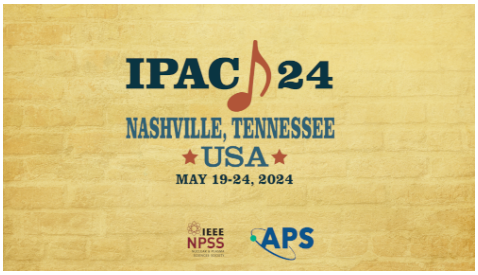

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Extended Jiles-Atherton hysteresis model to accurately predict fields in a Rapid Cycling Synchrotron dipole magnet

Tuesday, 21 May 2024 16:00 (2 hours)

Particle accelerators use high field quality magnets to steer and focus beams. Normal conducting magnets commonly use soft iron for the yoke, which is subject to hysteresis effects. It is common practice to use an initialization procedure to accomplish a defined state of the magnet for which its hysteresis behavior must be known. In this article, a variation of the scalar Jiles-Atherton model with an improved physical basis called the Extended Jiles-Atherton (EJA) model is employed to predict the B-H trajectories in a Rapid Cycling Synchrotron (RCS) magnet. Simulations are conducted using COMSOL Multiphysics using the external material feature to integrate EJA model with the Finite Element Method (FEM). Results from the experimental studies conducted on a magnet prototype are also presented. Finally, potential improvements in the model and extension to the case of a two-dimensional anisotropic material are discussed.

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