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Development and testing of cut-cell boundaries for electromagnetic particle-in-cell codes. CHET NIETER, DAVID N. SMITHE, PETER H. STOLTZ, JOHN R. CARY[1], Tech-X Corporation — The finite difference time domain (FDTD) approach for electromagnetic particle-in-cell (EM-PIC) is a proven method for many problems involving interactions of charged particles with electromagnetic fields. However accurately modeling fields and particle process at complex boundaries with such methods is still an active research topic. A variety of methods have been developed for this purpose but the testing and application of these methods to real world problems in fairly limited. We have recently implemented the Dey-Mittra boundary algorithm into our EM-PIC code VORPAL. Convergence tests comparing how the frequency of cavity oscillations converge to the physical values for simulations run with stair-step and Dey-Mittra algorithms will be presented. These tests demonstrate how the Dey-Mittra algorithm provides considerable improvements over stair step boundaries. A method to correct for the image charge accumulation from removing particles at complex surfaces will also be presented. Applications to superconducting RF cavities and high-powered microwave devices will be presented.

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