

Mesh Refinement for Particle-In-Cell Plasma Simulations: application to Heavy Ion Fusion

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The numerical simulation of the driving beams in a heavy ion fusion power plant is a challenging task, and, despite rapid progress in computer power, one must consider the use of the most advanced numerical techniques. One of the difficulties of these simulations resides in the disparity of scales in time and in space which must be resolved. When these disparities are in distinctive zones of the simulation region, a method which has proven to be effective in other areas (e.g. fluid dynamics simulations) is the mesh refinement technique. We will discuss the challenges posed by the implementation of this technique into plasma simulations. A collaboration project is under way to couple the Adaptive-Mesh-Refinement and the Particle-In-Cell techniques. We will describe our progress and present our initial findings.