Beam dynamics study of RF and solenoid fields for PITZ gun without space charge

OUTLINE

- SETUP
- SIMULATION STUDY
- EXPERIMENTAL STUDY
- CONSCLUSION

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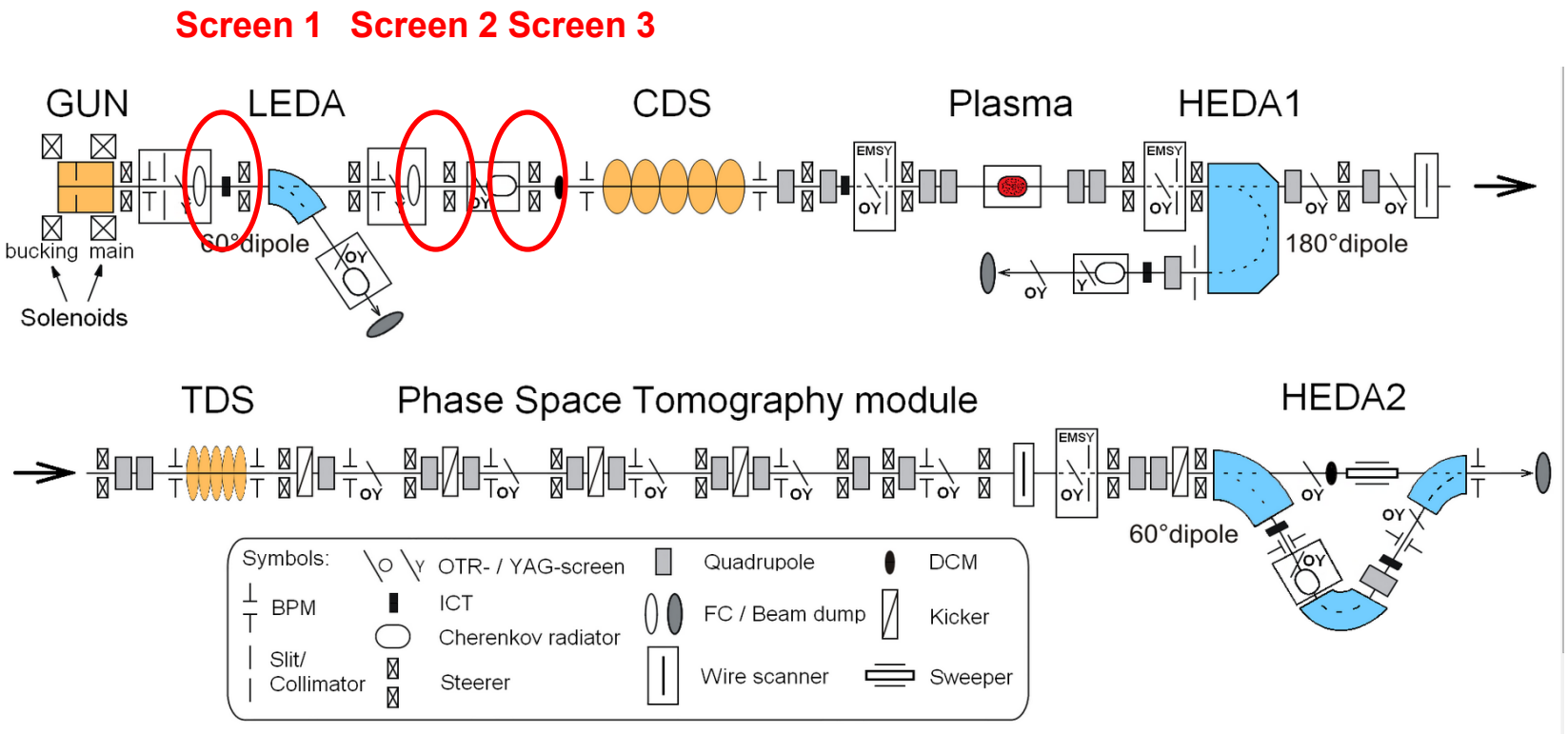
Zeuthen, 6/8/2015

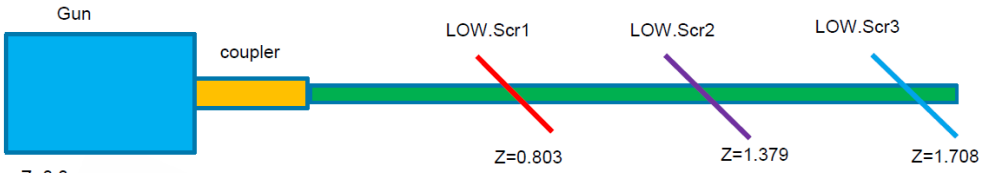
HELMHOLTZ ASSOCIATION

DESY

PITZ beamline



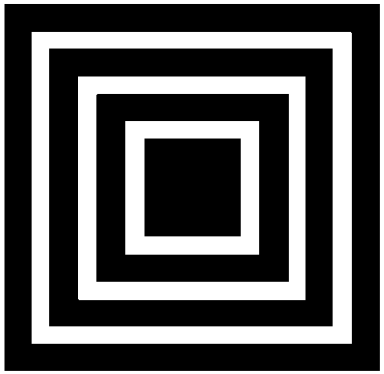
Simulation – Experimental SETUP



- Beam charge (20pC)
- Gaussian longitudinal and uniform transverse distribution
- Grid is used to shape the beam
- Imaging at Low Screen1 , Low Screen2, Low Screen3
- Magnetic field is computed by the formula:

$$B_{z,main}[T] = 5.889 \times 10^{-4} * I_{main}[A] + 7.102 \times 10^{5}$$

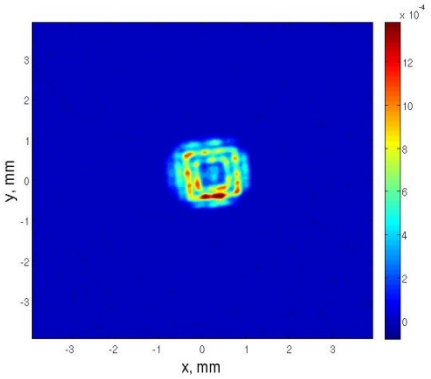
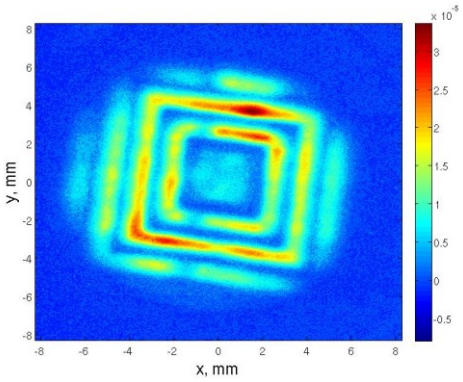
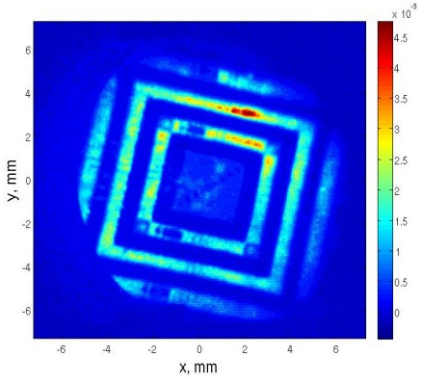
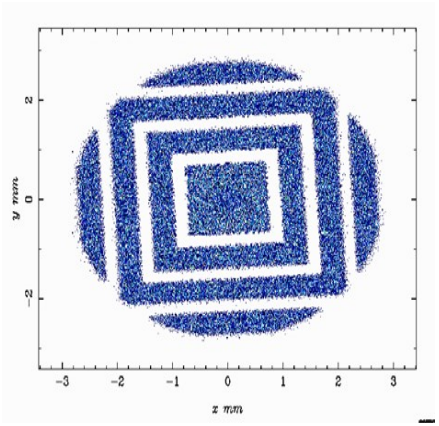
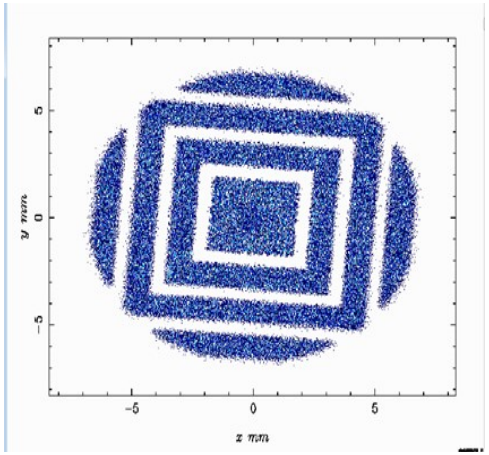
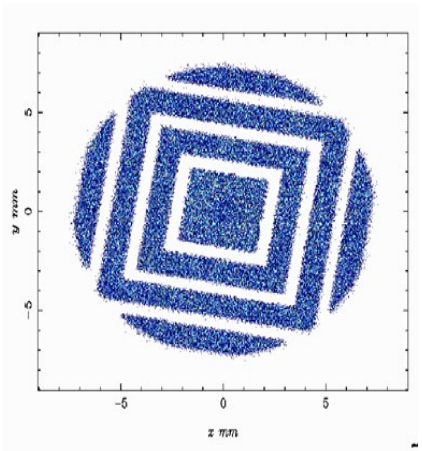
- Experimental data from 17/06/2015 (5MW in the Gun)



Grid after the cathode.

I_{main} : solenoid current from experiment
B_z : magnetic field of solenoid in simulation

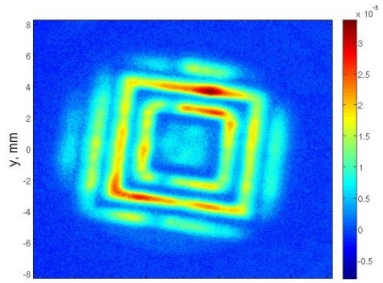
Simulation Study

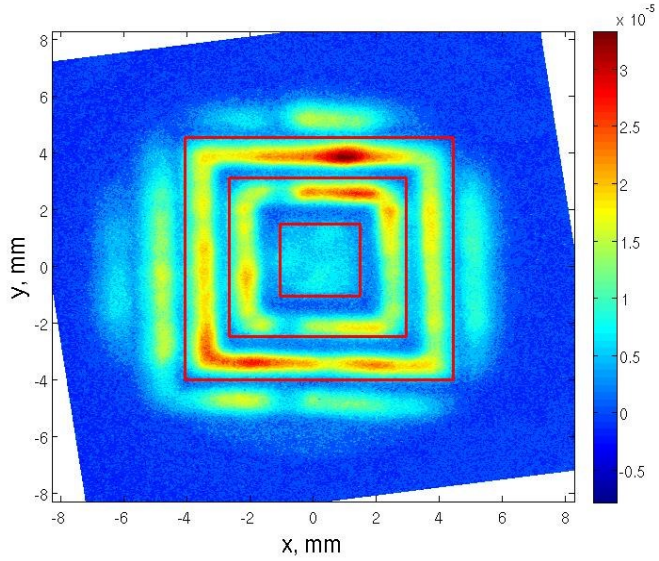
	Low Screen 1 B = 0.272 I = 462.5A	Low Screen 2 B = 0.249 I = 423.6A	Low Screen 3 B = 0.234 I = 397.1A
Data (17/6/2015 Morning shift)			
Simulation			
Magnification	1.15	2.8	3

Experimental study

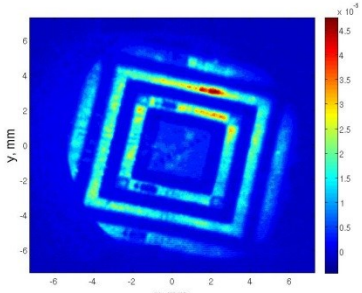
Data
(17/6/2015
Morning shift)

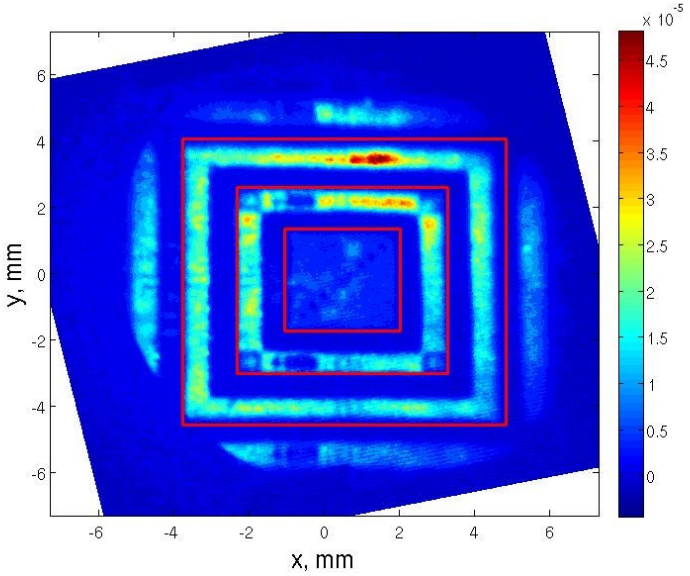
Low Screen 2
B = 0.249





Low Screen 3
B = 0.234





Magnification

2.8

2.9

SUMMARY

- Grid image is rotated by the magnetic field of the solenoid.
- Magnification factor has to be confirmed.
- Simulation in accordance with the experimental imaging data.
- The calibration formula for the longitudinal magnetic peak field of the solenoid magnet seems consistent.
- More experimental data for 3MW in the Gun.

Acknowledgment

- Quantang Zhao

THANK YOU FOR YOUR ATTENTION!