**Accuracy and Efficiency of 2D and 3D Fast Poisson's Solvers for Space Charge Field Calculation of Intense Beam**, Y.K. BATYGIN, RIKEN - Design of particle accelerators with intense beams requires careful control of space charge problem. To obtain accurate treatment of the problem, solution of the Poisson's equation for electrostatic potential created by an arbitrary space charge distribution of the beam is required. Numerical programs developed for particle-in-cell calculation of 2D and 3D space charge field of high current beam in perfect conducting pipe of rectangular and circular cross section are examined. Two numerical techniques are used: (i) finite-difference method, combining Fourier expansion and Gauss elimination and (ii) spectral method, utilizing Fourier or Fourier-Bessel expansion of electrostatic potential. Accuracy and time consuming for calculation of test problem are compared. Number of macroparticles varied between 5e+03 and 5e+05; number of mesh points varied between 2e+02 and 2e+06. Typical error in space charge field calculation for 2D test problem is 0.2% - 1%, while for 3D problem is 1.5% - 5%.