A CONVERGENT LINEAR FINITE ELEMENT SCHEME FOR SCATTERED MAXWELL–LANDAU–LIFSHITZ–GILBERT EQUATIONS

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Abstract. We consider the Landau–Lifshitz–Gilbert-equation (LLG) on a bounded domain Ω with Lipschitz-boundary Γ coupled with the linear Maxwell equations on the whole space. As the material parameters outside of Ω are assumed to be constant, we are able to reformulate the problem to a scattered MLLG system in Ω coupled to a boundary equation on Γ.
We define a suitable weak solution (which still has a reasonable trace for the boundary equation) and propose a time-stepping algorithm which decouples the Maxwell part and the LLG part of the system and which only needs linear solvers even for the nonlinear LLG part. The approximation of the boundary integrals is done with convolution quadrature.
Under weak assumptions on the initial data and the input parameters we show convergence of the algorithm towards weak solutions, which especially guarantees the existence of solutions to the scattered MLLG system.

Keywords: convolution quadrature · maxwell · maxwell-LLG · linear scheme · ferromagnetism · boundary elements · transparent boundary conditions · convergence

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