Title: The calculation of magnetic field distribution in nonlinear anisotropic media

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Abstract: In the present work we study the modelling of stationary magnetic fields in nonlinear anisotropic media by FEM. The magnetic characteristics of such materials are thouroughly examined and eventually applied to the construction of a full 2D model of an anisotropic steel sheet. Some improvements in the construction in comparision with the ones previously published were achieved. We point out that the standard formulations and the subsequent theorems for the boundary value problems do not in fact correspond with the physical situation. Instead, we propose new formulations that reflect real physical properties of matter. General existence and uniqueness theorems for the obtained boundary value problems are proved as well as the convergence theorems for the discrete solutions. The conventional and full 2D model of an anisotropic steel sheet are compared in two transformer core models using the adaptive Newton-Raphson iterative scheme. The obtained results are then presented with commentary. This work also points out the steps needed for the construction of an accurate 3D model of steel-dielectric laminations that was not yet elaborated.

Keywords: anisotropic, magnetic, reluctivity, Newton-Raphson method