



# Rethinking Electrostatic Solvers in Particle Simulations for the Exascale Era

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In preparation to the exascale era, an alternative approach to calculate the electrostatic forces in Particle Mesh (PM) methods is proposed. While the traditional techniques are based on the calculation of the electrostatic potential by solving the Poisson equation, in the new approach the electric field is calculated by solving the Ampere's law. When the Ampere's law is discretized explicitly in time, the electric field values on the mesh are simply updated from the previous values. In this way, the electrostatic solver becomes an embarrassingly parallel problem, making the algorithm extremely scalable and suitable for exascale computing platforms. An implementation of a one dimensional PM code is presented to show that the proposed method produces correct results, and it is a very promising algorithm for exascale PM simulations.

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