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A posteriori error estimates for finite element discretizations of time-harmonic Maxwell's equations coupled with a non-local hydrodynamic Drude model

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We consider finite element discretizations of Maxwell's equations coupled with a non-local hydrodynamic Drude model that accurately accounts for electron motions in metallic nanostructures. Specifically, we focus on *a posteriori* error estimation and mesh adaptivity, which is of particular interest since the electromagnetic field usually exhibits strongly localized features near the interface between metals and their surrounding media. We propose a novel residual-based error estimator that is shown to be reliable and efficient. We also present a set of numerical examples where the estimator drives a mesh adaptive process. These examples highlight the quality of the proposed estimator, and the potential computational savings offered by mesh adaptivity.

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