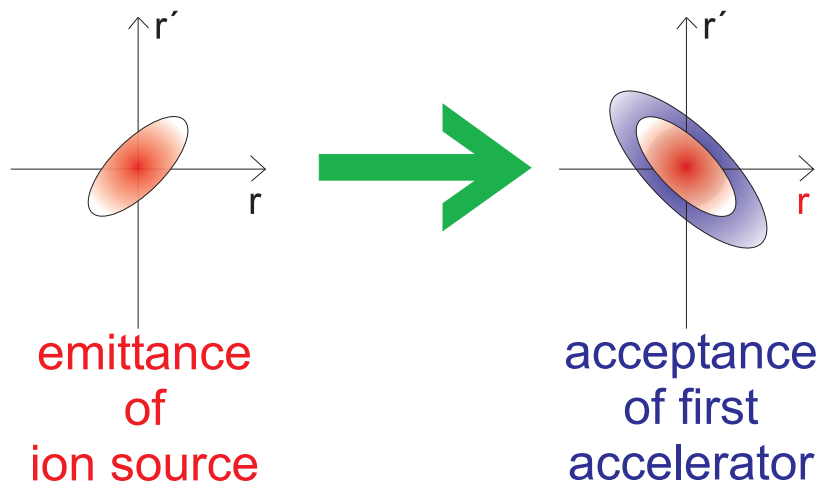


## Low Energy Beam Transport



emittance growth is influenced by

- space charge forces
- lens aberrations
- current fluctuations

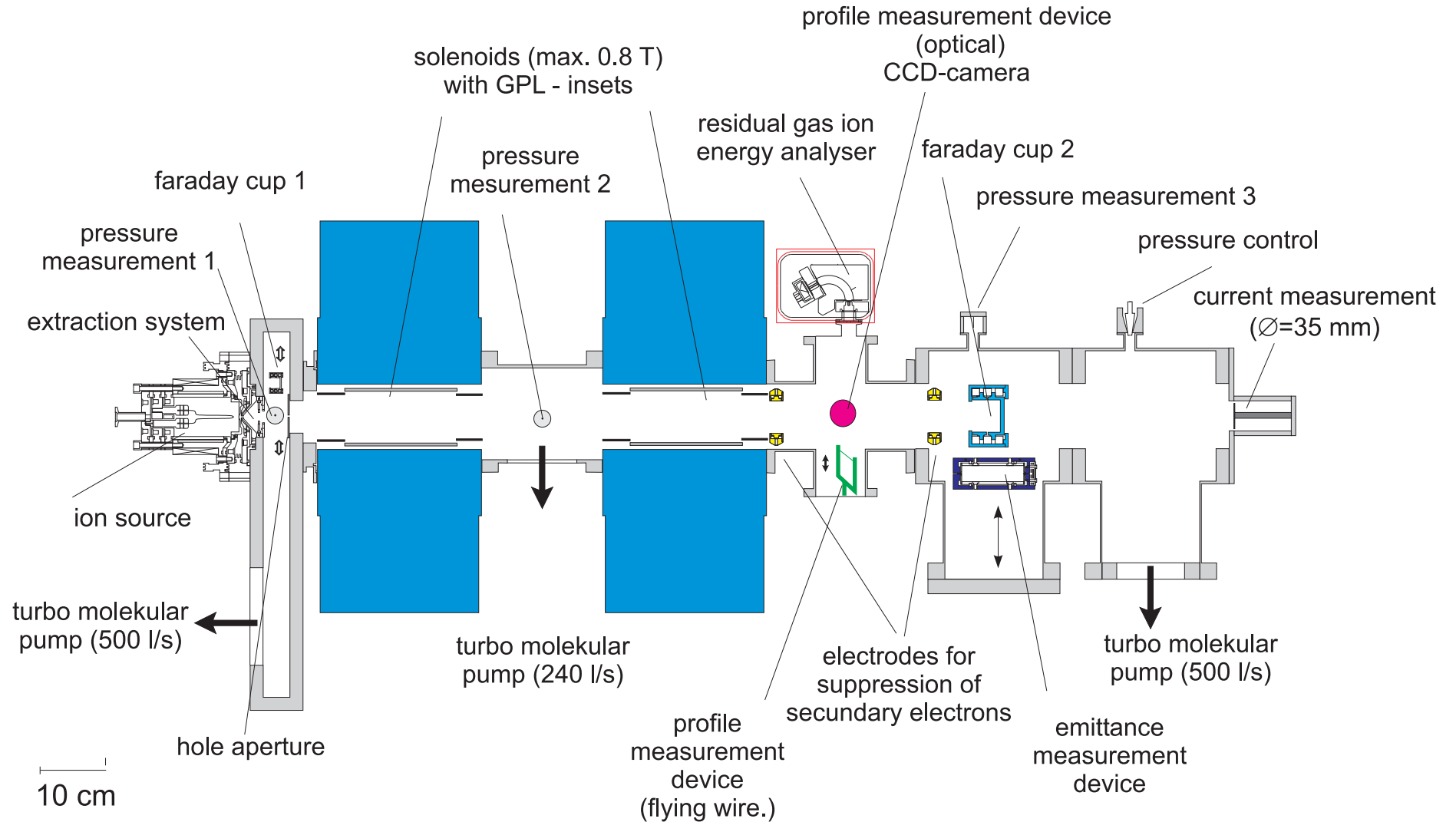
...

transmission is influenced by

- space charge forces
- residual gas pressure
- length of LEBT

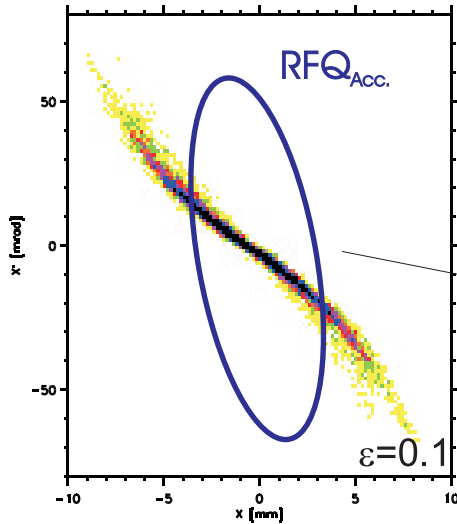
...

# Low Energy Beam Transport (LEBT) Section Experimental set up in Frankfurt

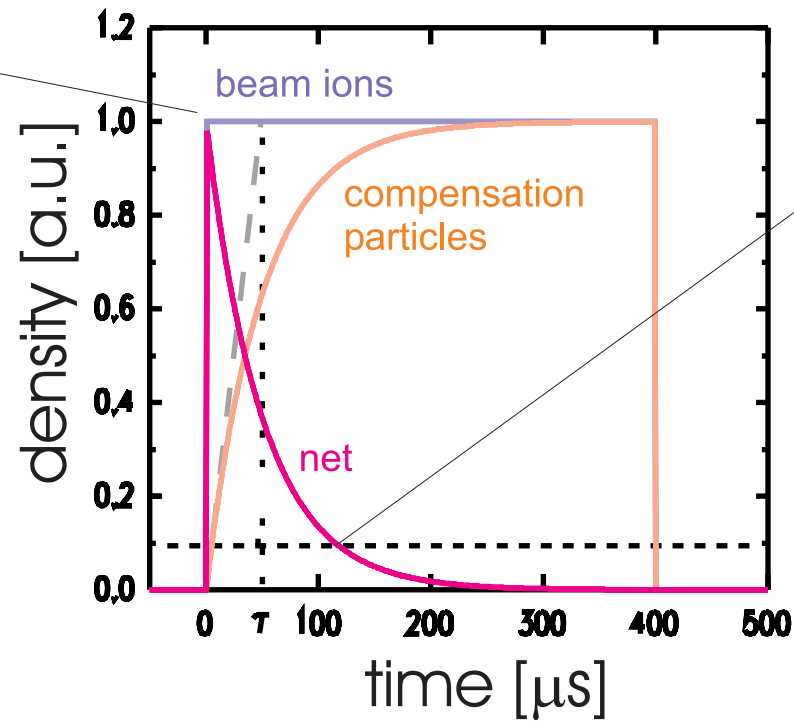
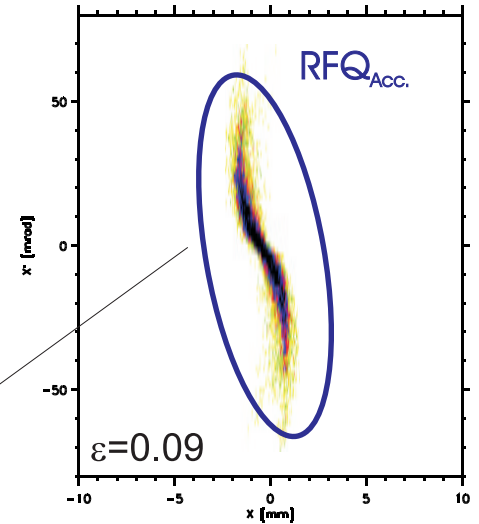


# Influence of space charge fluctuations on emittance at RFQ entrance:

Space charge<sub>net</sub> = 100 %  
0% compensated

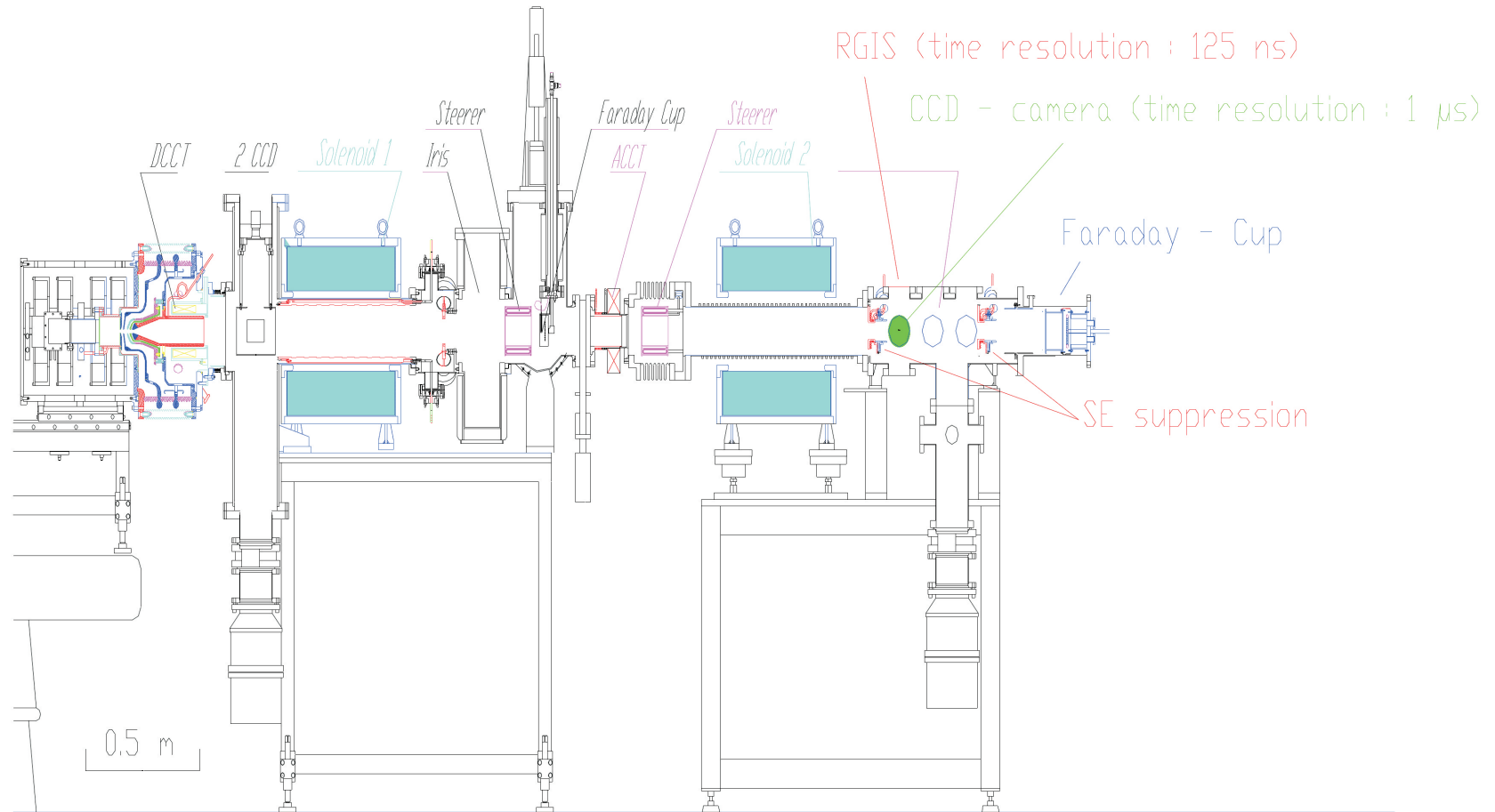


Space charge<sub>net</sub> = 10 %  
90% compensated

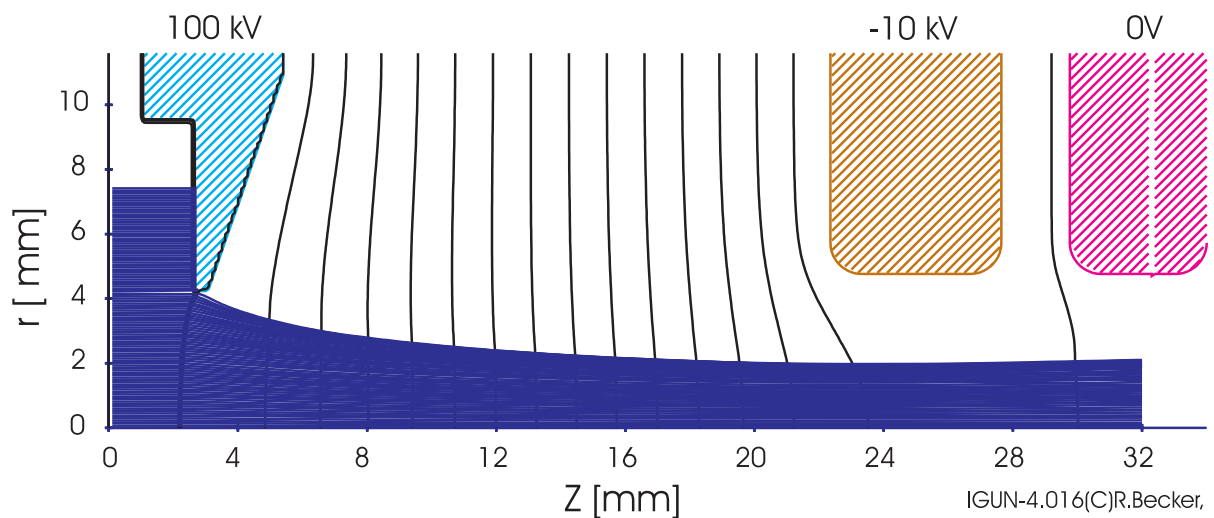


# Low Energy Beam Transport (LEBT) Section SILHI

*SOURCE and BEAM ANALYSIS LEBT*

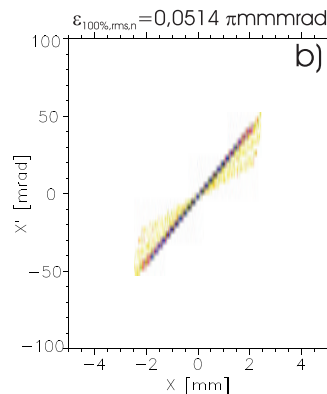
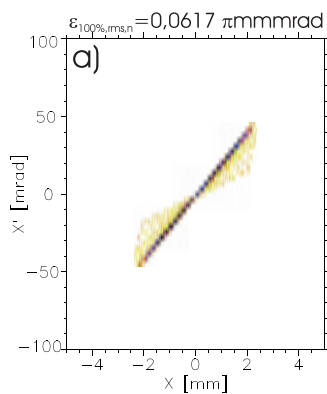


## Ion extraction



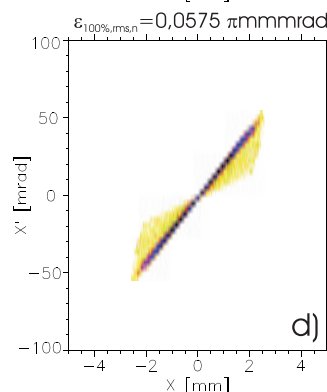
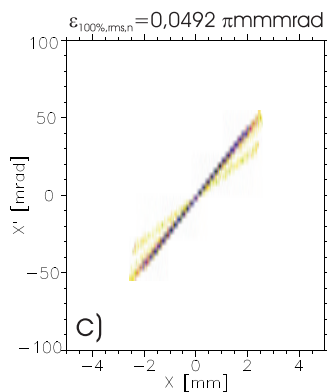
## Emittances

137.2 mA



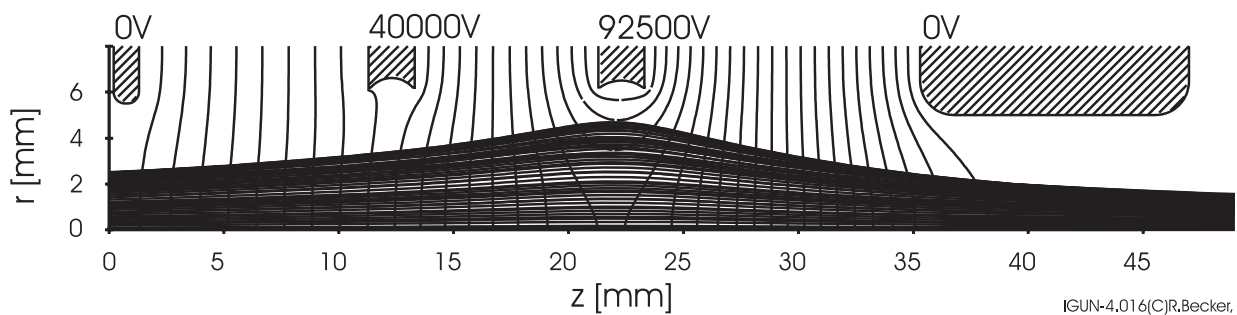
140 mA

142.8 mA



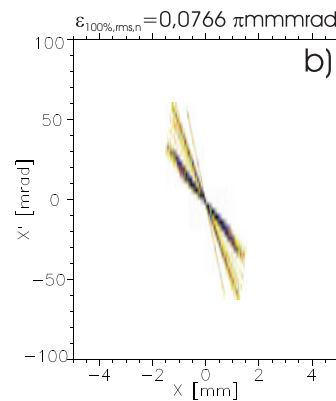
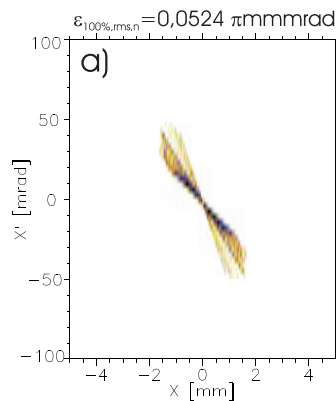
140 mA  
+ -2%

## Electrostatic LEBT



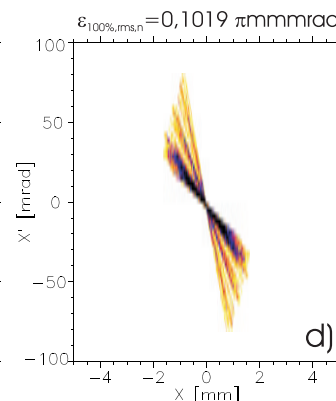
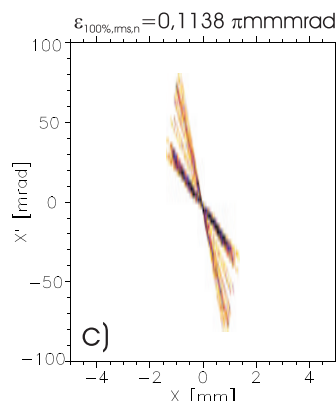
## Emittances

137.2 mA



140 mA

142.8 mA



140 mA  
+ -2%

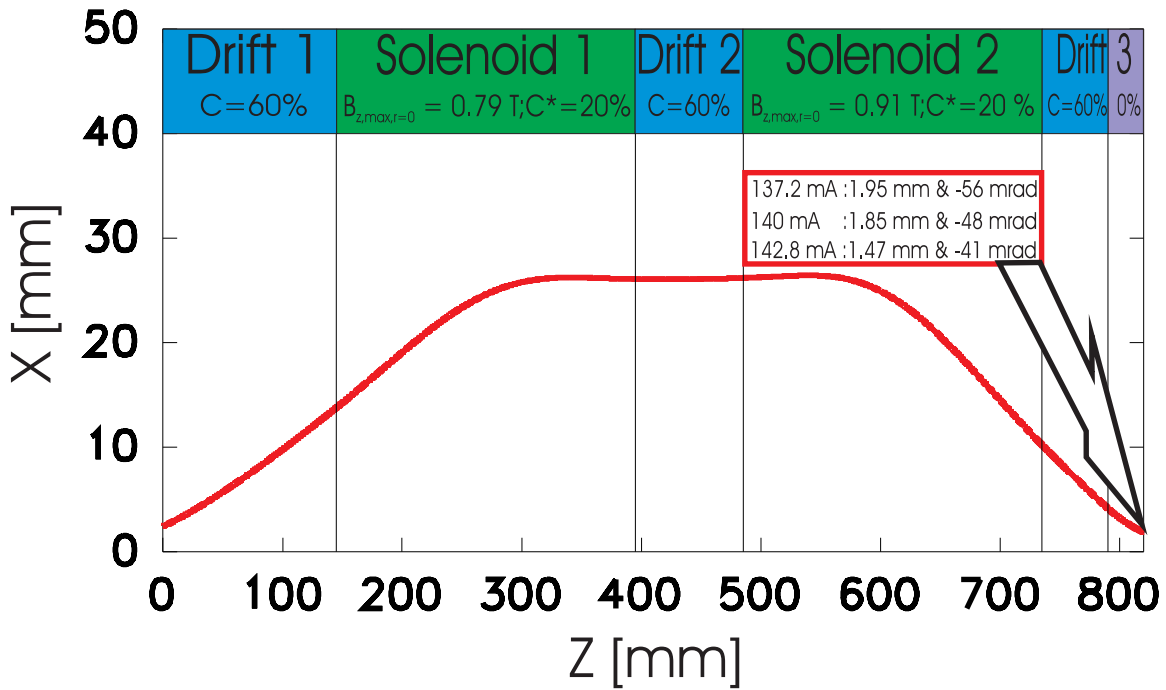


# Johann Wolfgang Goethe-Universität Frankfurt am Main

Institut für Angewandte Physik

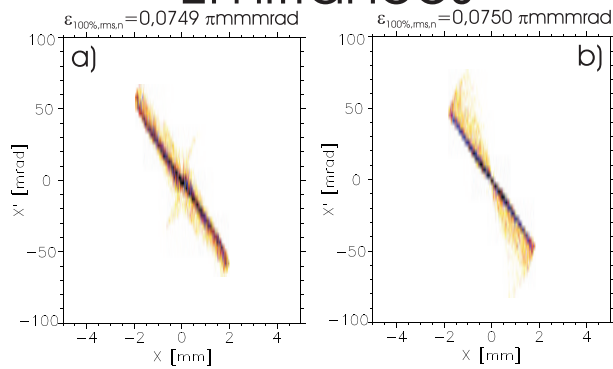
J. Pzimski

## Magnetic LEBT



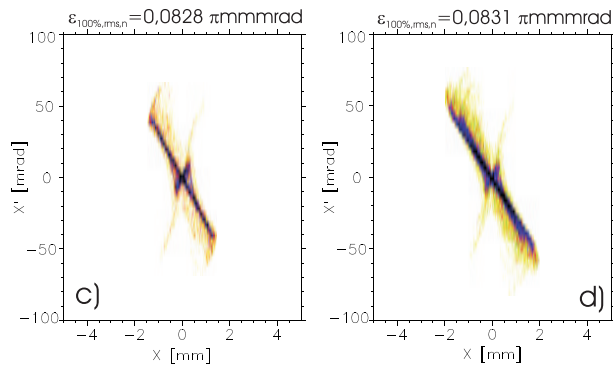
## Emittances

137.2 mA



140 mA

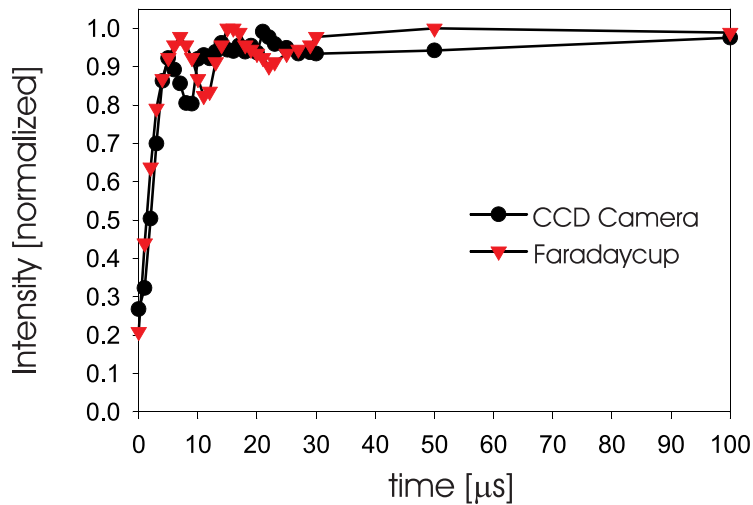
142.8 mA



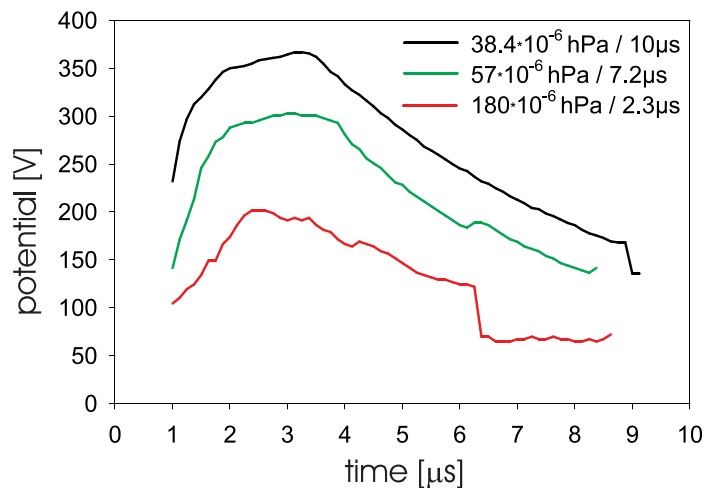
140 mA  
+ -2%

## Space charge compensation

### Current / Space charge fluctuation



### Time dependency of beam potential



### Cut-off noise frequencies

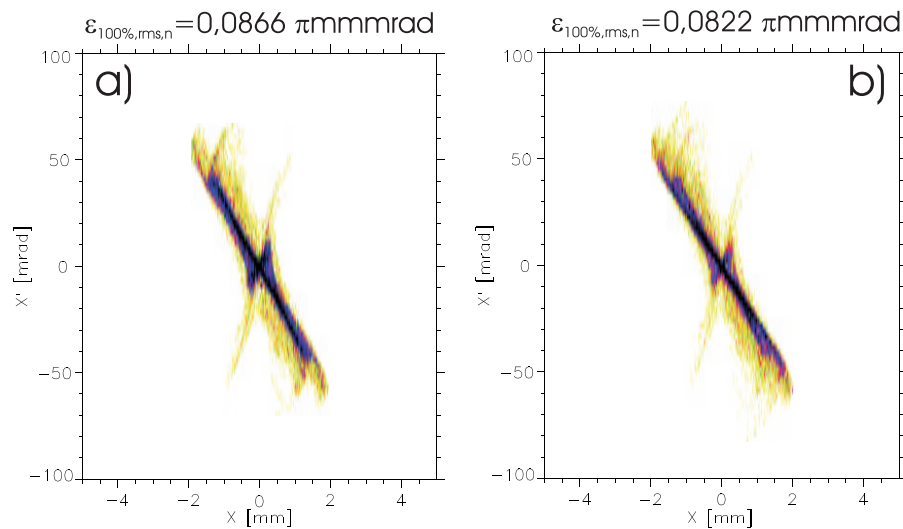
$$f_{noise,min} \approx 20 - 100 \text{ kHz}$$

$$f_{noise,max} \approx 500 \text{ MHz}$$



## Magnetic LEBT

### Emittances



140 mA  
+ -2%

140 mA  
+ -2%



### Future Work :

- \* measurements on rise time of compensation at SILHI-LEBT for reduced residual gas pressure
  - \* measurements on source noise and influence on beam transport (incl. artificial noise)
- \* measurements on influence of RFQ fields on beam injection (compensation preservation electrode)
- \* Determination on electron density distribution inside the solenoids and their influence on emittance growth