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Particle-In-Cell Multi-Algorithm Numerical Test-Bed[1] M.D. MEYERS, P. YU, A. TABLEMAN, V.K. DECYK, W.B. MORI, University of California Los Angeles — We describe a *numerical test-bed* that allows for the direct comparison of different numerical simulation schemes using only a single code. It is built from the UPIC Framework, which is a set of codes and modules for constructing parallel PIC codes. In this test-bed code, Maxwell's equations are solved in Fourier space in two dimensions. One can readily examine the numerical properties of a real space finite difference scheme by including its operators' Fourier space representations in the Maxwell solver. The fields can be defined at the same location in a simulation cell or can be offset appropriately by half-cells, as in the Yee finite difference time domain scheme. This allows for the accurate comparison of numerical properties (dispersion relations, numerical stability, etc.) across finite difference schemes, or against the original spectral scheme. We have also included different options for the charge and current deposits, including a strict charge conserving current deposit. The test-bed also includes options for studying the analytic time domain scheme, which eliminates numerical dispersion errors in vacuum. We will show examples from the test-bed that illustrate how the properties of some numerical instabilities vary between different PIC algorithms.

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