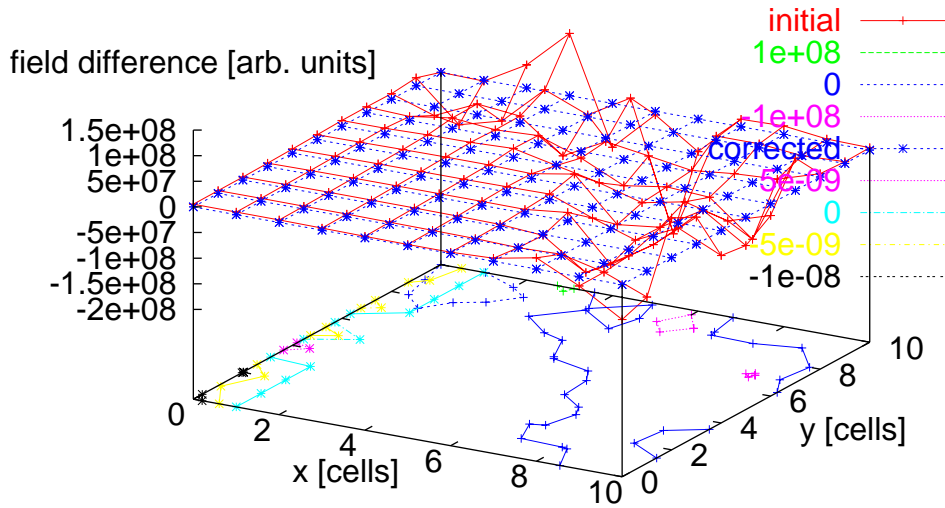
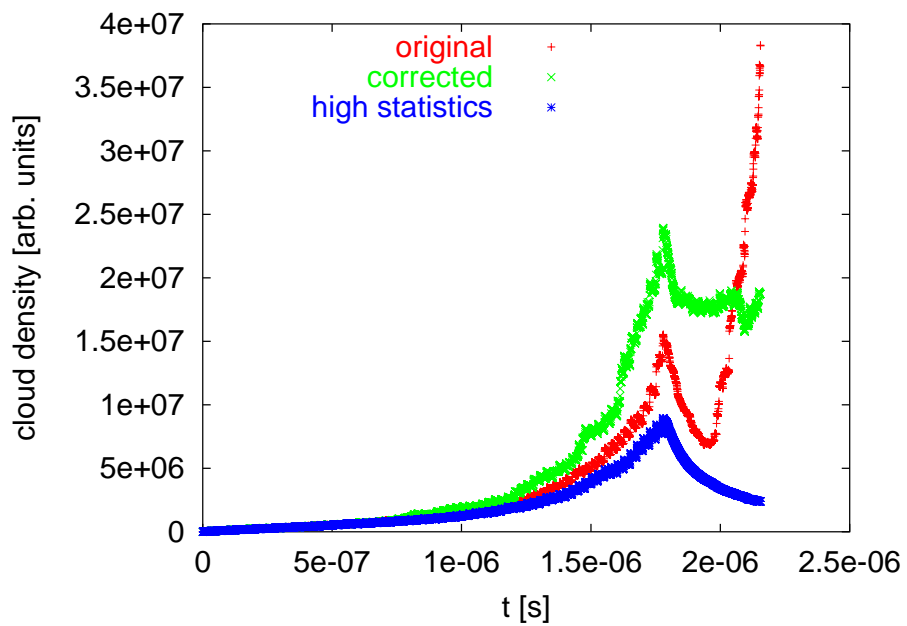


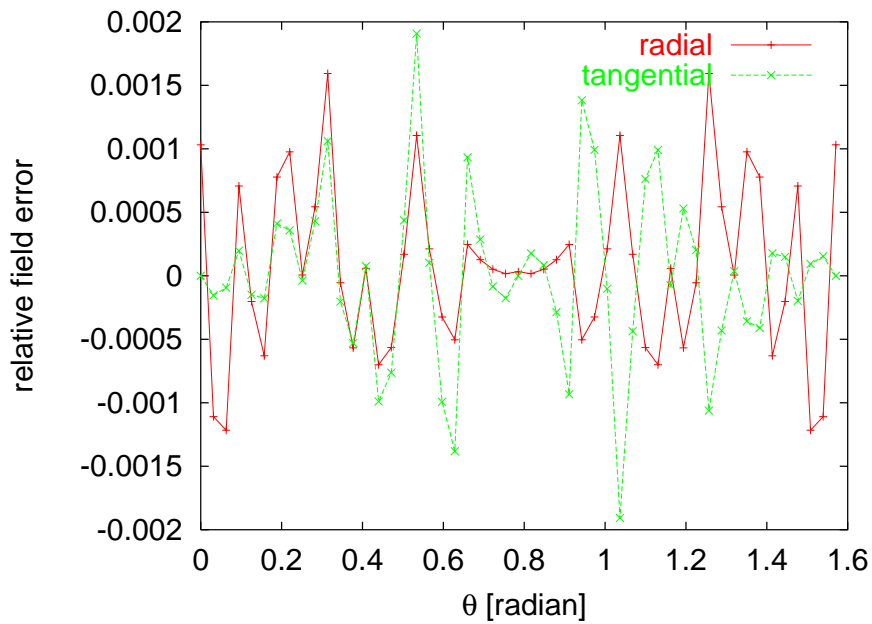
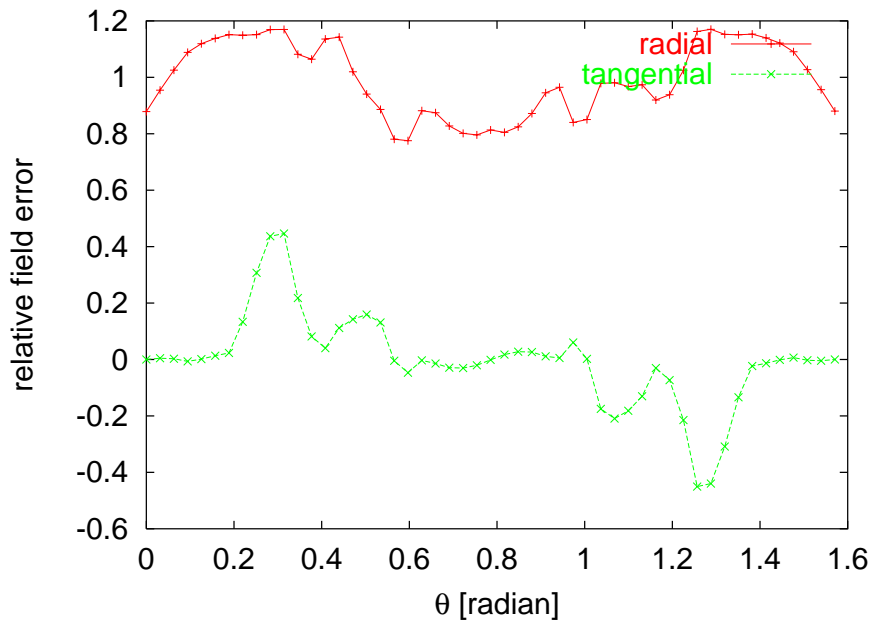
Field Symmetry for Space Charge



Charges close to the surface lead to an asymmetry



Field Precision



Improvements in Performance

Concentrating on elliptical case (LHC)

Strong Dipole

- only vertical motion

- run time 5 h \rightarrow 1 h (72 bunches)

 - improved space charge calculation

Quadrupole

- Full solution of equation of motion using ODE-solver

- run time 340 s \rightarrow 145 s (1 bunch)

 - better ODE-solver

Dipole with ODE-solver

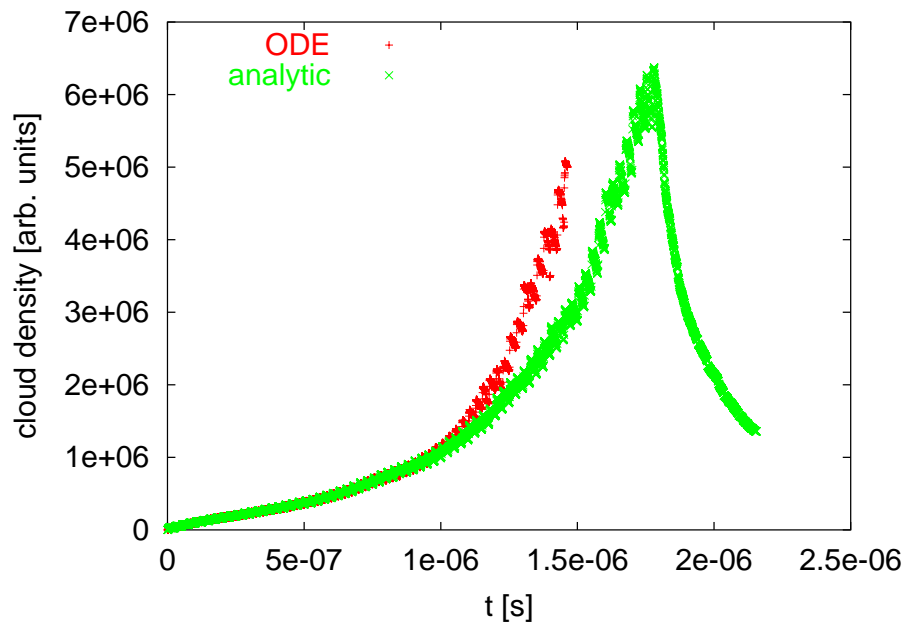
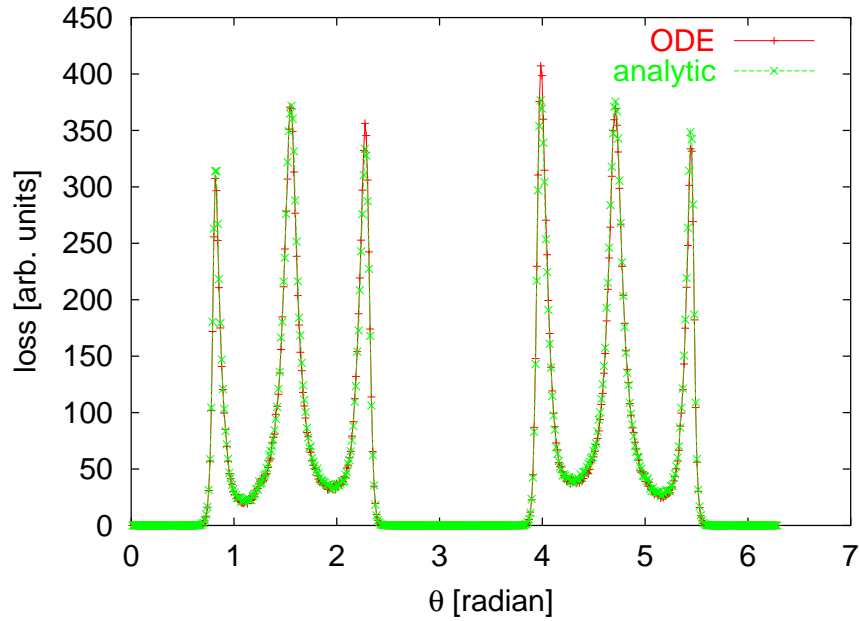
- Full solution of equation of motion using ODE-solver

- can be done analytically ($\gamma \approx 1$)

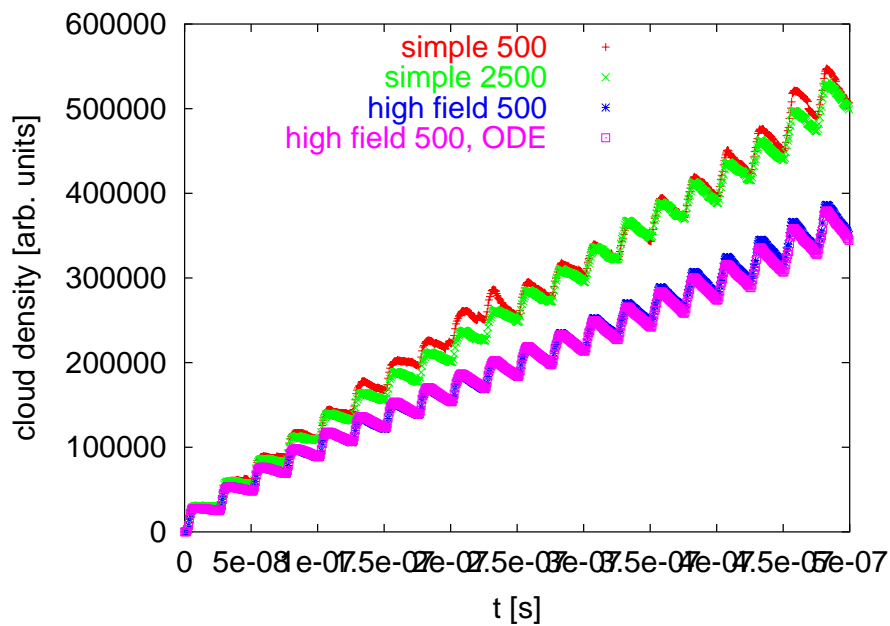
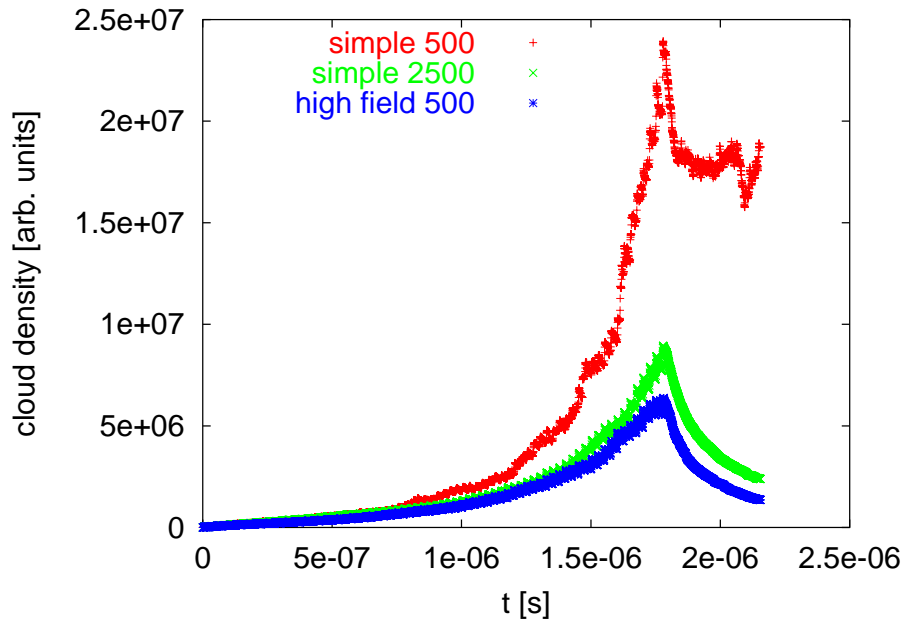
- run time 31 h \rightarrow 5 h (low field, 72 b.)

- run time ?? h \rightarrow 1 h (high field, 72 b.)

Comparison ODE and Analytic Solution



Comparison: Fixed Position and ODE



Dependence on Field

