GTS gun CST simulations

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Original GTS gun design – Ron's corrected model – with NEGs

-300 kV at the cathode, 0 V at the anode





E field









Original GTS gun design – Ron's corrected model – no NEGs

-300 kV at the cathode, 0 V at the anode





0 -1 -2 -2 -3 -4 0.06 0.08 0.10 0.12 0.14 0.16 0.18 0.20 Z [m]







Flat cathode front and flat anode- cathode anode gap 5 cm – no NEGs

-300 kV at the cathode, 0 V at the anode

Beam pipe is not connected to anode.









Potential

-2.0

국승.... Mr(Ez) = -6.80771e+06 0.08

0.10

0.12

0.14

z [m]

0.16

0.18

0.20



Original GTS gun design – Ron's corrected model

Comparison between with NEGs and without NEGs



- Without the NEGs beam is on axis in x.
- X and Y emittances are bit off.

Comparison between original design (with NEGs, without NEGs) and flat anode-cathode model



- Beam is more centered in flat anode-cathode model than original model.
- X and Y emittances are almost same in the flat anode-cathode model.

Flat cathode front and flat anode- cathode anode gap 5 cm – no NEGs

Suggested designs to connect anode (at 5cm) and beam pipe

Spider model



Smaller pipe between anode and actual beam pipe



Flat cathode front and flat anode- cathode anode gap 5 cm – no NEGs

Suggested designs to connect anode (at 5cm) and beam pipe

Spider model





Small pipe model



Flat cathode front and flat anode- cathode anode gap 5 cm – no NEGs – Spider model

-300 kV at the cathode, 0 V at the anode





E-Field [1]

Component

Frequency Phase

Maximum

Cross section

Cutplane at X

Abs 1 Hz

0 °

Maximum (Plane) 2.1364e+08 V/m

0.000 m

4.12609e+08 V/m

Potential

V/m 1e+7-9e+6-

8e+6-

7e+6-6e+6-

5e+6-

4e+6 -

3e+6-2e+6 ----

1e+6 -





Flat cathode front and flat anode- cathode anode gap 5 cm – no NEGs – Spider model

-300 kV at the cathode, 0 V at the anode



Flat cathode front and flat anode- cathode anode gap 5 cm – no NEGs – Small pipe model

-300 kV at the cathode, 0 V at the anode

E field





E-Field [1] Component Abs Frequency 1 Hz Phase 0 * Cross section A Cutplane at X 0.000 m Maximum (Plane) 2.1473e+08 V/m Maximum 4.07945e+08 V/m







Flat cathode front and flat anode- cathode anode gap 5 cm – no NEGs – Small pipe model

-300 kV at the cathode, 0 V at the anode



Flat cathode front and flat anode- cathode anode gap 5 cm – no NEGs – Spider model

-300 kV at the cathode, 0 V at the anode Anode shifted -1.6 mm **E** field

Frequency

Maximum

Phase









Flat cathode front and flat anode- cathode anode gap 5 cm – no NEGs – Small pipe model

-300 kV at the cathode, 0 V at the anode Anode shifted -1.6 mm













GPT simulations

Simulation Parameters

- Gun HV -300 kV (3D E Field map CST)
- Charge 1 nC
- Gun solenoid off
- Pulse width FWHM-75 ps (Gaussian)
- Rep rate 50 kHz
- Laser Spot size (rms)-1.5 mm (Gaussian)
- Accuracy- 6.5
- Space charge calculation off
- Beamline distance 2 m
- Beam pipe radius included
- Focusing solenoids are off
- Correctors are off





Emittance_y is better with the -1.6 mm shifted anode.



