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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.