

Title: Simulation of the Magnetic Induction Vector of a Magnetic Core to be Used in FFC NMR Relaxometry

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Abstract: This paper is a contribution for the assessment and comparison of magnet properties based on magnetic field characteristics particularly concerning the magnetic induction uniformity in the air gaps. For this aim, a solver was developed and implemented to determine the magnetic field of a magnetic core to be used in Fast Field Cycling (FFC) Nuclear Magnetic Resonance (NMR) relaxometry. The electromagnetic field computation is based on a 2D finite-element method (FEM) using both the scalar and the vector potential formulation. Results for the magnetic field lines and the magnetic induction vector in the air gap are presented. The target magnetic induction is 0.2 T, which is a typical requirement of the FFC NMR technique, which can be achieved with a magnetic core based on permanent magnets or coils. In addition, this application requires high magnetic induction uniformity. To achieve this goal, a solution including superconducting pieces is analyzed. Results are compared with a different FEM program.

Author Keywords: Magnetic core; Magnetic uniformity; Superconductors; Permanent magnet

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