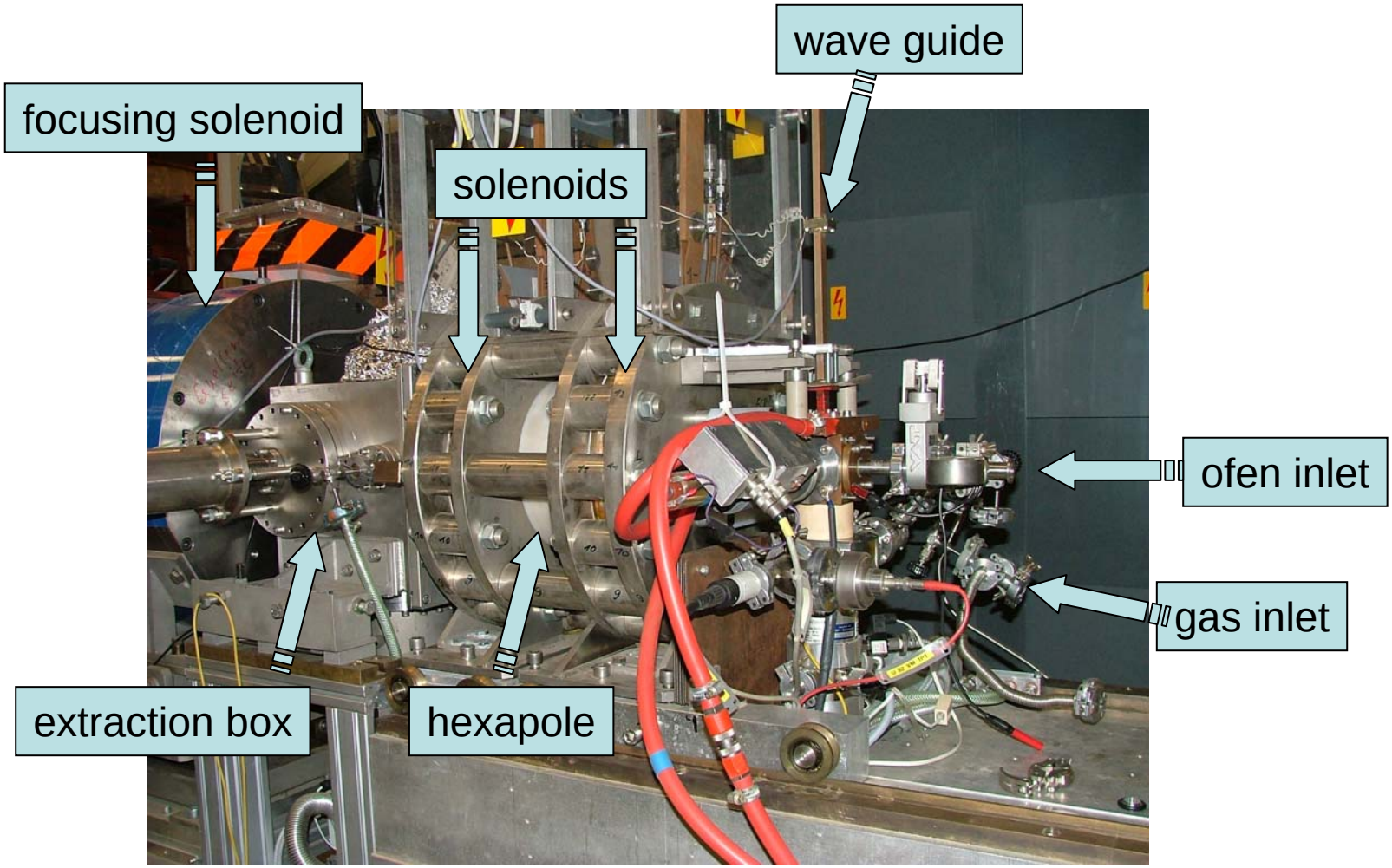
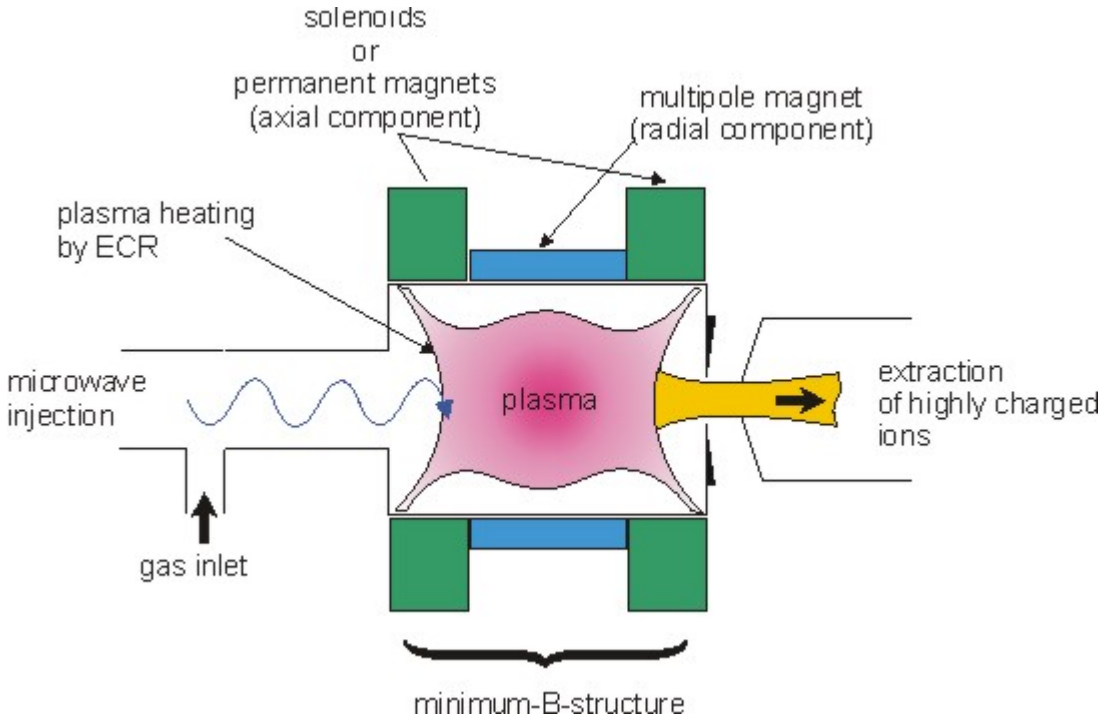
Usage of viewing screens at the ECR ion source at GSI



CAPRICE-type ECRIS at the EIS testbench

ECR – Ion Source



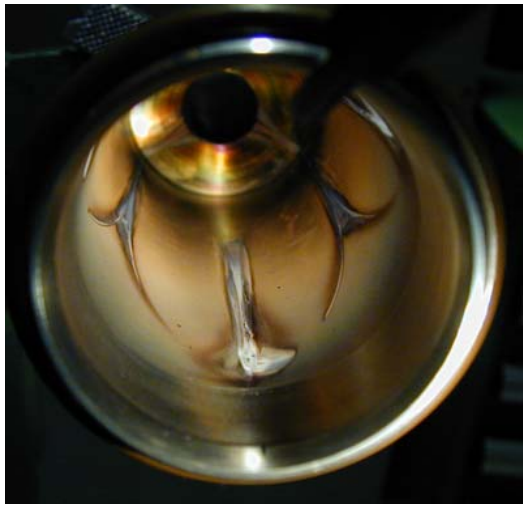
<u>conventional ECRIS :</u>

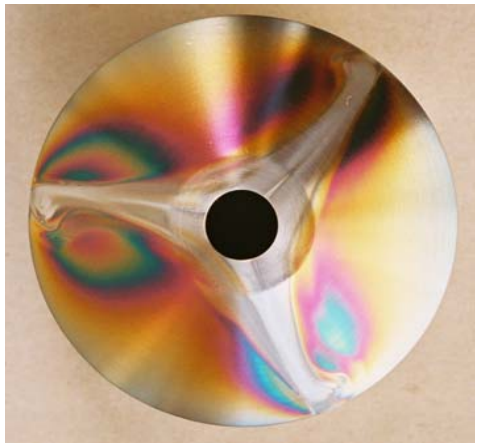
Hexapol field :	1..1.2 T
Solenoid field:	0.8..1.3 T
µW- power:	max. 800 W cw
µW- frequency:	14.5 GHz
Gas pressure:	10^{-7}…10^{-5} mbar
Particle energy:	2.5 keV/u

Plasma chamber

Calcium plasma inside CAPRICE

CAPRICE plasma chamber

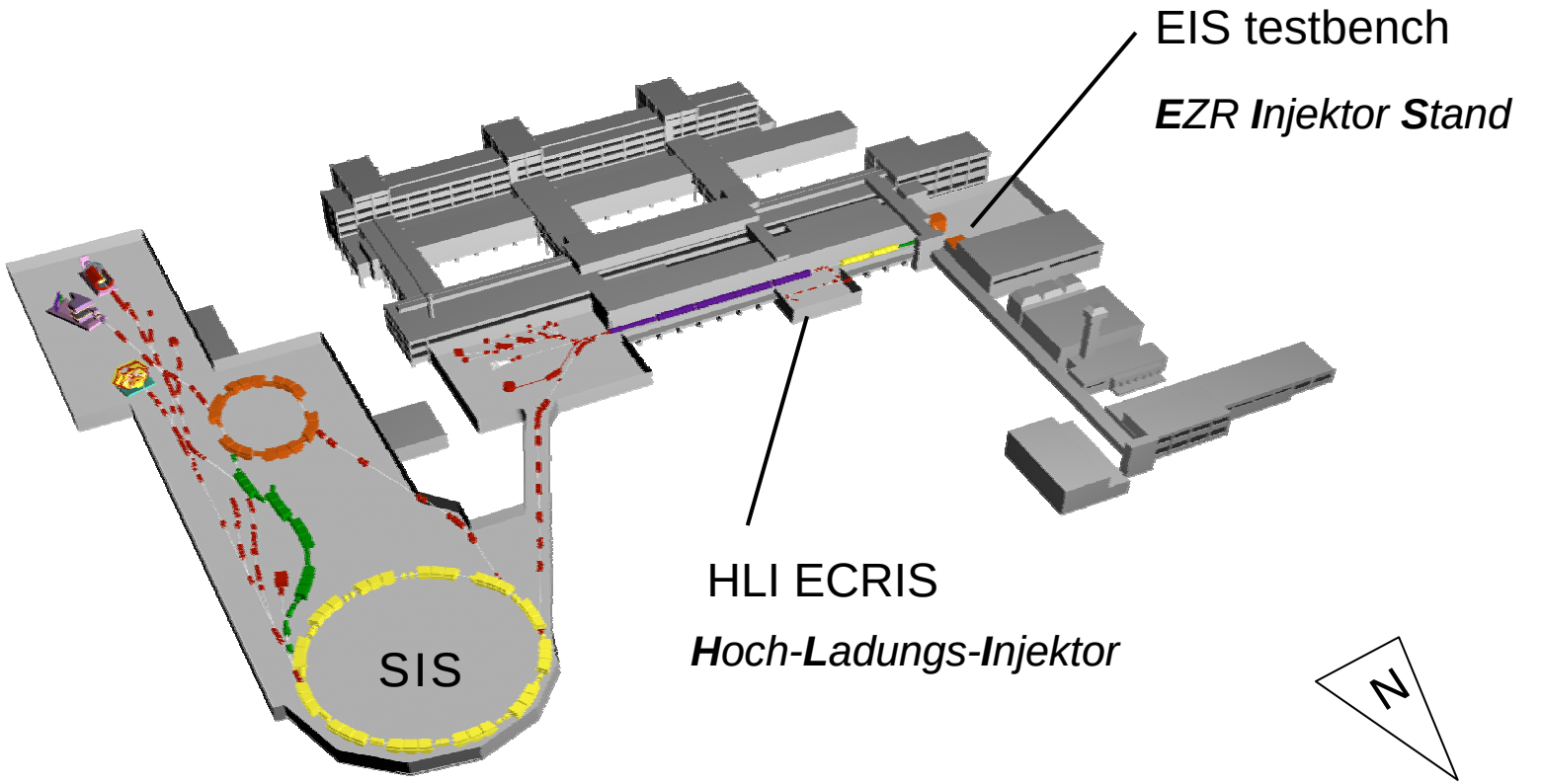




CAPRICE plasma electrode

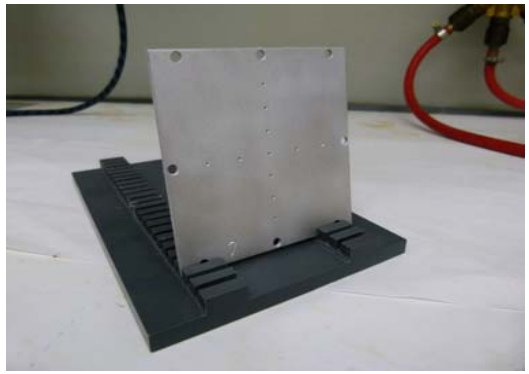
CAPRICE = Compacte A Plusieurs Résonances Ionisantes Cyclotron Electroniques

ECR ion sources at the GSI facility



Target production I

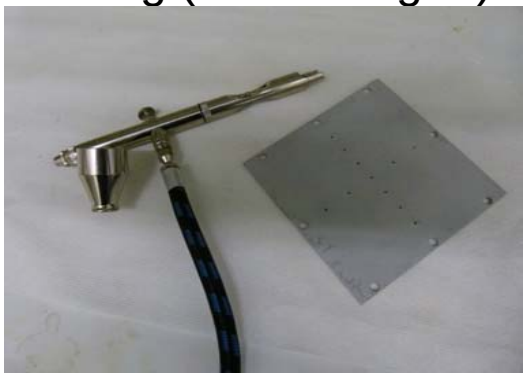
base plate (90 x 90mm)



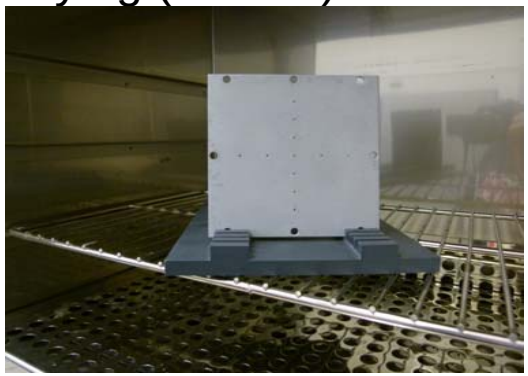
preheat (~120°C)

materials (BaF_2,KBr,CsI)

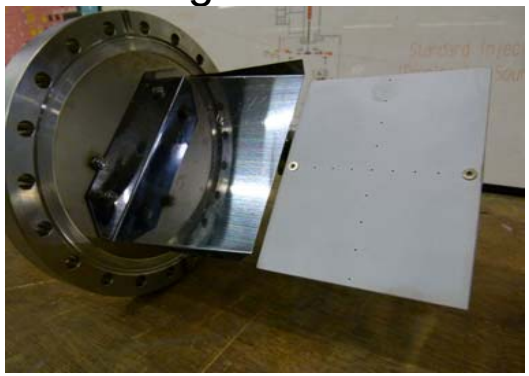
coating (air brush gun)



drying (< 80°C)



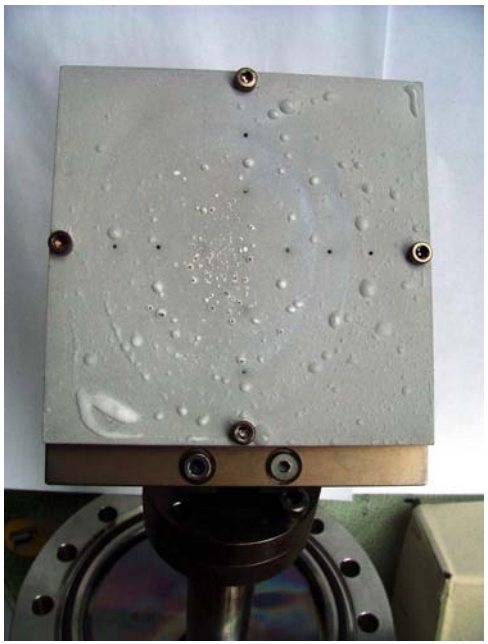
mounting



Target production II

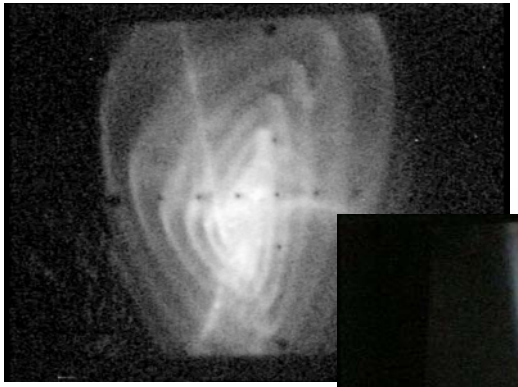
- Airbrush method is an easy and cheap way to produce custom sized targets
- Thin layer of scintillating material leads to short lifetimes (sputtering)
- High temperature destroys the scintillating layer
- Active cooling seems necessary to increase the lifetime

	BaF_2	**KBr**	**CsI**
sensitivity	+	++	+++
lifetime	+++	++	+



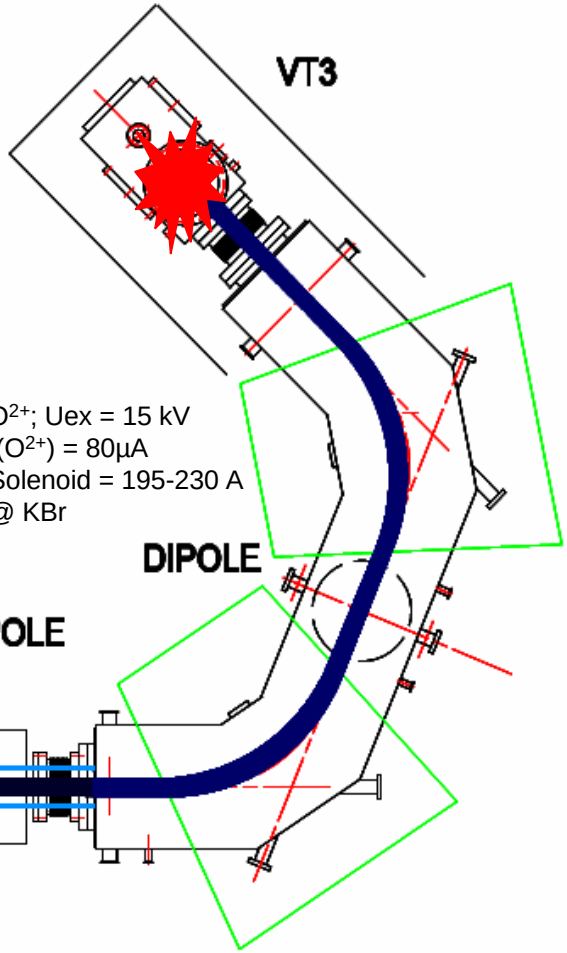
BaF_2 –target destroyed by heat

Viewing screens at the EIS test bench I



Ar/He; Uex = 15 kV
Iex = 2,5 mA @ BaF_2

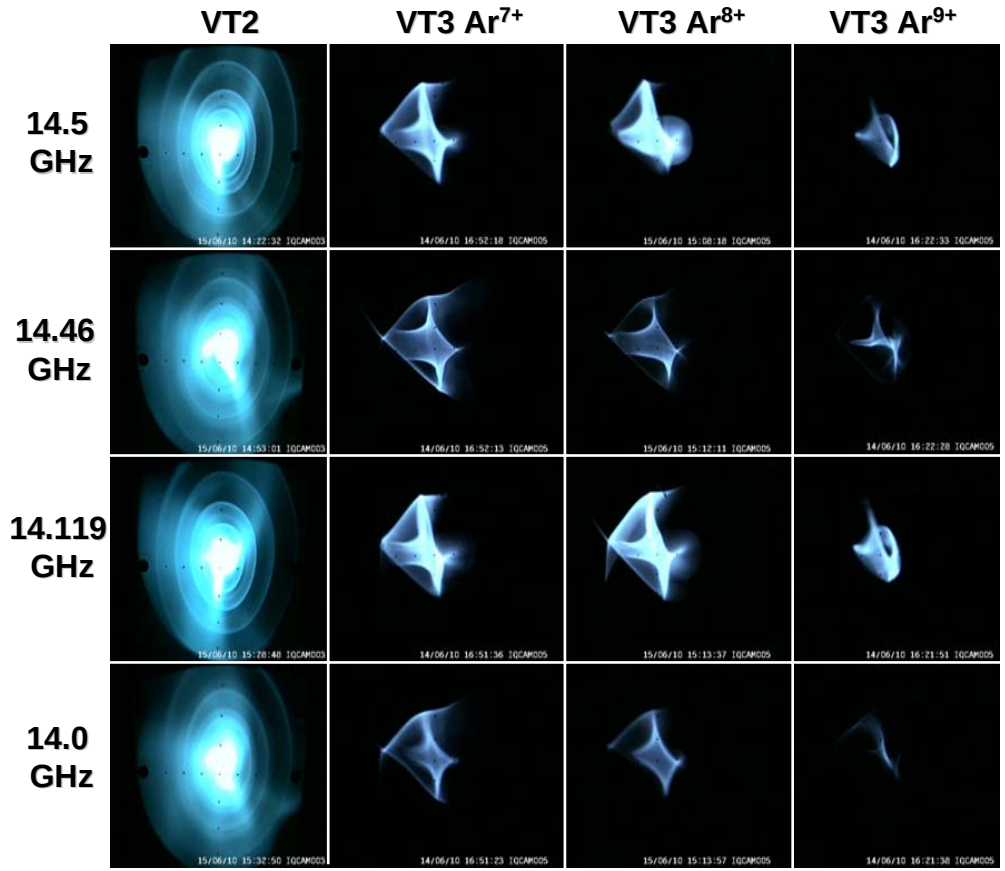
Ar/He; Uex = 12 kV
Iex = 2,3 mA
Solenoid 0-350 A @ BaF_2



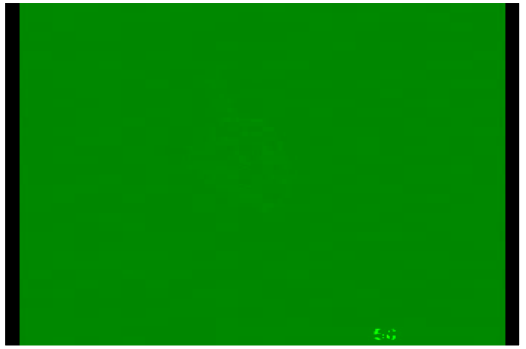
O^{2+}; Uex = 15 kV
$I(O^{2+})$ = 80µA
Solenoid = 195-230 A
@ KBr

Viewing screens at the EIS test bench II

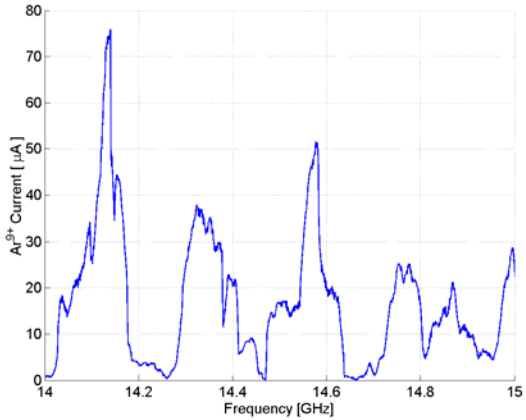
Microwave frequency tuning is affecting the beam intensity and the beam shape



Uex = 15 kV @ KBr

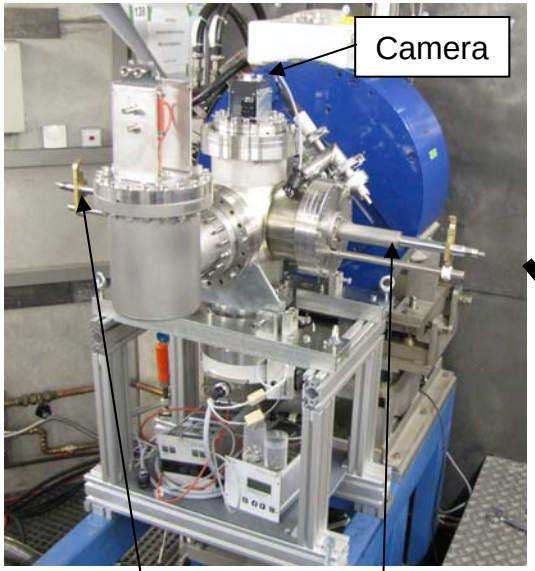


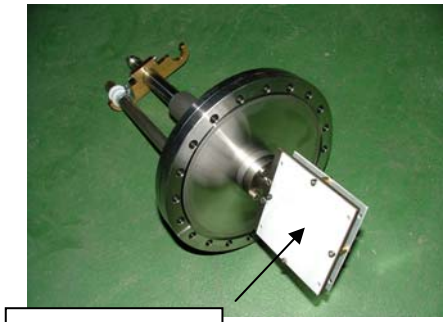
Frequency range12,5 - 16,5GHz

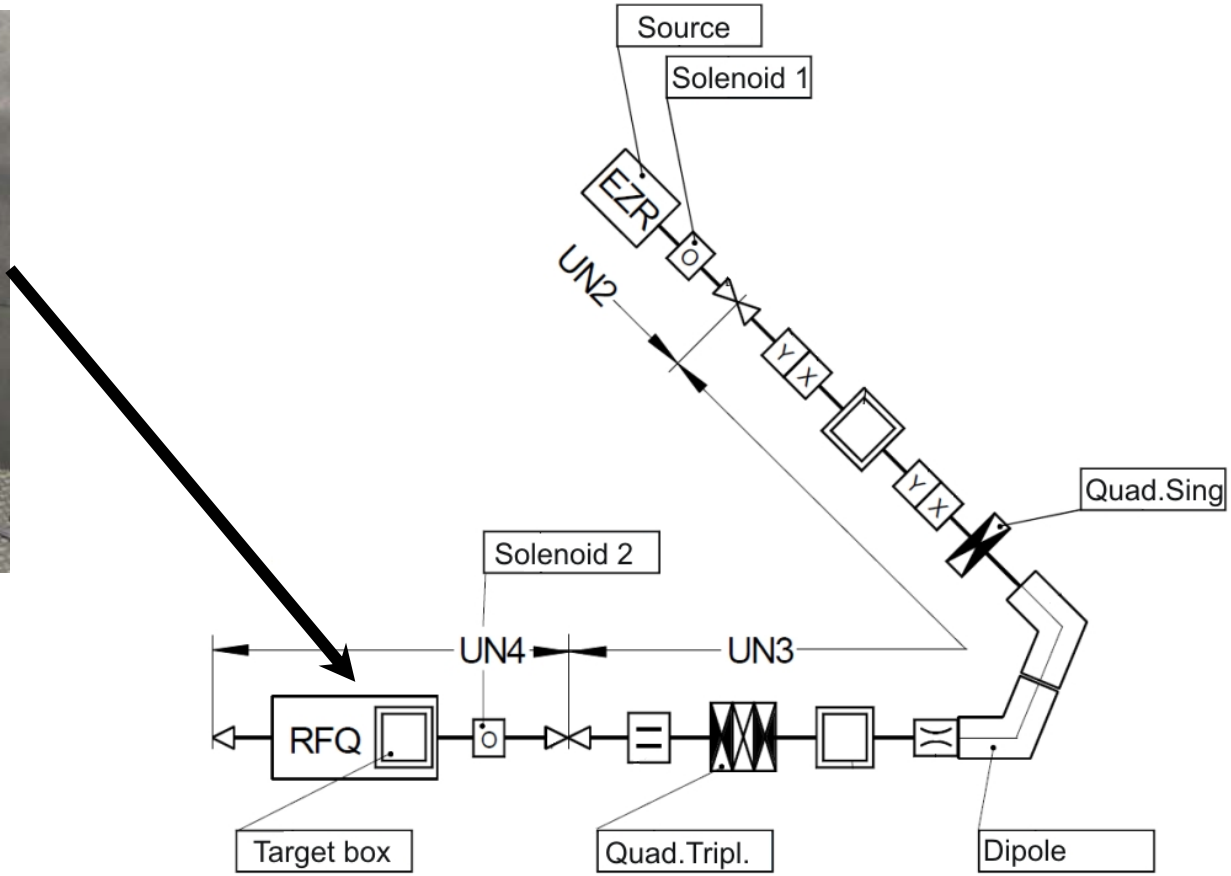


Viewing screens at the HLI

Target-Box

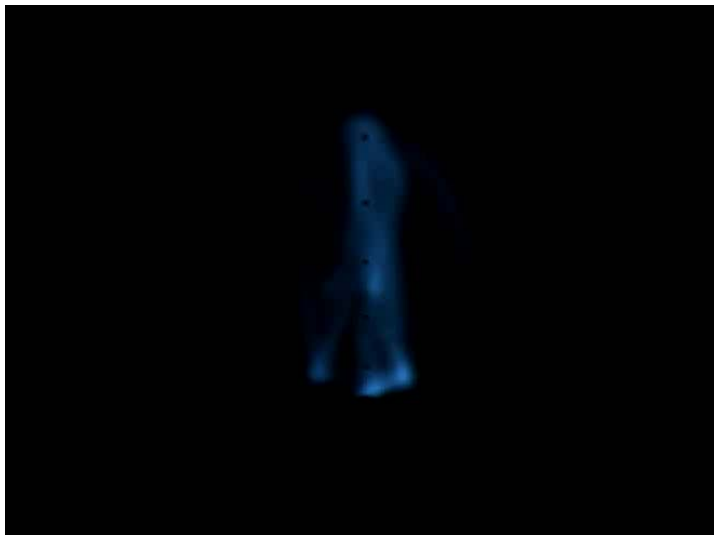






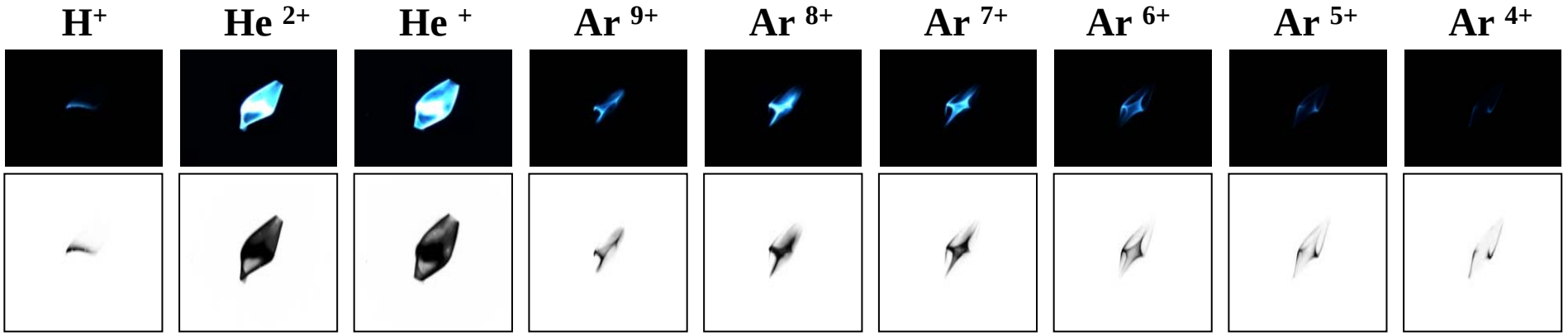
Focusing effect of the beamline solenoids

Ar $^{5+}$; Uex=20 kV; Solenoid 1: 150 - 350A @ KBr

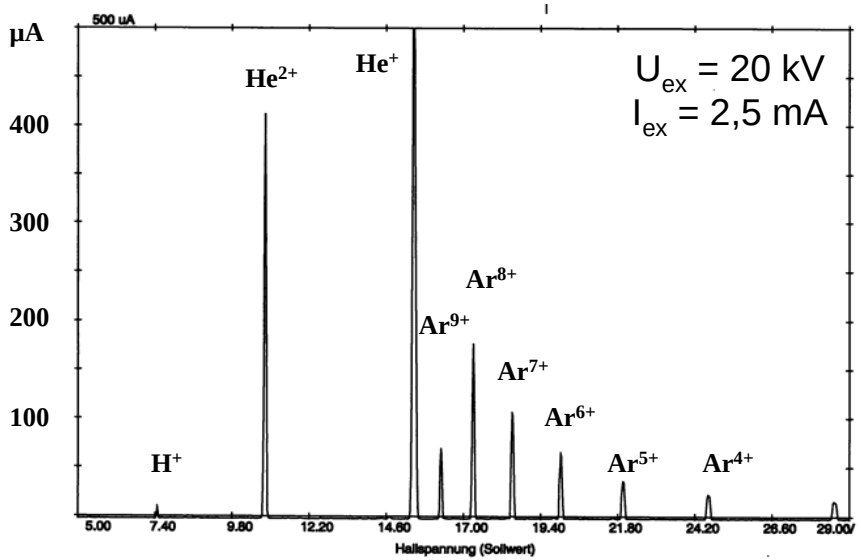


Ar $^{7+}$; Uex=14,3kV; Solenoid 2: 0 - 350A @ KBr

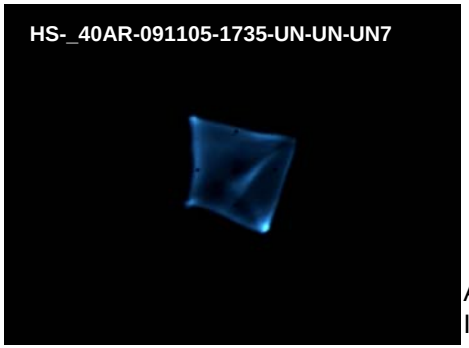
Different ion species and charge states



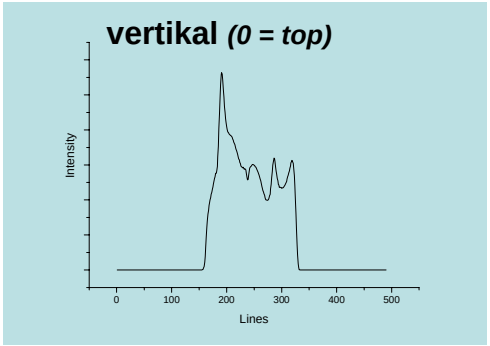
Charge state distribution for Ar-He beam

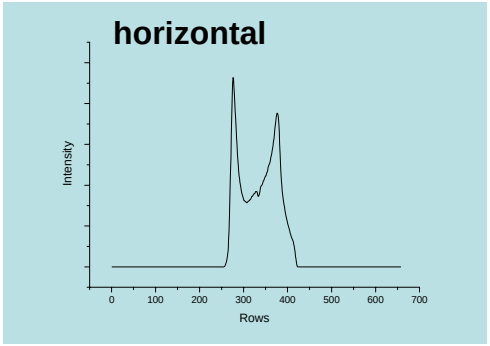


2D pictures vs. grid profile



Ar^{7+}; Uex = 14,28 kV
$I(Ar^{7+})$ = 120µA





Ar^{7+}; Uex = 14,28 kV
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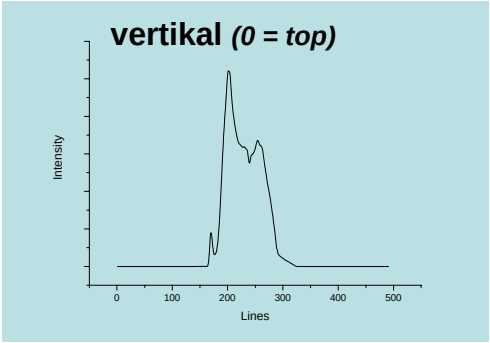
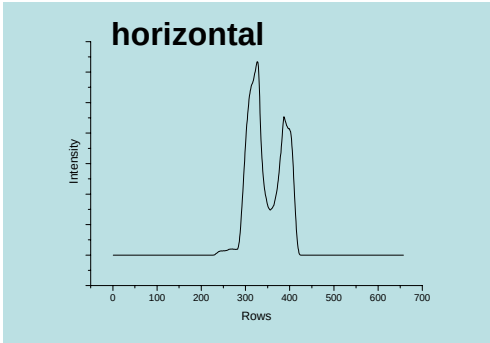
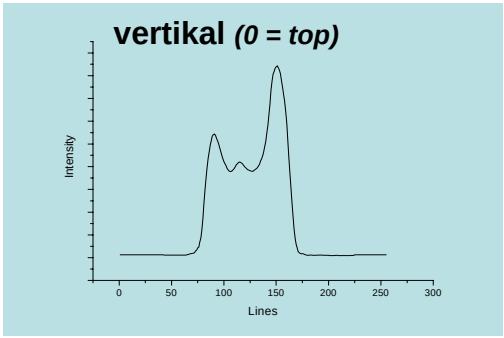
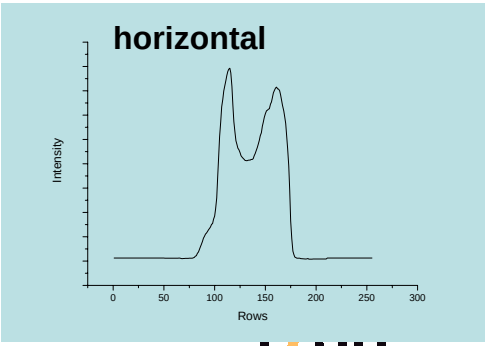


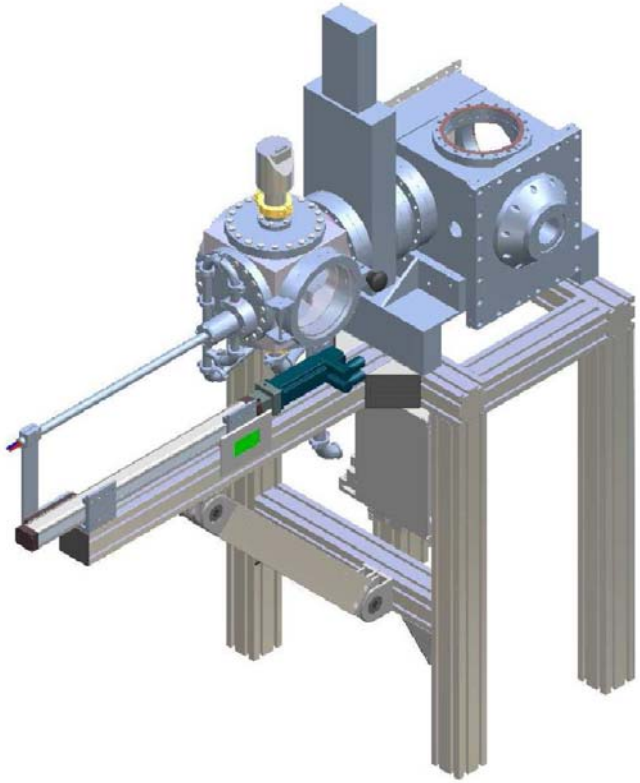


Ar^{7+}; Uex = 14,28 kV
$I(Ar^{7+})$ = 120µA



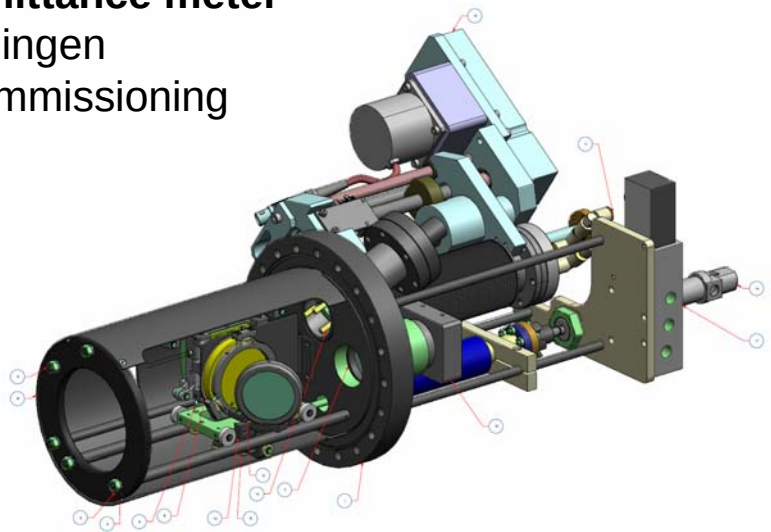


future



- **Automatic drive unit**
  - Water cooled viewing target
  - Separate vacuum chamber for target exchange
  - Target and camera mounted at the same flange
  - Exchange of the target without braking the beam line vacuum

- **Pepper pot emittance meter**
  - KVI Groningen
  - under commissioning



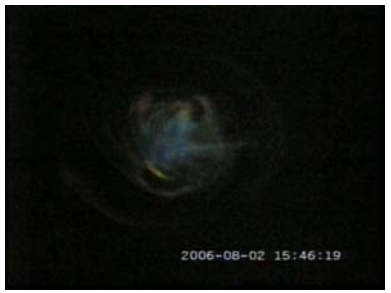
Thanks to

GSI Ion sources:

- Peter Spädtke
- Klaus Tinschert
- Ralf Lang
- Jon Rossbach
- Fabio Maimone

NSCL Michigan State University :

- Jeff Stetson



Thank you for your attention!

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