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## Abstract

Components that store electrical energy in ferroelectrics and produce currents when their permittivity is explosively reduced are used in a variety of applications. The modeling and simulation of such devices is a challenging problem since one has to represent the coupled physics of detonation, shock propagation, and electromagnetic field generation. The high fidelity modeling and simulation of complicated electromechanical devices was not feasible prior to having the ASCI computer and the ASCI developed codes at Sandia National Laboratories. One tool used to model and simulate the performance of such devices is the EMMA computer code. EMMA is based on the ALEGRA code which is an arbitrary Lagrangian-Eulerian material dynamics code that accommodates large deformations and strong shock physics. EMMA adds to ALEGRA the capabilities to perform electromagnetic calculations based on a quasi-static approximation to Maxwell's equations and to model circuits. EMMA includes models for ferroelectric materials that couple the stress and dielectric tensors through a set of electrostrictive coupling parameters. Here, I discuss the capabilities of the EMMA code for modeling and simulation one such electromechanical device, a firing set, with the added complexity of assessing its performance with aged materials. The calibration of the models

using experimental data is also discussed.

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