTENS, TANVIR BAIG, MIHAI CARA, ROBERT BROWN, Case Western Reserve University, DAVID DOLL, MICHAEL TOMSIC, Hyper Tech Research Inc. — Superconducting magnets for MRI are often constructed with NbTi wire cooled below 4.2K using liquid helium. As helium costs have more than tripled in the last decade, there is a need for a cryogen-free conduction-cooled alternative. A key reason for pursuing MgB_2 superconductor wire in the design of MRI magnets is its superior critical current compared to NbTi over a temperature range of 10-15K. We present a 1.5T whole body actively shielded main magnet design assuming second-generation multifilament MgB_2 wire using an improved functional approach. The design exhibits 4 pairs of primary bundles and 1 pair of shielding bundles with an inner (outer) diameter of 1.1 (1.89)m and a length of 1.54m. The imaging volume is 45cm with a maximum of 9ppm inhomogeneity. The wire dimension is assumed to be $1mm^2$ and the wire current is 135A. The maximum field on a wire is found to be 4.1T well below the critical field value of approximately 6T at 10K for the second-generation wire. The 5-Gauss footprint for the new magnet is found to be 2.7 (3.7)m in the radial (axial) direction. The maximum hoop stress and axial force on a bundle, respectively, are 82.9MPa and 2680.2kN. Trade-offs for the reduction of any given parameter are analyzed.

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Robert Brown
Case Western Reserve University

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