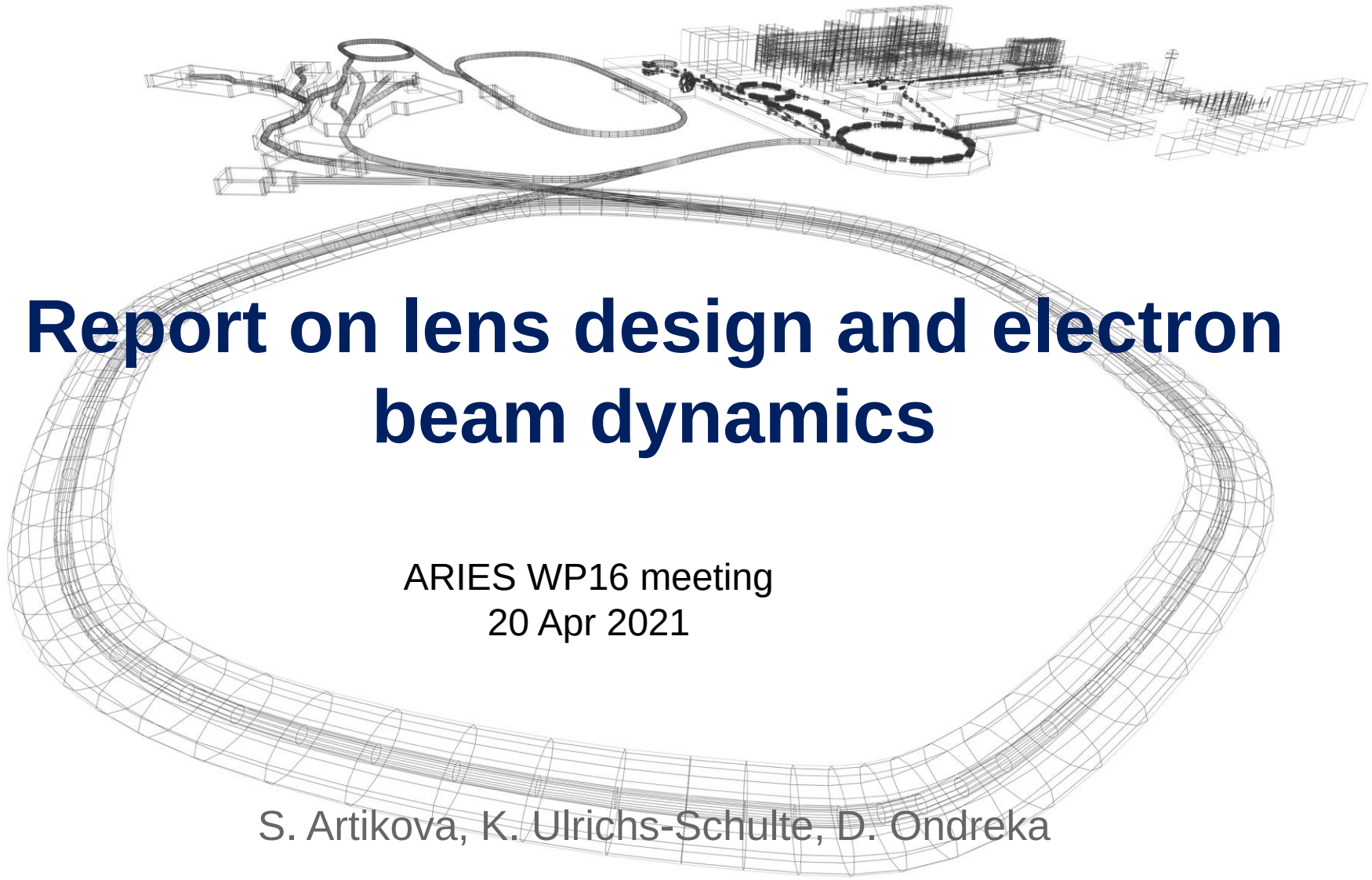


Report on lens design and electron beam dynamics

ARIES WP16 meeting
20 Apr 2021

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

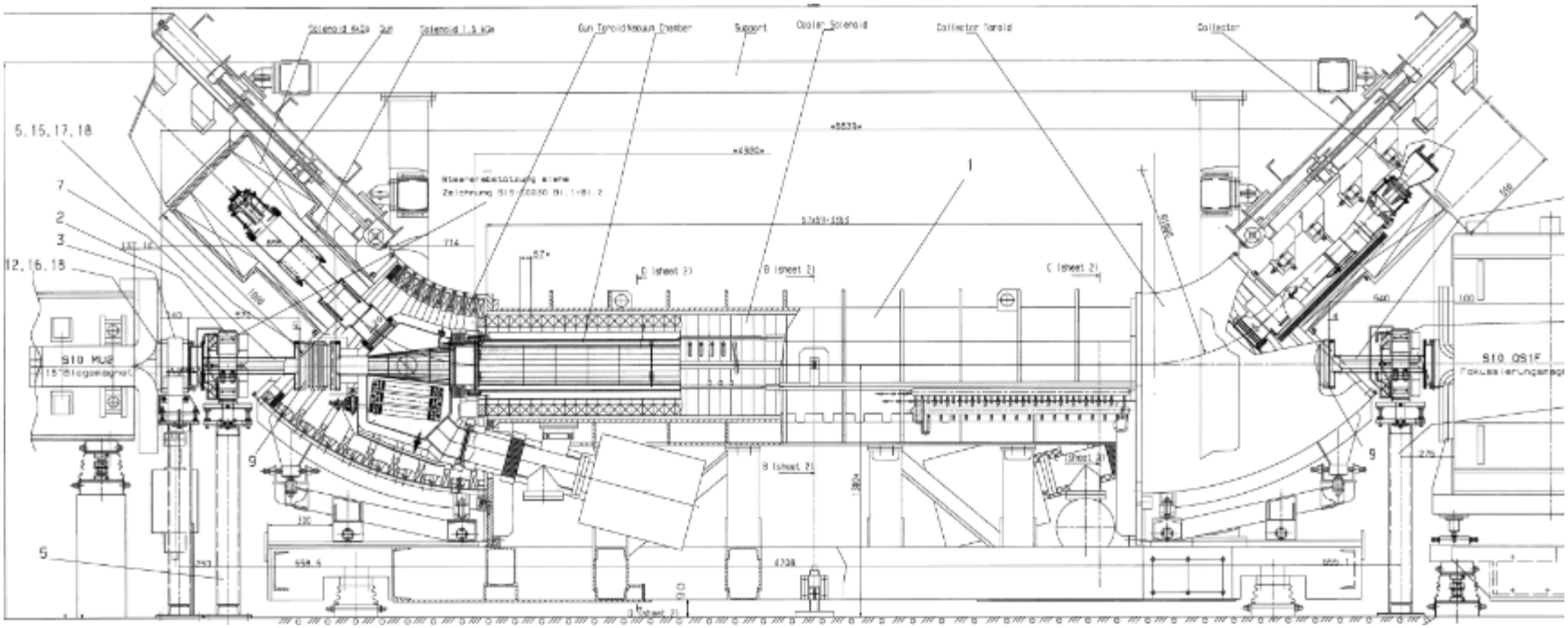
Contents

- E-lens conceptual design
- Electron beam transport simulation

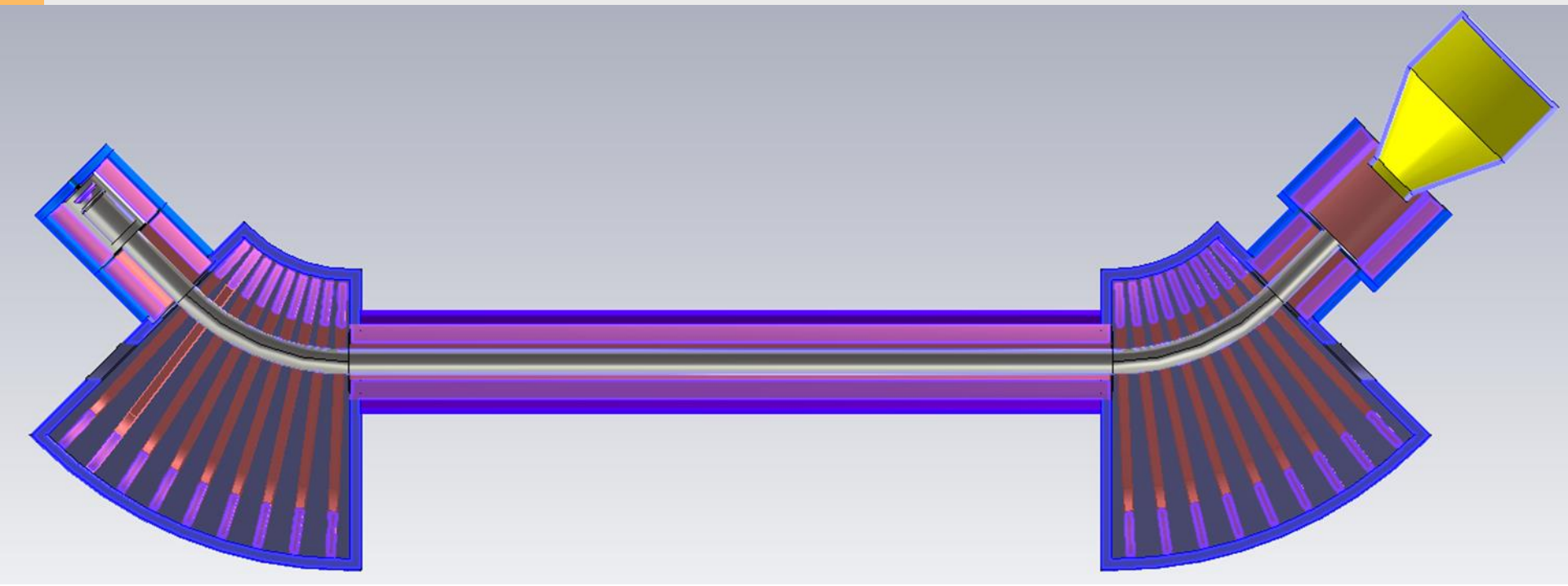
- Setup (gun solenoid only) and current extraction
- Electron beam acceleration process (space charge)
- Space charge potential

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

SIS18 electron cooler



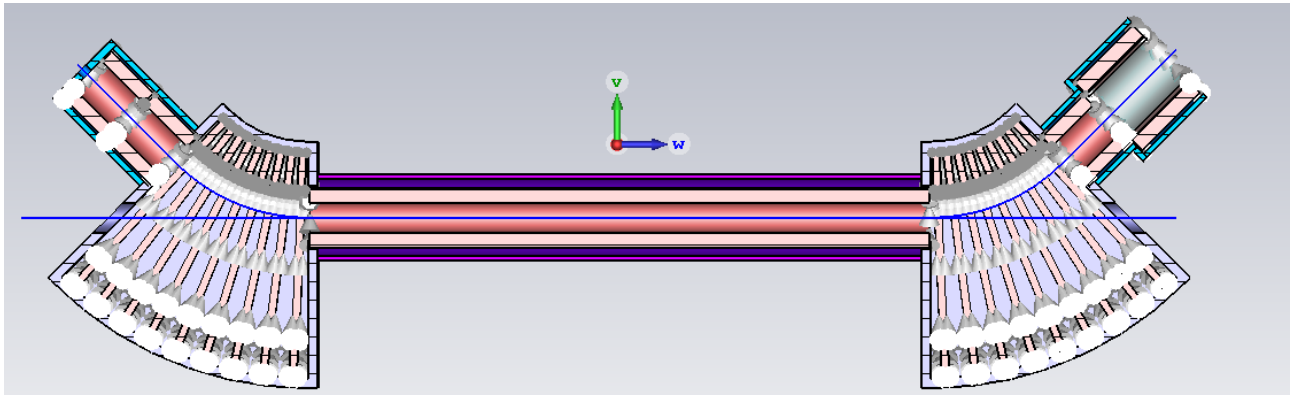
Electron lens design

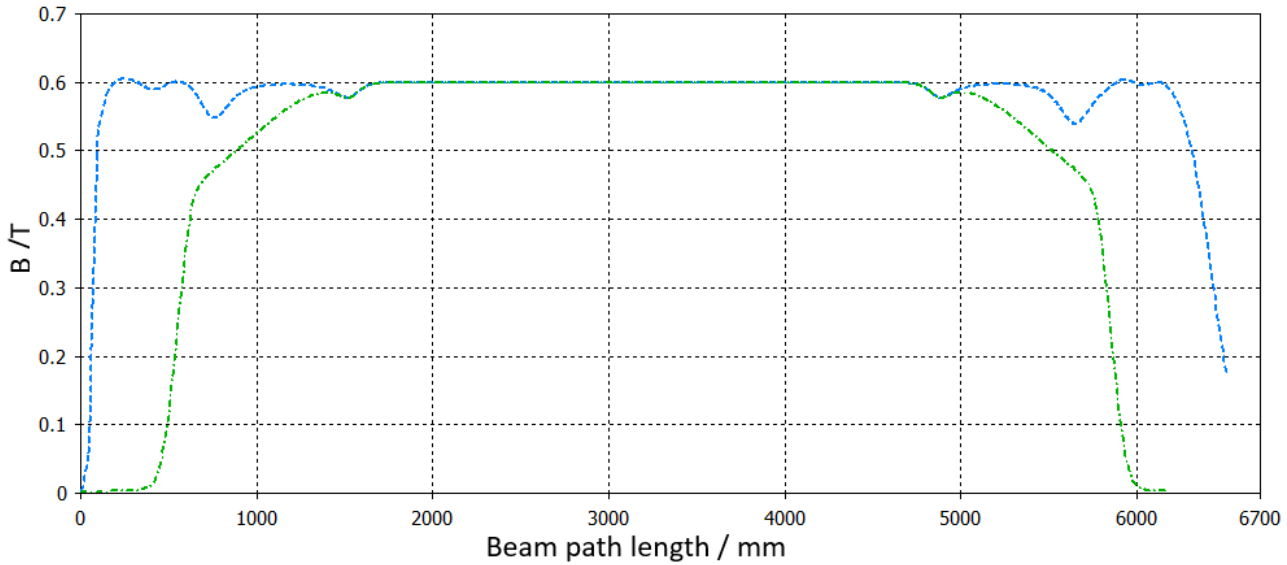


3 solenoids with identical coils
2 toroidal section with identical (9) coils
main solenoid
pre-collector solenoid
collector

cathode
anode
beampipe
grounded electrode
ceramic insulator

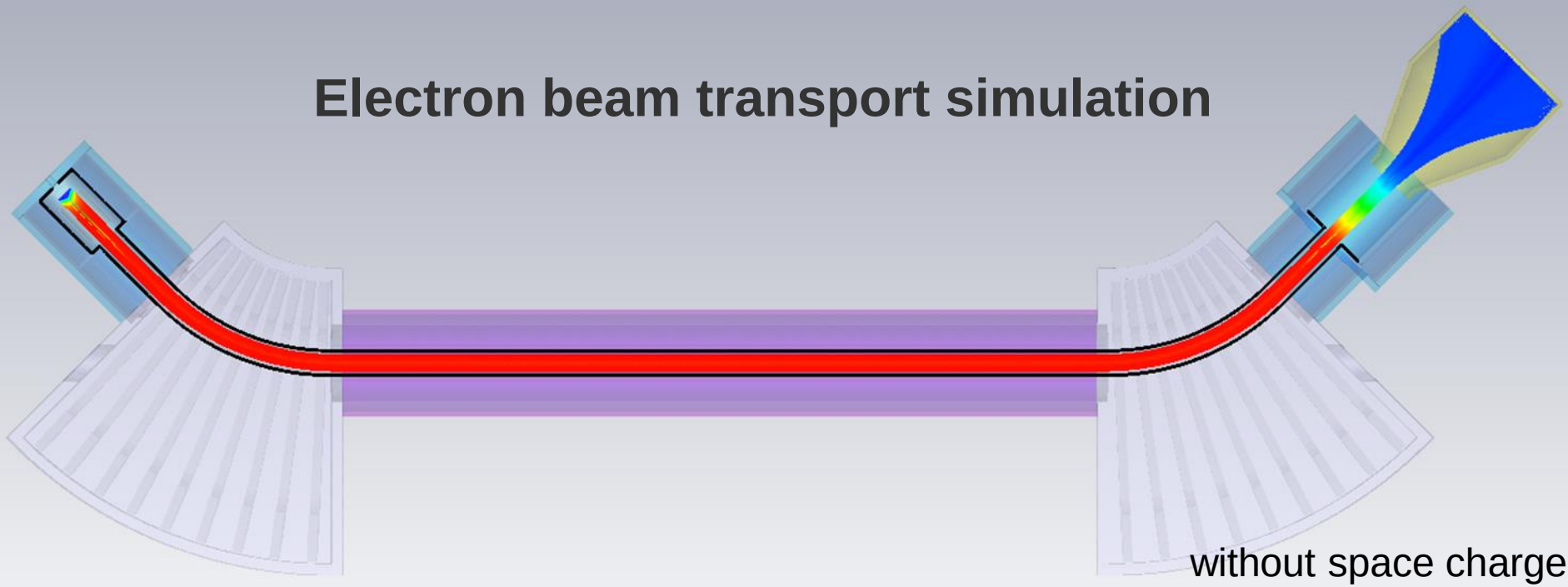
Magnetic field 0.6T





electron path
ion path

Electron beam transport simulation

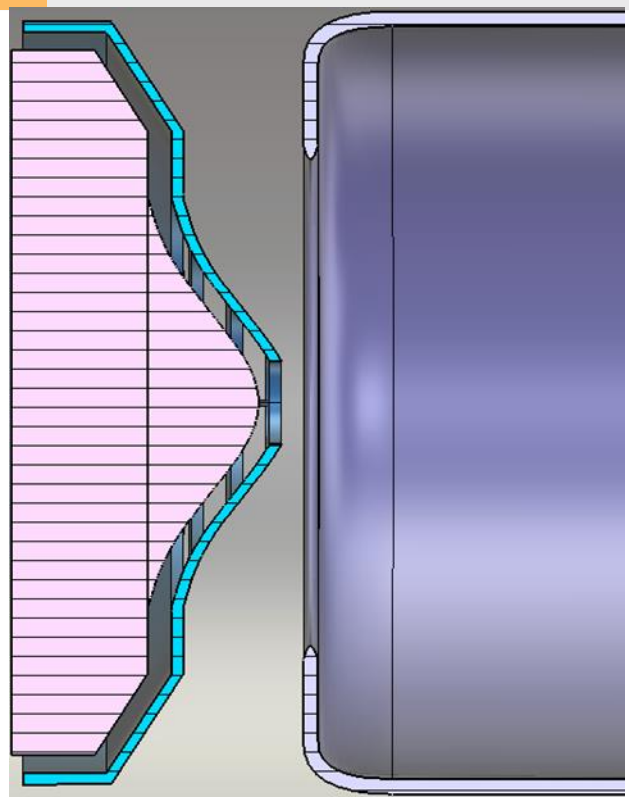


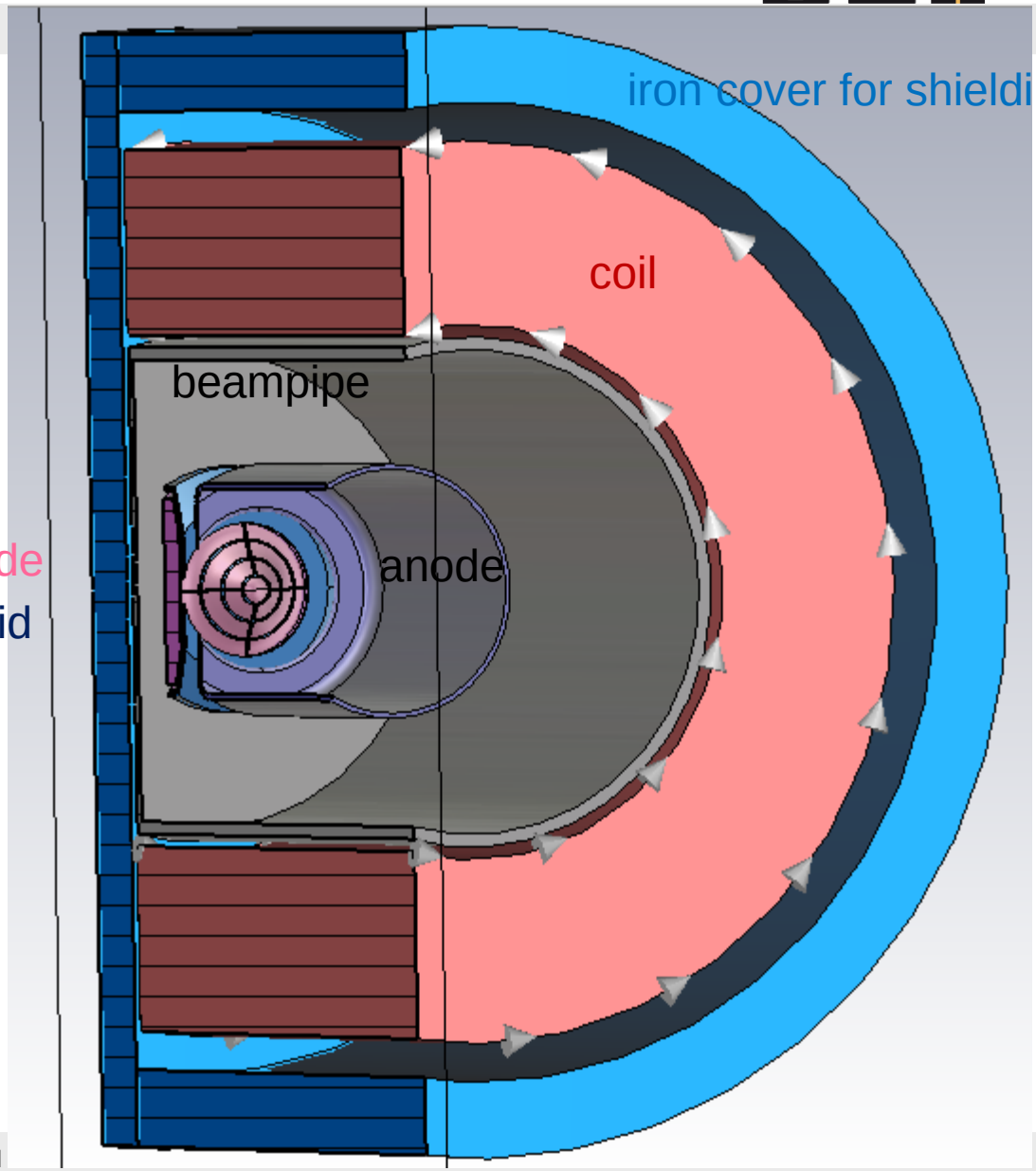
without space charge

simulation time has to be increased

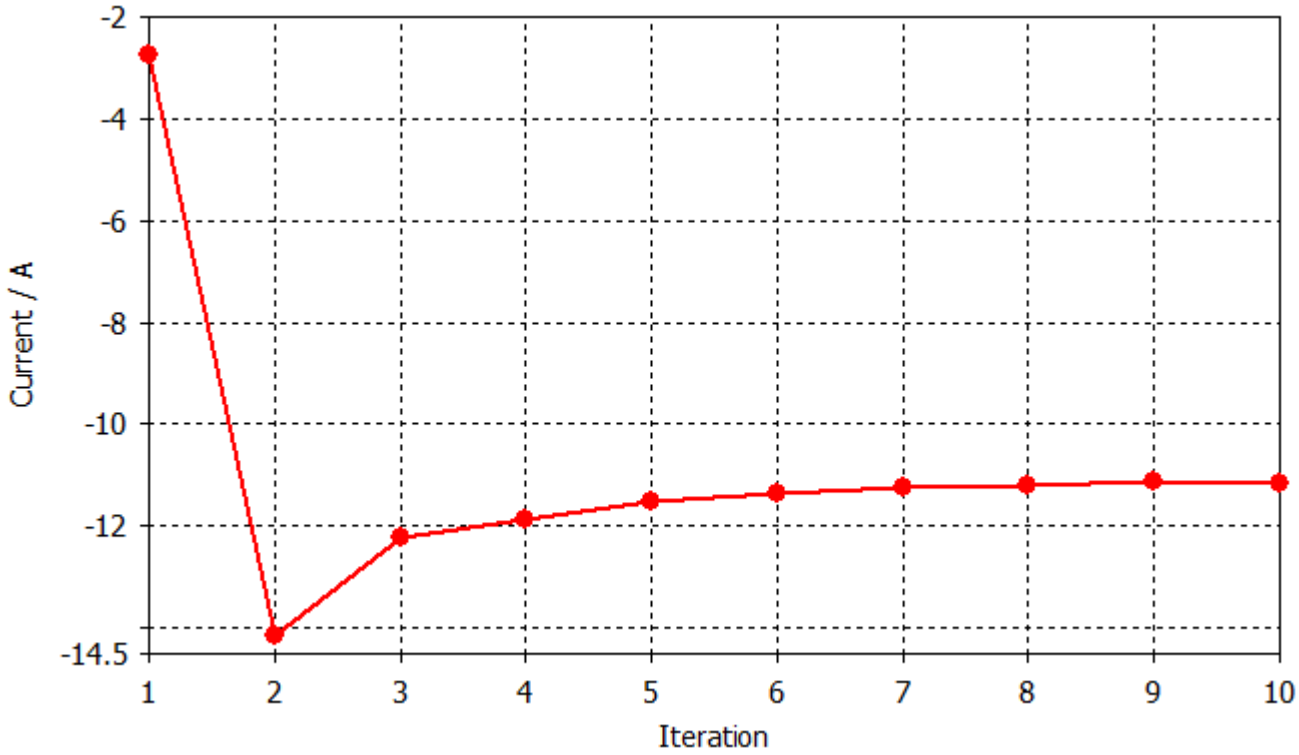
with space charge

Setup: gun solenoid (only)



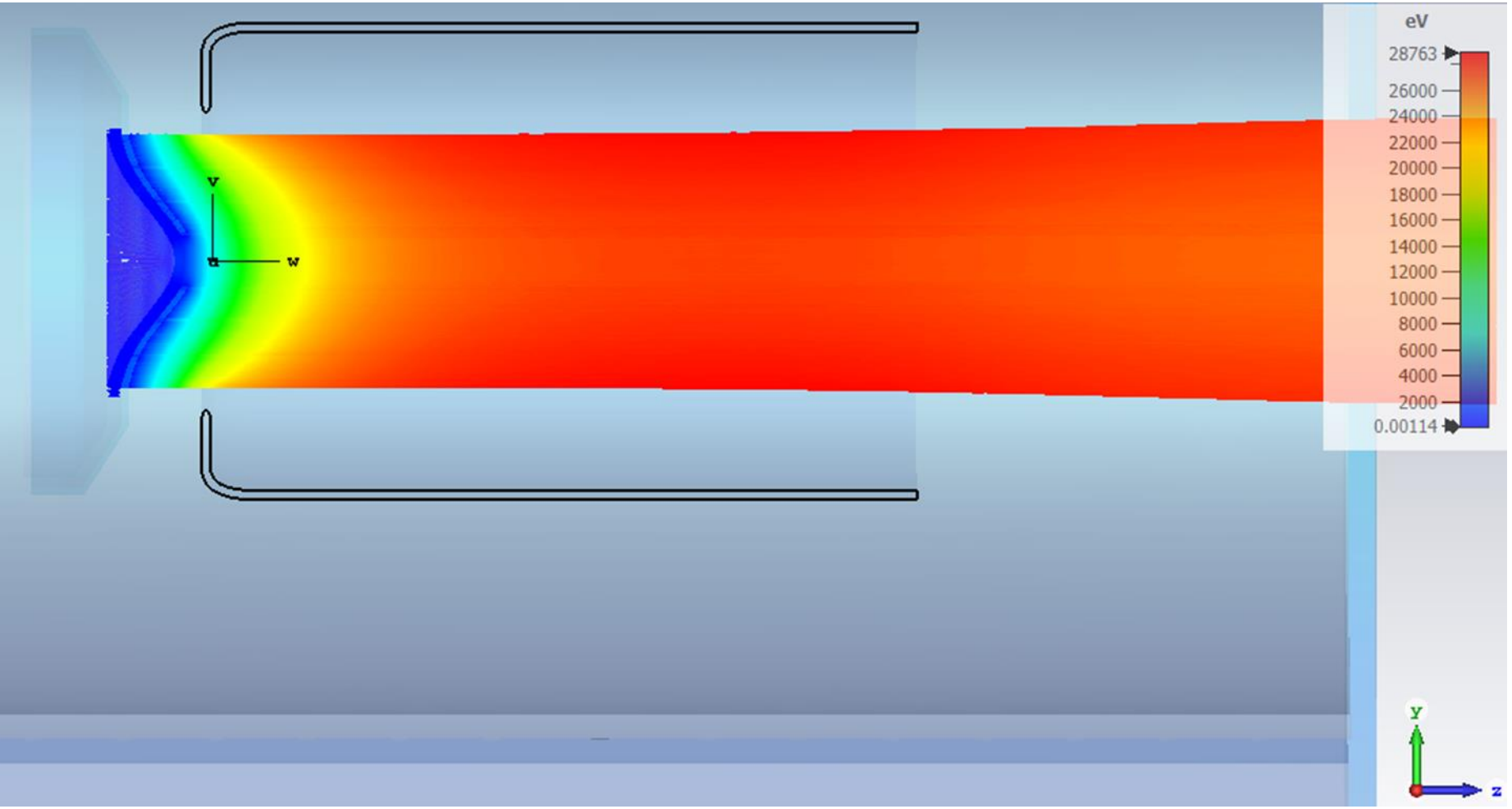


Source current: 11 A

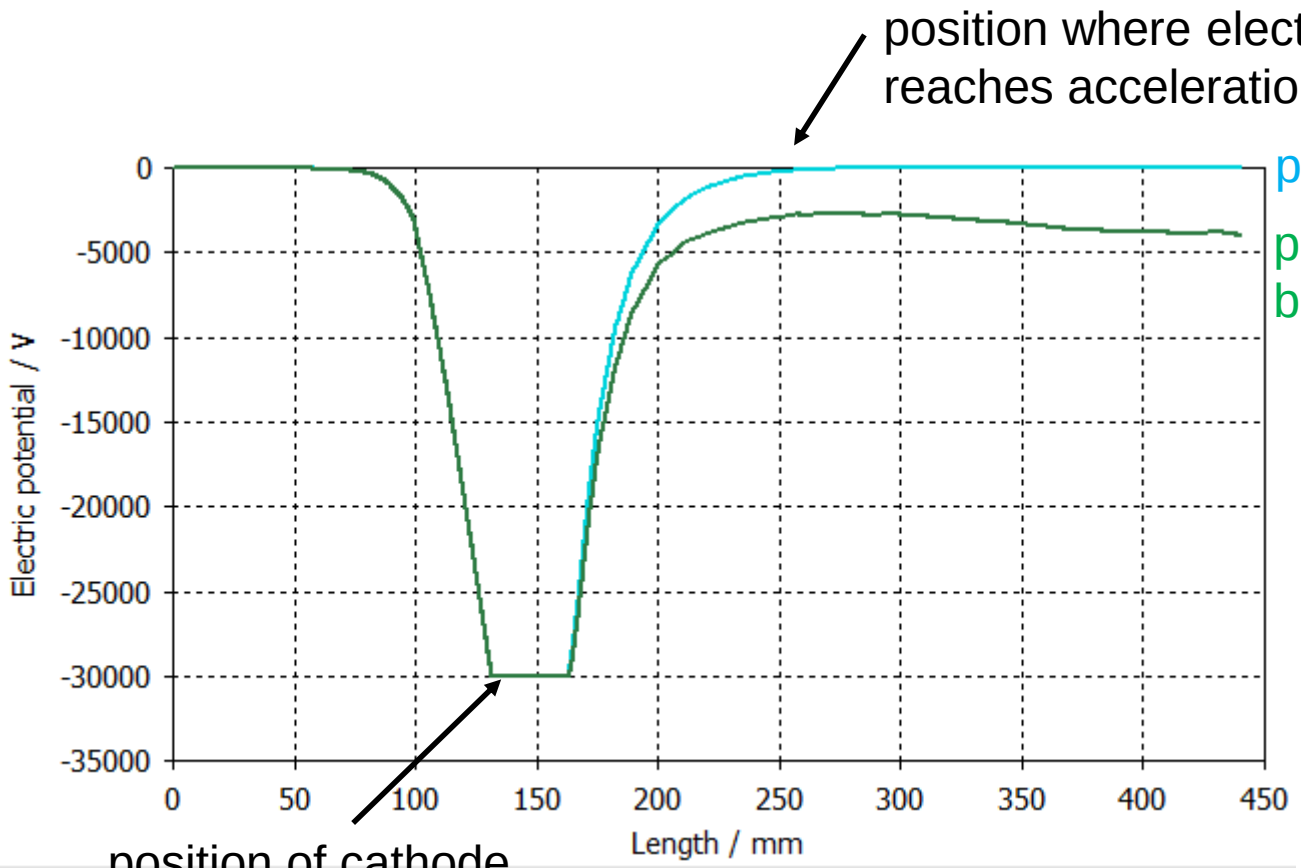


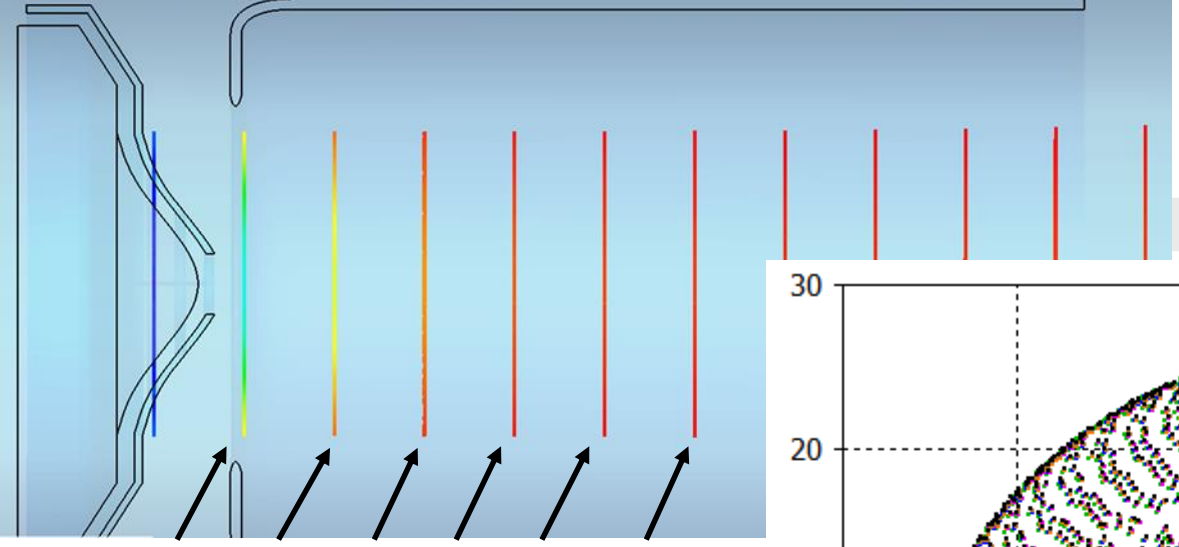
the solver iteratively repeats an electrostatic calculation and then tracks the particles until the desired accuracy of the space charge deviation between two successive iterations is reached.

Electron beam trajectories

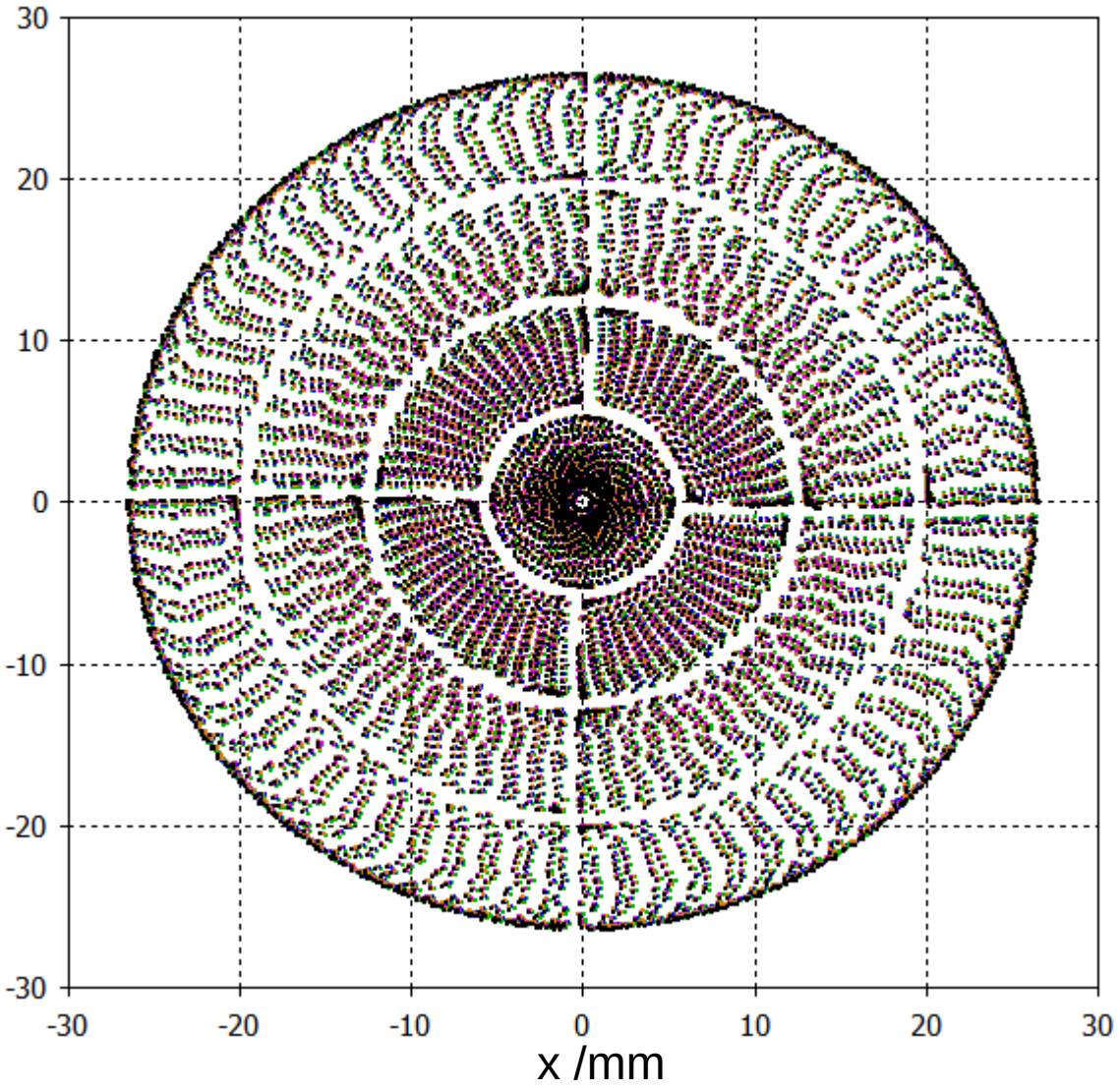


Potential vs. path

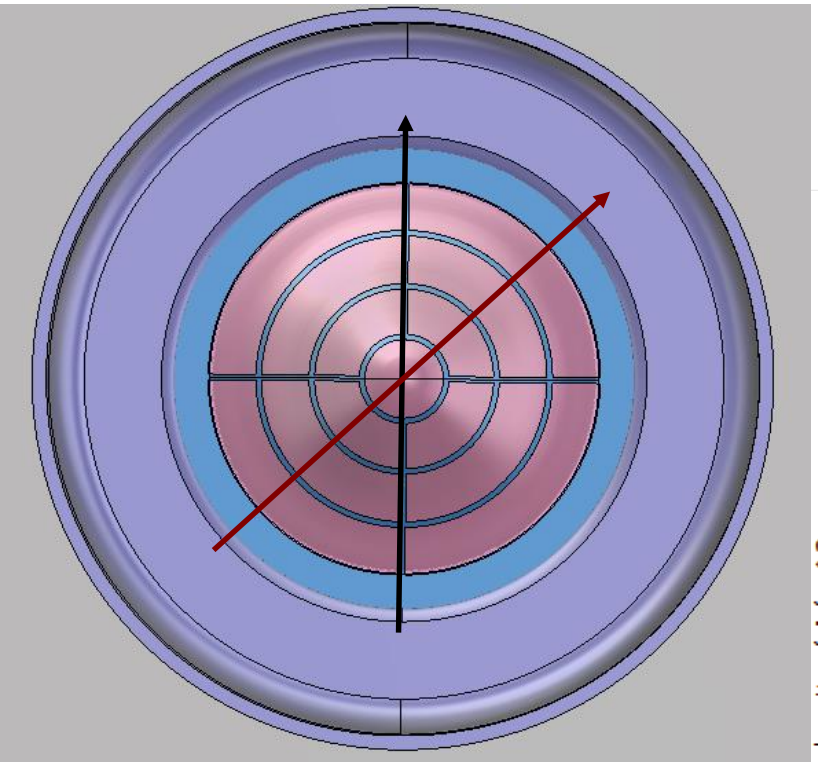


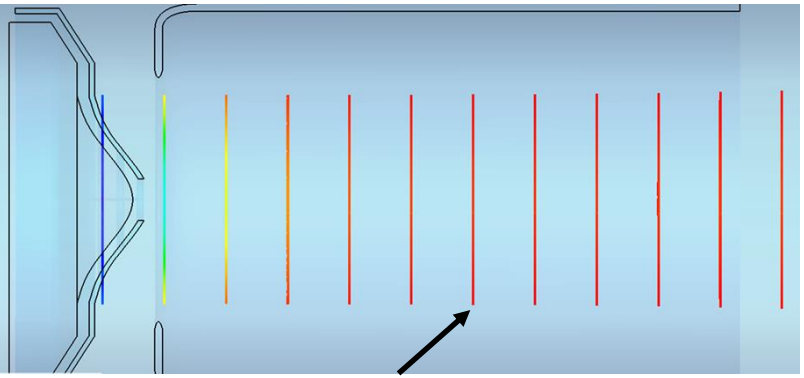


2D virtual beam monitors

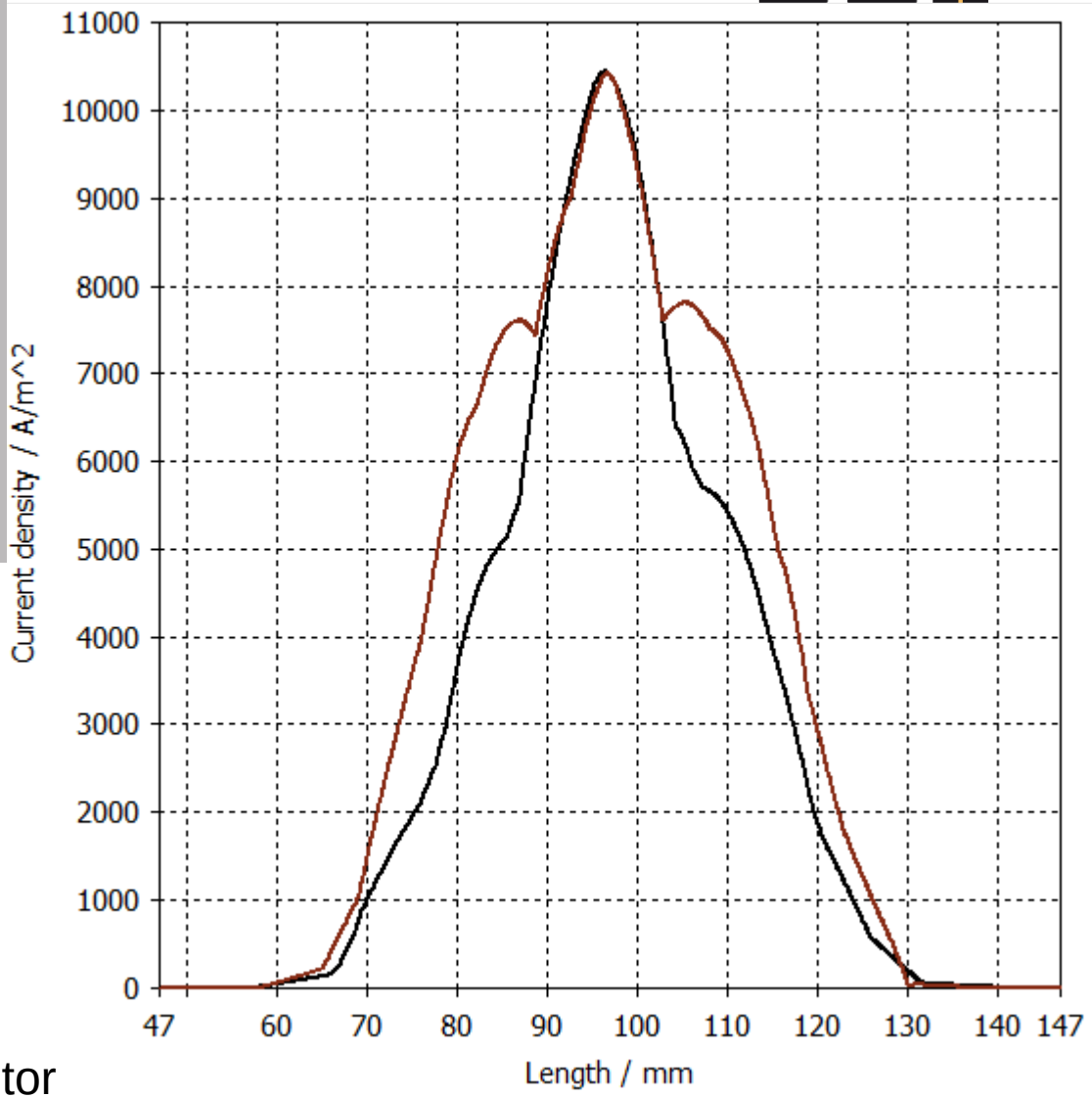


Current density

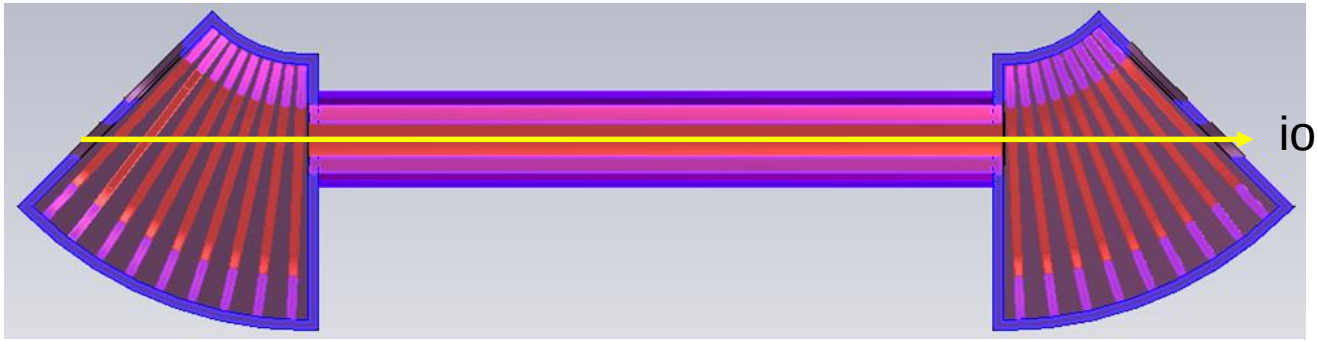


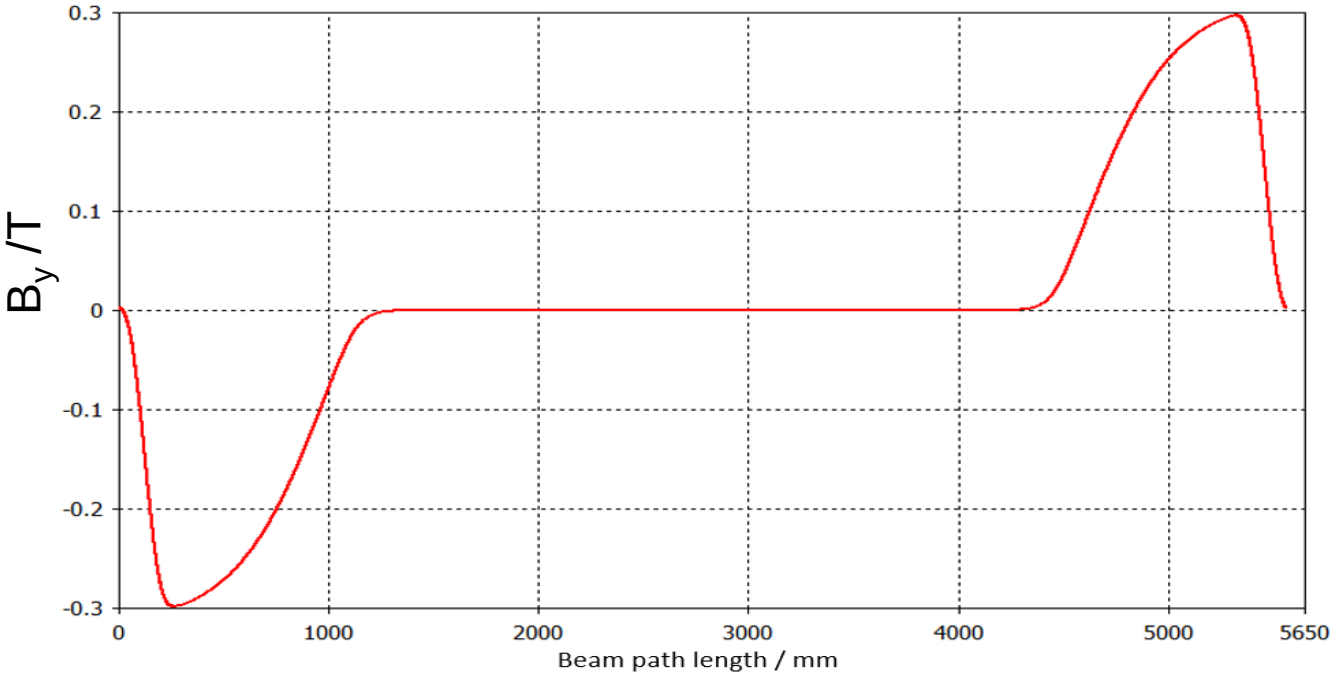


longitudinal position of current monitor

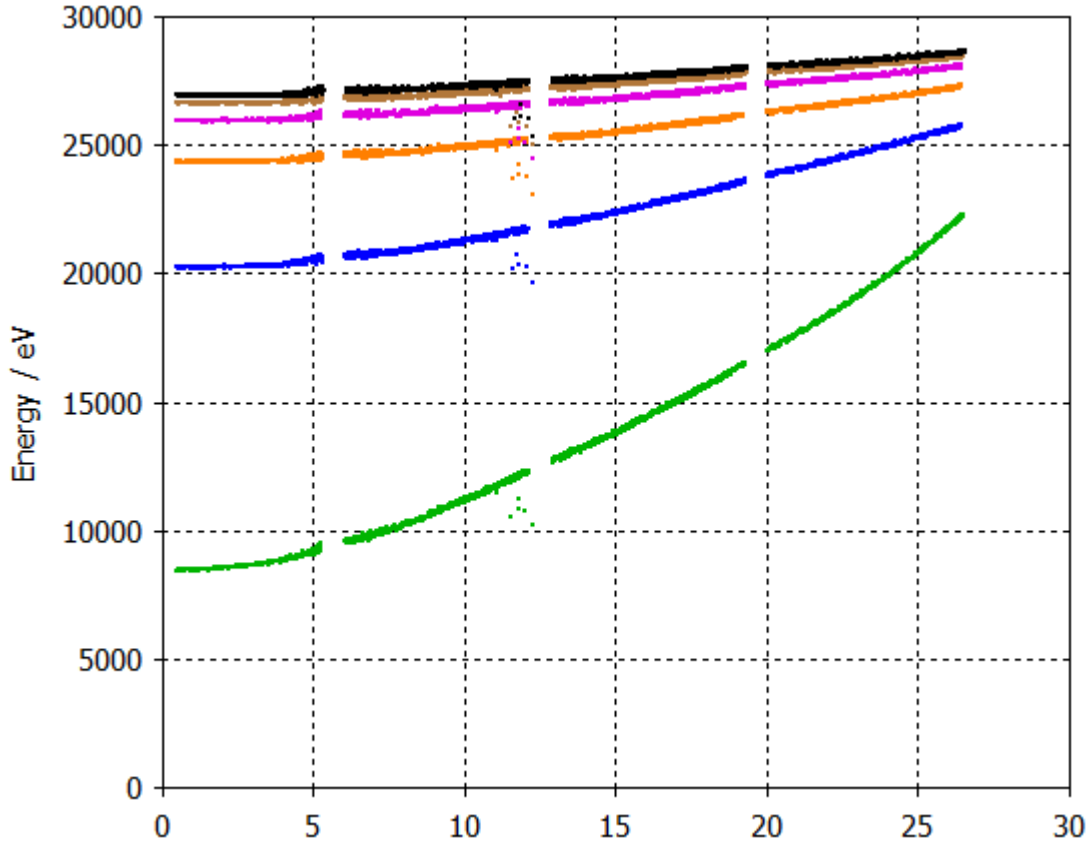


Transverse magnetic field along ion path

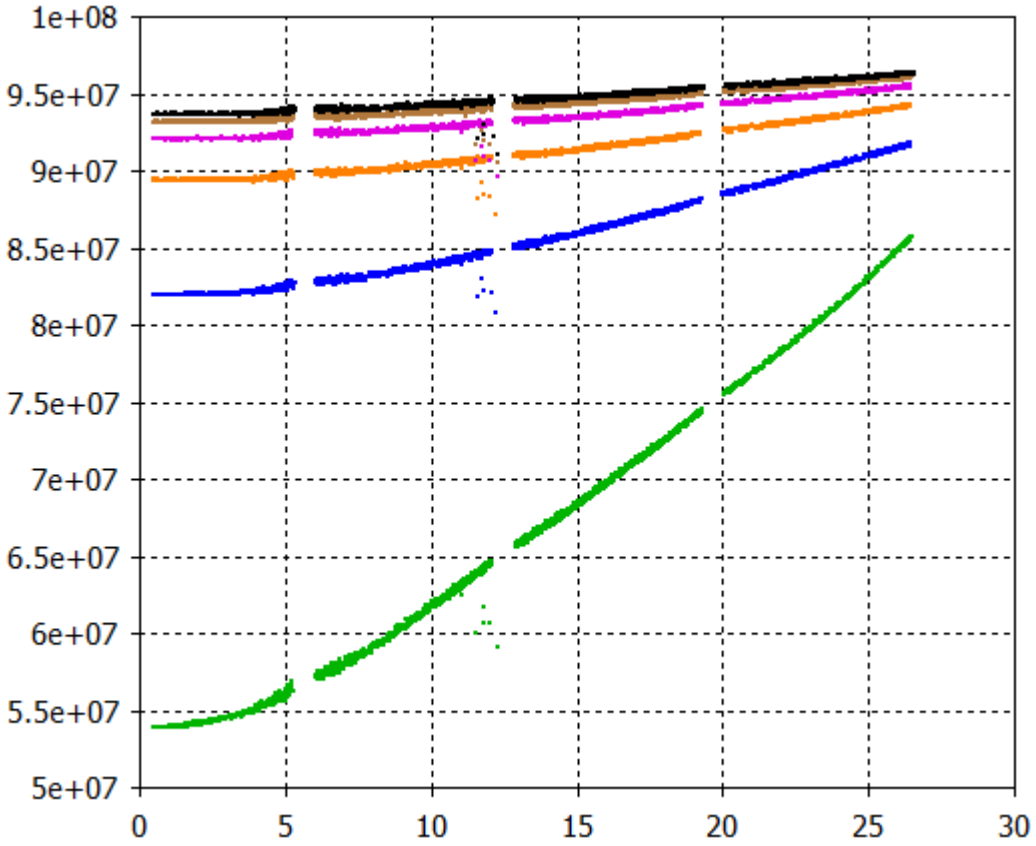




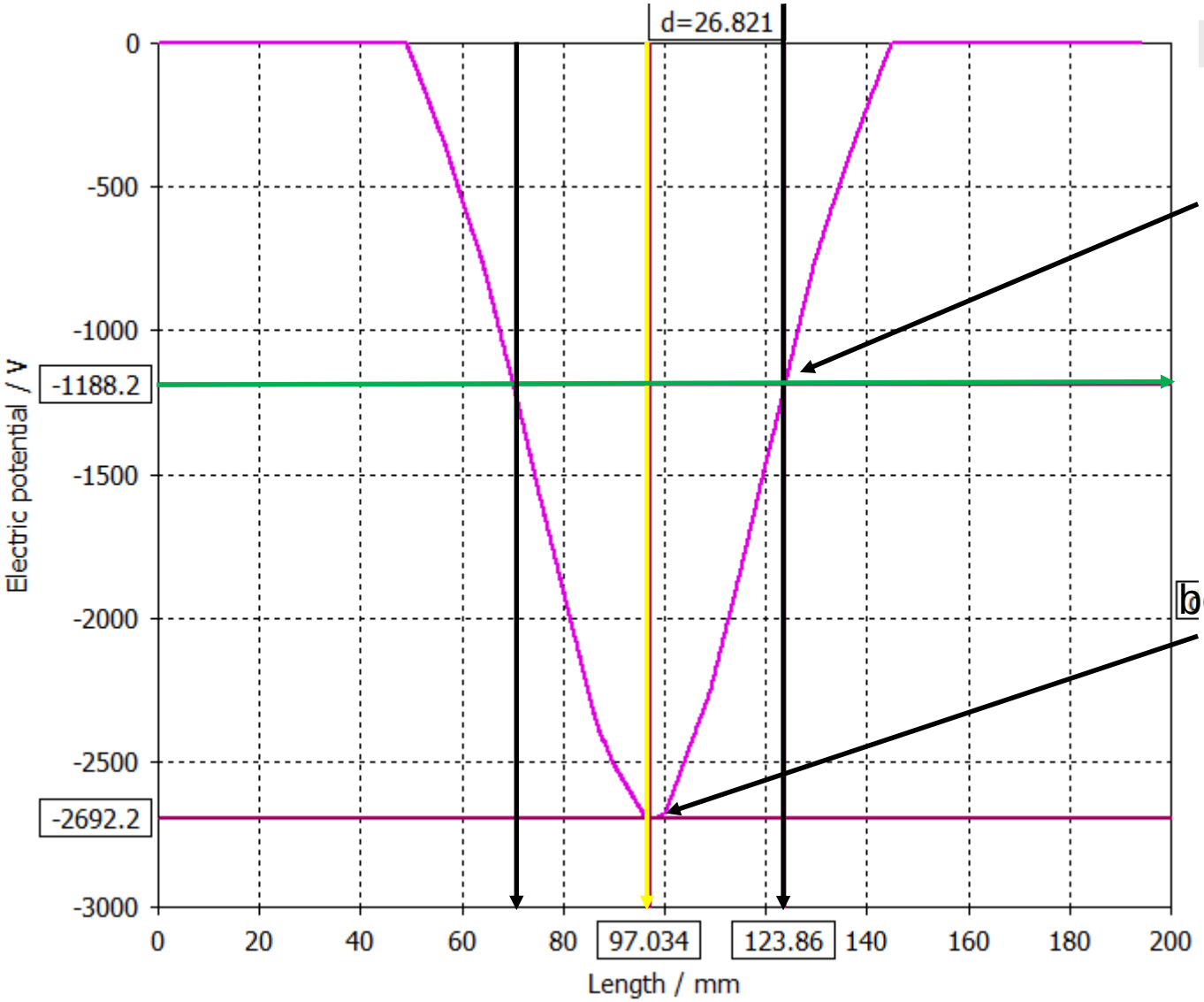
Energy vs. beam radius (mm)



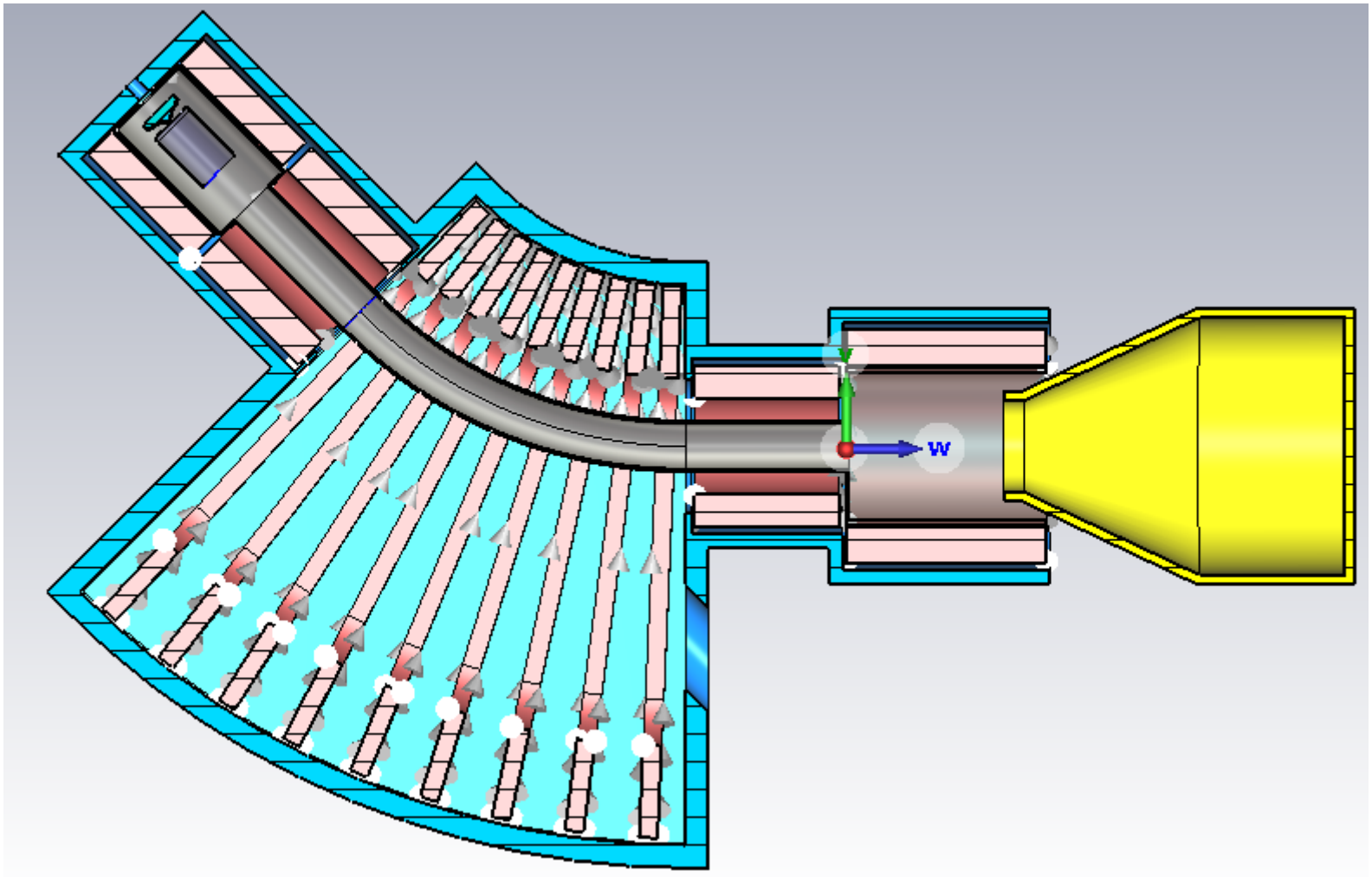
Velocity (m/s) vs. beam radius (mm)



Space charge potential of electron beam



Setup for collector design and SEE simulation



Thank you for your attention!

Mesh: a Delaunay triangulation