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Variation of magnetic H field in closed loop magnetic circuits: problems with the standard equation ESAINDANG UMENEI, EUGENE MELIKHOV, DAVID JILES, Wolfson Centre for Magnetics, Cardiff University, WOLFSON CENTRE FOR MAGNETICS TEAM — We have developed a reliable method for calculating the variation of magnetic field H in closed circuits. This offers advantages over standard numerical Finite Element Modeling which requires meshing of the spatial domain. Such calculations can consume enormous computational resources and time. Analytical models work much faster but are only applicable in restricted cases. The well known "standard model" for the relationship between current I and magnetic field H derived from Ampere's Law is$H = \frac{N\,I}{L}$, where N I is magnetomotive force and L is the length of the magnetic path. However, this formula fails to describe the variation in magnetic field with position. In fact H is usually inhomogeneous around a closed path unless special precautions have been taken to ensure uniformity. In order to describe the magnetic field around a closed circuit we have introduced extensions to the standard formula for a finite coil in a closed circuit. This includes parameters for location and shape of core to enhance the accuracy. This analytic model produces fast and accurate predictions for the variation of H with position. Results are comparable with FEM calculations that take much longer to generate.

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