Advantage of local p-adaptivity in FEM simulation of normal zone propagation in a Rebco tape

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***Abstract*--- The Finite Element Method (FEM) allows detailed simulation of multi-physics problems in HTS magnets. It is well-known that the required high level of discretization, especially in 3D, becomes quickly computationally expensive, and practically limits the size of the domain that can be reliably simulated. However, often high accuracy is needed only locally, so the model efficiency could be improved by dynamically adapting the accuracy based on the system characteristics. In this work we explore the so-called p-adaptivity, meaning that the order of the polynomial shape functions is locally adapted based on an appropriate criterion, e.g. a local field gradient or a residual. We added p-adaptivity capabilities to the open source FEM library Sparselizard (www.sparselizard.org) to demonstrate and quantify the improvement in simulation time for a quench propagation in a Rebco tape.**

Key words: FEM, mesh adaptivity, p-adaptivity, Sparselizard, normal zone propagation velocity

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