

New Configuration and Results with the LPSC Charge Breeder

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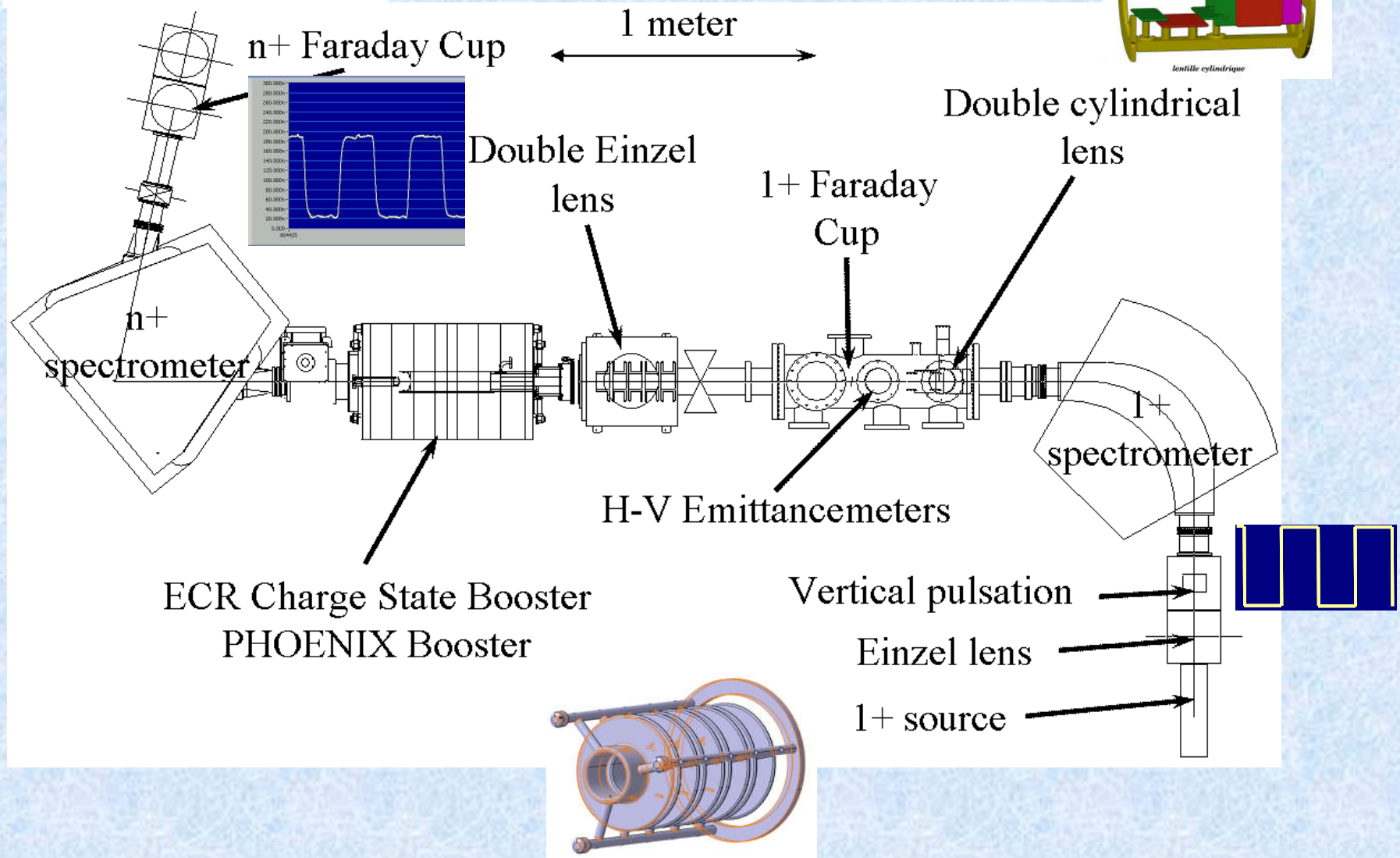
Laboratoire de Physique Subatomique et de Cosmologie
CNRS-IN2P3/UJF/INP Grenoble

Experimental setup
Light and heavy ions charge breeding
Booster 'improvements'
14 GHz results with the new configuration
18 GHz results
Preliminary 14+18 GHz frequency mixing

New Configuration and Results with the LPSC Charge Breeder

Experimental setup (1)

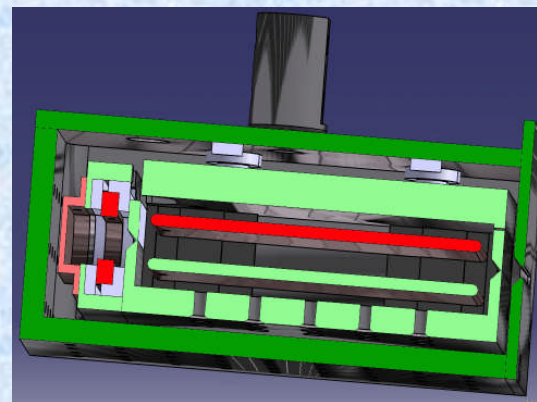
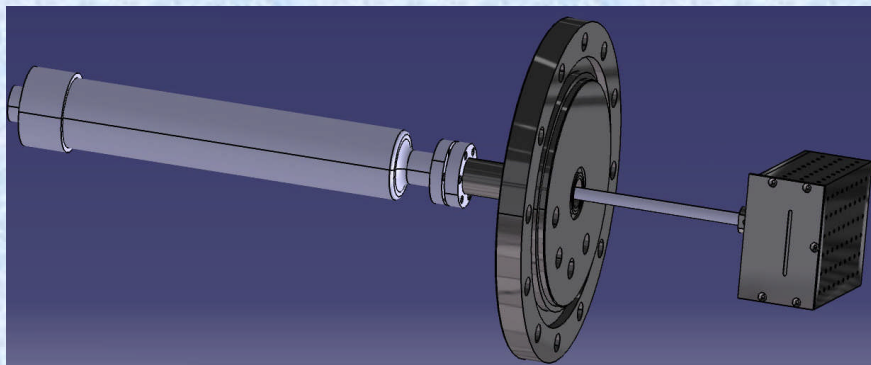
H-V Emittancemeters



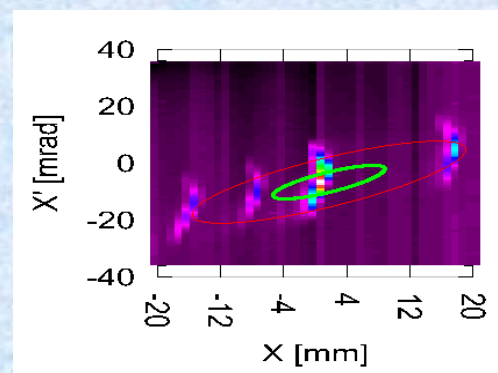
New Configuration and Results with the LPSC Charge Breeder

Experimental setup (2)

Allison type 1+ and n+ Emittancemeters

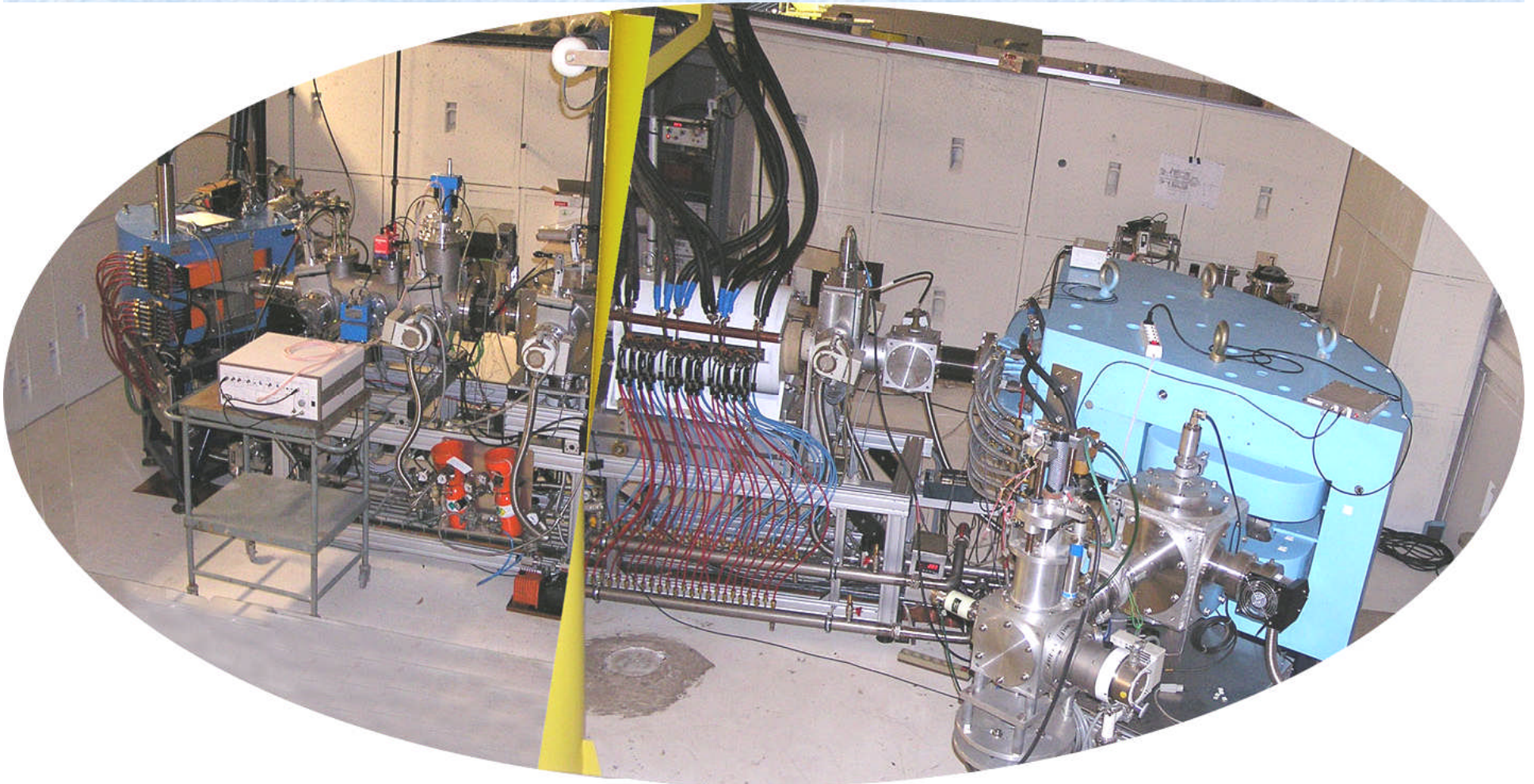


Example natural Kr^{1+} isotopes
Delivered by the 2.45 GHz Monobob source
(GANIL-SPIRAL2)



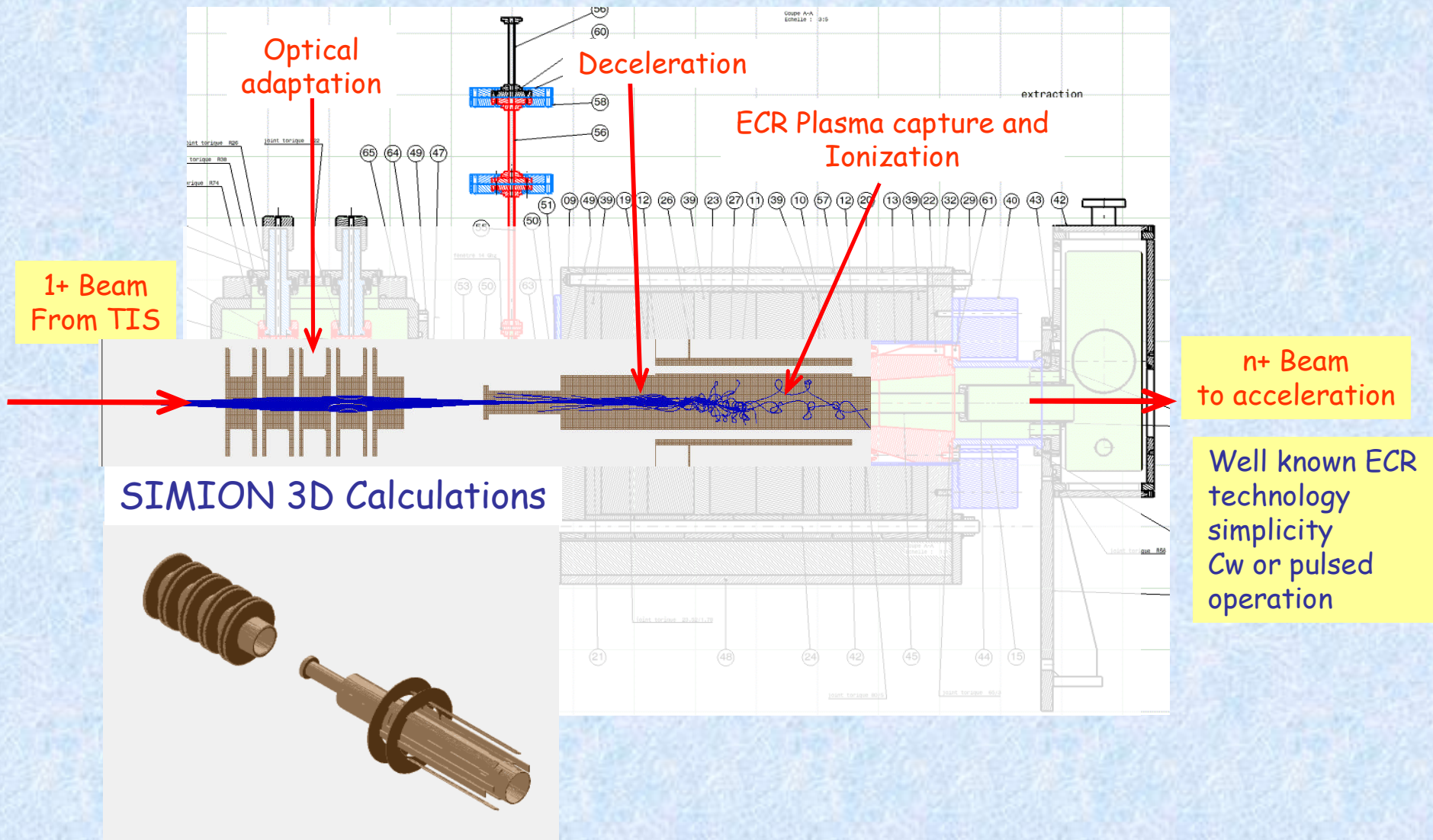
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Experimental setup (3)



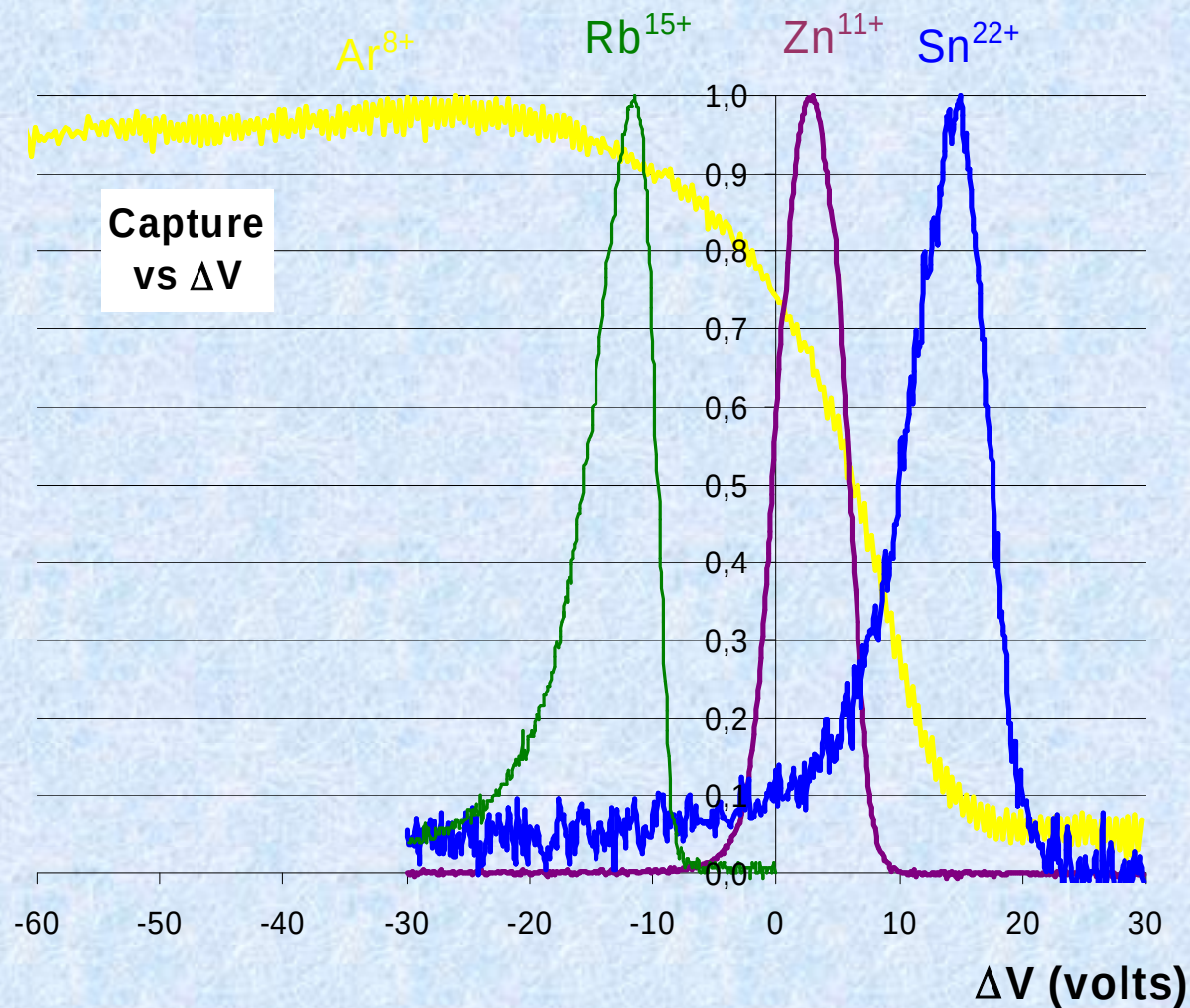
New Configuration and Results with the LPSC Charge Breeder

Experimental setup (4)



New Configuration and Results with the LPSC Charge Breeder Experimental setup (5)

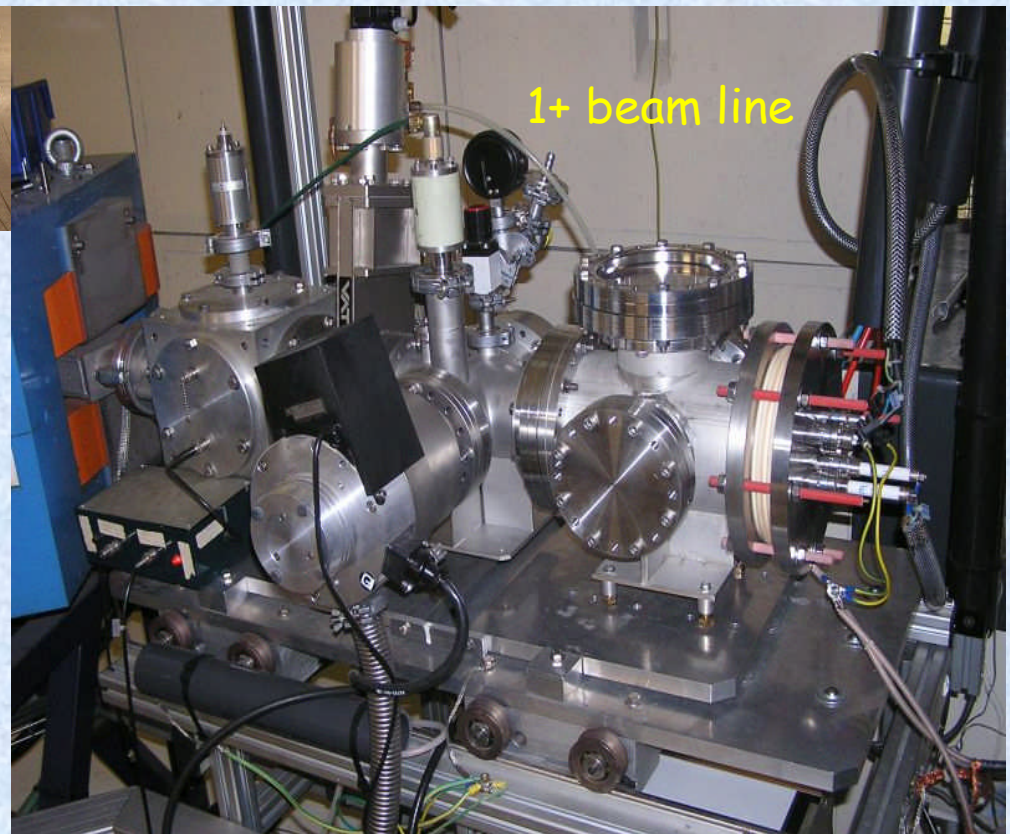
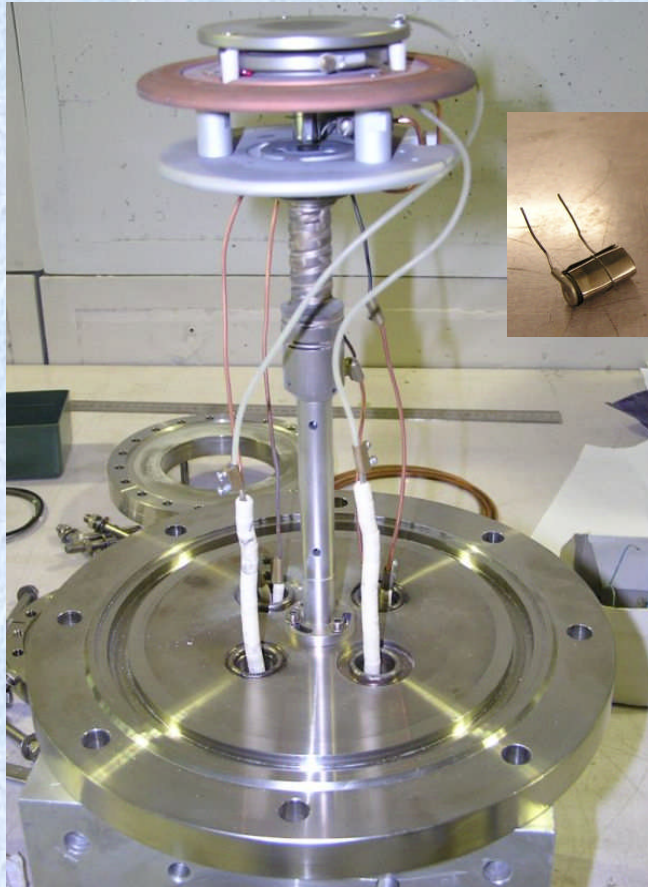
The potential difference between the 1+ and the n+ sources permit the capture



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Light and heavy ions charge breeding (1)

Thermoionization source

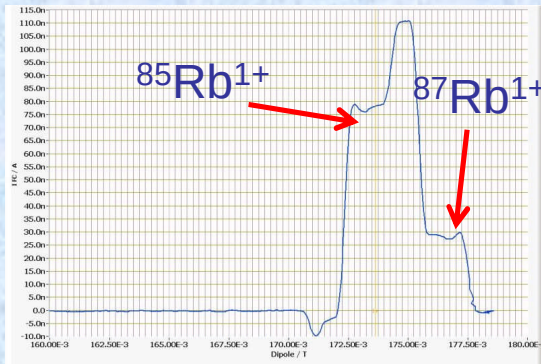


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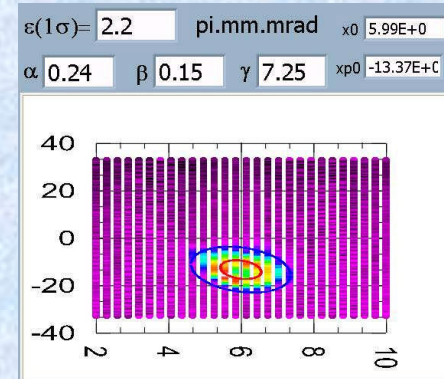
Light and heavy ions charge breeding (2)

Rubidium

Rb^{1+} spectrum



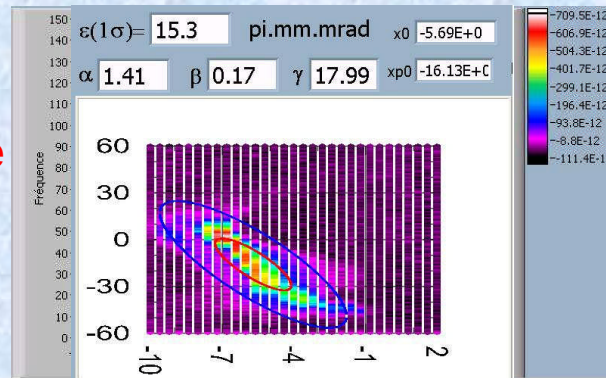
$^{85}Rb^{1+}$ X emittance



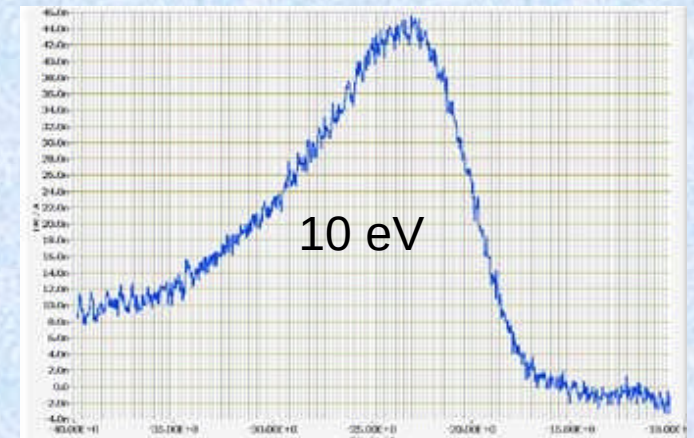
$^{85}Rb^{15+}$ (+ O₂ gas) 3.6 % 70 ms, (We had before, 5 %, 225 ms)

The tuning of the booster
 may depend on the isotope
 half life

^{74}Rb 64.9 ms
 ^{82}Rb 1.273 m



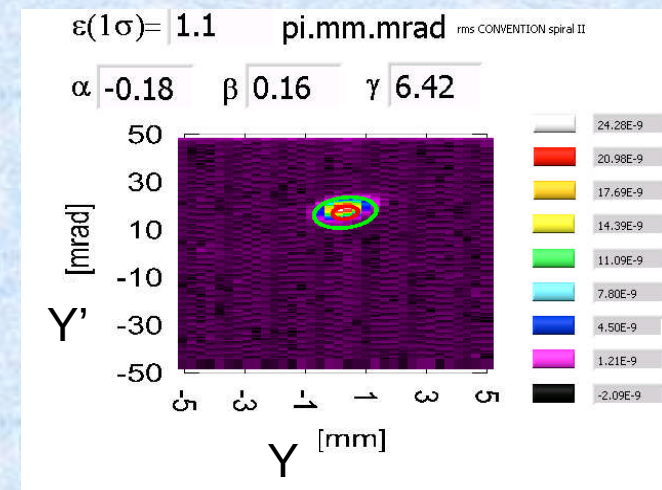
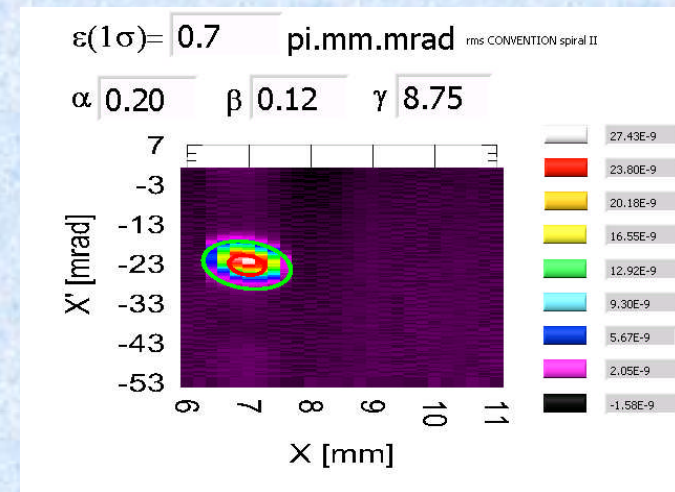
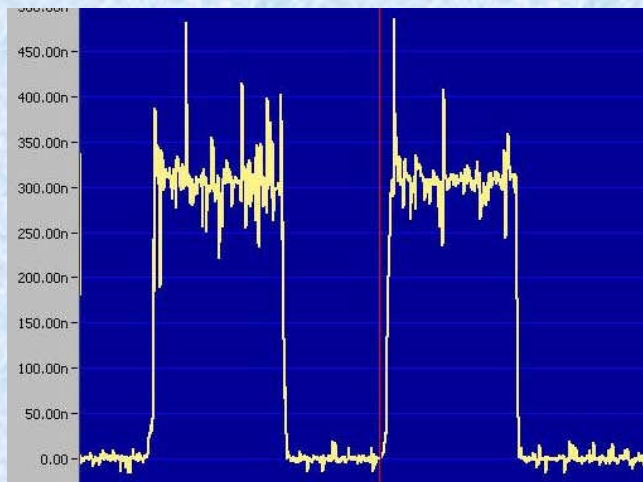
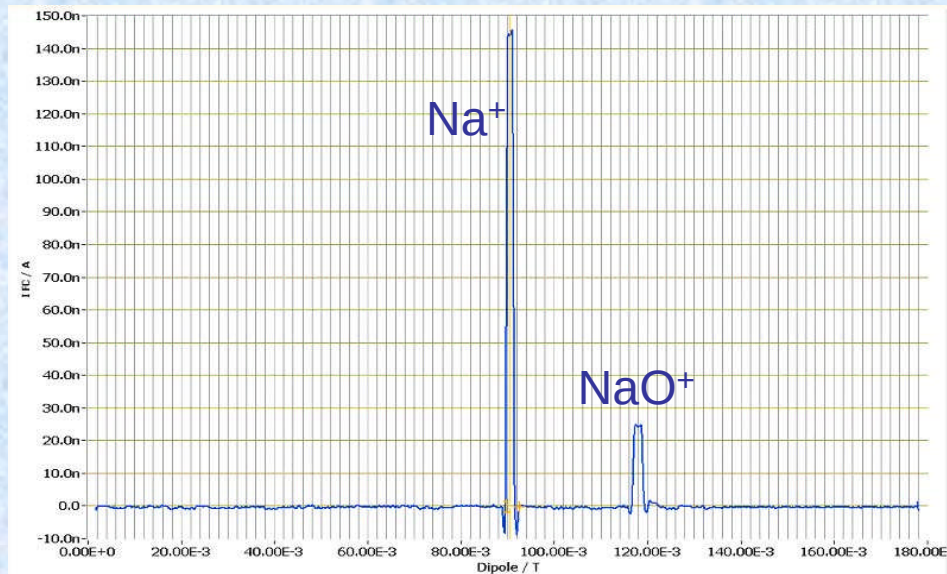
$^{17}O^{15+}$, $^{34}S^{15+}$, $^{64}Zn^{12+}$, $^{85}Rb^{15+}$...



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Light and heavy ions charge breeding (3)

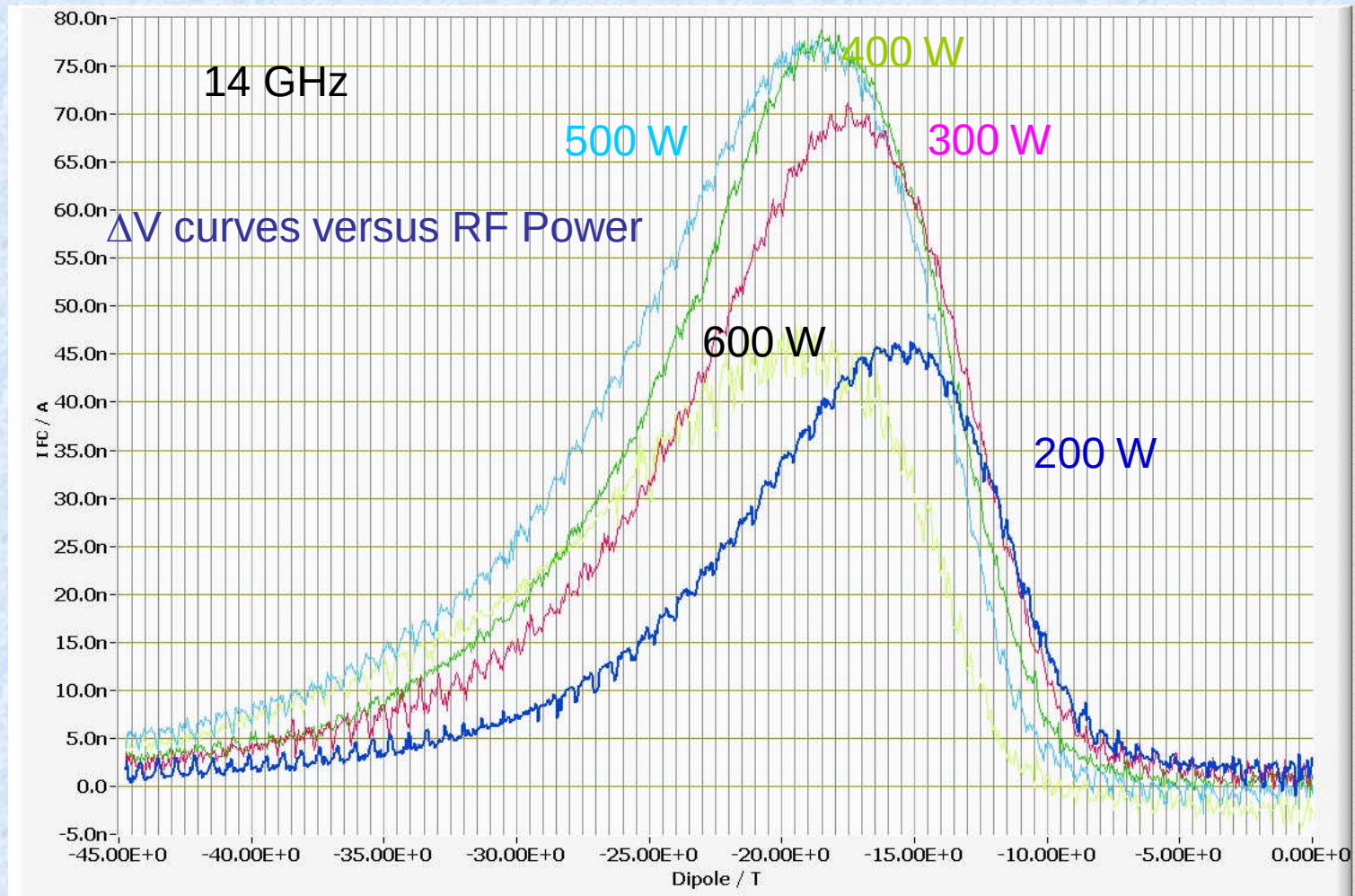
Sodium beam



$^{23}\text{Na}^{6+}$ (+ He gas) 1.9 % 50 ms

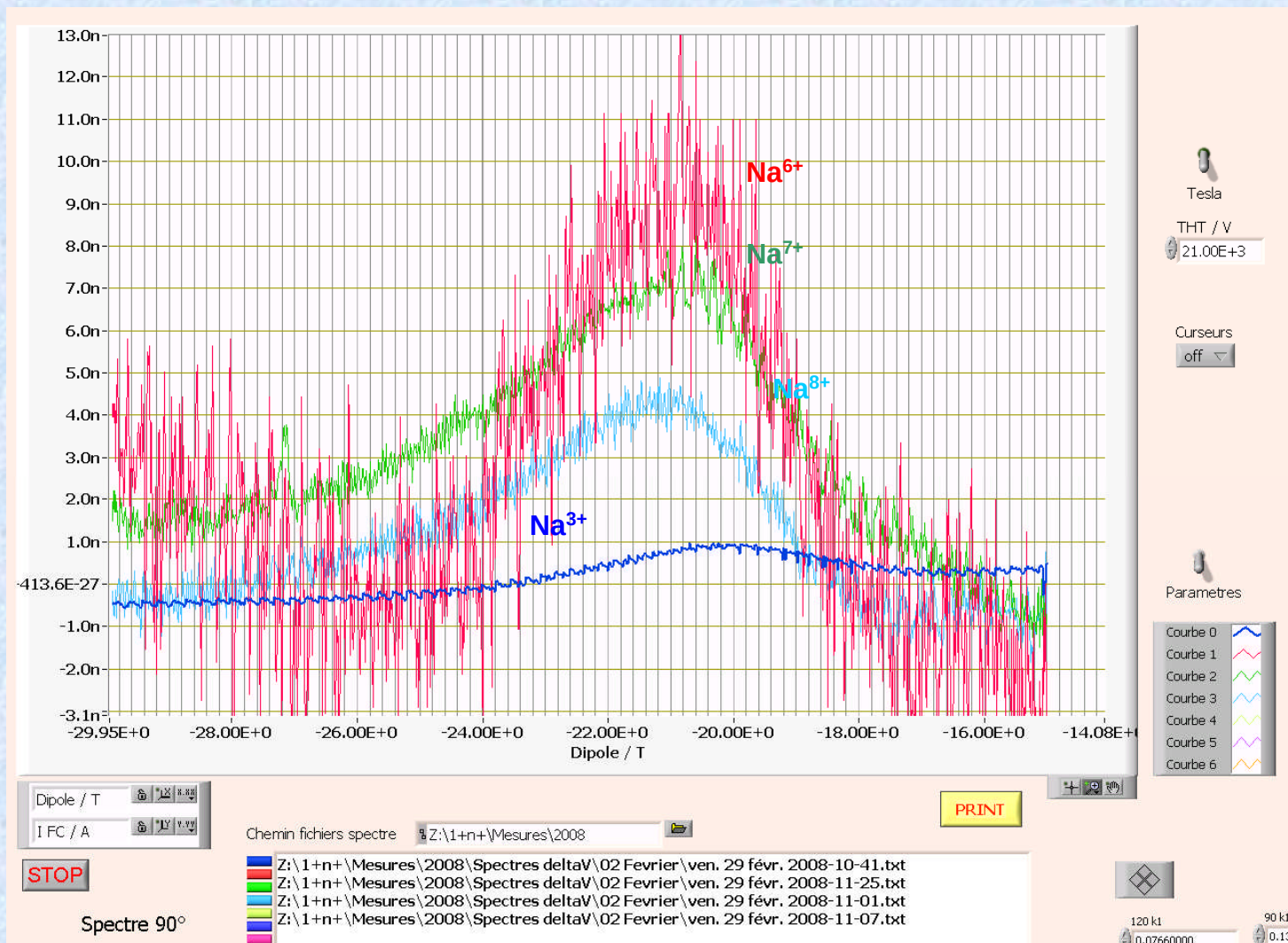
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Light and heavy ions charge breeding (4)

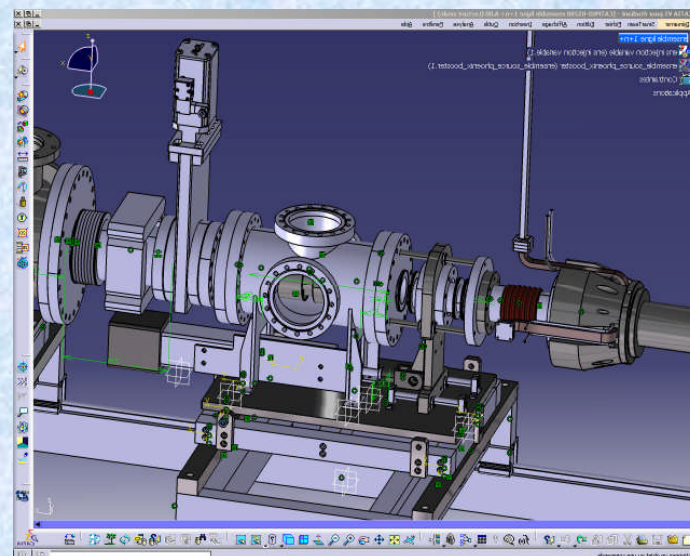
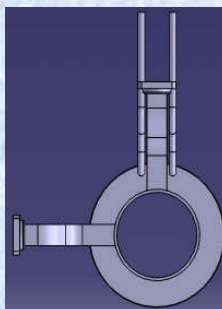
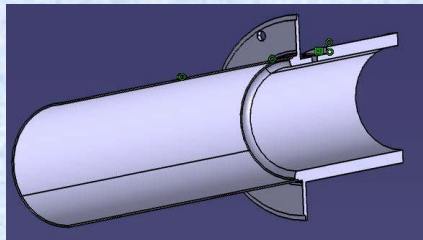
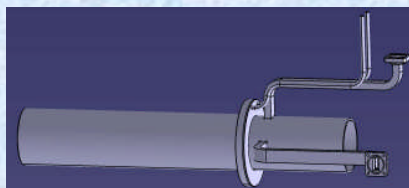
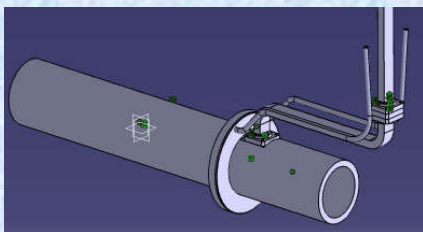
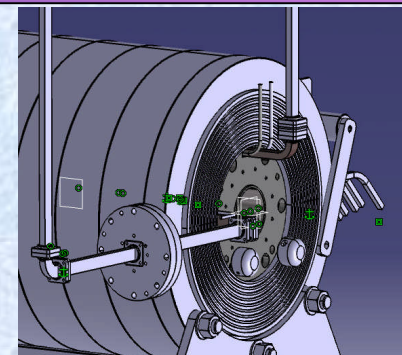
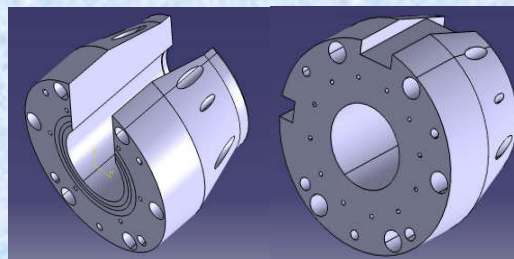
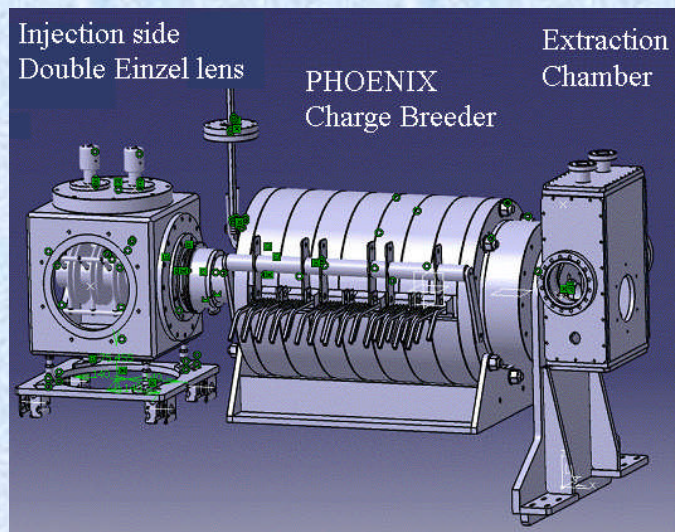


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Light and heavy ions charge breeding (5)

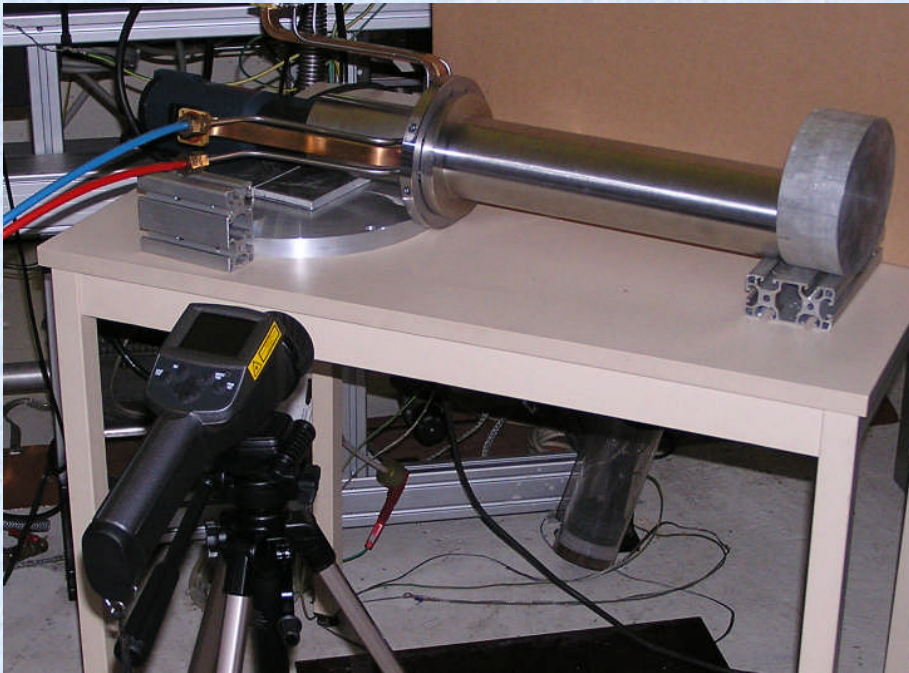


New Configuration and Results with the LPSC Charge Breeder Booster 'improvements'



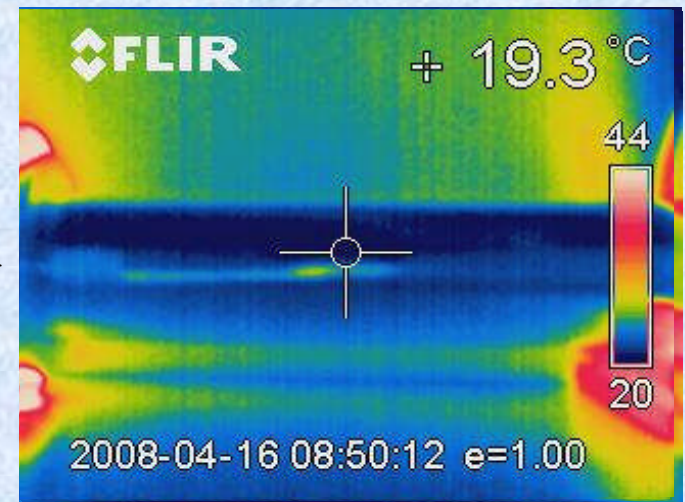
New Configuration and Results with the LPSC Charge Breeder

Cooling tests of the double frequency plasma chamber



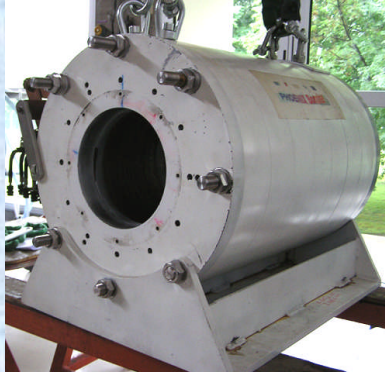
New double frequency plasma chamber
Cooling between inner and outer cylinder
IR camera: FLIR Thermacam E45

Evacuation ←
Admission →



Plasma chamber fully cooled down in 25 ms

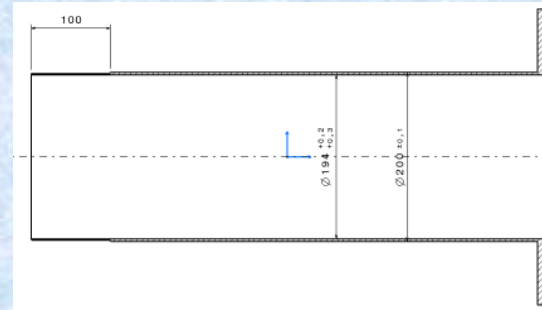
New Configuration and Results with the LPSC Charge Breeder Booster 'improvements'



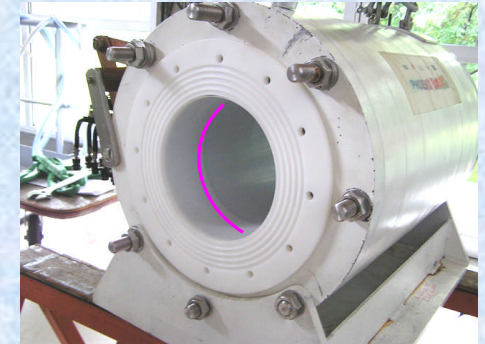
Booster Body (grounded)



Central insulator, $e = 3\text{mm}$
(2 parts) 60 kV: OK



Insertion central insulator 1



Insertion central insulator 1
Recouvrement (1et 2): 100 mm



Remember: central core of the Booster (HT)
To be inserted into the insulator



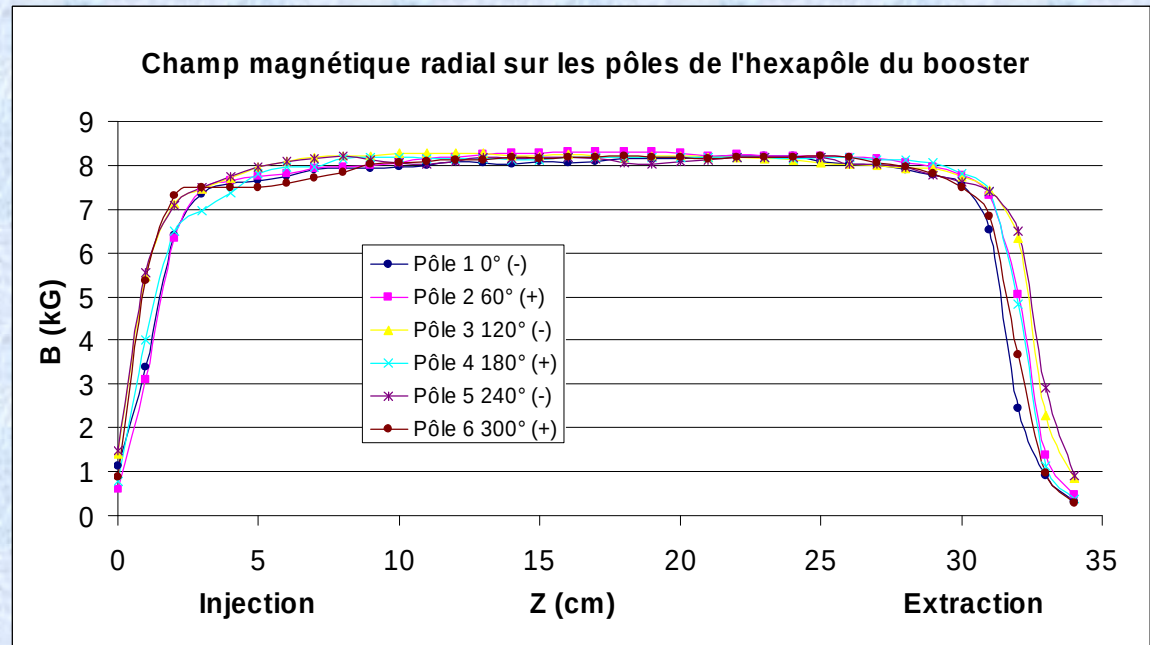
After 10 years



New Configuration and Results with the LPSC Charge Breeder Booster 'improvements'

Hexapole magnetization check

A slight demagnetization at the
 injection 8 kG on the poles (nominal)



Hexapole insertion
 Into the central
 insulator

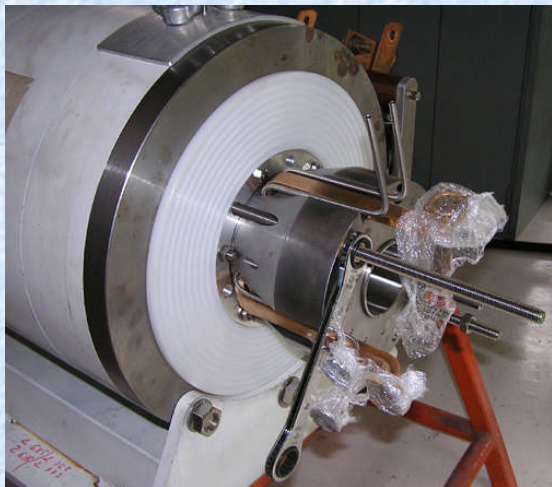


Plasma chamber insertion
 Into the hexapole



New Configuration and Results with the LPSC Charge Breeder Booster 'improvements'

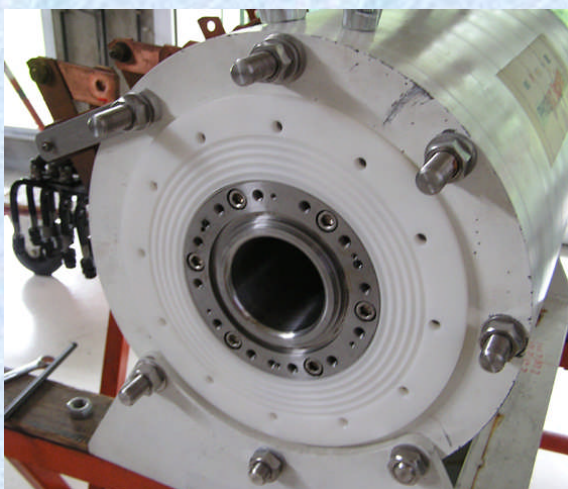
Magnetic plug injection insertion



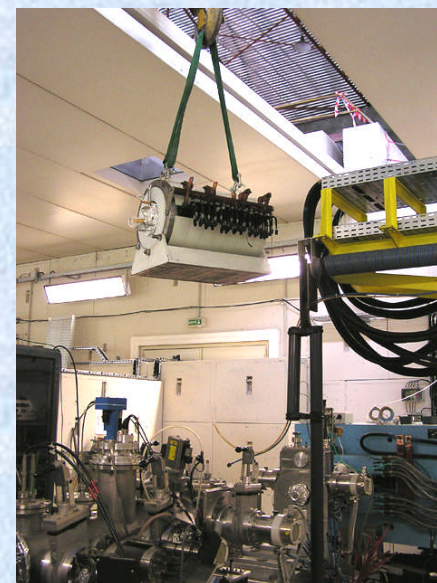
Efficient and fast worker
(Julien not contaminated)
6 screws to tighten



Magnetic plug extraction insertion 6 screws to tighten

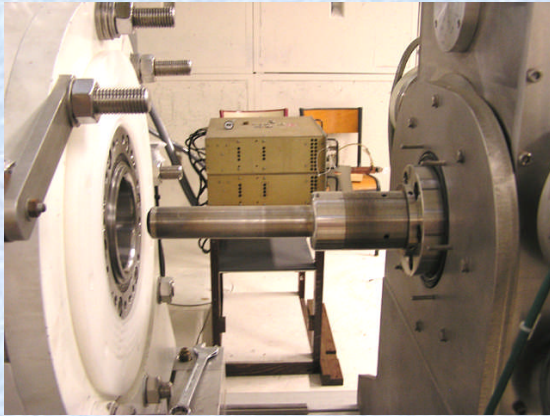


Booster ready to land !

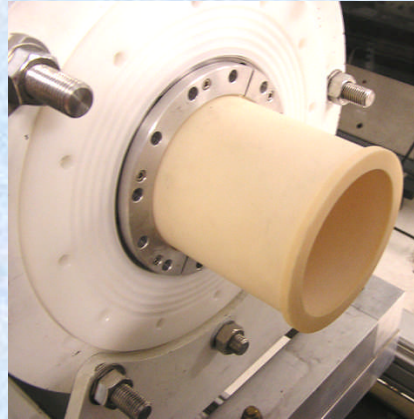


New Configuration and Results with the LPSC Charge Breeder Booster 'improvements'

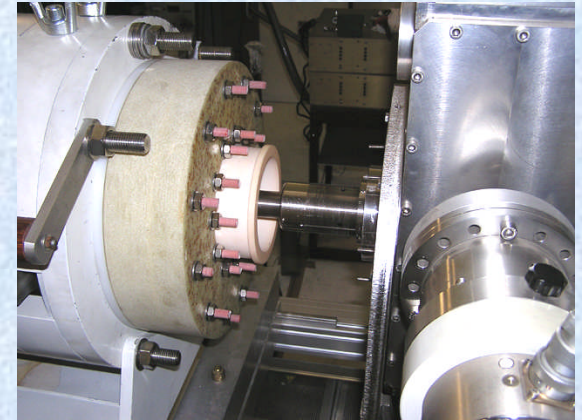
Vue nez extraction



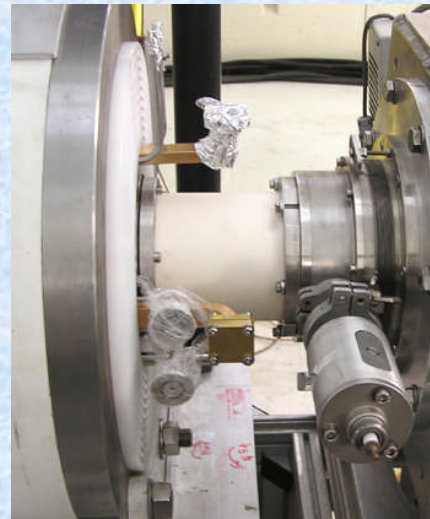
Montage alumine extraction



Montage butée Permaglass



Fixation alumine injection



Fixation alumine extraction



Vue support tube ralentisseur

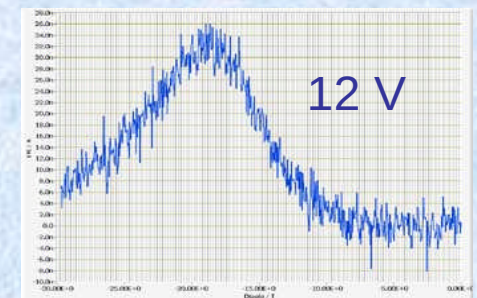


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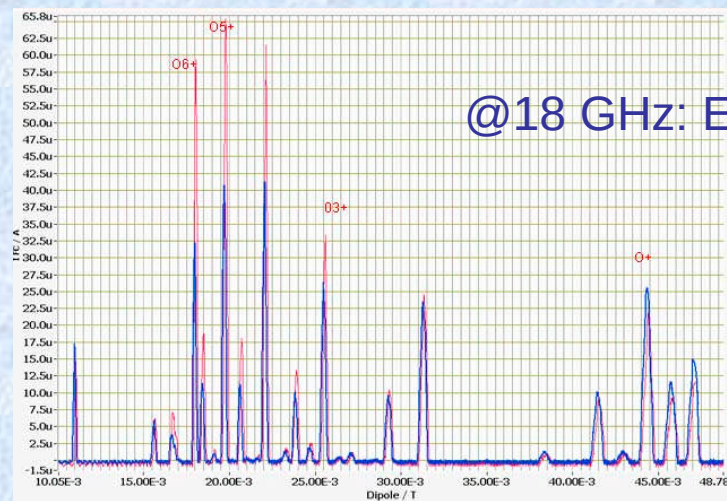
Preliminary results

Booster opened many times (high drain current on power supply)

@14 GHz the Eff. Yield $^{85}\text{Rb}^{13+}$ after the modifications 2%



After 1 week
drying



@18 GHz: Eff. Yield $^{85}\text{Rb}^{13+}$ 1% (after 1 hour)

New Configuration and Results with the LPSC Charge Breeder

Preliminary results

1.3 % at best after 3 hours experiment
 'slight' effect of frequency mixing
 At least no drama...!

