

Non-linear material modeling in ICEPIC

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The improved concurrent electromagnetic particle in cell (ICEPIC) code is successfully used to model high power microwave sources and devices. Some devices of interest contain non-linear materials for which the permittivity depends on the strength of the fields applied. Examples include Barium Strontium Titanate (BST), and lead magnesium niobate (PMN). Modeling these materials while achieving numerical stability and preserving the relevant physics is challenging. For example, the non-linear materials admit shock waves, and an infinitely steep shock causes numerical difficulty. In reality, shocks are not infinitely steep because the materials do not respond with infinite speed. The numerical method must capture these issues. The presentation will discuss the merits and shortcomings of the non-linear material model.