Joint DESY and University of Hamburg Accelerator Physics Seminar

Tuesday, December 4-th, 2007

(16:00 in Room 459/30b)

3d Space Charge Routines:
the Software Package MOEVE and FFT Poisson Solvers†

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Abstract

Precise and fast 3D space charge calculations for bunches or clouds of charged particles are of growing importance in recent electron cloud studies. One of the possible approaches is the particle mesh method, computing the potential of the bunch in the rest frame by means of Poisson's equation. The software package MOEVE has been developed for space charge calculations on non–equidistant grids [2]. It consists of several iterative Poisson solvers (MOEVE Poisson solvers), among them the state–of–the–art multigrid Poisson solver. Furthermore, the MOEVE Poisson solvers have been implemented in the tracking code Astra [1], where a 3D FFT Poisson solver is also available. In this paper the algorithms of the software package MOEVE will be described and differences to the FFT–based Poisson solvers will be discussed. Furthermore the recently developed FFT Poisson solver applying the integrated Green's function was added to our test suite [3]. A tracking simulation with Astra will demonstrate the advantages and disadvantages of each method, respectively.

[1] K. Flöttmann. *ASTRA*. DESY, Hamburg, `http://www.desy.de/~mpyflo`, 2000.

[2] G. Pöplau. *MOEVE: Multigrid Poisson Solver for Non–Equidistant Tensor Product Meshes.* Universität Rostock, 2003.

[3] Ji Qiang, Steve Lidia, Robert D. Ryne, and Cecile Limborg–Deprey. *Three–dimensional quasistatic model for high brightness beam dynamics simulation.* Phys. Rev. ST Accel. Beams, 9(4):044204, Apr 2006.

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