Status Report
Electron Gun Design

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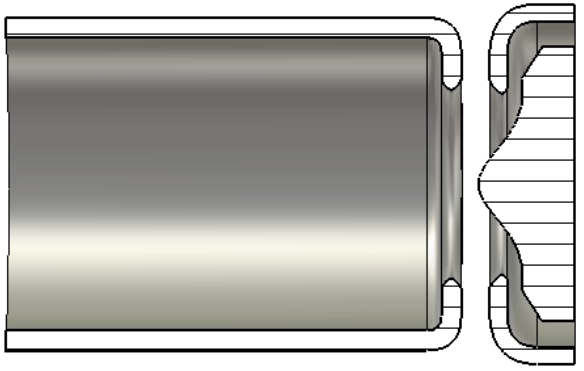
Cathode

The cathode is round with radius of 26.5 mm and Gaussian profile.

The profile of the cathode is given by

$$y = y_0 + \frac{A}{w\sqrt{\frac{\pi}{2}}} e^{\frac{-2(x-x_c)^2}{w^2}}$$

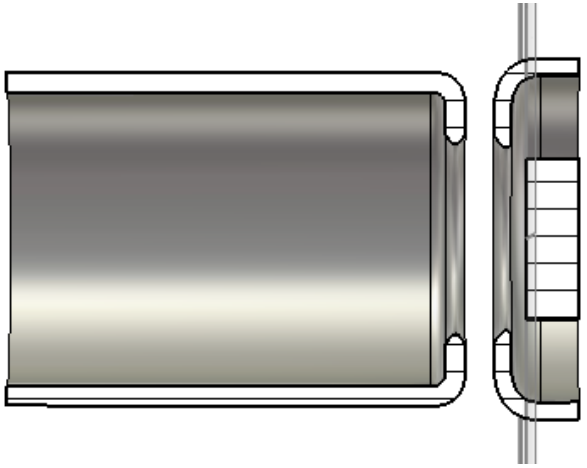


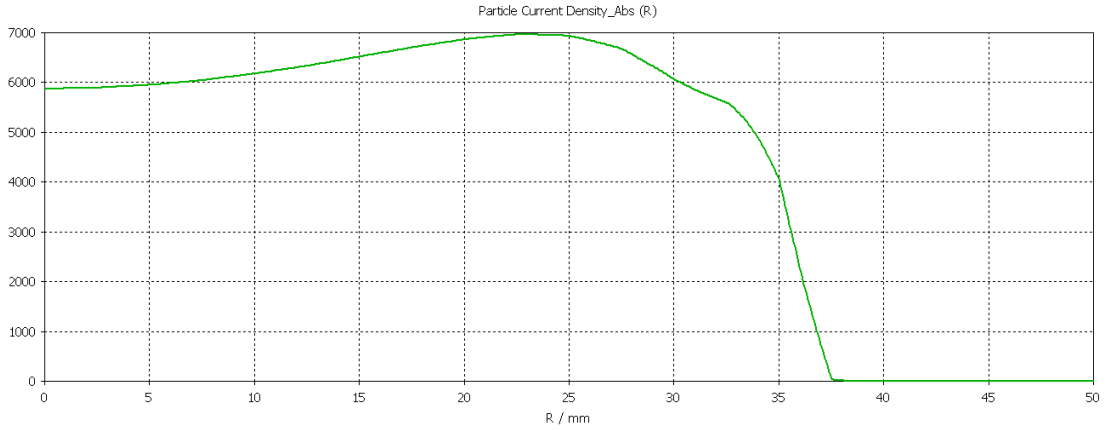
where offset y_0=0.97, centre x_c=-0.17, width w=2.82, and area A=433.42.

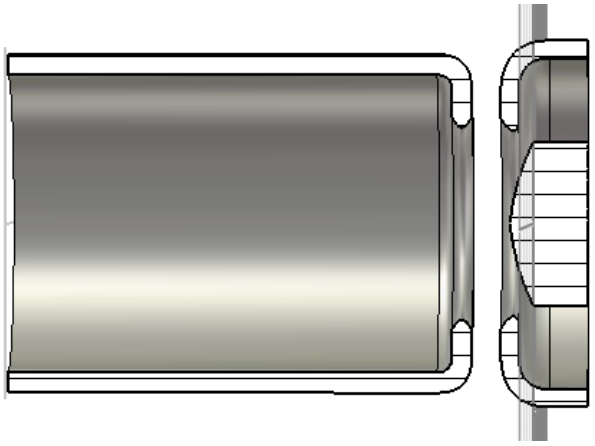
The required maximum current density is in the order of 3.2 A/cm^2. A current density of 4 A/cm^2 is achievable for standard thermionic dispenser cathodes based on barium oxide.

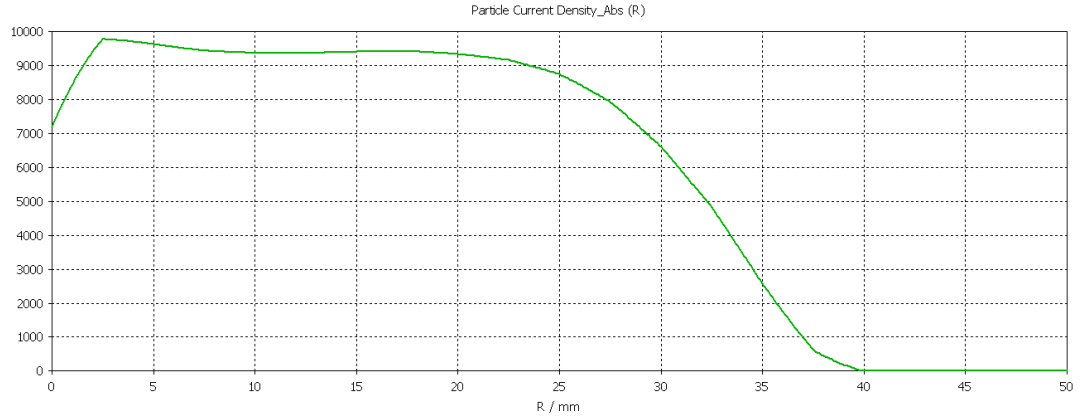
Cathode

Study on generation of homogeneous beam by flat cathode





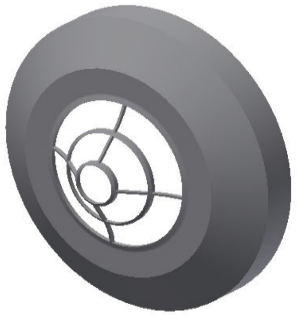


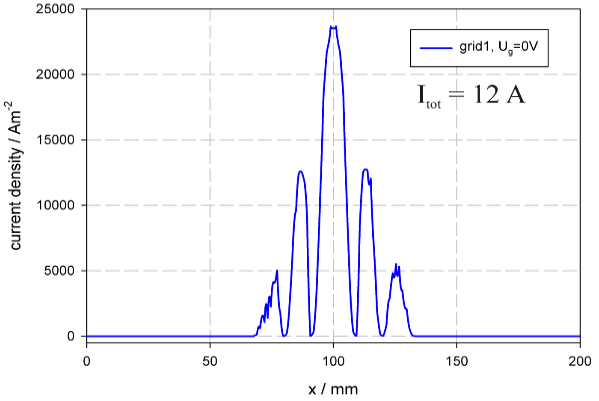


Cathode design not finalized yet.

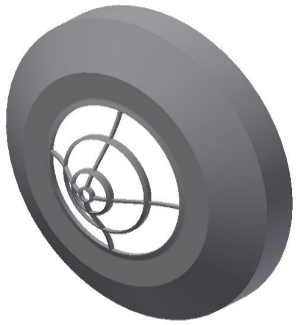
Grid Design

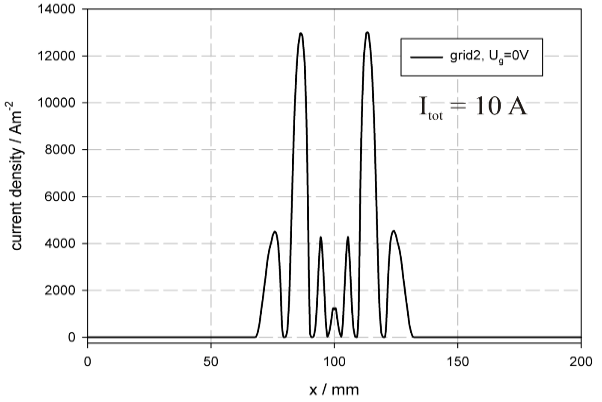
Grid design I



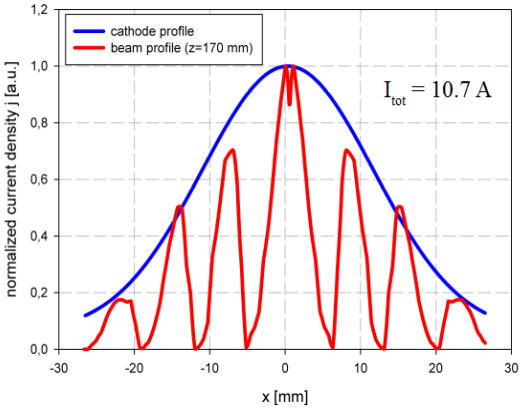


Grid design II

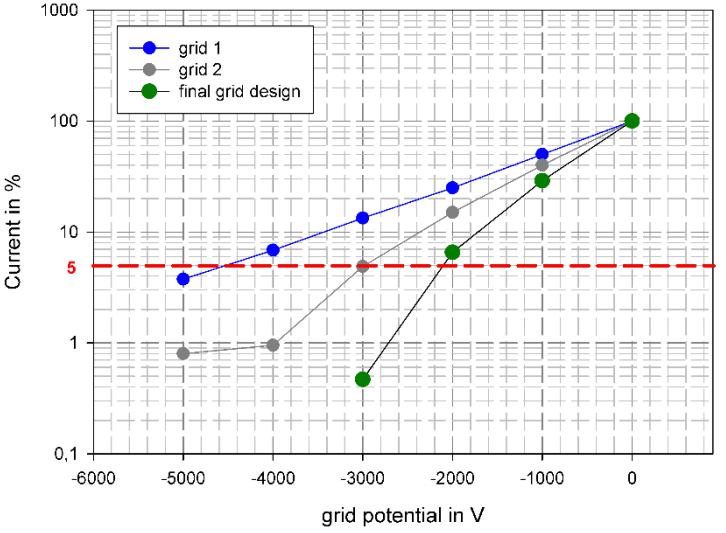




Final grid design and resulting current density profile for U_a=30 kV and B_z=0.4 T

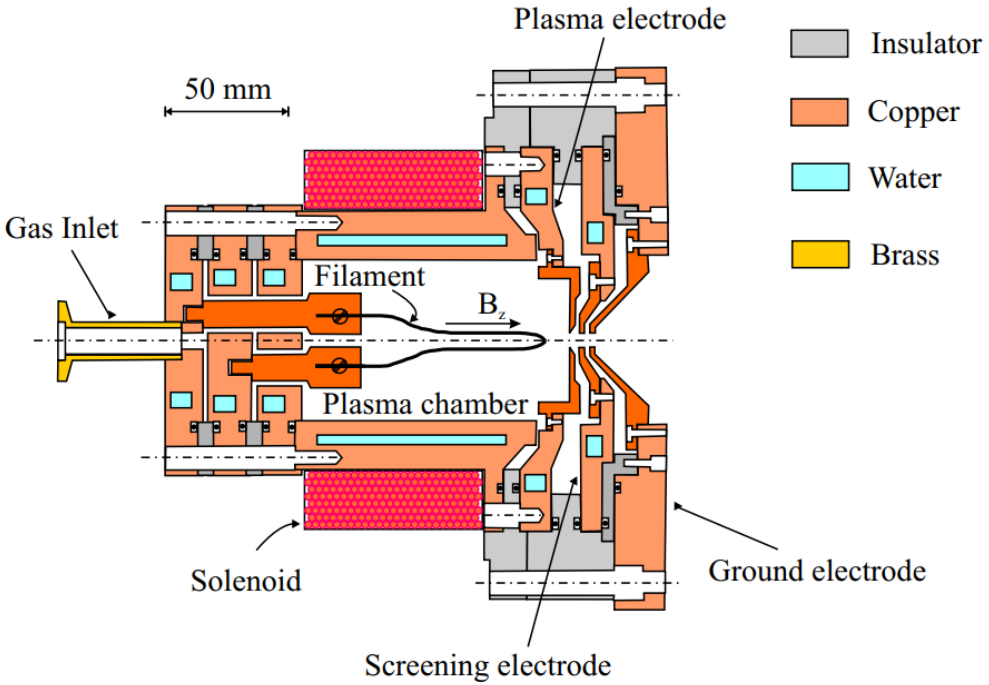


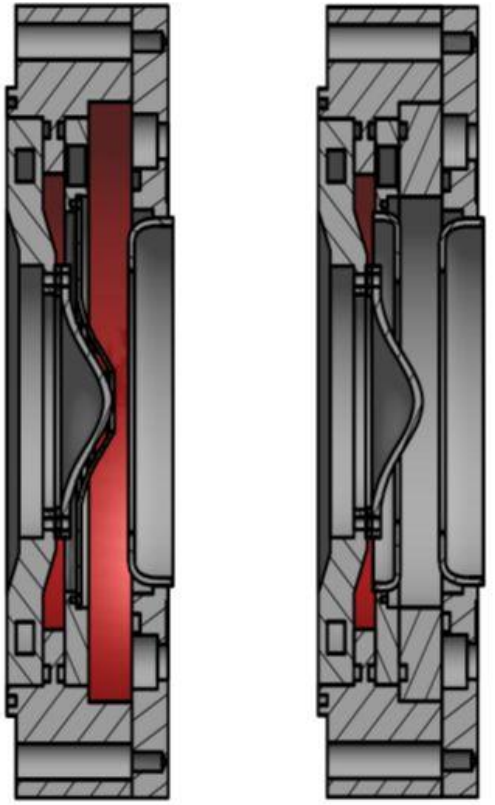
Required grid voltages to cut off beam current for different grid designs.



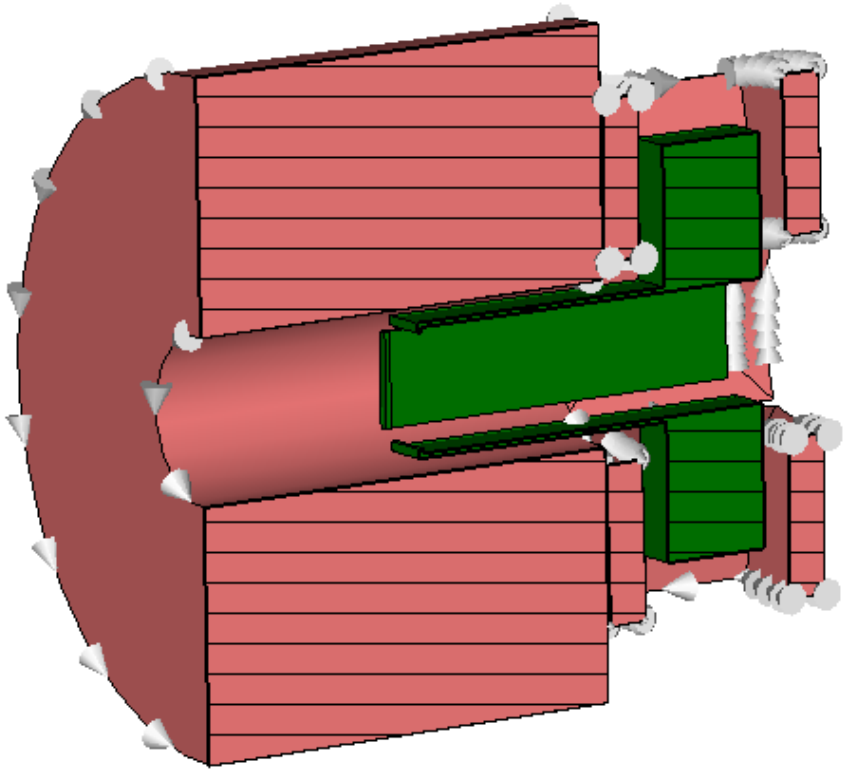
Beam Load Study

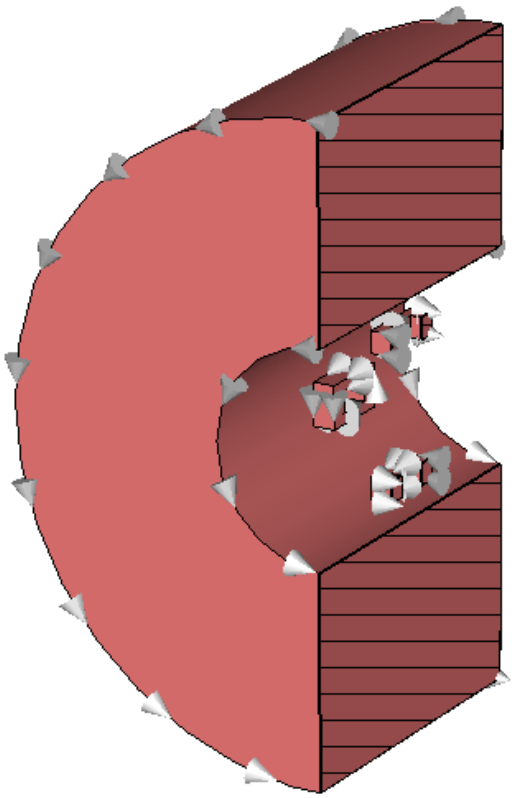
- Numerical study of beam load on grid by M. Droba
- Experimental study using electron Gun Dummy
  - using body and infrastructure of volume ion source
  - cathode and grid made of tungsten
  - cathode indirectly heated by filament





Magnet Design



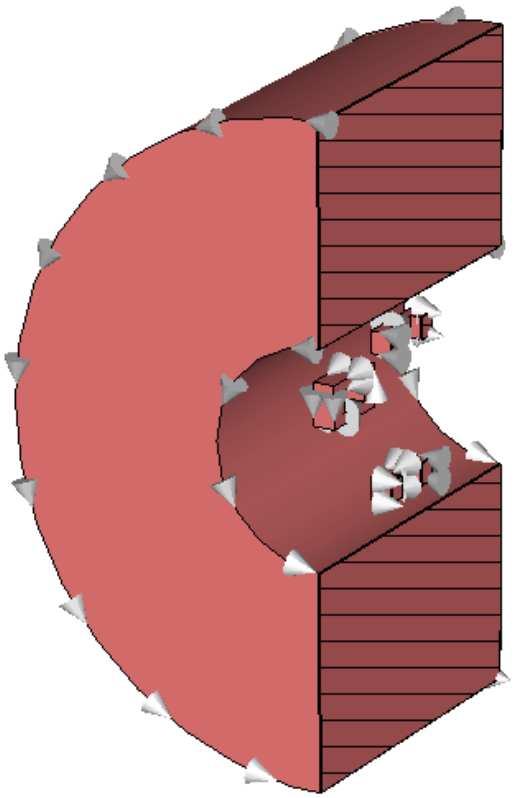


Technical integration of quadrupole is still ongoing.

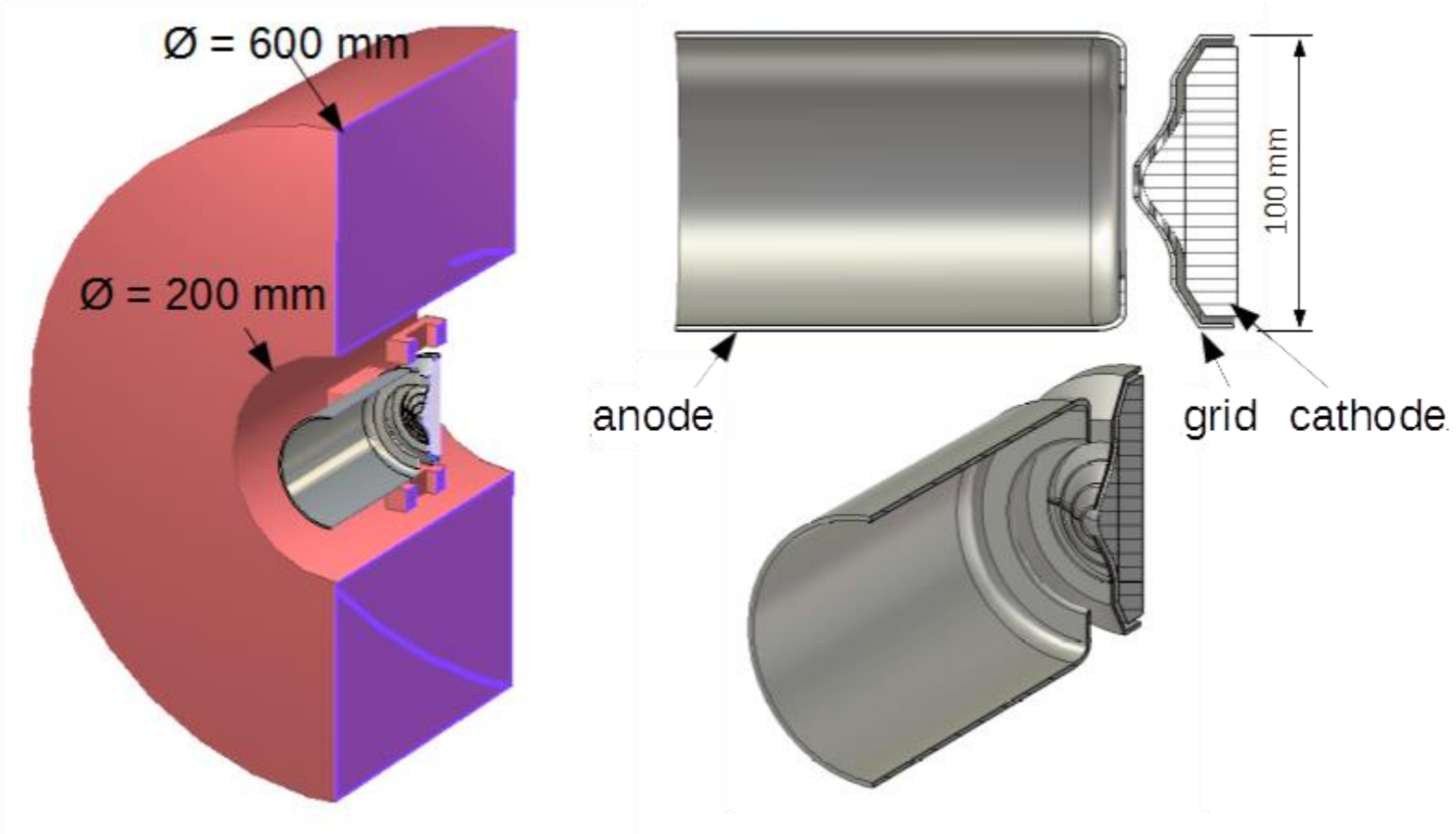
Gun Solenoid

- open call for tender
- Delivery date 15.12.2019
- Specifications

Magnetic field on axis	0.60	T
Current max.	500	A
Voltage max.	130	V
Solenoid length	408	mm
Aperture	200	mm
Outer diameter	600	mm



Overview Gun Design



Parameter Summary

Electron Gun		Magnetic System	
Cathode radius R_c [mm]	26.5	Max. magnetic field of Solenoid $B_{z,max}$ [T]	0.6
Anode voltage U_A [kV]	25 - 30	Max. magnetic field of quadrupol air coil $B_{x,max}$ [T]	0.06 · $B_{z,max}$
Distance cathode to anode d_{ca} [mm]	20		
Max. extracted beam current I_{max} [A]	10		
Max. grid voltage $U_{g,max}$ [kV]	3		
Grid capacity C_g [pF]	~75		
Distance cathode to grid d_{cg} [mm]	3		