

A detailed wireframe model of an electron accelerator is shown. The model features a large, central ring structure with a complex internal lattice of components. To the left, there are several smaller, interconnected sections of the accelerator, including a section with a circular loop. The entire structure is rendered in a light gray wireframe style, highlighting the intricate geometry of the machine.

Report on lens design and electron beam dynamics

ARIES WP16 meeting
20 Apr 2021

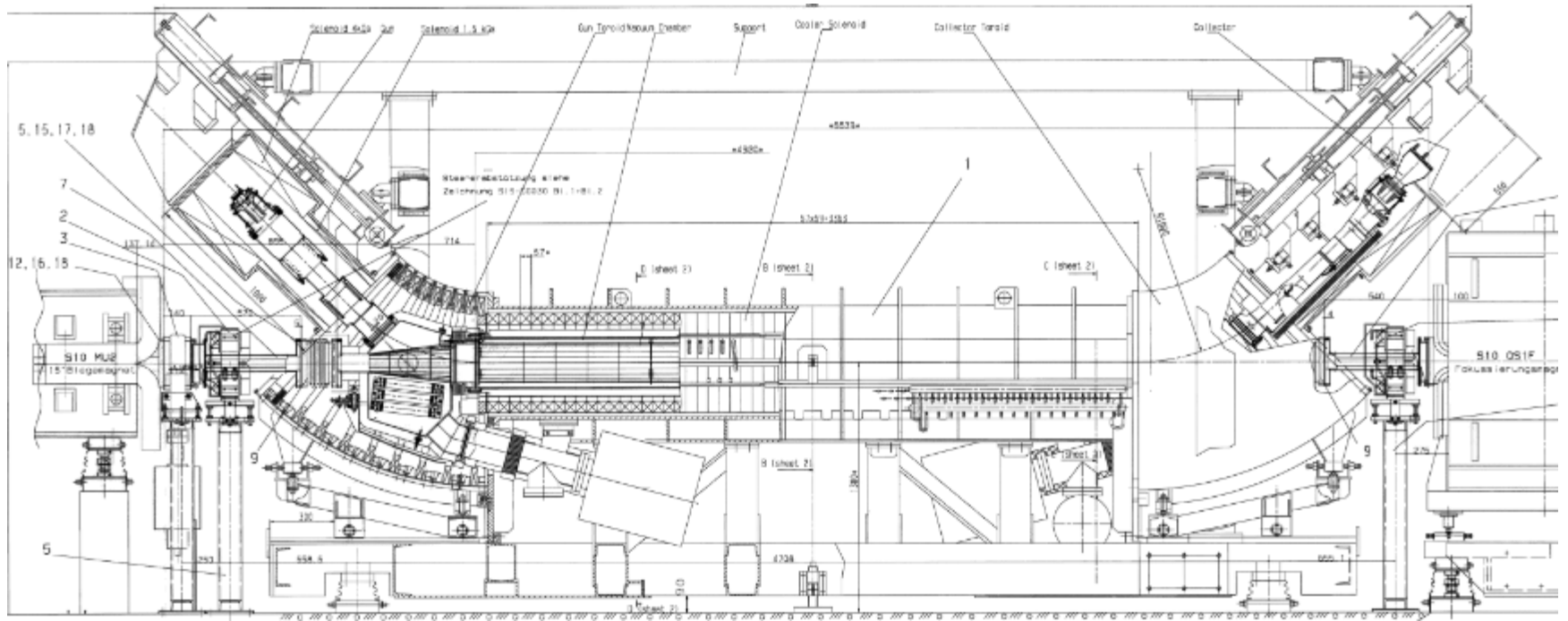
S. Artikova, K. Ulrichs-Schulte, D. Ondreka

- E-lens conceptual design
- Electron beam transport simulation

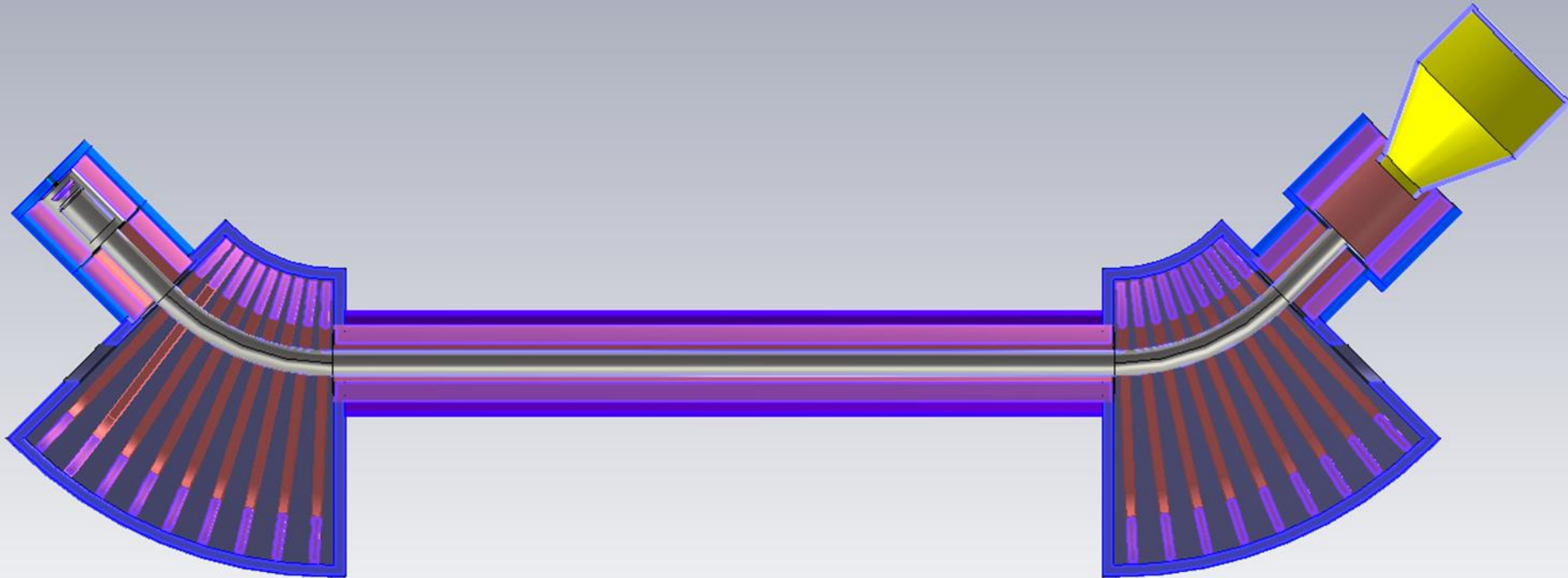
- Setup (gun solenoid only) and current extraction
- Electron beam acceleration process (space charge)
- Space charge potential

- Ongoing work: to analyze the results from SEE simulation
- optimize the collector and repeller electrode positions
- correction coils

SIS18 electron cooler



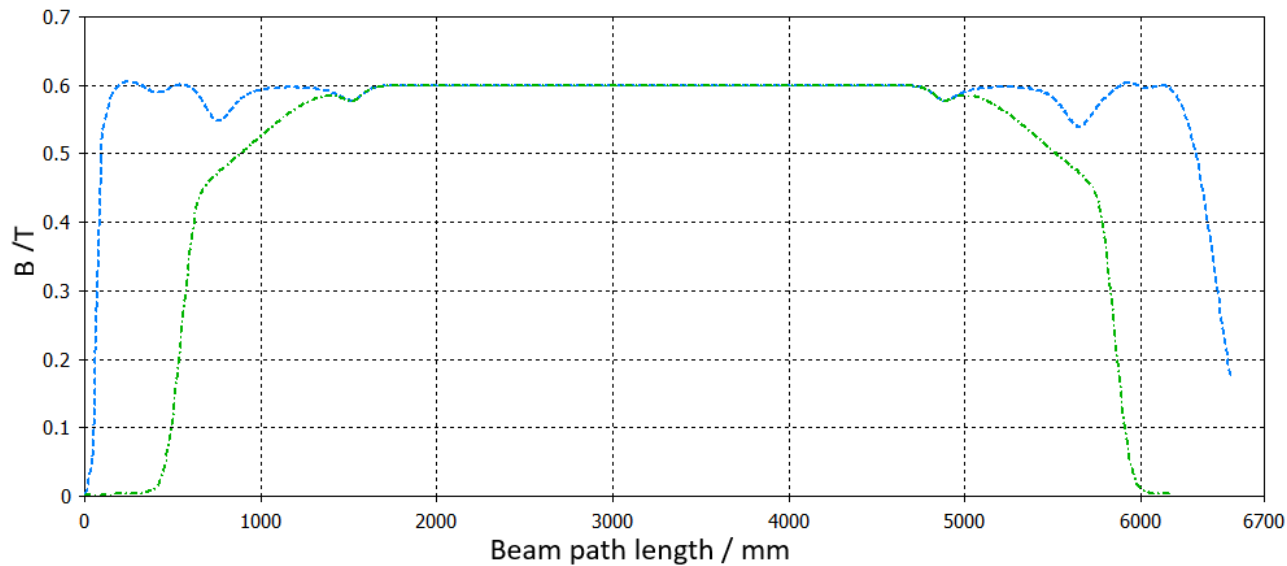
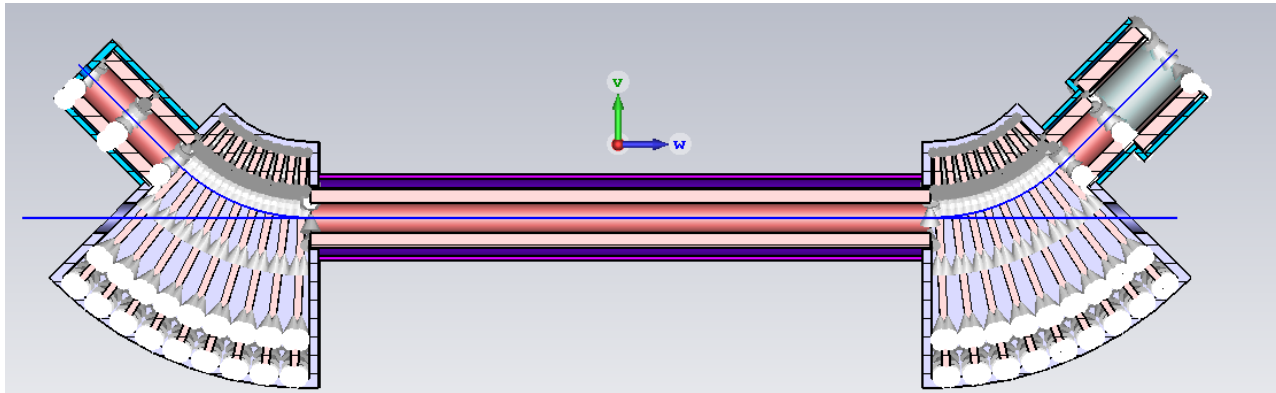
Electron lens design



3 solenoids with identical coils
2 toroidal section with identical (9) coils
main solenoid
pre-collector solenoid
collector

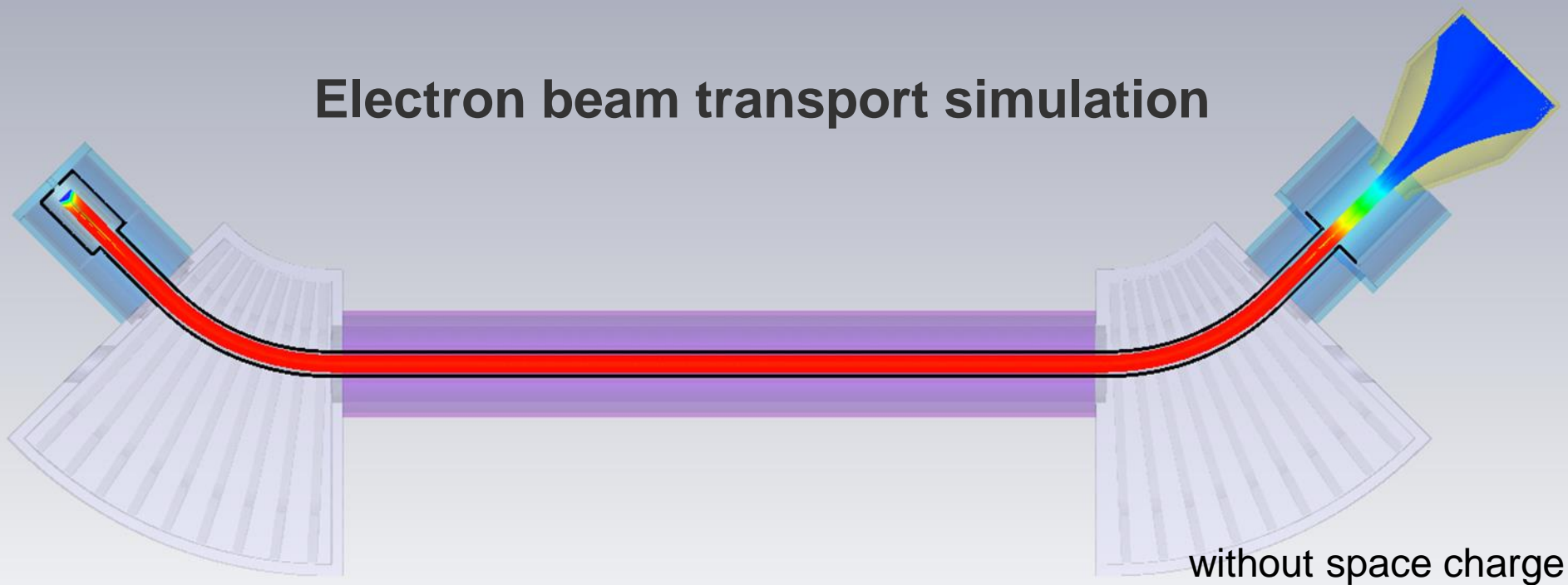
cathode
anode
beampipe
grounded electrode
ceramic insulator

Magnetic field 0.6T

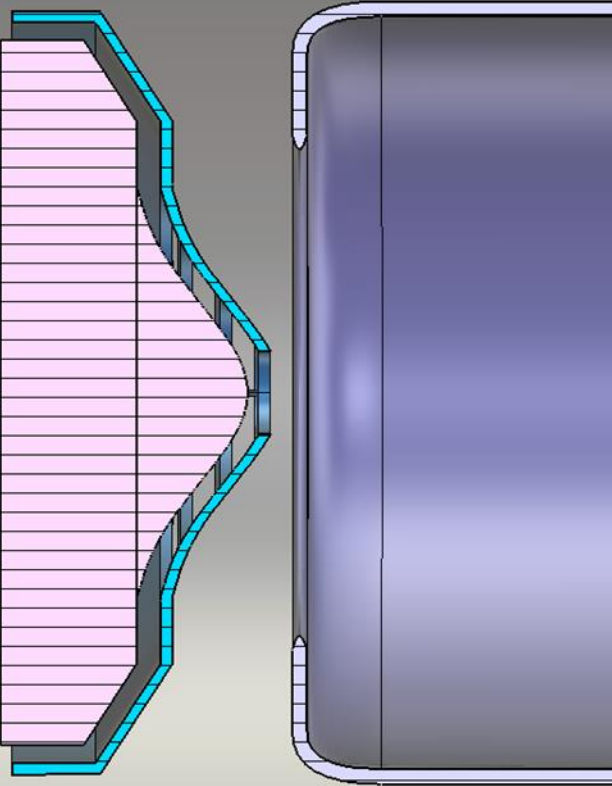


electron path
ion path

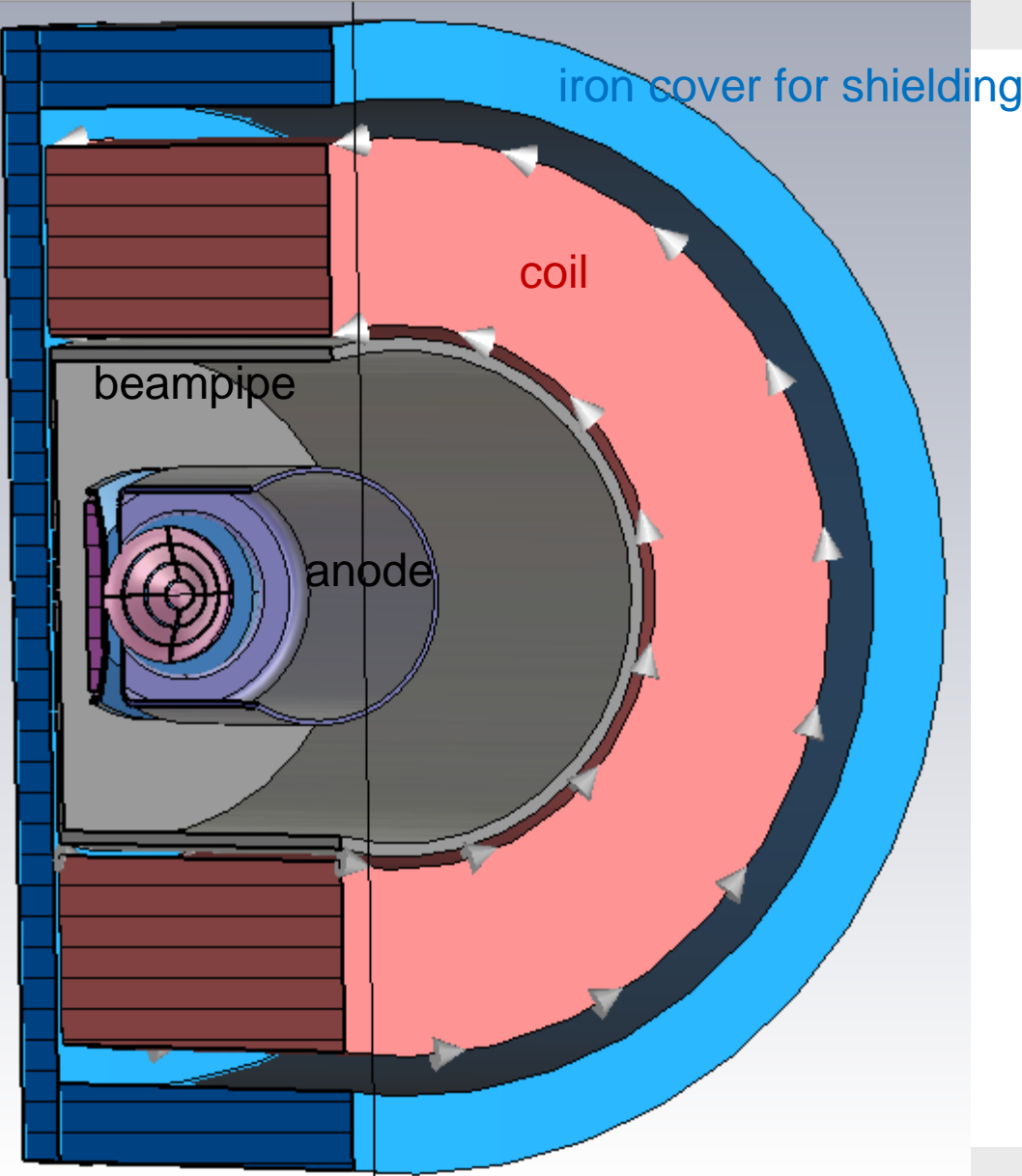
Electron beam transport simulation



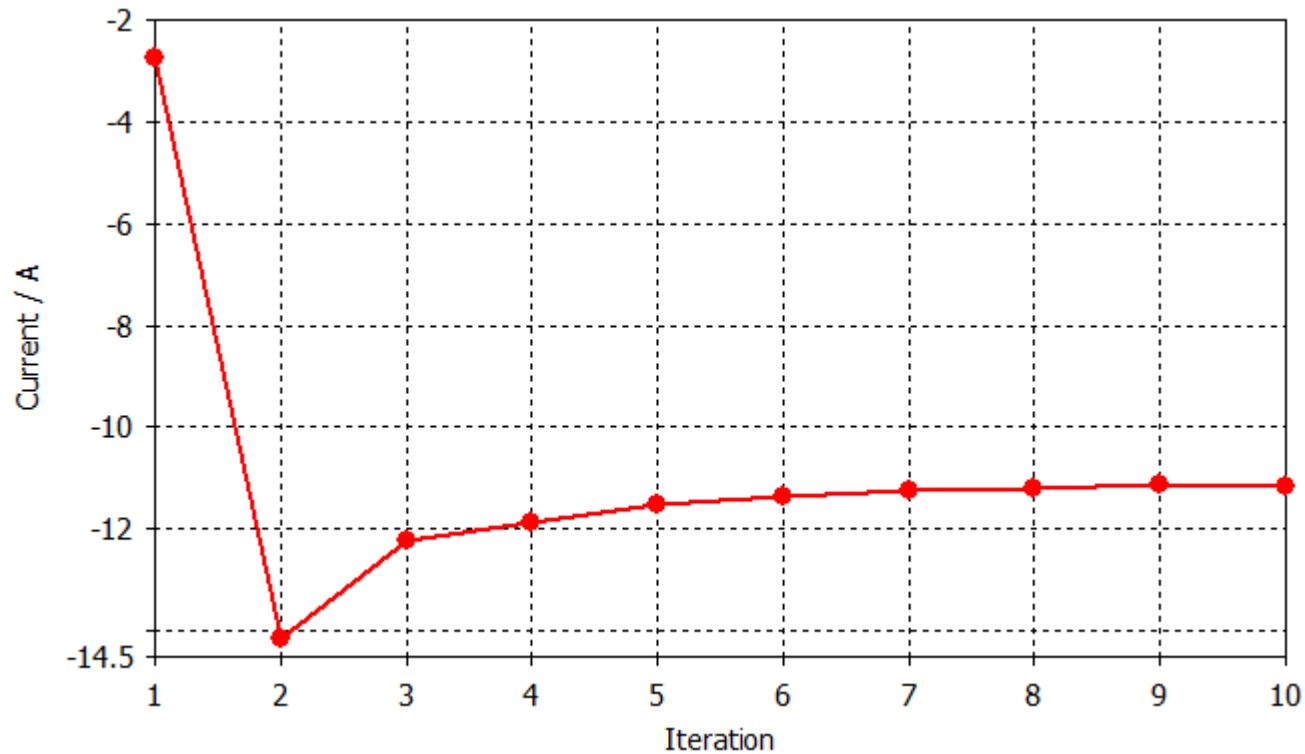
Setup: gun solenoid (only)



cathode
grid

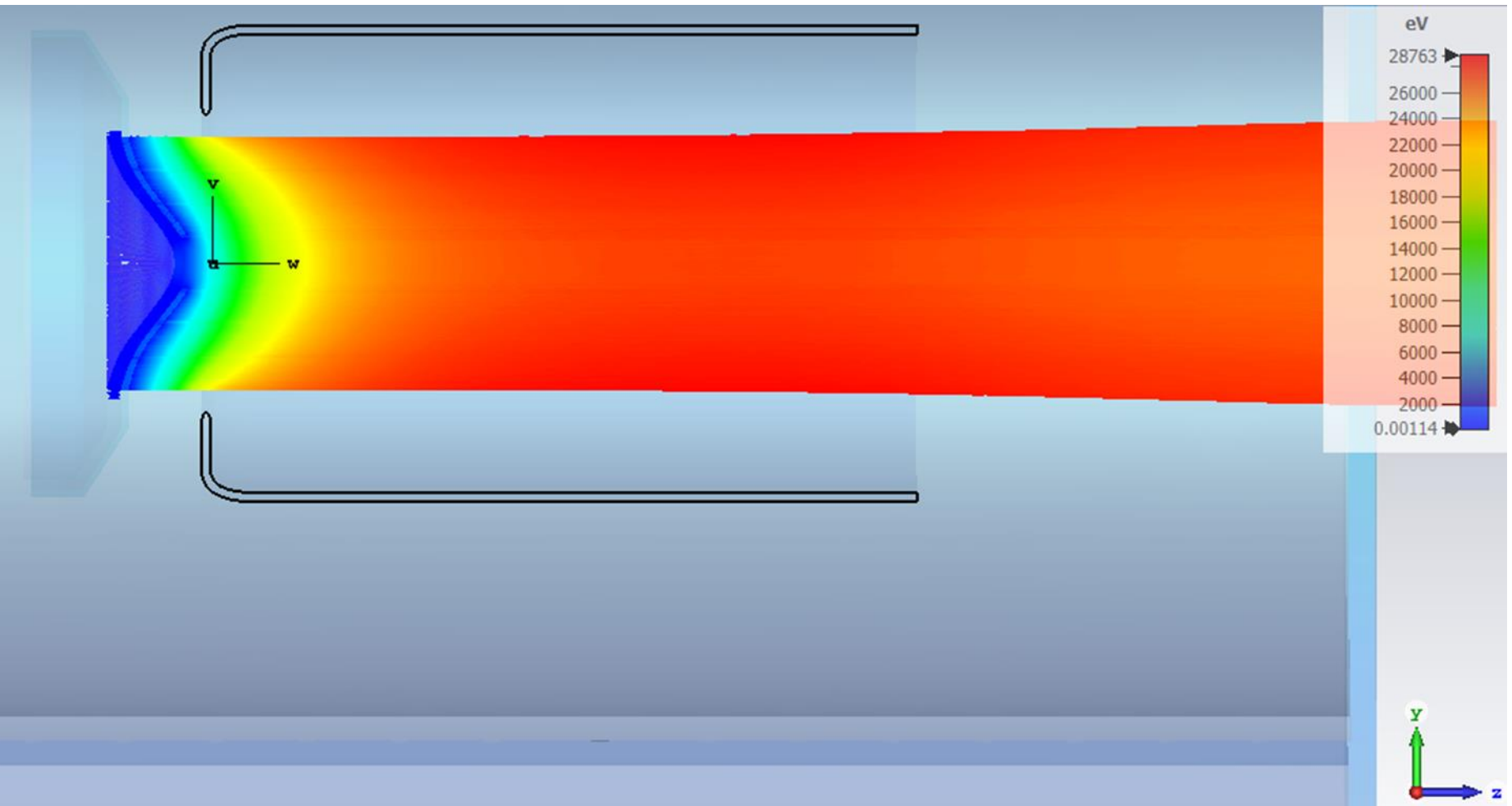


Source current: 11 A

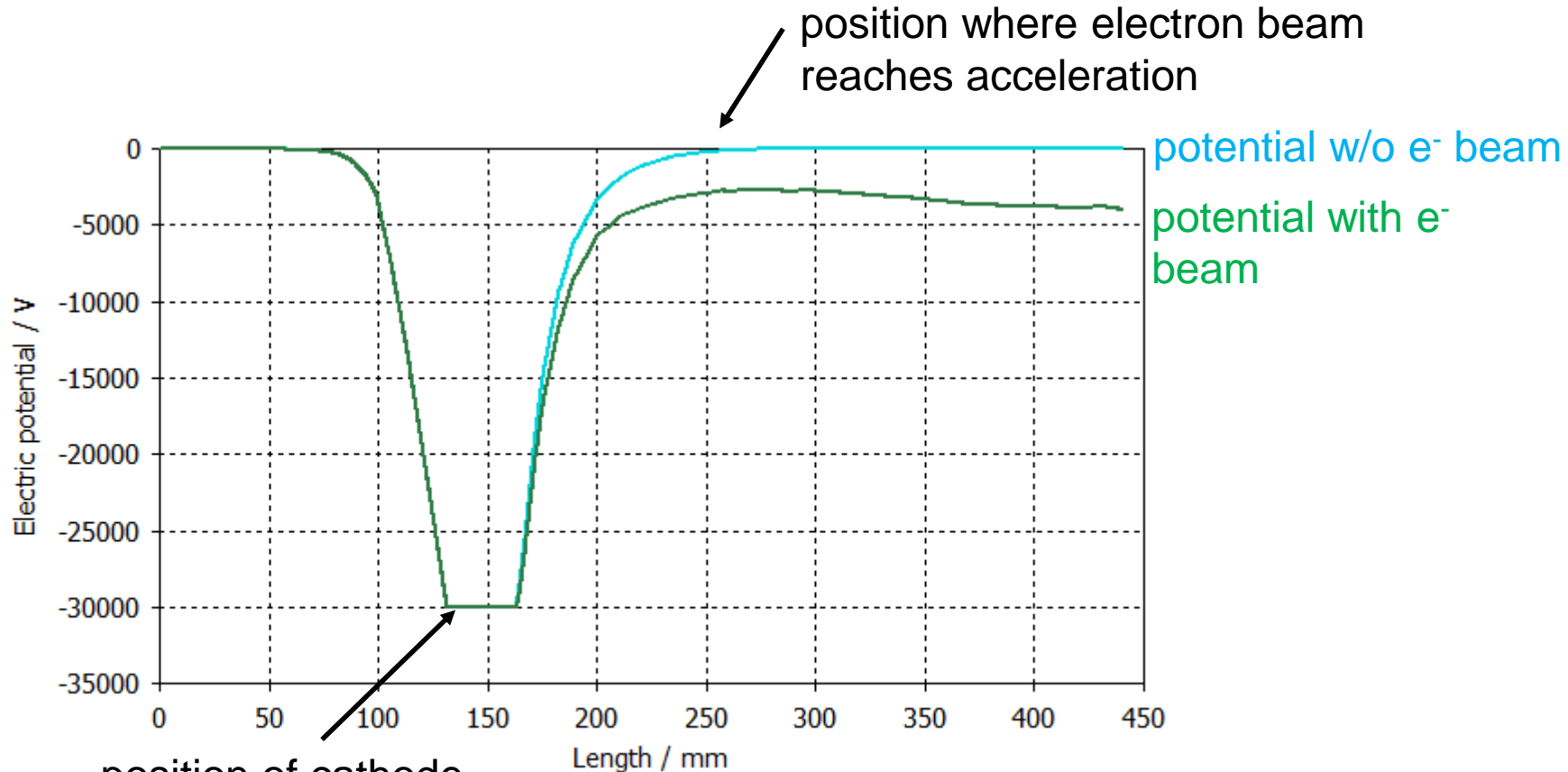


the solver iteratively repeats an electrostatic calculation and then tracks the particles until the desired accuracy of the space charge deviation between two successive iterations is reached.

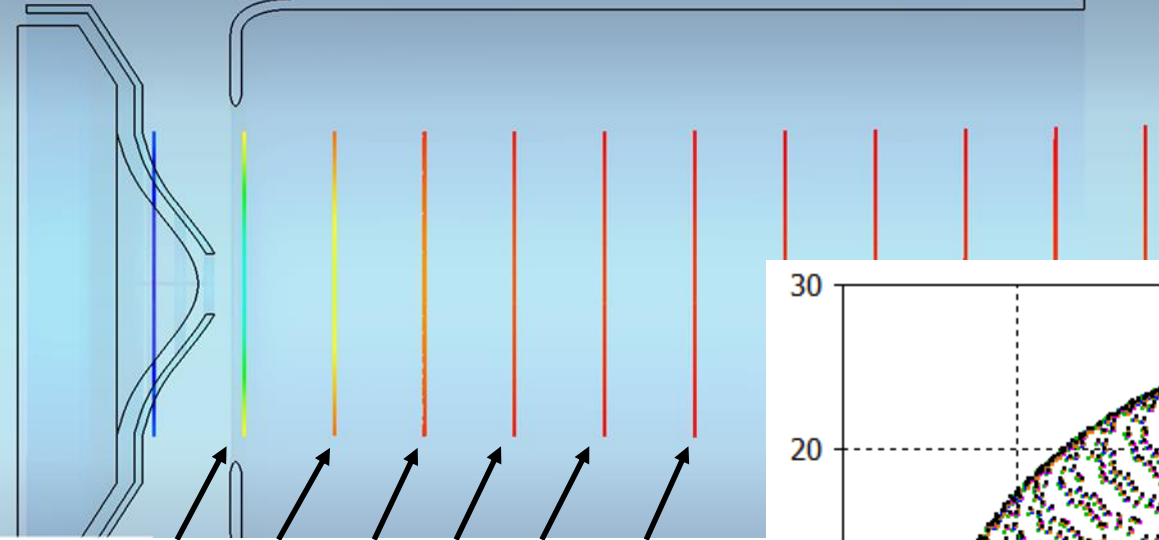
Electron beam trajectories



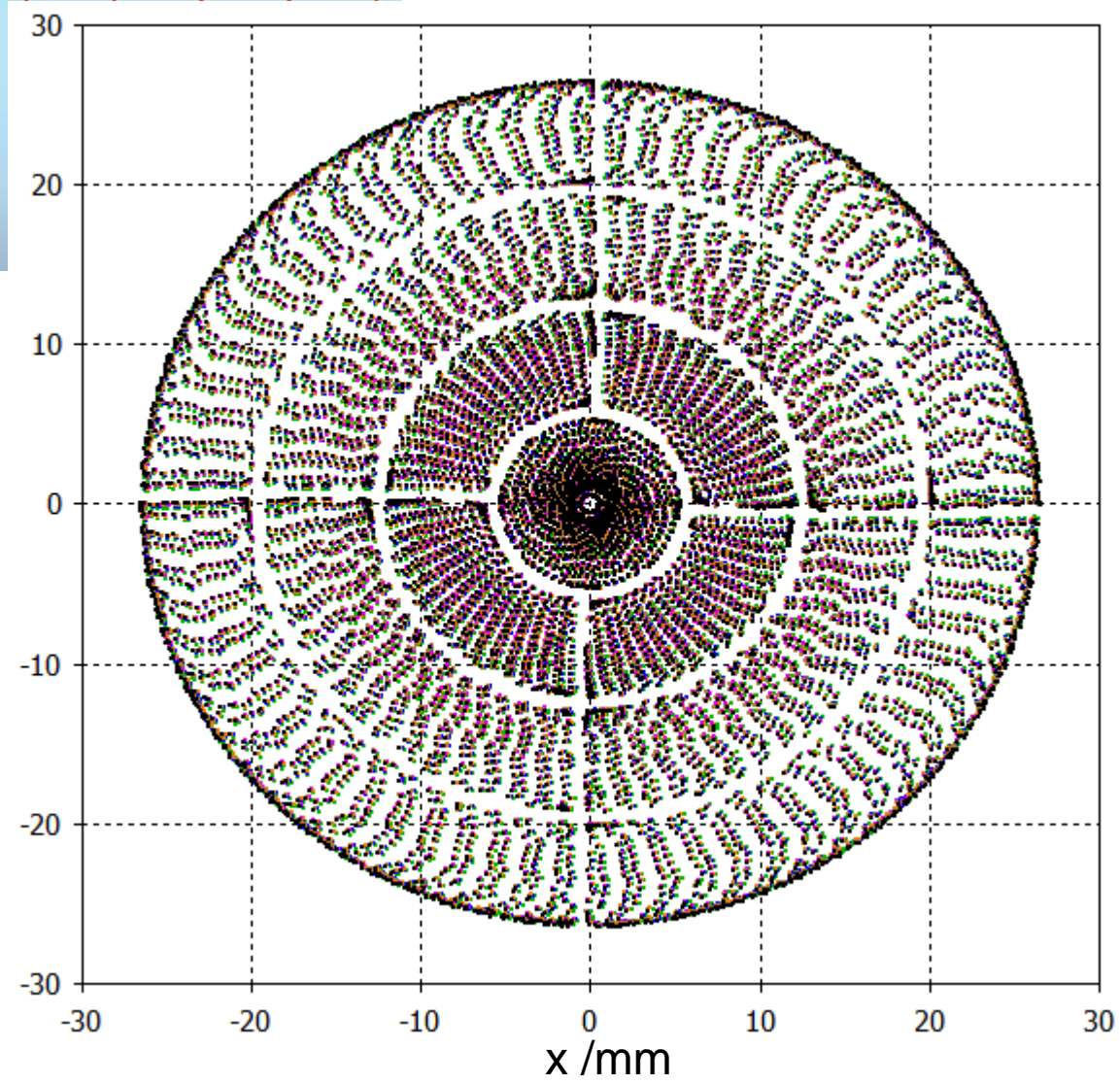
Potential vs. path



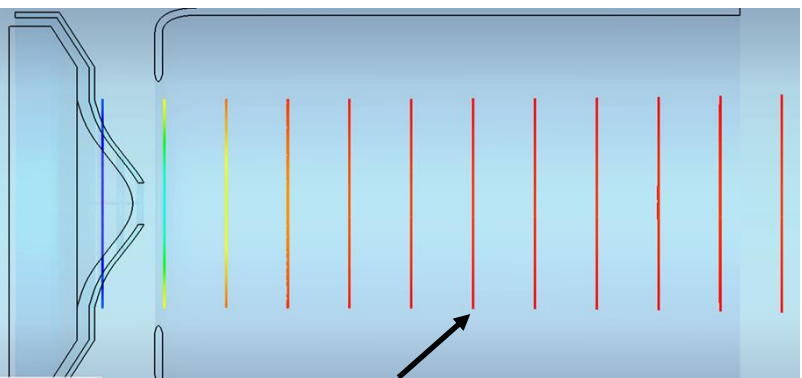
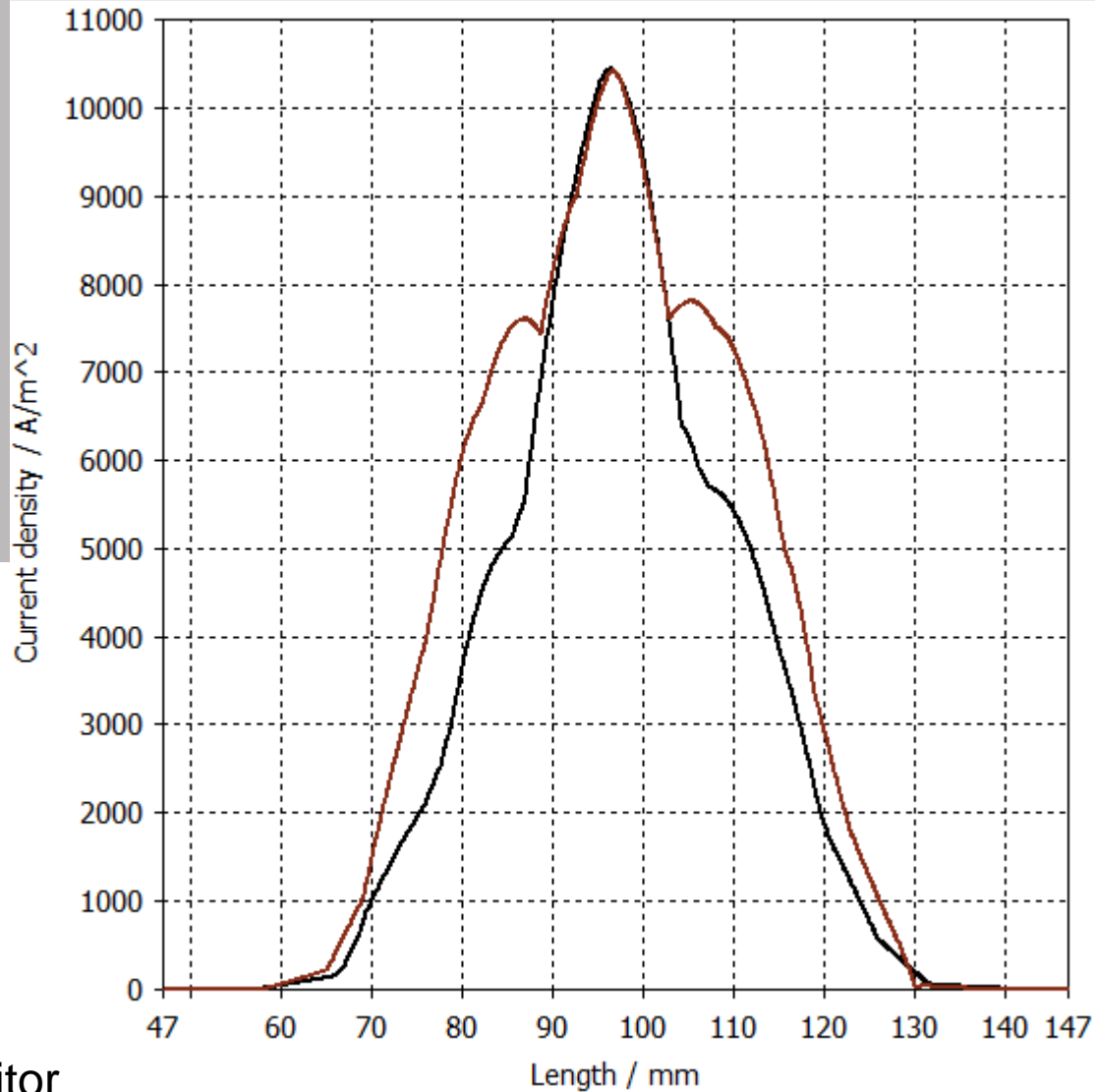
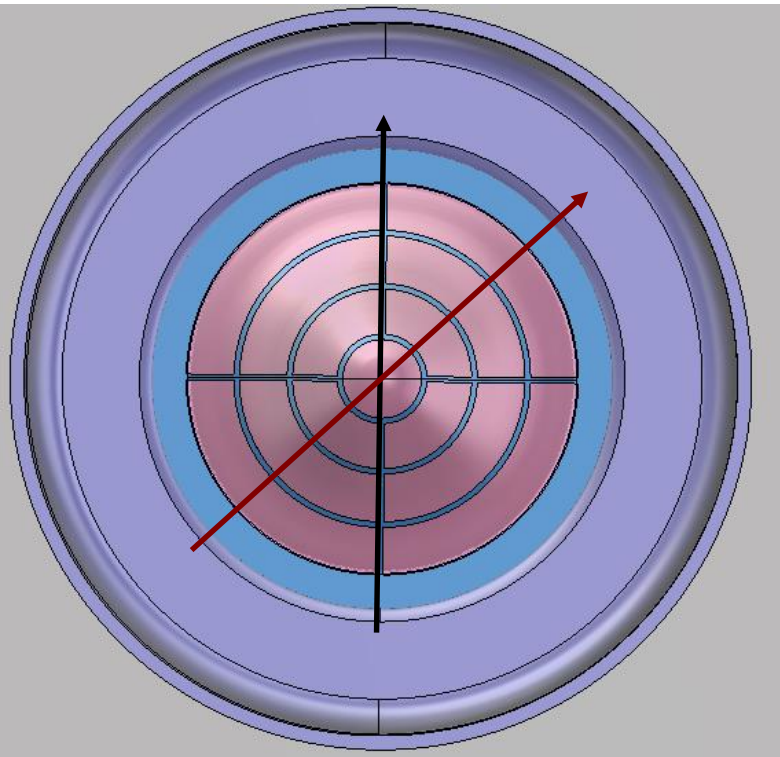
position of cathode
cathode thickness is 31.6 mm



2D virtual beam monitors

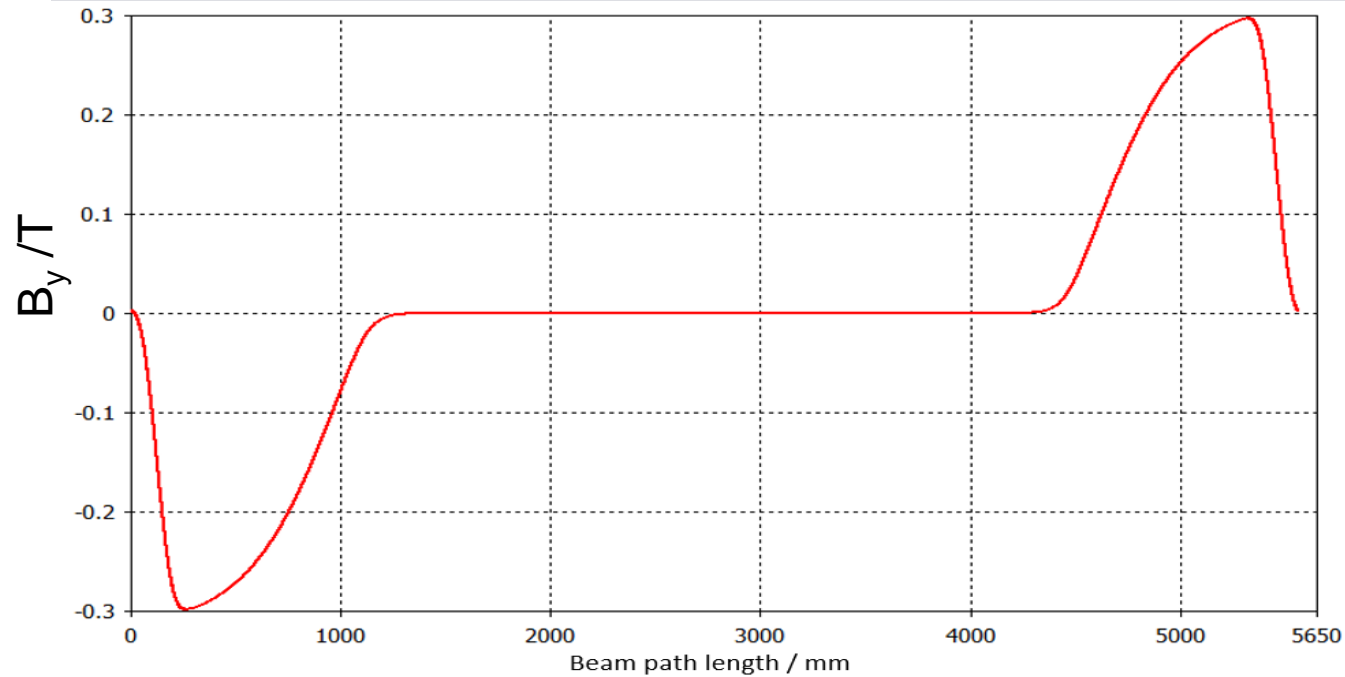
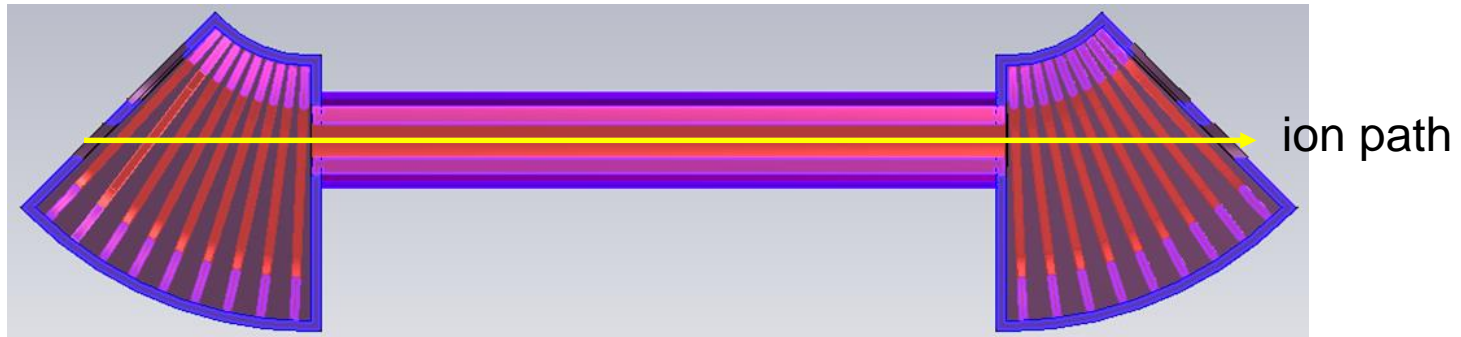


Current density

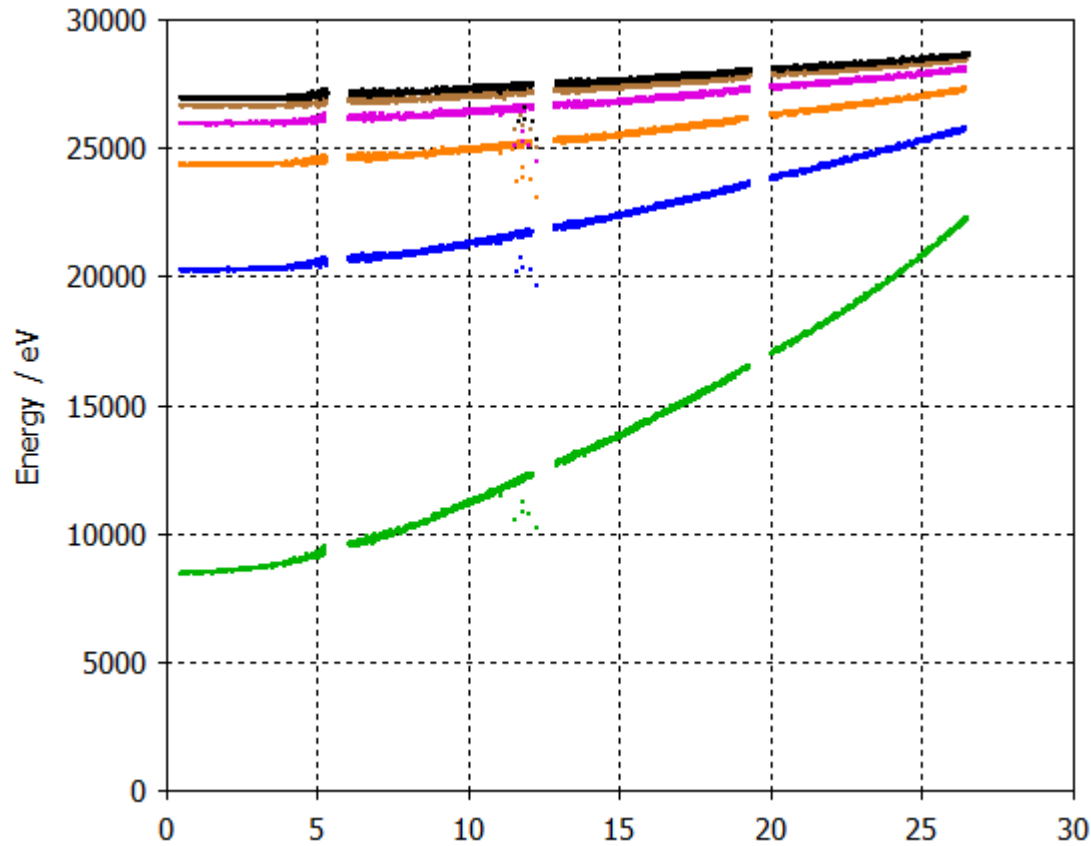


longitudinal position of current monitor

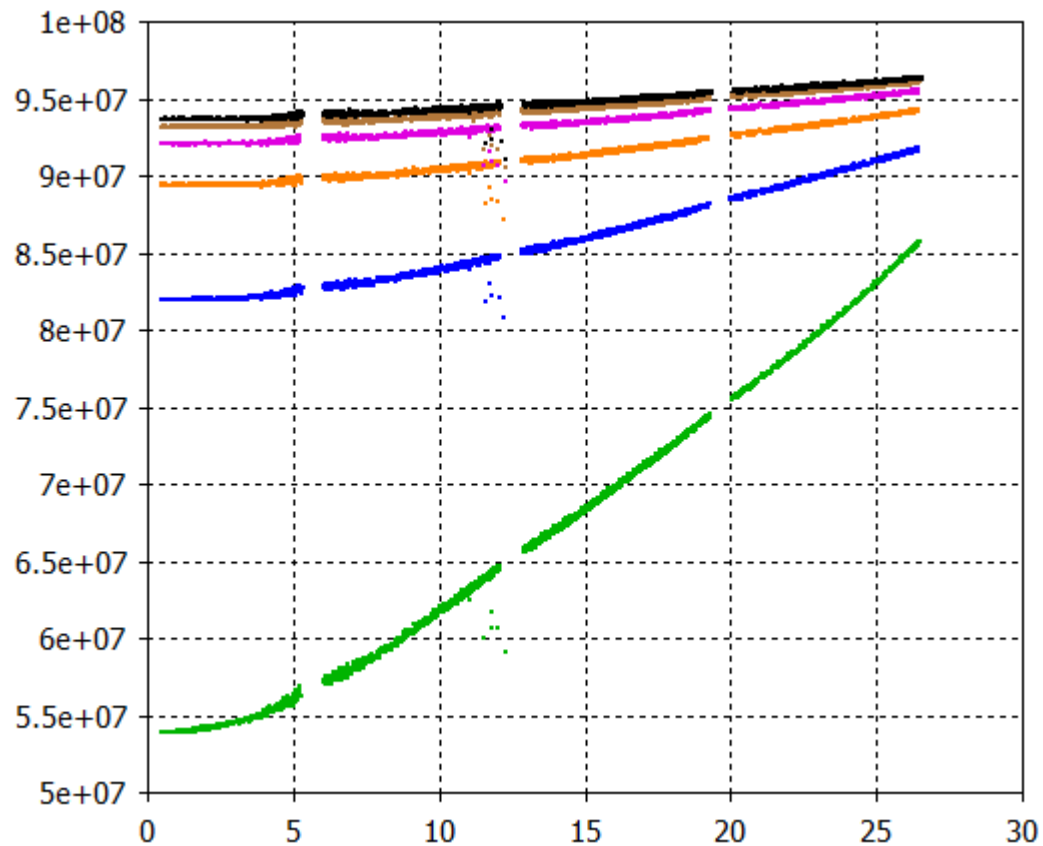
Transverse magnetic field along ion path



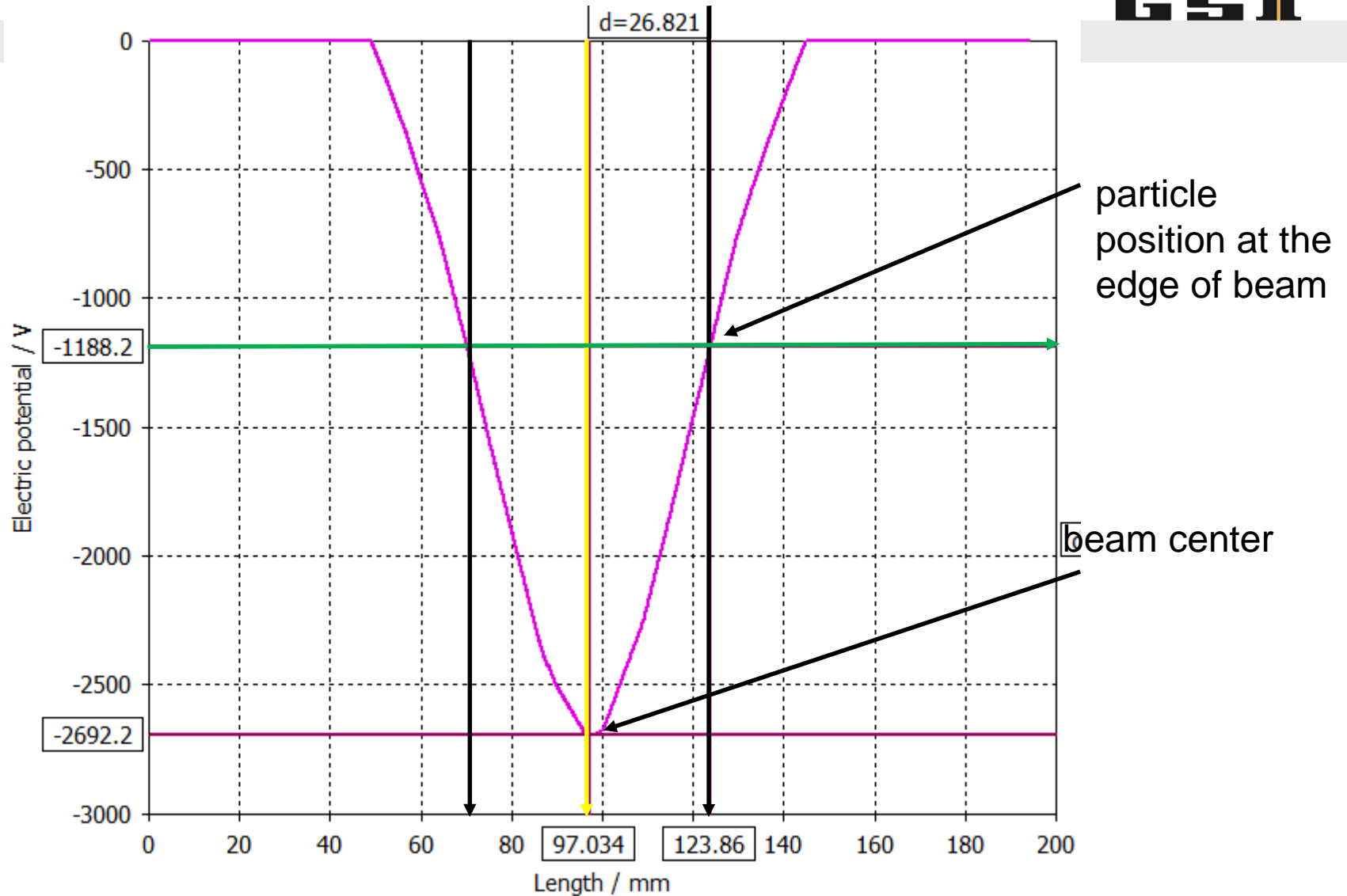
Energy vs. beam radius (mm)



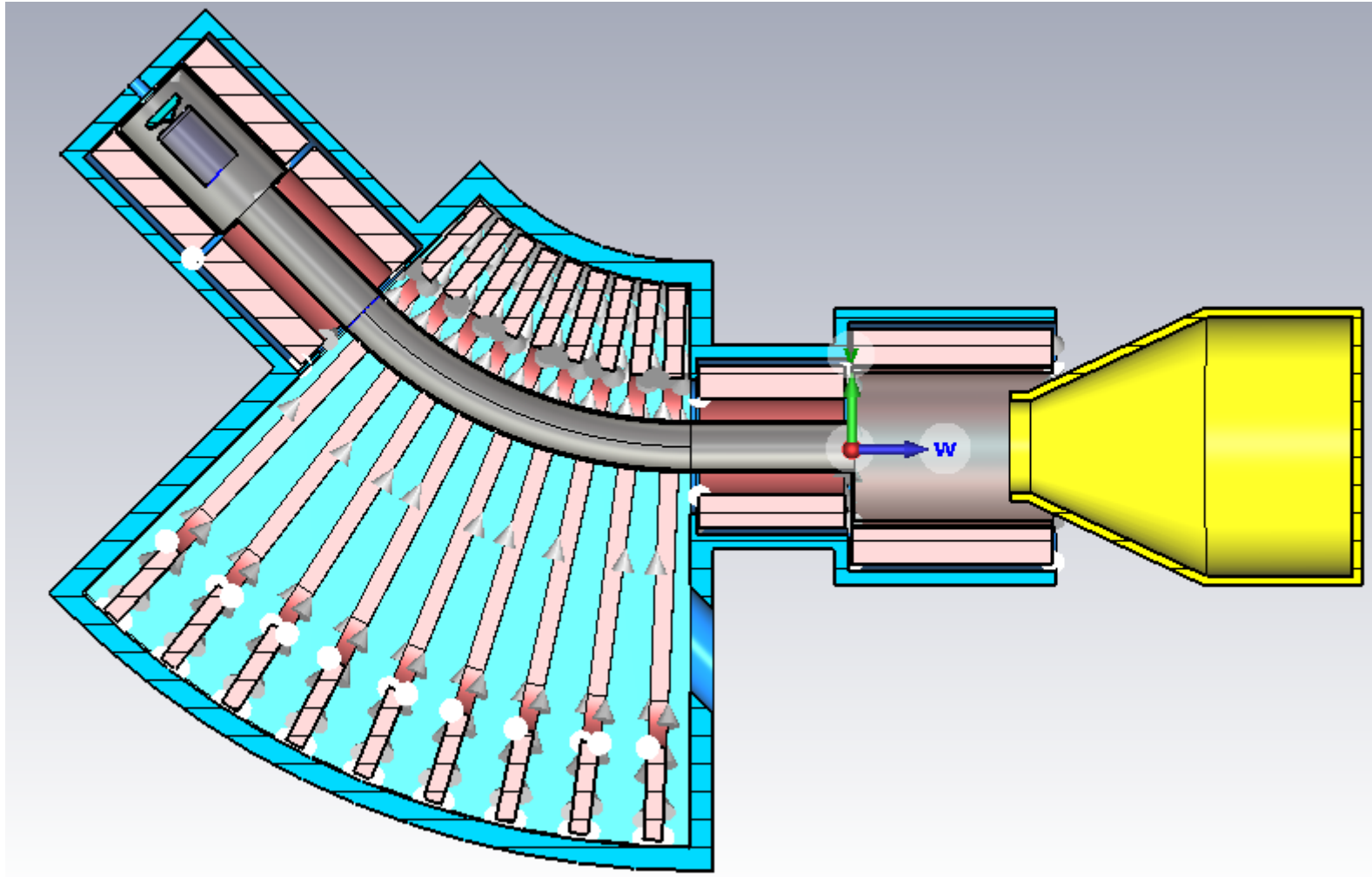
Velocity (m/s) vs. beam radius (mm)



Space charge potential of electron beam



Setup for collector design and SEE simulation



Thank you for your attention!

Mesh: a Delaunay triangulation

