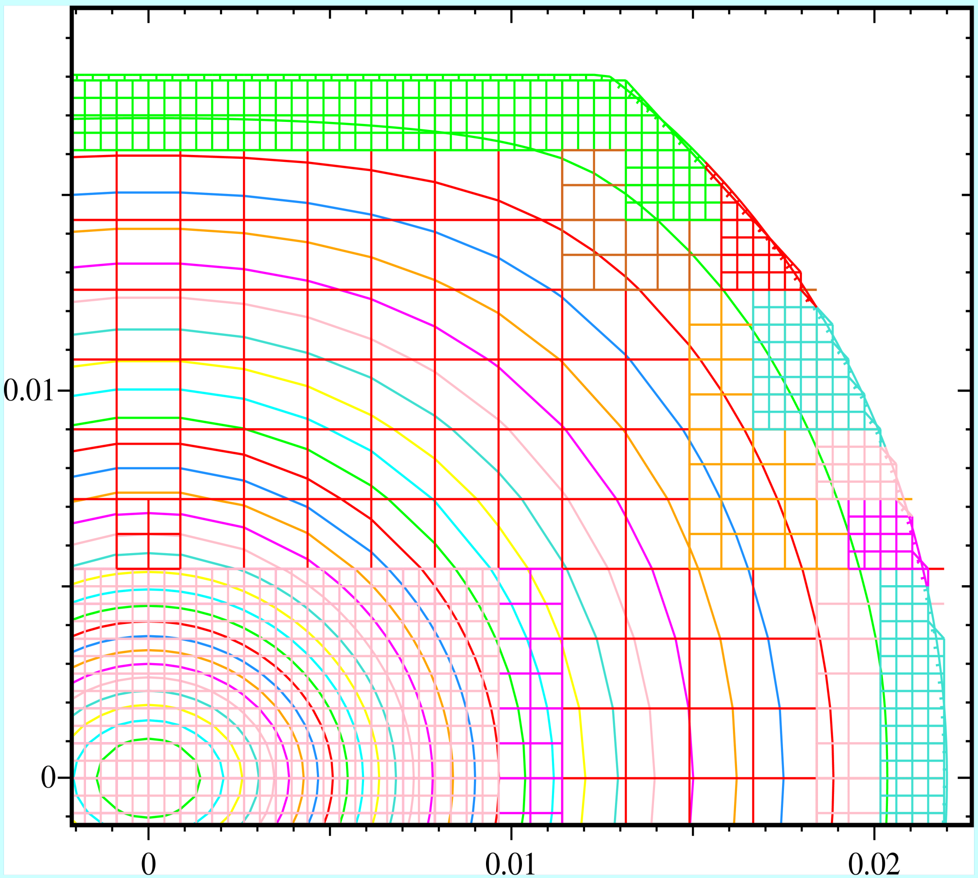
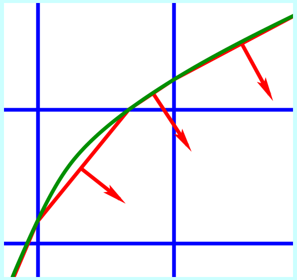
Faktor2: Electrostatic PIC in 2D/3D



For each timestep:
- Charge deposition on the grid.
- Solution of Poissons equation to obtain electrostatic force.
- Integrating Newtons law to obtain new particle positions.

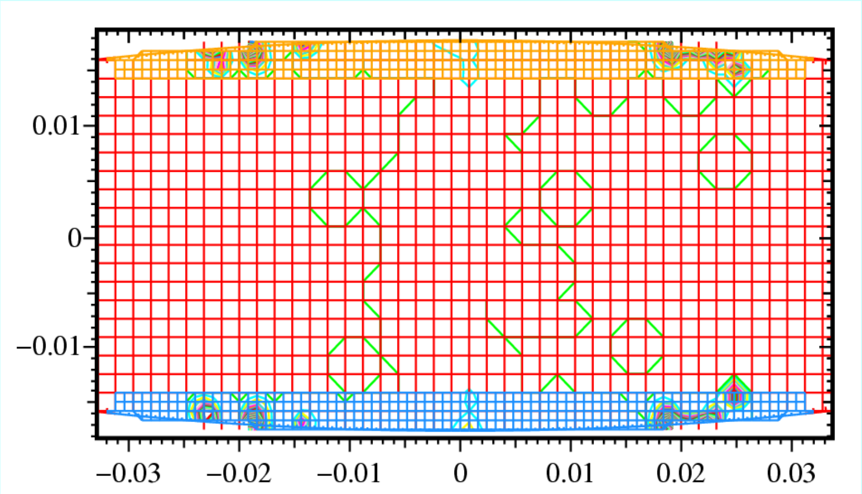
The mesh is recursively refined.
The spacing decreases by a factor of 2 per refinement level.
Electrons and Ions of arbitrary mass are tracked.
The exciting beam may have any cross section.
Arbitrary 3D magnetostatic fields may be applied.

Secondary Emission Yield depends on the impact angle.
Collision of particles with the boundary is detected by computing the distance to the nearest boundary segment.

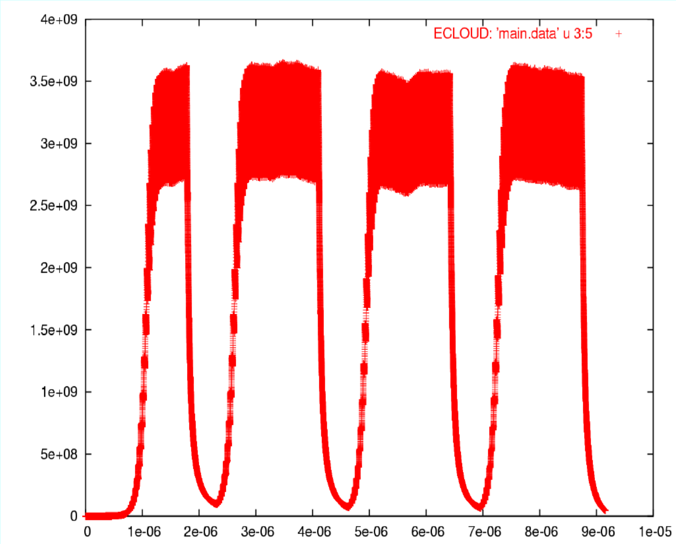


Electron cloud buildup

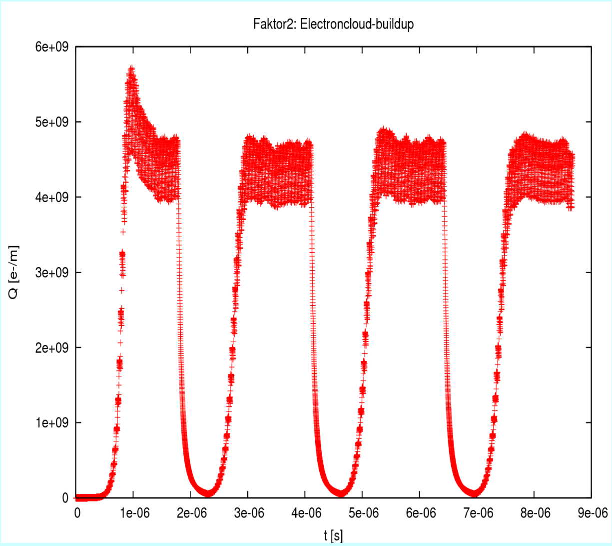
- 2D Results comparable with ECLOUD



Snapshot of charge density



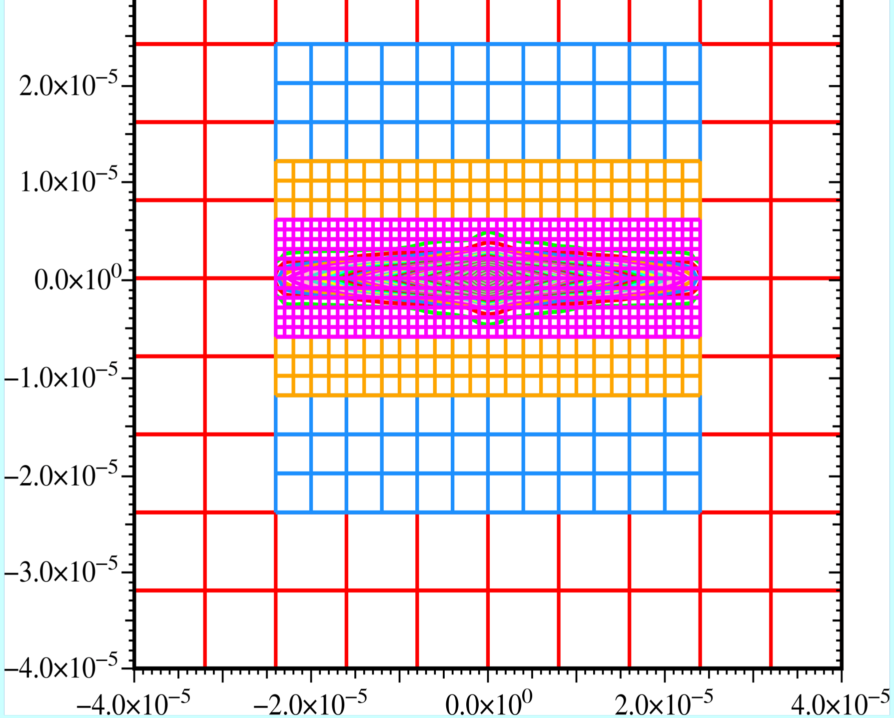
e-/m, computed by ECLOUD



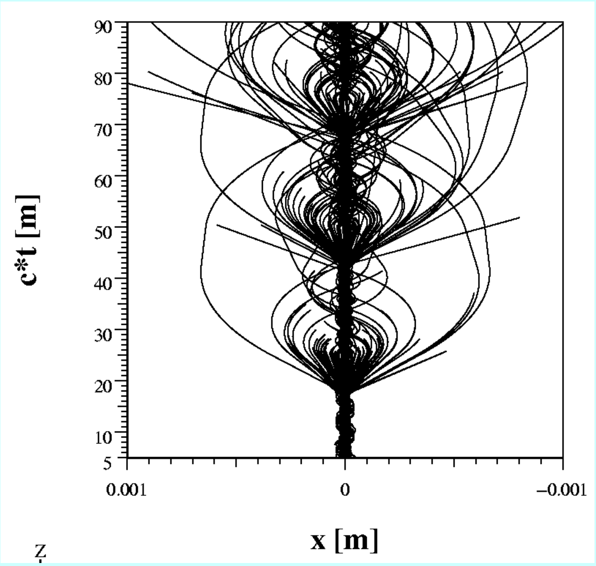
e-/m, computed by Faktor2

Ion-Trapping

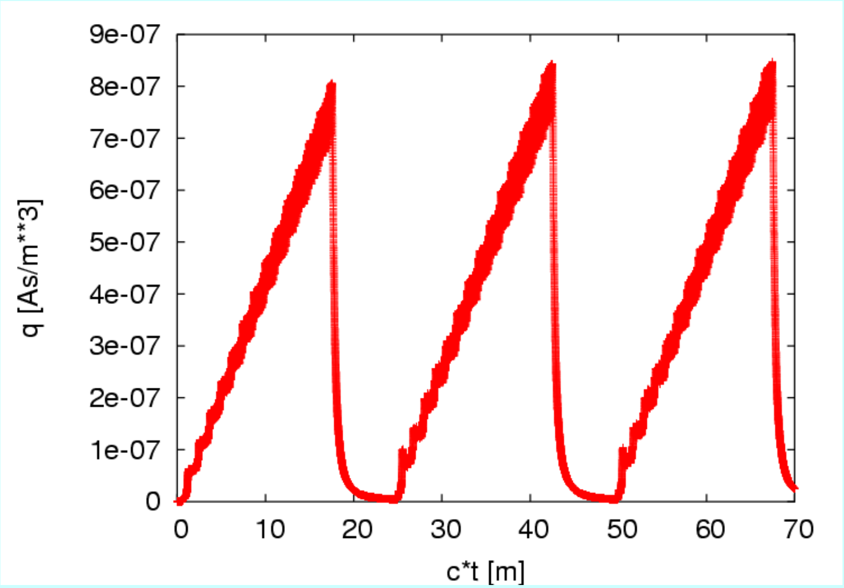
- Recursively refined mesh allows resolution of tiny beam extensions.
- Ion-Trapping can be simulated.



Snapshot of charge density of CO-Ions



CO-Trajectories

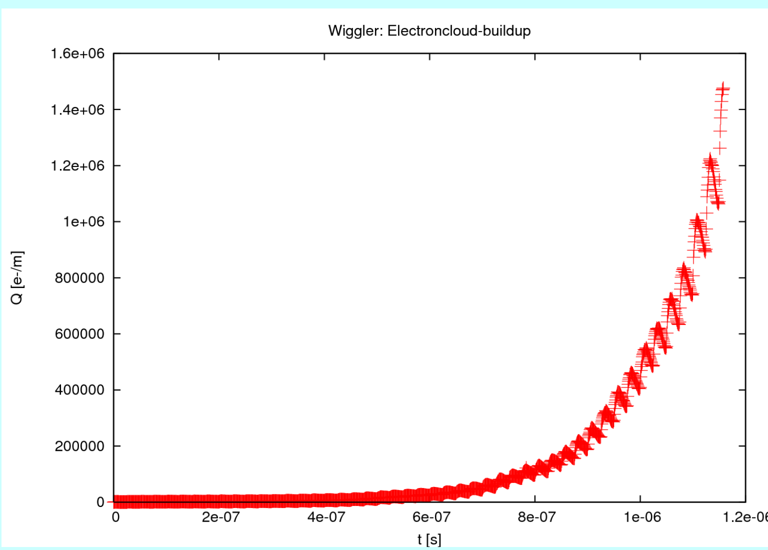


Density of CO-Ions on the axis

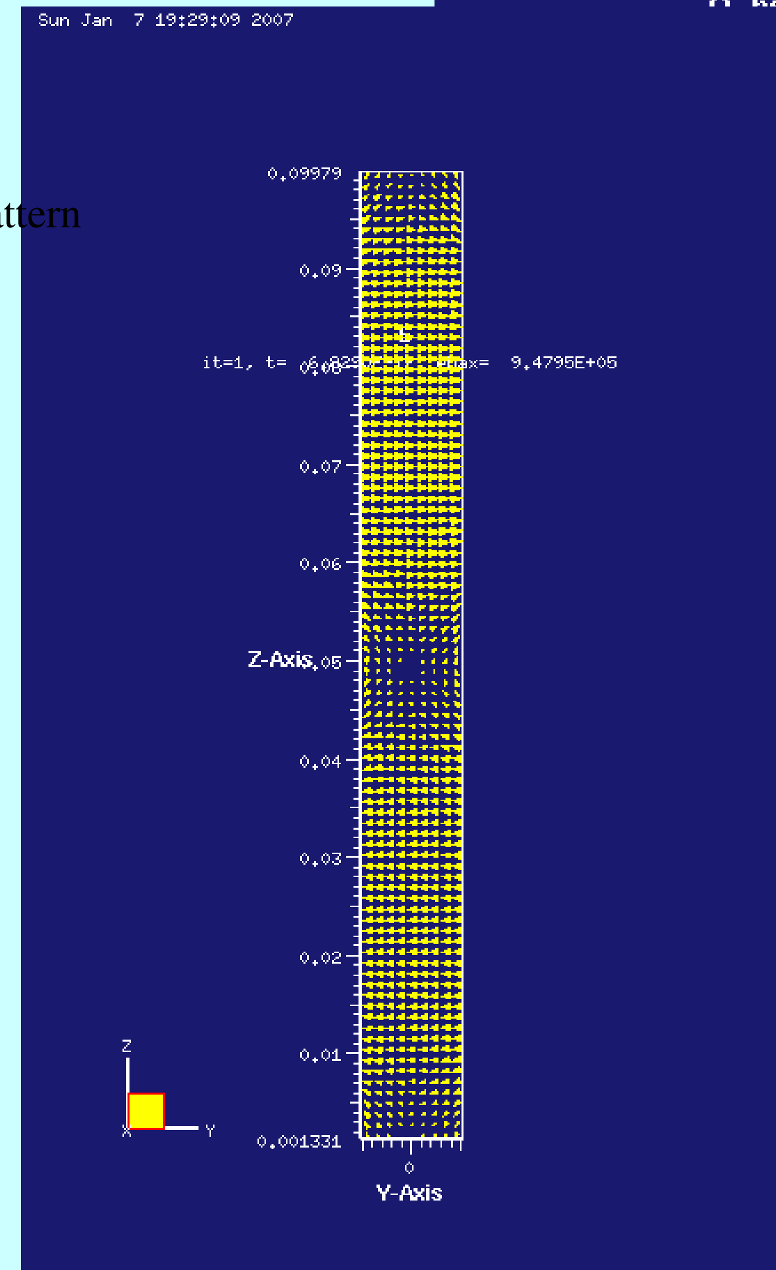
Electron cloud in wiggler

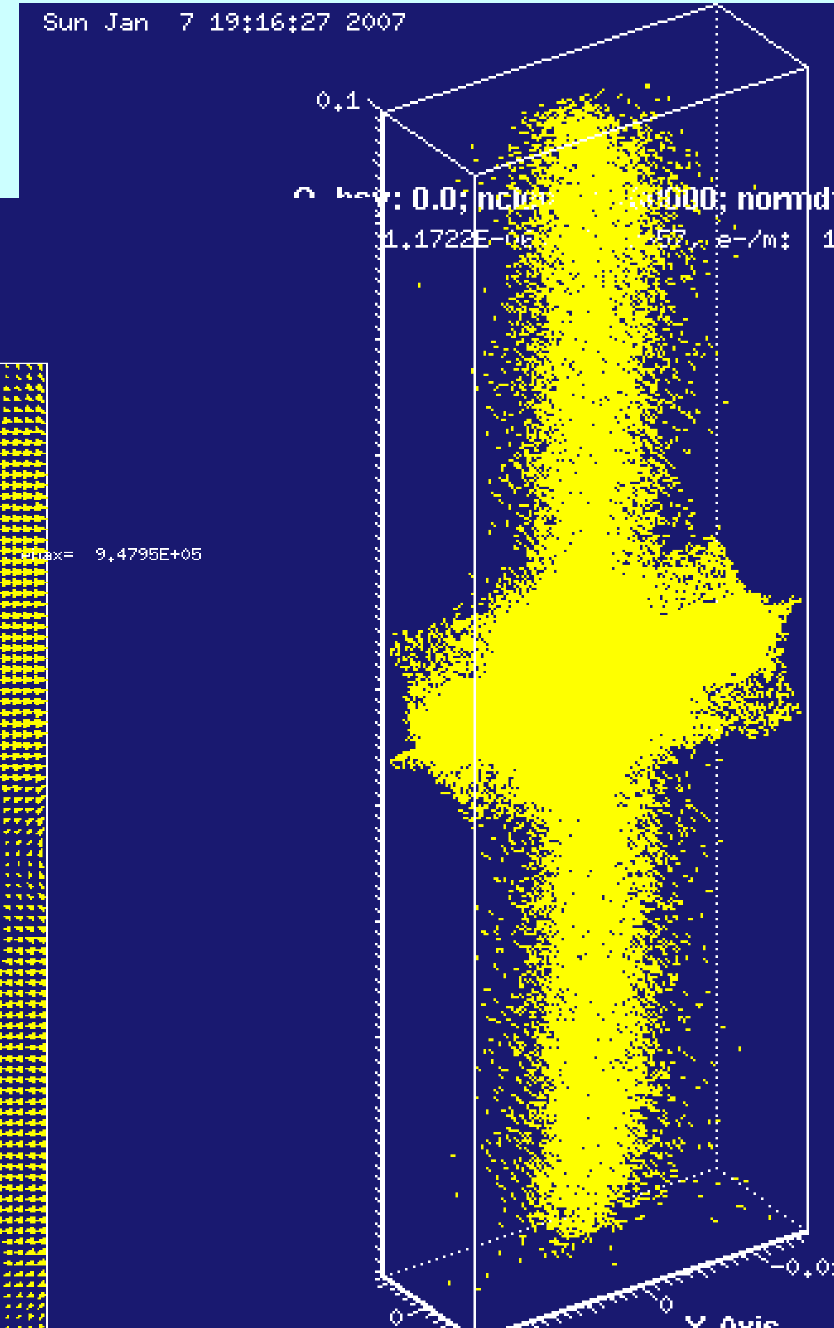
- 3D magnetostatic field

3D magnetostatic field produces 3D charge pattern and 3D trajectories.

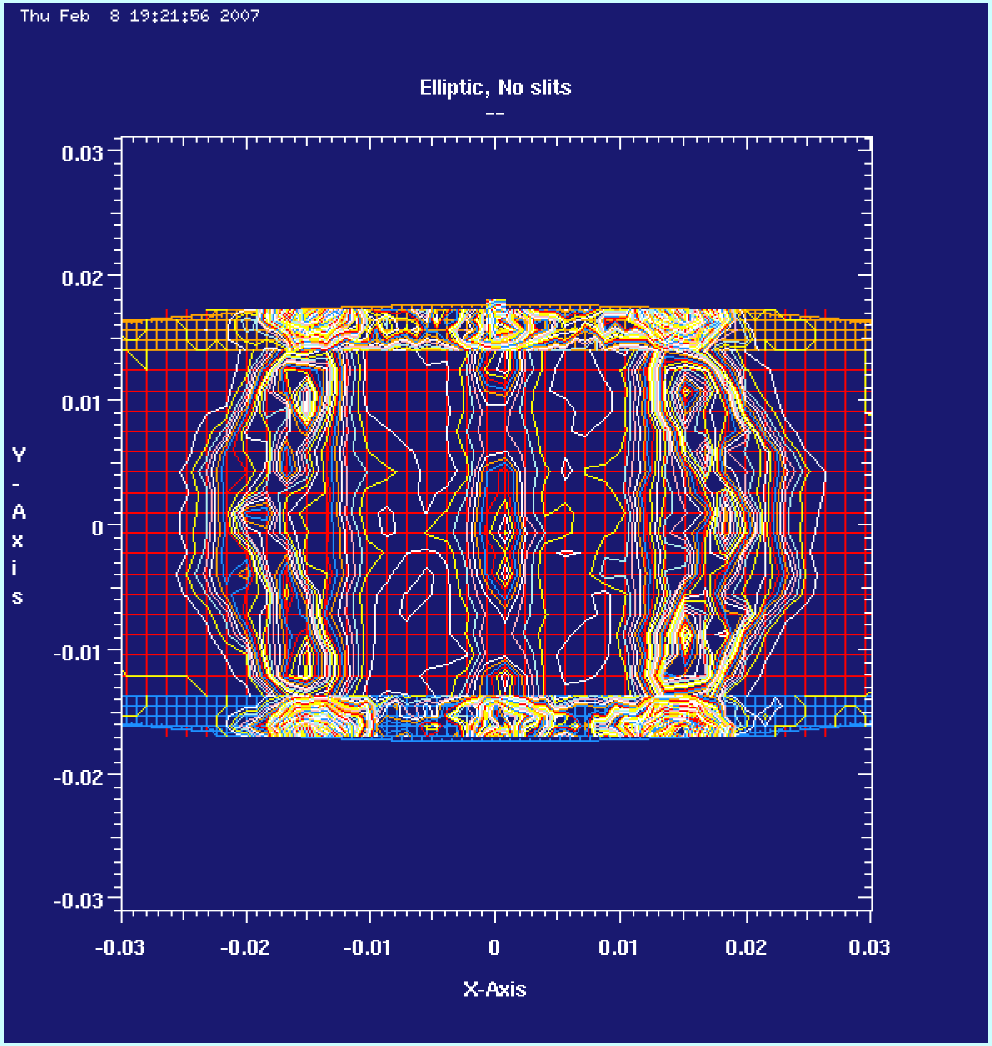


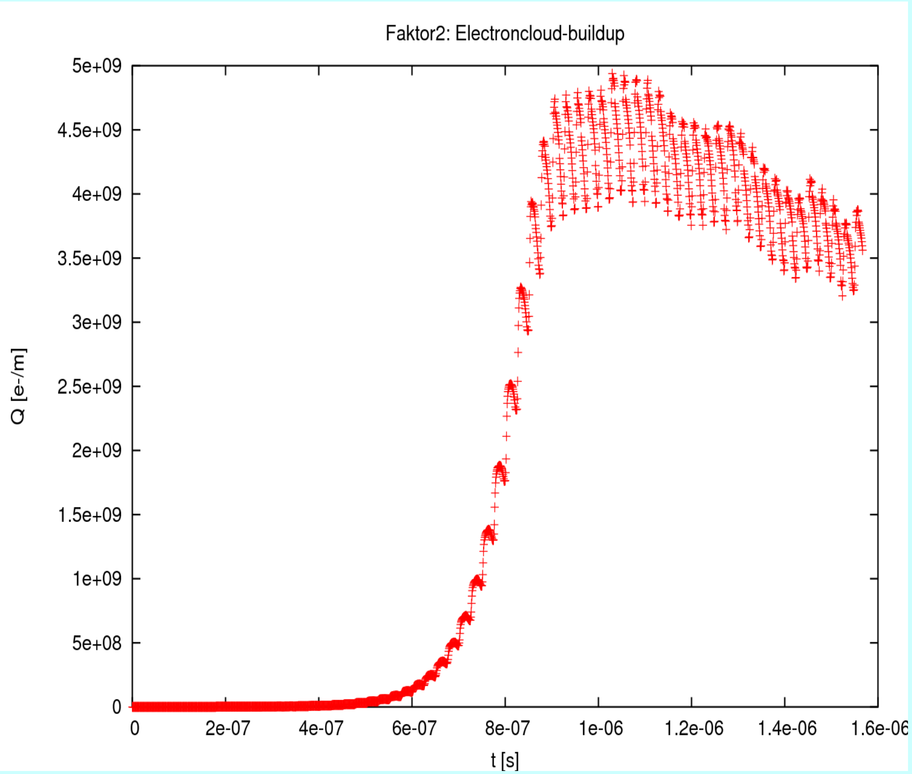
Electron cloud buildup in wiggler.
This time range needed 30 cpu hours, then the computation stopped because of insufficient disk space :-(





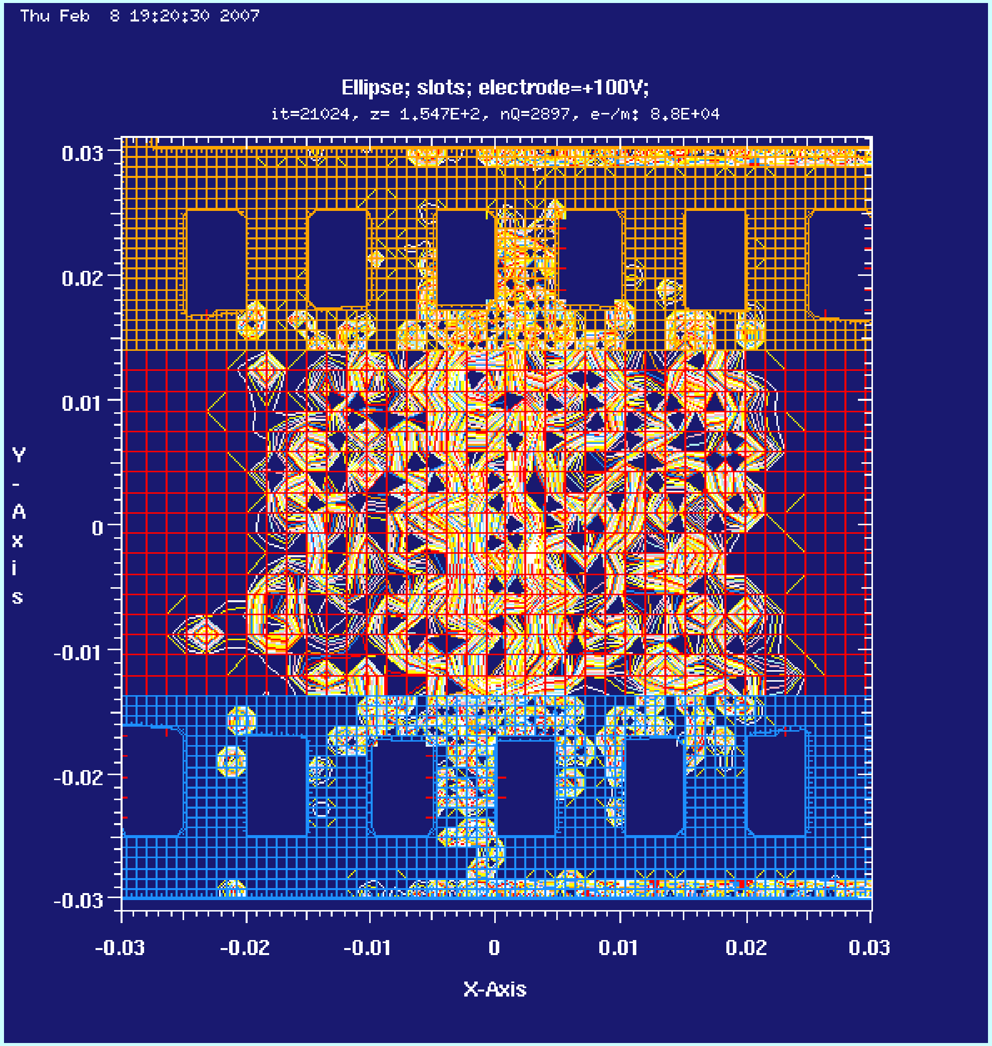
Slits for catching Electrons (1)

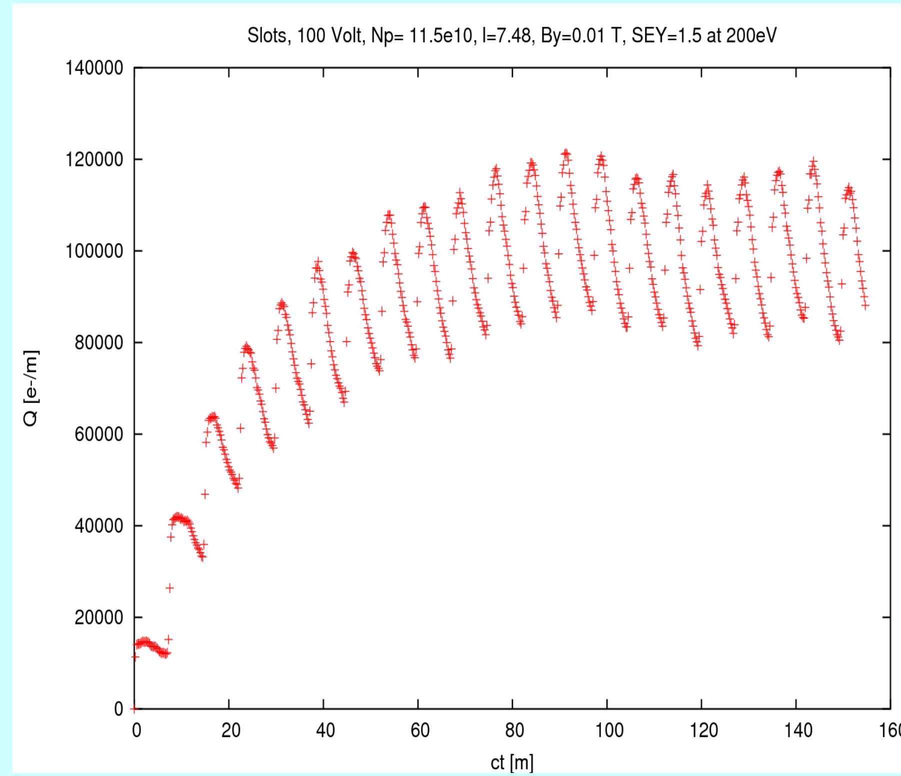




The charges move mainly in y-direction, following the magnetic field lines.
The positions of maximal charge density are such that the electrons hit the opposite wall with an energy where a maximum of the secondary emission yield is.
The position of the maximum varies with the charge of the beam.

Slits for catching Electrons (2)





When the beampipe is slitted such that electrons which start on a wall end up in slits on the other side of the beampipe, they will not be accelerated out of that slit.
The slits have to be wider than the gyro-radius.
Clearing electrodes behind the slits may suck the electrons further away from the beampipe.