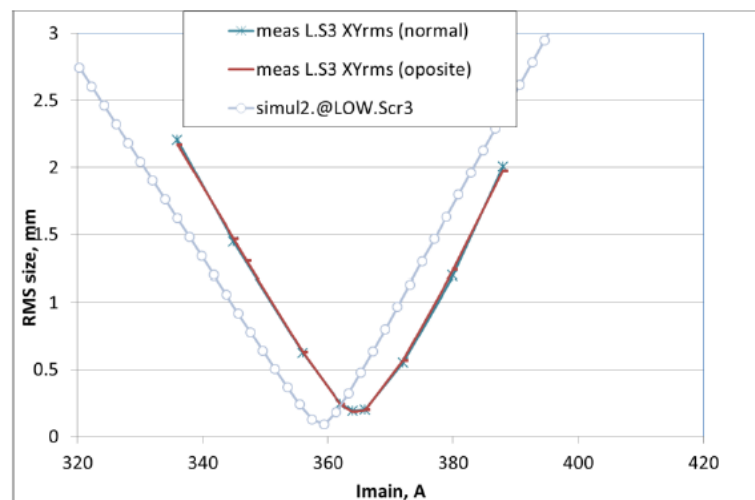# Refine gun RF focusing model

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2017 Jul 27

Main reasons

- Gun focusing
- Solenoid focusing
- Beam energy, beam charge
- Beamline ASTRA model & real coordinates
- Imperfection in gun coupler region & solenoid field
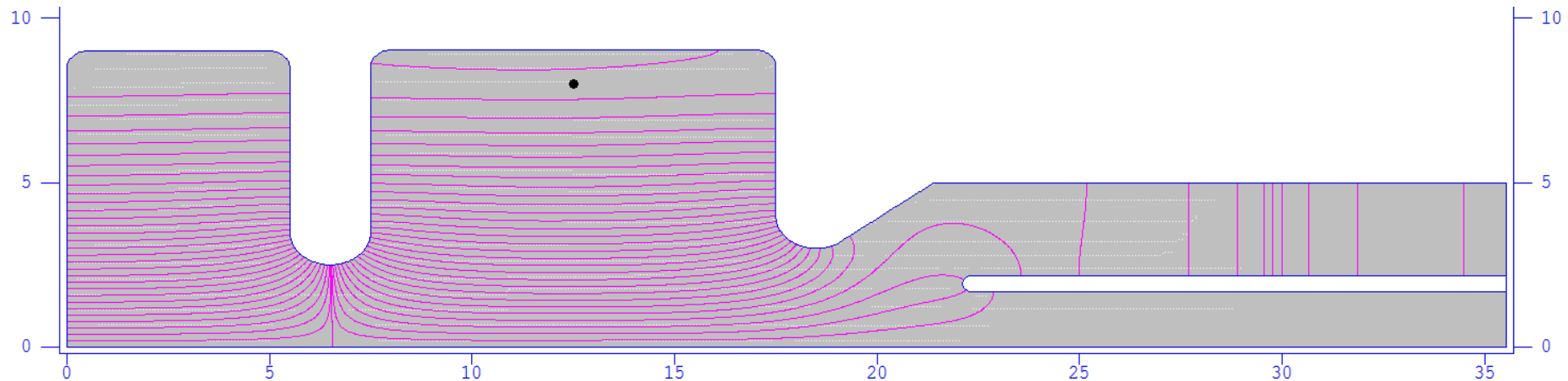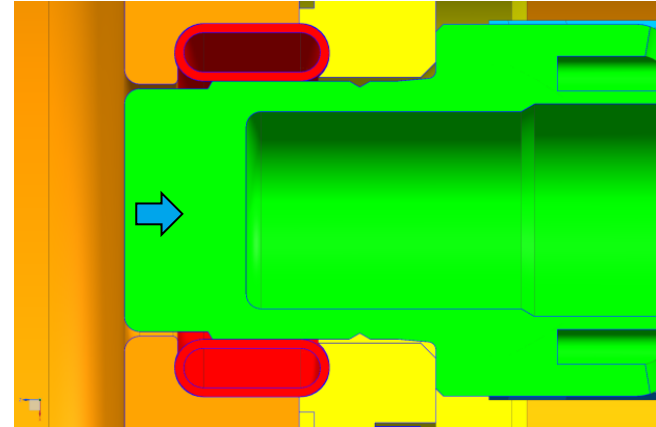- …
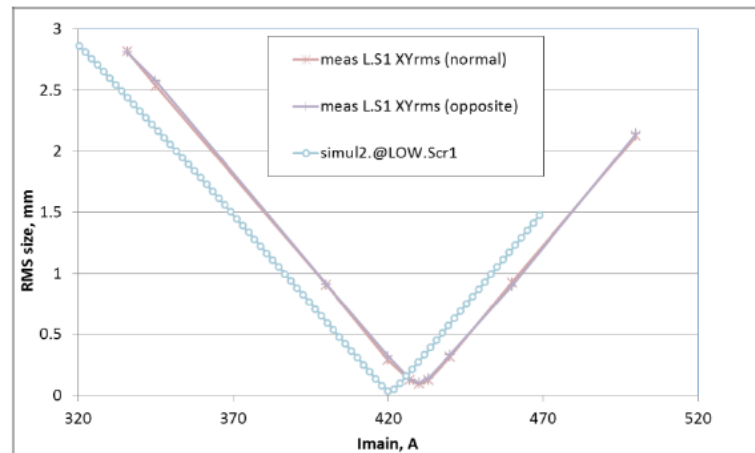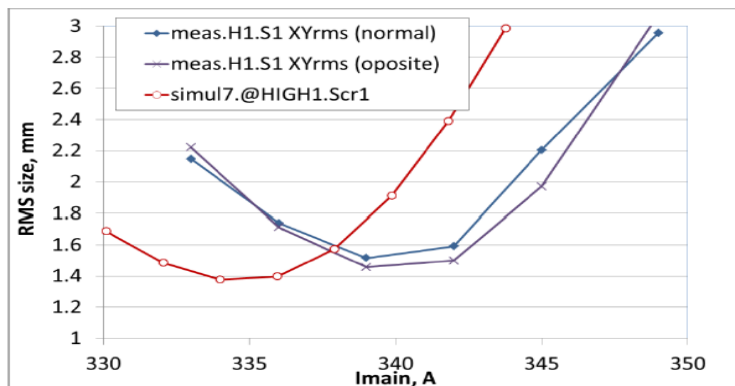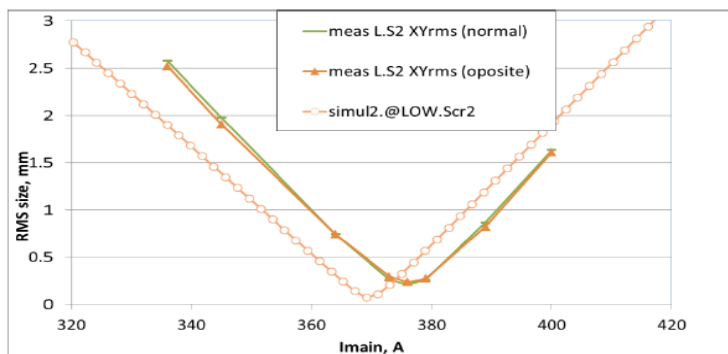
Plug focusing effect depends on location

> Change of plug location can correspondingly cause change of electromagnetic field on the cathode surface hence changing gun focusing effect on the beam

> Superfish simulation to involve the case when cathode is not ideally flat in the entrance of gun
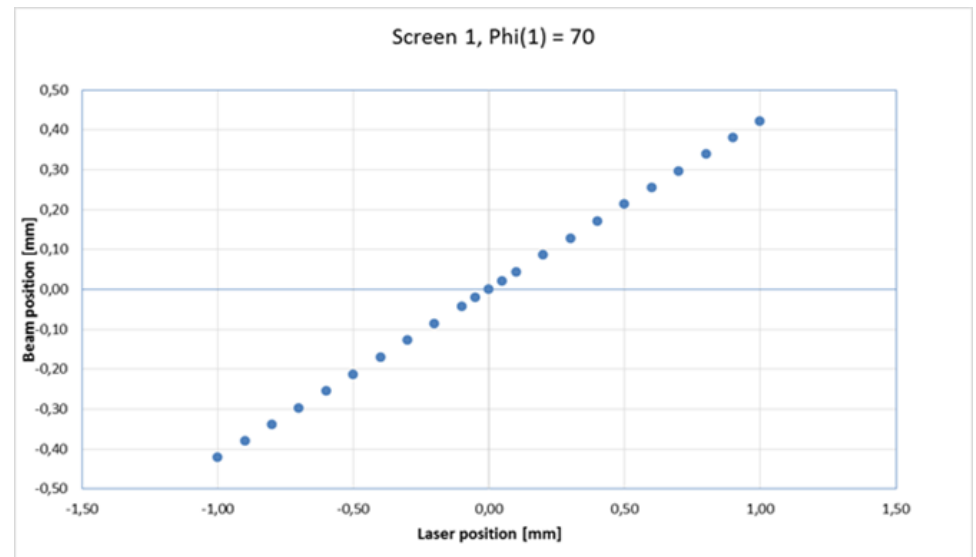
Method to compare the simulation result with an experiment

$$\begin{bmatrix} X \\ X' \end{bmatrix}_S = \begin{bmatrix} M_{11} & M_{12} \\ M_{21} & M_{22} \end{bmatrix} \begin{bmatrix} X \\ X' \end{bmatrix}_C$$

simulation

> $\dfrac{\partial X_S}{\partial X_C} = M_{11}$

experiment

Screen 1, Phi(1) = 70
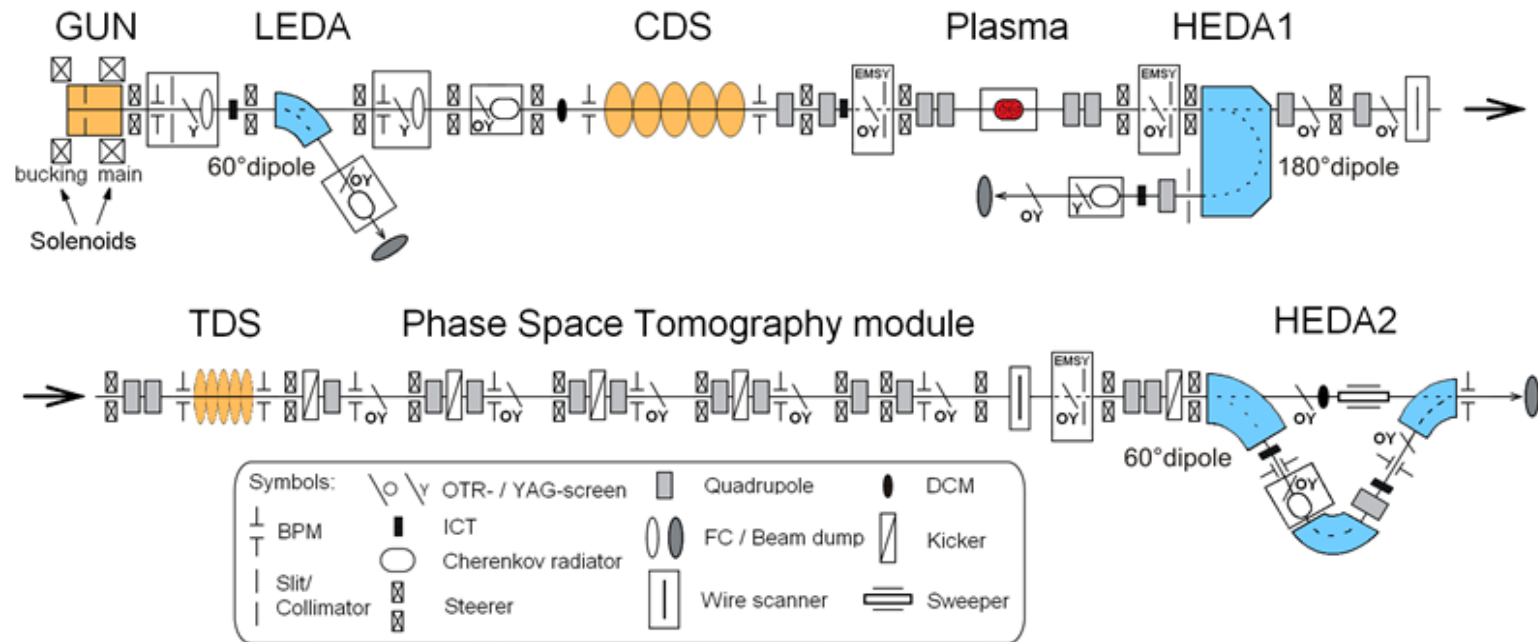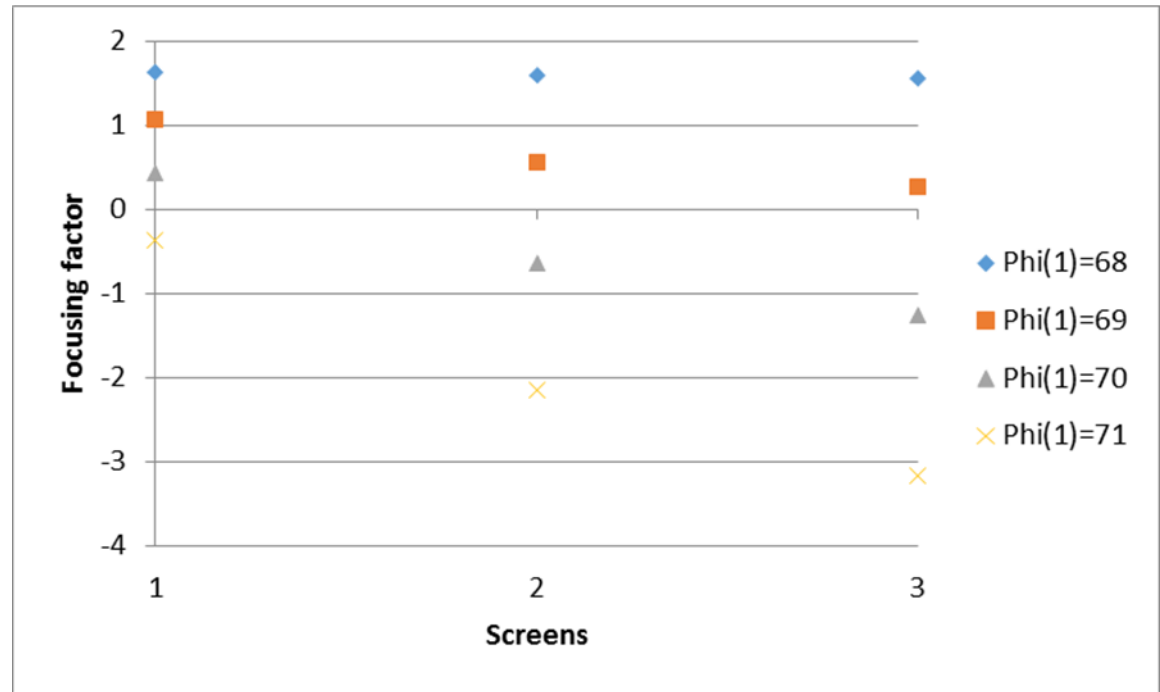
Method: remove complication due to space charge effect

- Solenoid off, find the gun focusing phase

- Solenoid on, check MMMG phase

- Solenoid off, Scan beam on cathode, fit beam centroid movement on screen

- Using different gun field maps, fit simulation to experiment, by tuning cathode plug location in gun using superfish

> Solenoid off

> MaxE(1)=30MV/m

> $X_{off} = 1mm$

Work & Goal

> Superfish simulation for gun geometry with different cathode plug location

> Continue ASTRA simulation for gun focusing at different screens

> Join PITZ operation to measure the gun focusing

> Fit simulation to experiment

> Write a report for summary

Thank you for attention