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CPIC: A Parallel Particle-In-Cell Code for Studying Spacecraft Charging COLLIN MEIERBACHTOL, GIAN LUCA DELZANNO, DAVID MOULTON, LOUIS VERNON, Los Alamos National Laboratory — CPIC is a three-dimensional electrostatic particle-in-cell code designed for use with curvilinear meshes [1]. One of its primary objectives is to aid in studying spacecraft charging in the magnetosphere. CPIC maintains near-optimal computational performance and scaling thanks to a mapped logical mesh field solver [2], and a hybrid physical-logical space particle mover (avoiding the need to track particles). CPIC is written for parallel execution, utilizing a combination of both OpenMP threading and MPI distributed memory. New capabilities are being actively developed and added to CPIC, including the ability to handle multi-block curvilinear mesh structures. Verification results comparing CPIC to analytic test problems will be provided. Particular emphasis will be placed on the charging and shielding of a sphere-in-plasma system. Simulated charging results of representative spacecraft geometries will also be presented. Finally, its performance capabilities will be demonstrated through parallel scaling data.

[1] G.L. Delzanno, et al., "CPIC: A Curvilinear Particle-In-Cell Code for Plasma-Material Interaction Studies," IEEE Trans. Plas. Sci., 41 (12), 3577 (2013).
[2] J.E. Dendy, "Black Box Multigrid," J. Comp. Phys., 48, 366 (1982).

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