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CPIC: a curvilinear Particle-In-Cell code for plasma-material interaction studies ENRICO CAMPOREALE, GIAN LUCA DELZANNO, LANL — We present a recently developed Particle-In-Cell (PIC) code in curvilinear geometry, CPIC (Curvilinear PIC), where the standard PIC algorithm is coupled with a grid generation/adaptation strategy. Through the grid generation strategy (based on Winslow's method), the code can simulate domains of arbitrary complexity, including the interaction of complex objects (with the simulation domain conforming exactly to the objects without any stair-stepping) with a plasma. At present the time-integration is explicit and the code is two-dimensional and electrostatic (only Poisson's equation is solved). It features a hybrid particle mover, where the computational particles are characterized by position in logical space and velocity in physical space. Poisson's equation is solved with preconditioned GMRES. We will present the application of the code to standard test problems such as plasma waves, two-stream instabilities, Landau damping and the charging of a spherical object in a plasma. We will also discuss techniques that can be used to reduce PIC noise, which can be critical when the ratio of the largest to the smallest cell volume becomes large.

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