



Meeting CRISP-Topic Accelerator

Short report on Task 2 : Ion sources

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1) IPNL, 2) LPSC, 3) GANIL, 4) GSI





CLUSTER OF RESEARCH INFRASTRUCTURES
FOR SYNERGIES IN PHYSICS

WP3 Meeting



R. Revenko (Ganil) JL Vignet (Ganil), P. Forck (GSI) C. Peaucelle (CNRS/IPNL), B. Zwicker (GSI) L. Manoury (Ganil)

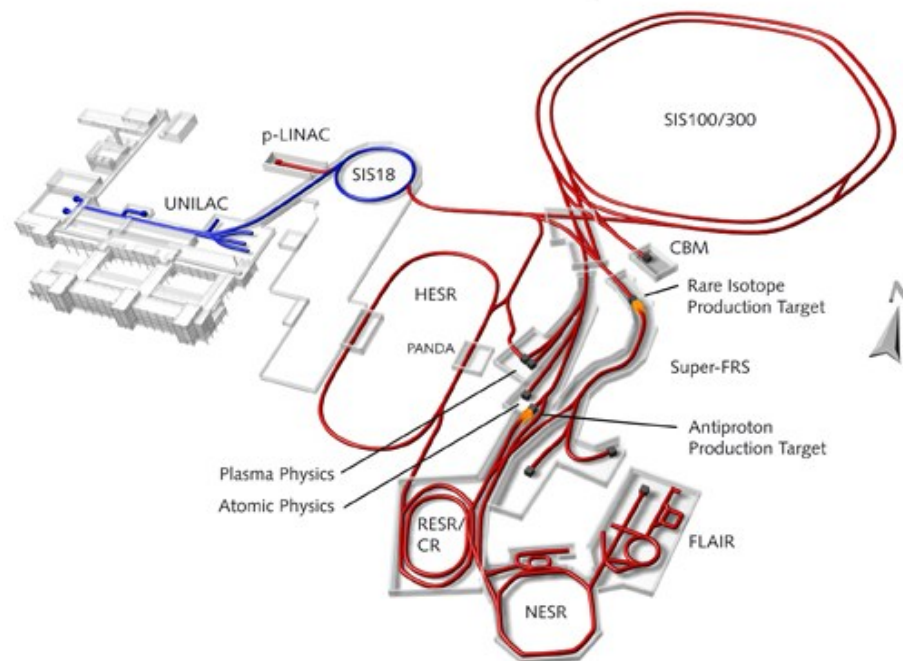
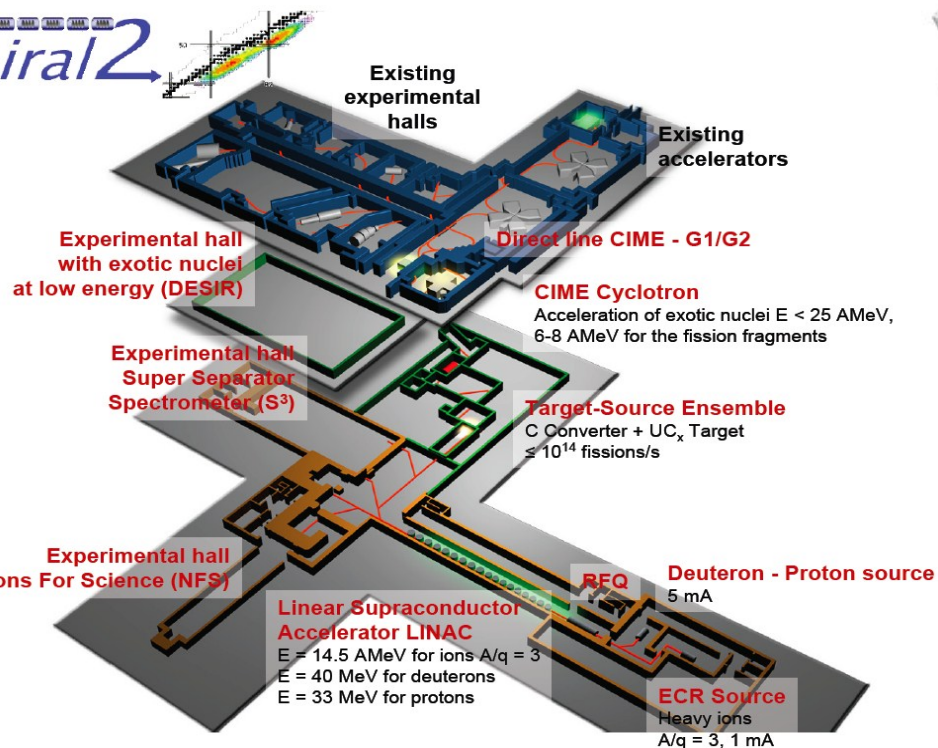
Scientific and technical presentation on beam shape monitor and upgraded ion source Phoenix V2



Common need for High Performance Heavy Ion Source

■ Spiral2: 1 mA Ar^{13+}

Spiral2

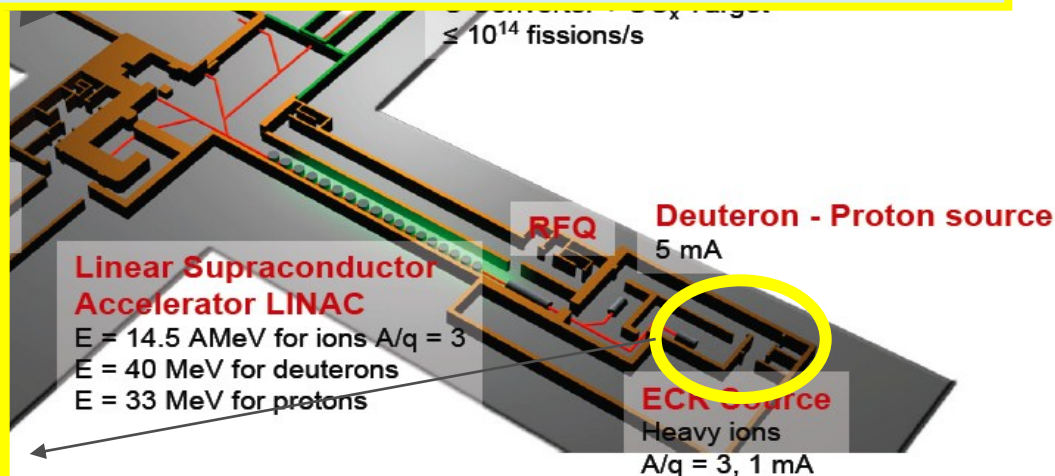
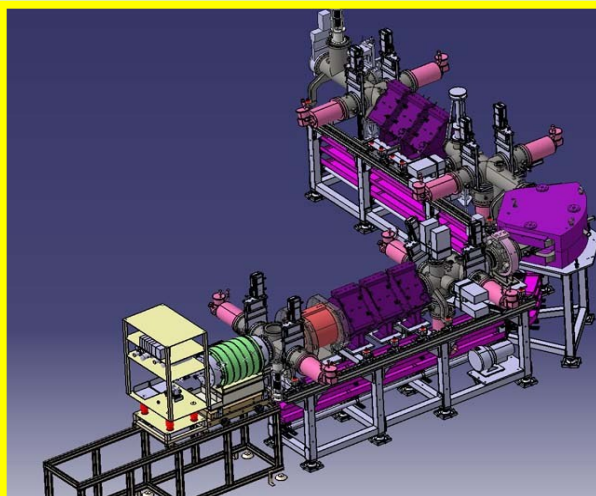


■ FAIR: 1 mA U^{28+}

Heavy Ion Source for Spiral 2

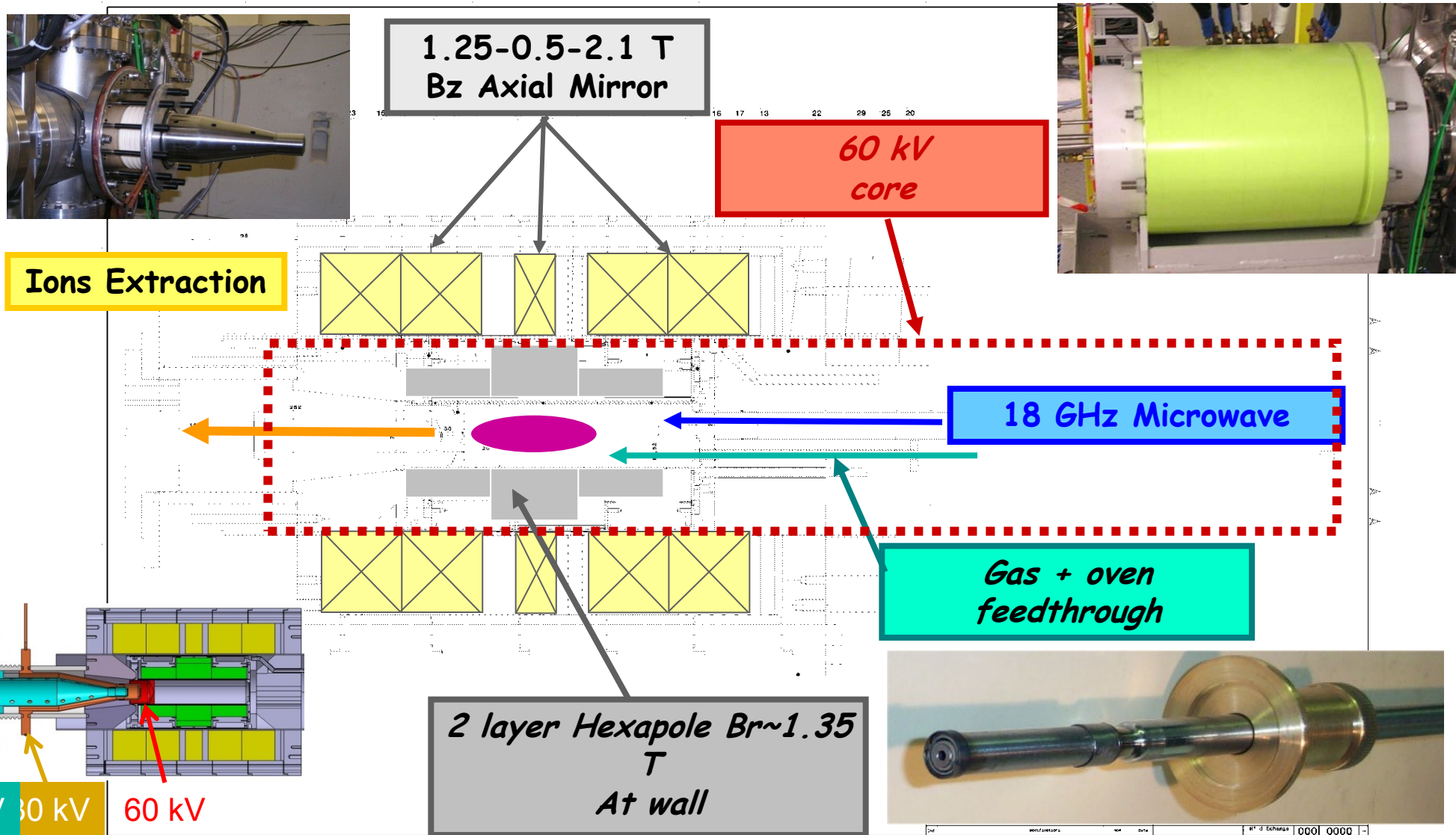
■ Beam requirements :

- ◆ Produce Intense beams of multicharged ions
- ◆ 1 mA (O, Ar, Ni...)
- ◆ $A/Q=3$
- ◆ 60 kV extraction voltage
- ◆ Up to $A=40$
- ◆ Higher A with highest current possible are welcome (especially for S3 experimentation)





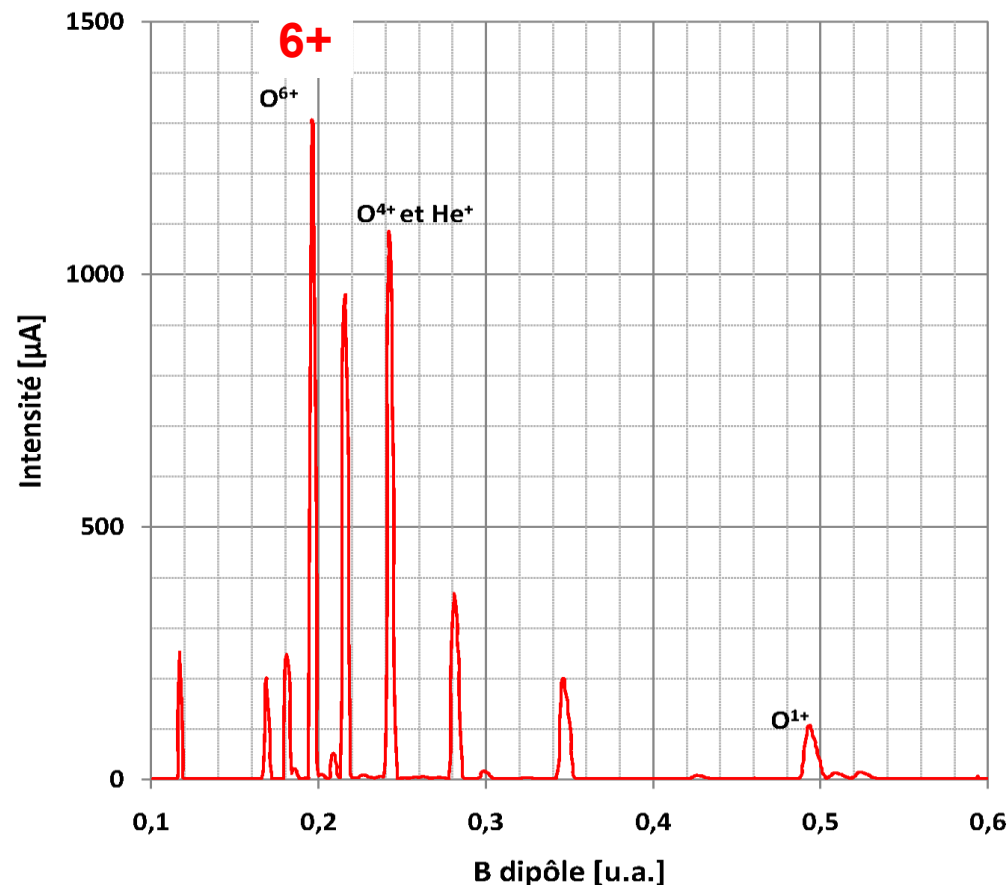
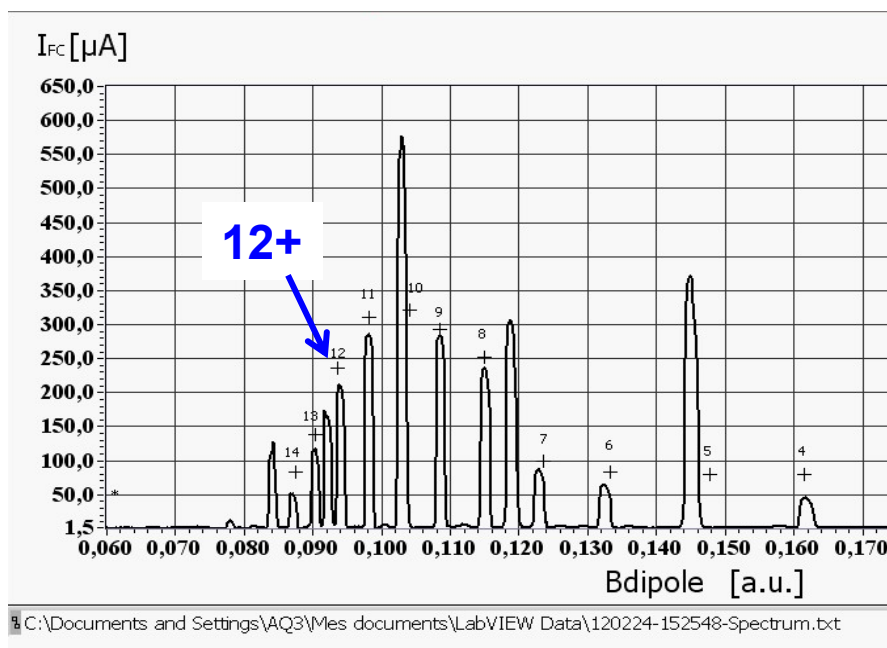
PHOENIX V2 : First ECRIS on Spiral2 LEBT



Recent results with Oxygen and Argon beams at 60 kV

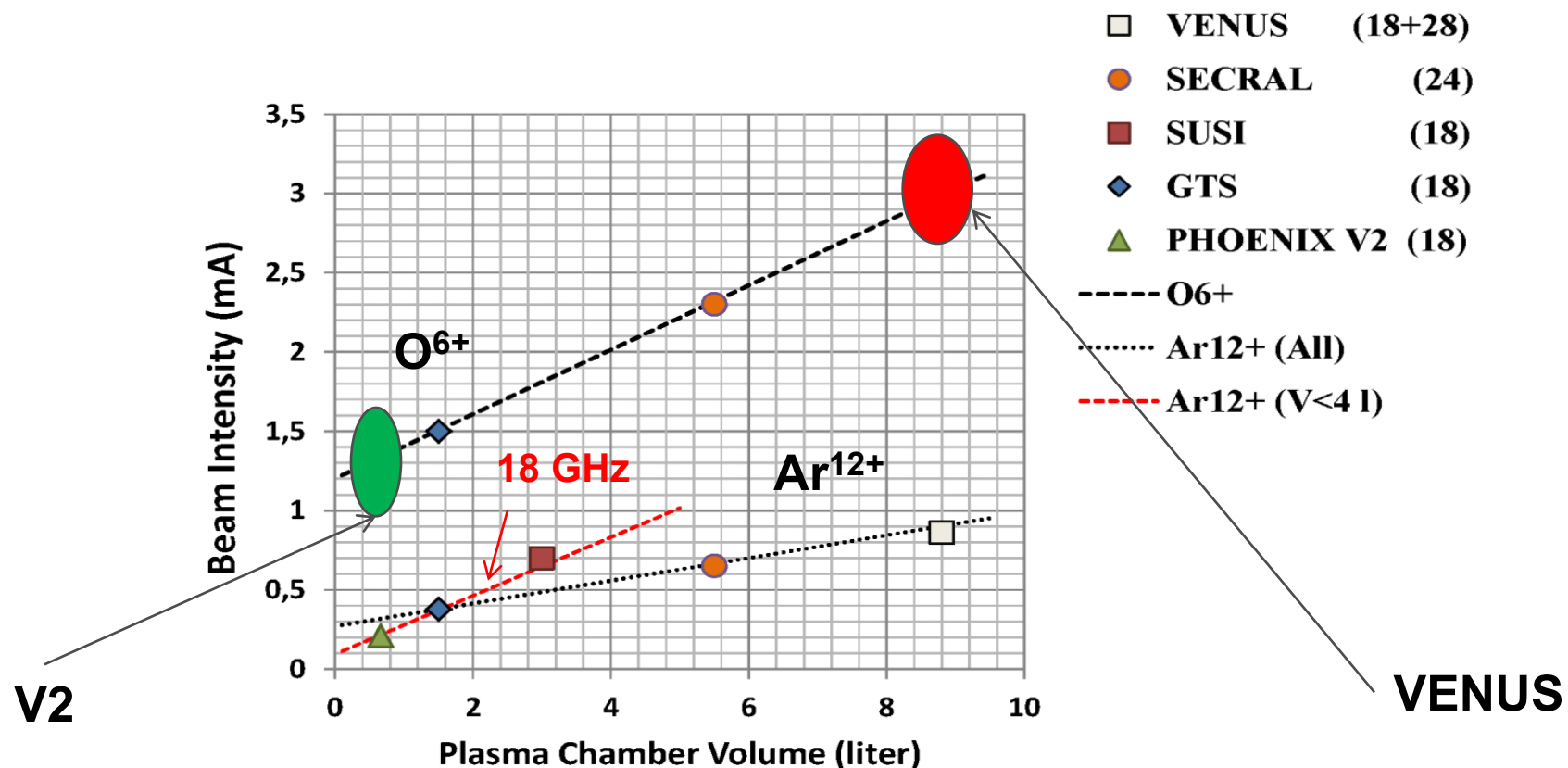
1.3 mA , Oxygen 6+ at 60 kV beam produced with PHOENIX V2

RF power at emitter : 1.6 kW
Reliable and stable beam



200 μA Argon 12+ at 60 kV beam produced with PHOENIX V2

Plasma chamber volume effect on $A/Q=3$ beams

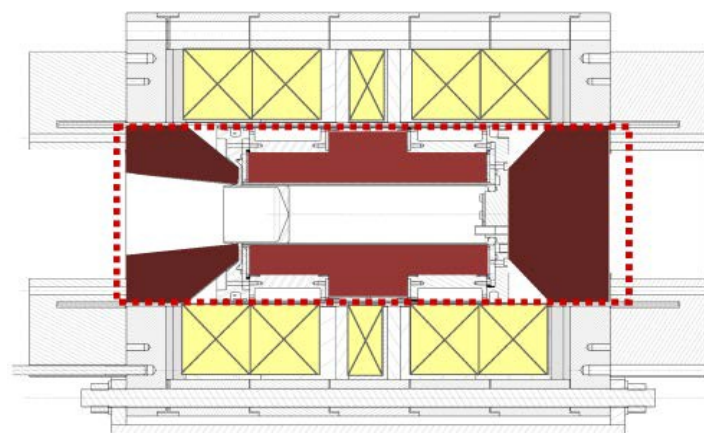


- Need to build a large volume to increase beams of multicharged ions

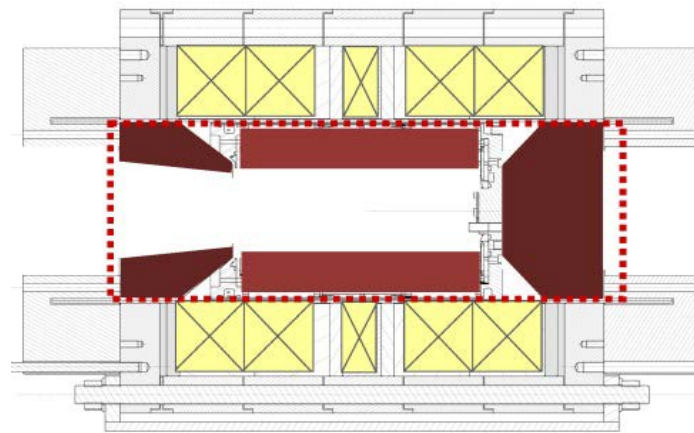
- ◆ Larger ECR surface enhances ion production rate
- ◆ Higher confinement time

Planned upgrade : Phoenix V2→V3

- Goal : Increase beam intensity by increasing plasma chamber volume from 0.6 to 1.3 liter
- expected $M/Q=3$ beam intensity increased by 50 to 100 %
- Magnetic confinement kept
 - ◆ Axial magnetic structure identical to PHOENIX V2
 - ◆ Radial magnetic intensity at wall almost unchanged
- Reversible design, easy to implement thanks to PHOENIX concept :
 - ◆ Only the central High Voltage core is changed
 - ◆ Allows short switching between V2 and V3 configuration during operation



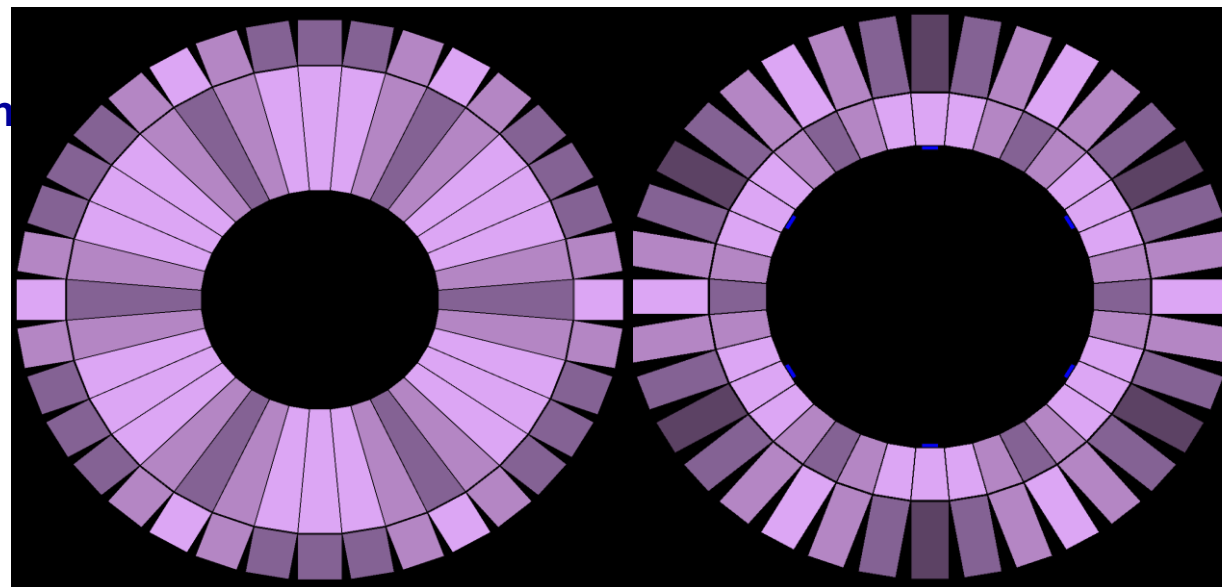
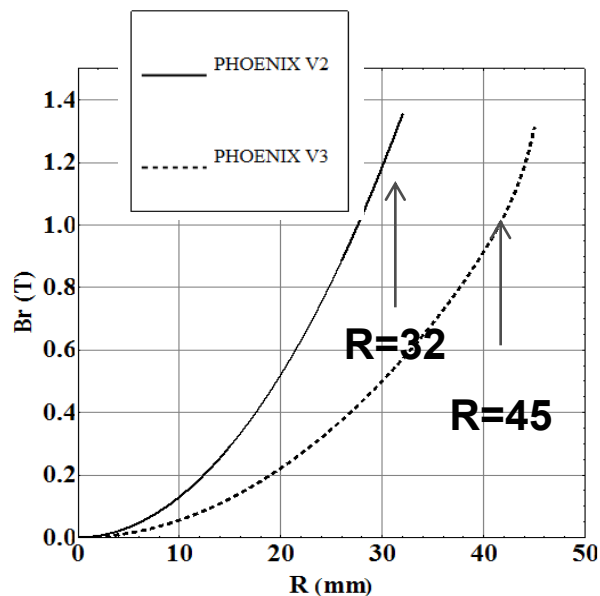
V2



V3

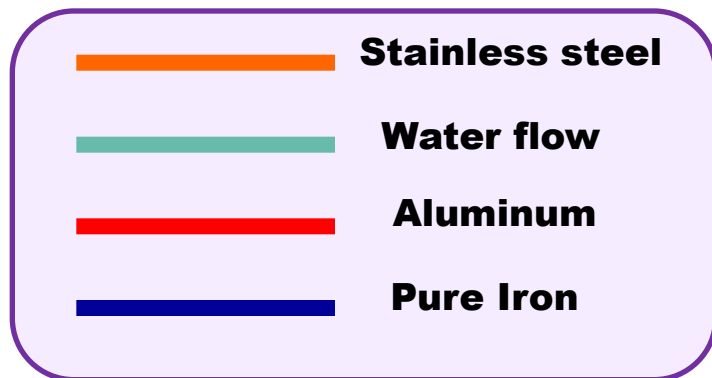
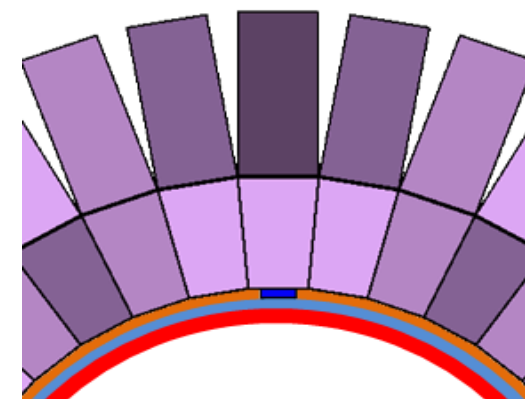
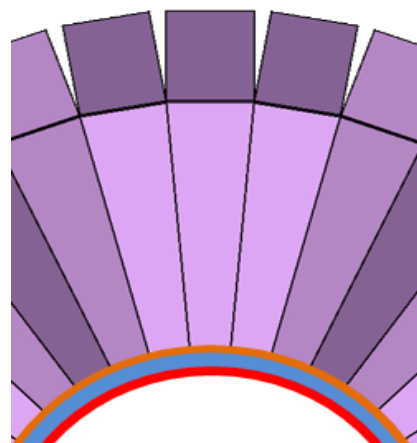
PHOENIX V2 and V3 Hexapole

Radial confinement at wall almost unchanged



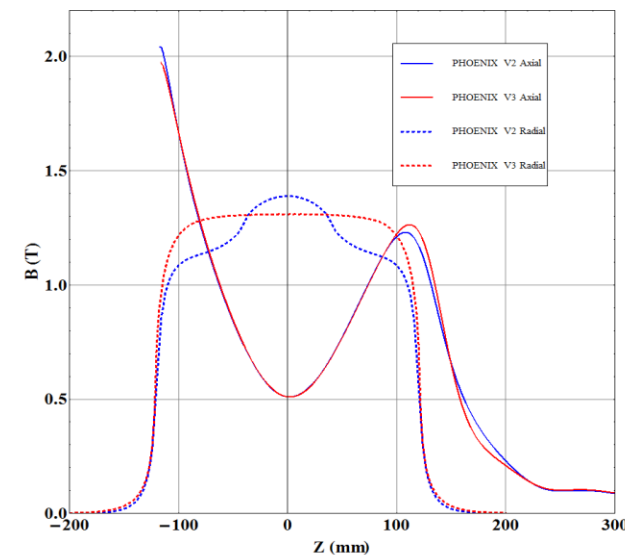
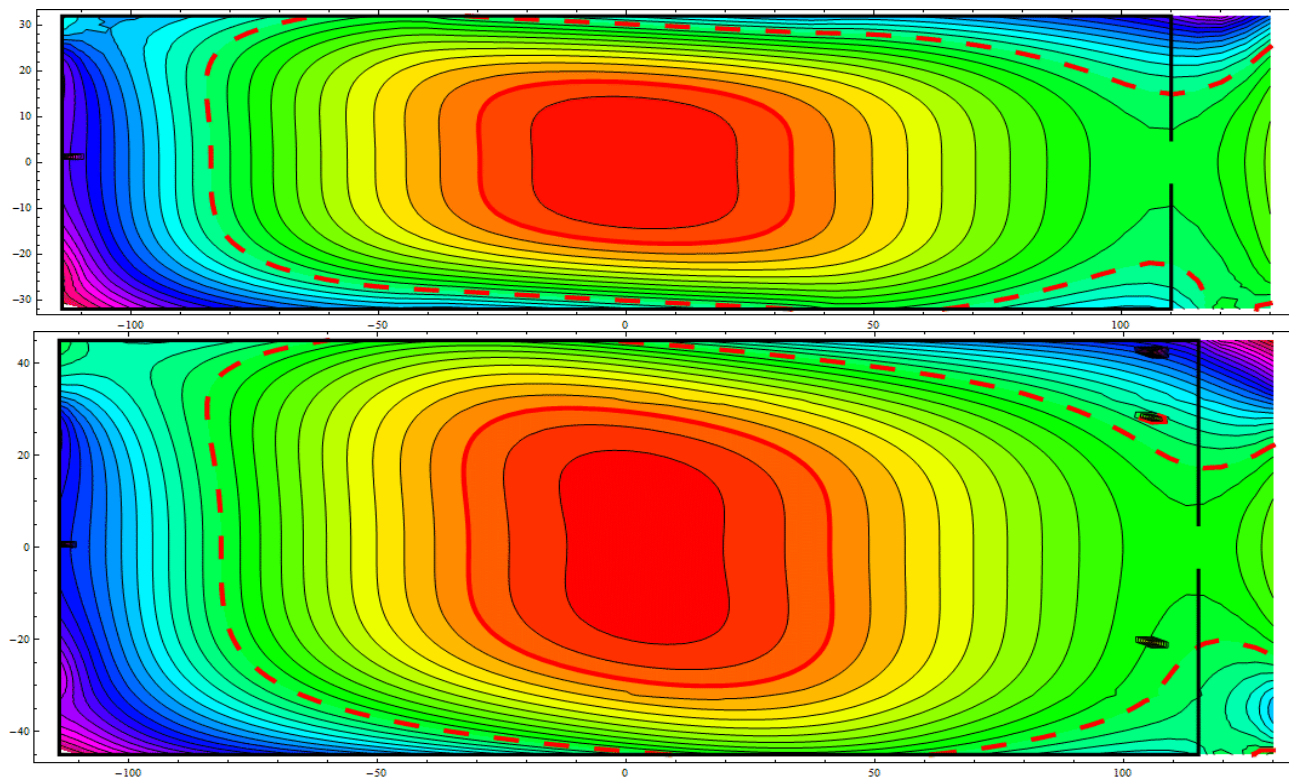
V2

V3



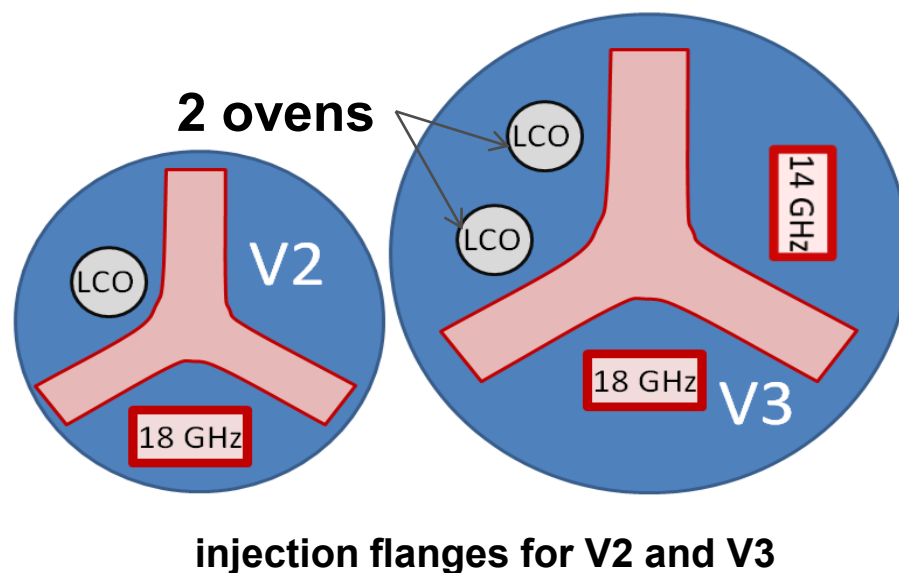
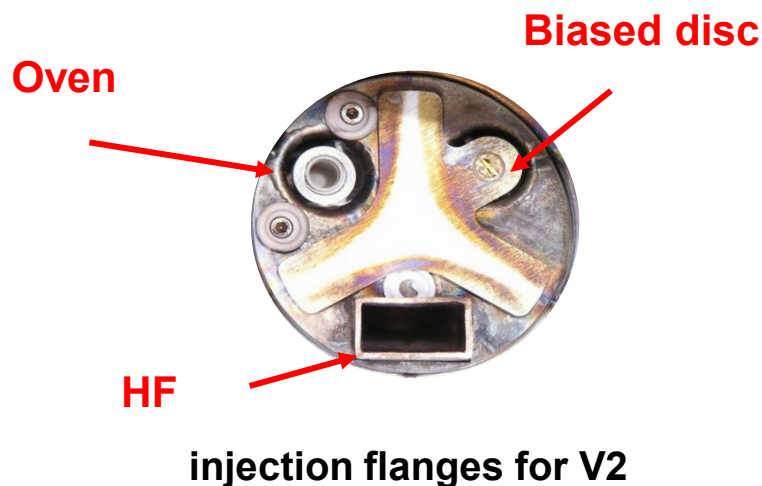
PHOENIX V2 et V3 min-B structure

- Volume doubled (0.66→1.3 l.)
- Same axial magnetic mirror
- Same distance of ECR zone to the wall
- ECR Zone doubled



Bz(Z) solid
Br(Z) at wall dash

- **Ion extraction study collaboration with GSI**
 - ◆ experimental/simulation comparison between V2 and V3
- **Double RF frequency to be considered (14+ 18 GHz)**
- **Two oven can be used simultaneously to enhance $A/Q=3$ current**





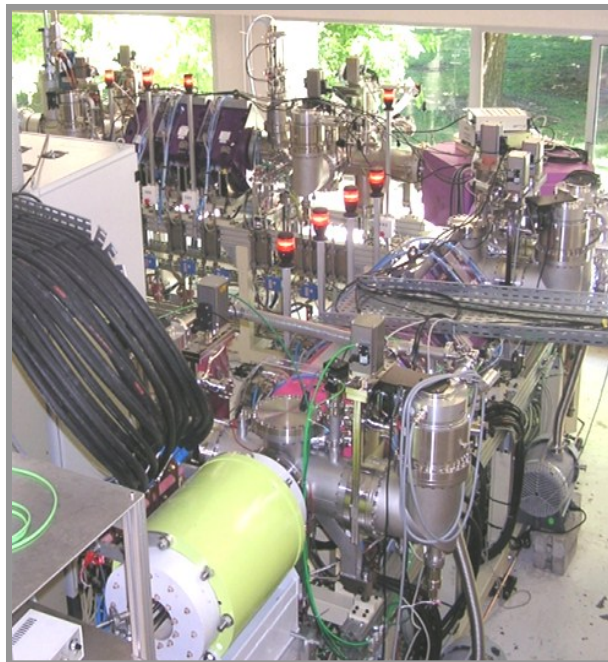
Planning

- Preliminary Magnetic structure of hexapole is done in all case T 2.1
- Extraction simulations are in progress with P. Spaedtke (GSI) T 2.2
- Detailed mechanical design starts in the beginning of November T 2.3
- Call for tender is expected at the end of 2012 for permanent magnet ; it should be bought in 2013 (100 k€)
- Mechanical pieces should be ordered in the beginning of 2013
- Hire a mechanical engineer to assembly the hexapole in February or March of 2013 for 6 months
- Commissioning scheduled for mid 2013
- First beam with PHOENIX V3 expected in September 2013

Low Beam Energy Transport Line $A/Q=3$ at Grenoble



October 2008



From april 2009 to june 2012

- Moved to Spiral2 in end of September 2012
- Rebuild from beginning of 2013 at GANIL



September 2012