New Configuration and Results with the LPSC Charge Breeder

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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
Experimental setup (1)

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H-V Emittancemeters

n+ Faraday Cup

Double Einzel lens

1+ Faraday Cup

Double cylindrical lens

n+ spectrometer

ECR Charge State Booster

PHOENIX Booster

H-V Emittancemeters

Vertical pulsation

Einzel lens

1+ source
Allison type 1+ and n+ Emittance meters

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)

1+ Beam From TIS

n+ Beam to acceleration

Well known ECR technology
simplicity
Cw or pulsed operation

Optical adaptation
Deceleration
ECR Plasma capture and Ionization

SIMION 3D Calculations
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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

1+ beam line
Rubidium

\[ ^{85}\text{Rb}^{1+} \]

\[ ^{85}\text{Rb}^{15+} (+ \text{O}_2 \text{ gas}) \text{ 3.6} \% \text{ 70 ms}, (\text{We had before, 5} \% , 225 \text{ ms}) \]

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

\[ ^{74}\text{Rb} \text{ 64.9 ms} \]
\[ ^{82}\text{Rb} \text{ 1.273 m} \]
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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)
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Booster ‘improvements’
Cooling tests of the double frequency plasma chamber

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

Plasma chamber fully cooled down in 25 ms
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Booster ‘improvements’

Booster Body (grounded)

Central insulator, e = 3mm (2 parts) 60 kV: OK

Extraction side

Insertion central insulator 1

Recouvrement (1 et 2): 100 mm

Remember: central core of the Booster (HT) To be inserted into the insulator
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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
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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!
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Booster ‘improvements’

- Vue nez extraction
- Montage alumine extraction
- Montage butée Permaglass
- Vue support tube ralentisseur
- Fixation alumine injection
- Fixation alumine extraction
New Configuration and Results with the LPSC Charge Breeder

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%

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

After 1 week drying
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…!