

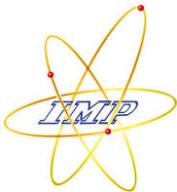
18th International Workshop on ECRISs

Chicago, Illinois USA - September 15 - 18, 2008

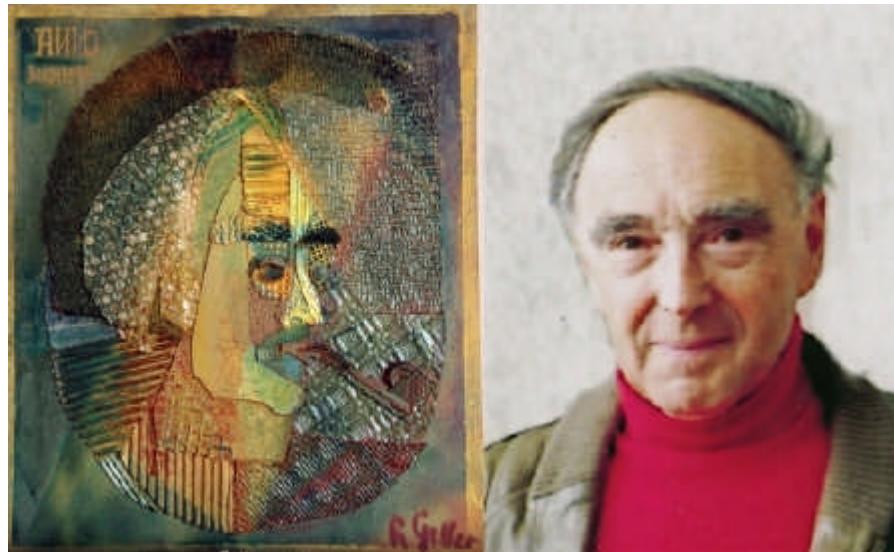
Richard Geller PRIZE

L. T. Sun

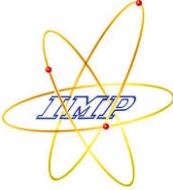
Institute of Modern Physics, CAS



Acknowledgements



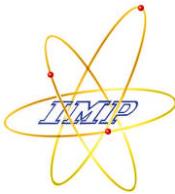
***Richard Geller PRIZE, really great prize for
those young scientists Working on ECRISs***



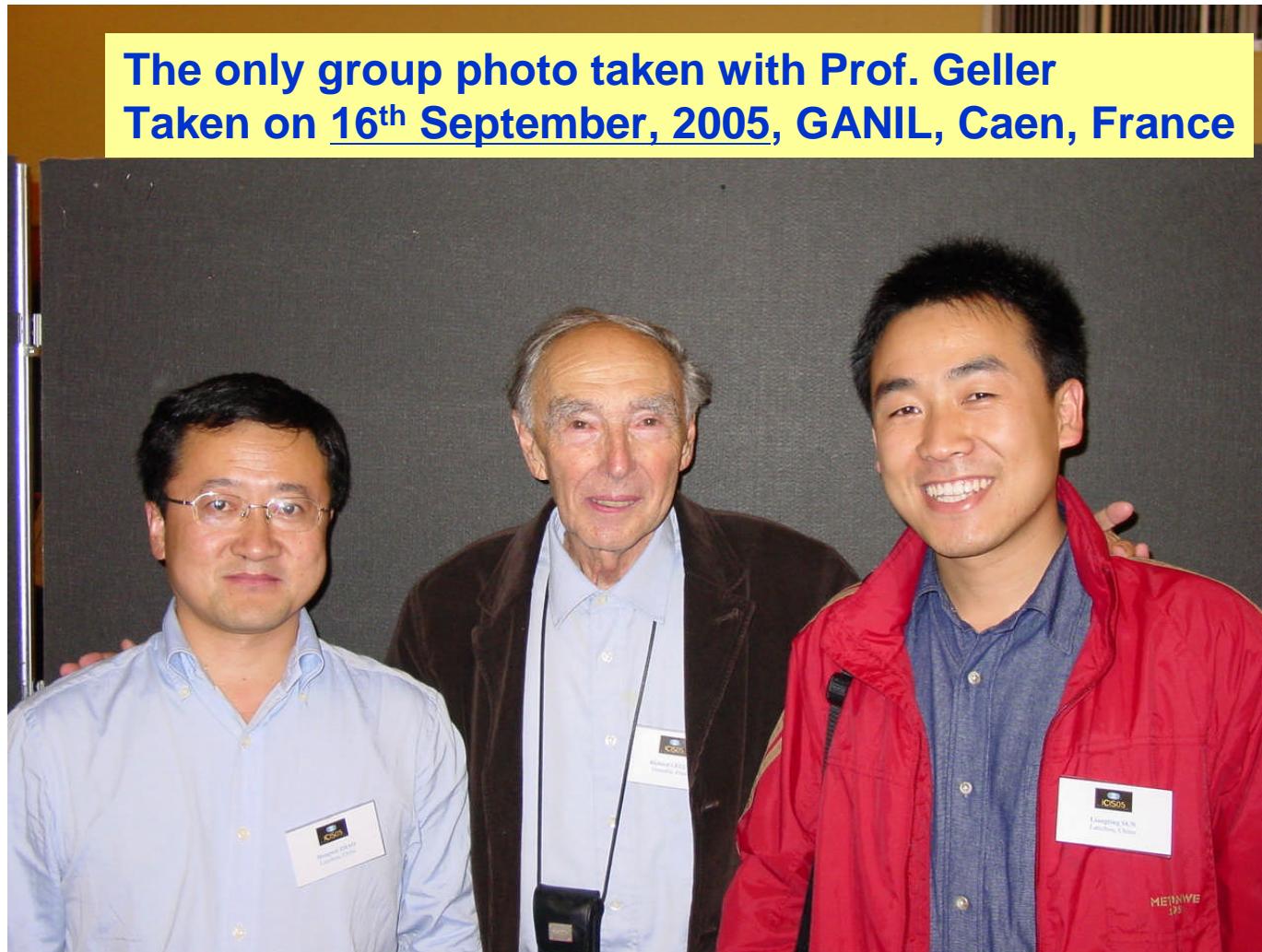
Acknowledgements

- Thank you, PANTECHNIK
Company for your support!**
- Thank you, prize committee!**
- Success belongs to my group!**
- Thanks to all colleagues who ever
helped us!**

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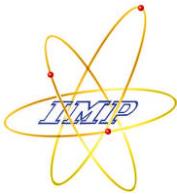


Acknowledgements



IMP-Lanzhou, China

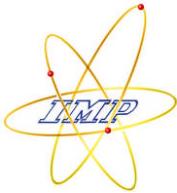
L. T. Sun, ECRIS08, Chicago-2008.9



Acknowledgements

I am happy to be one member of
this big family

Challenges!
Competitions!
& Cooperations!



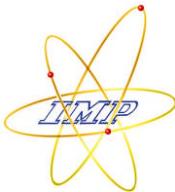
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High Charge State All Permanent Magnet ECRIS Operated on 320 kV HV Platform

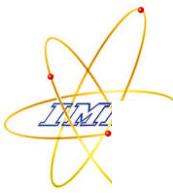
L. T. Sun

Institute of Modern Physics, CAS

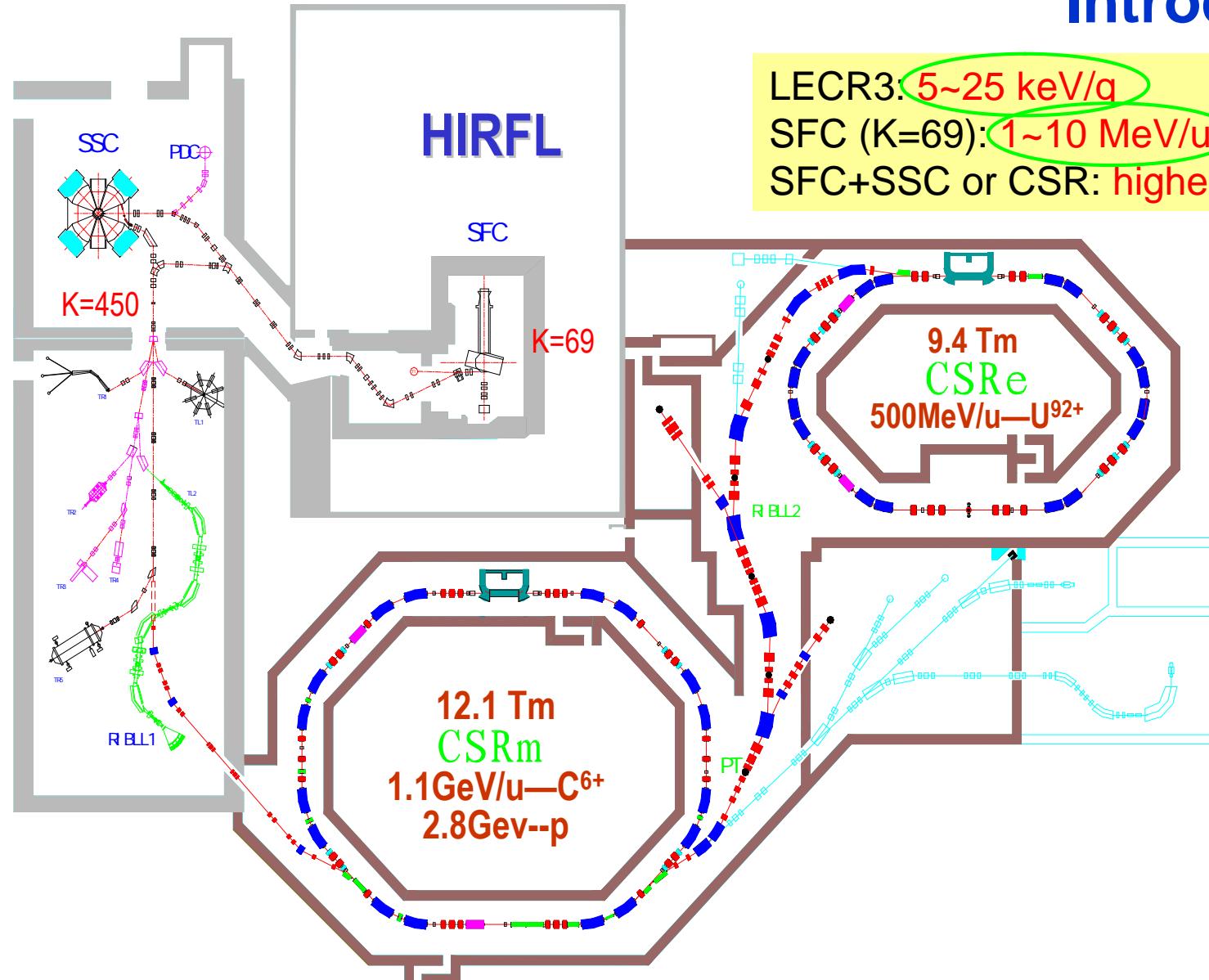


Outline

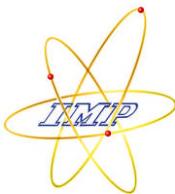
- Introduction to LAPECR2
- Ion Source Commissioning
- Metallic ion beam production (preliminary)
- 320 kV HV platform and LAPECR2
operation status



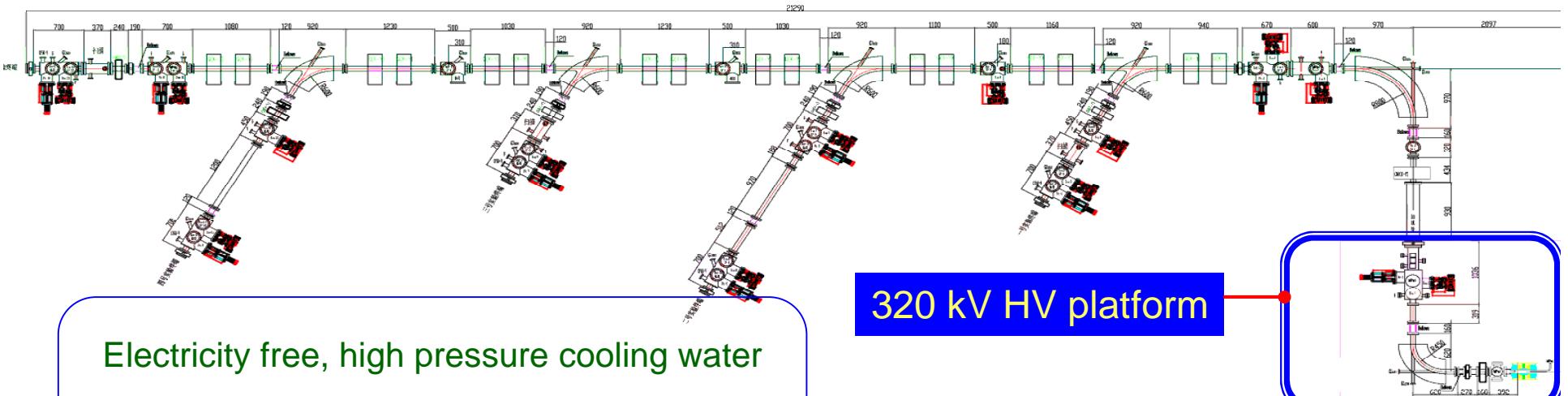
Introduction



LECR3: 5~25 keV/a
SFC (K=69): 1~10 MeV/u
SFC+SSC or CSR: higher energy



Motivation

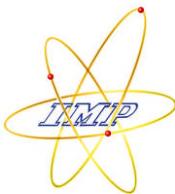


Electricity free, high pressure cooling water free, simplicity, low running expense, long-term running stability.

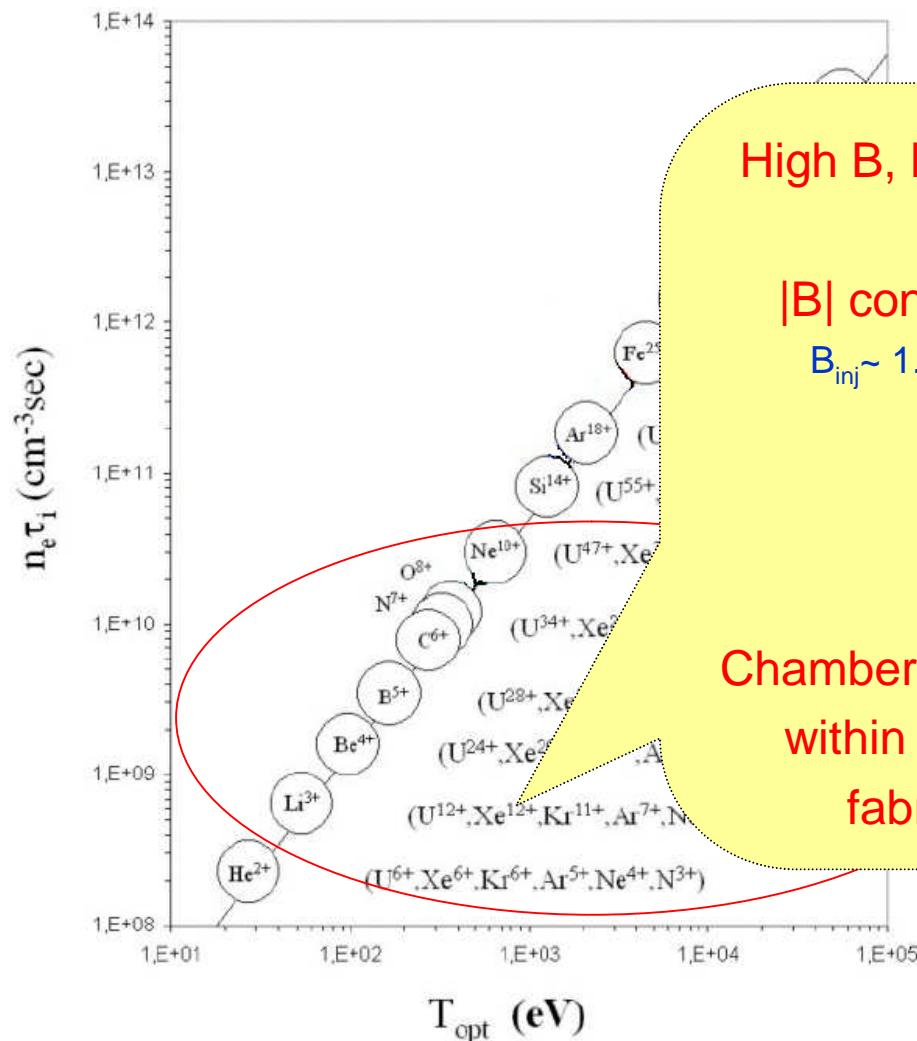
320 kV HV platform

Used on IMP 320 kV HV platform to produce stable intense medium charge state ion beams such as: hundreds of euA Ar^{8+} , C^{4+} ; high charge state ion beams, such as gaseous ion beams Ar^{14+} , Kr^{20+} , Xe^{27+} etc., and also metallic ion beams Ca^{14+} , Pb^{27+} ...

- highly charged ion physics
- material developing
- biophysics
- astrophysics
- atomic physics...



Conceptual Design



High B, high frequency modes:

$$\omega_{\text{rf}} = 14.5 \text{ GHz}$$

$|\mathbf{B}|$ contour closed at 2 B_{ecr} :

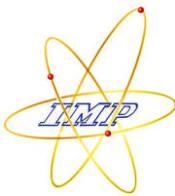
$$B_{\text{inj}} \sim 1.3 \text{ T} \text{ (2.1 T with iron plug)}$$

$$B_{\text{min}} \sim 0.42 \text{ T}$$

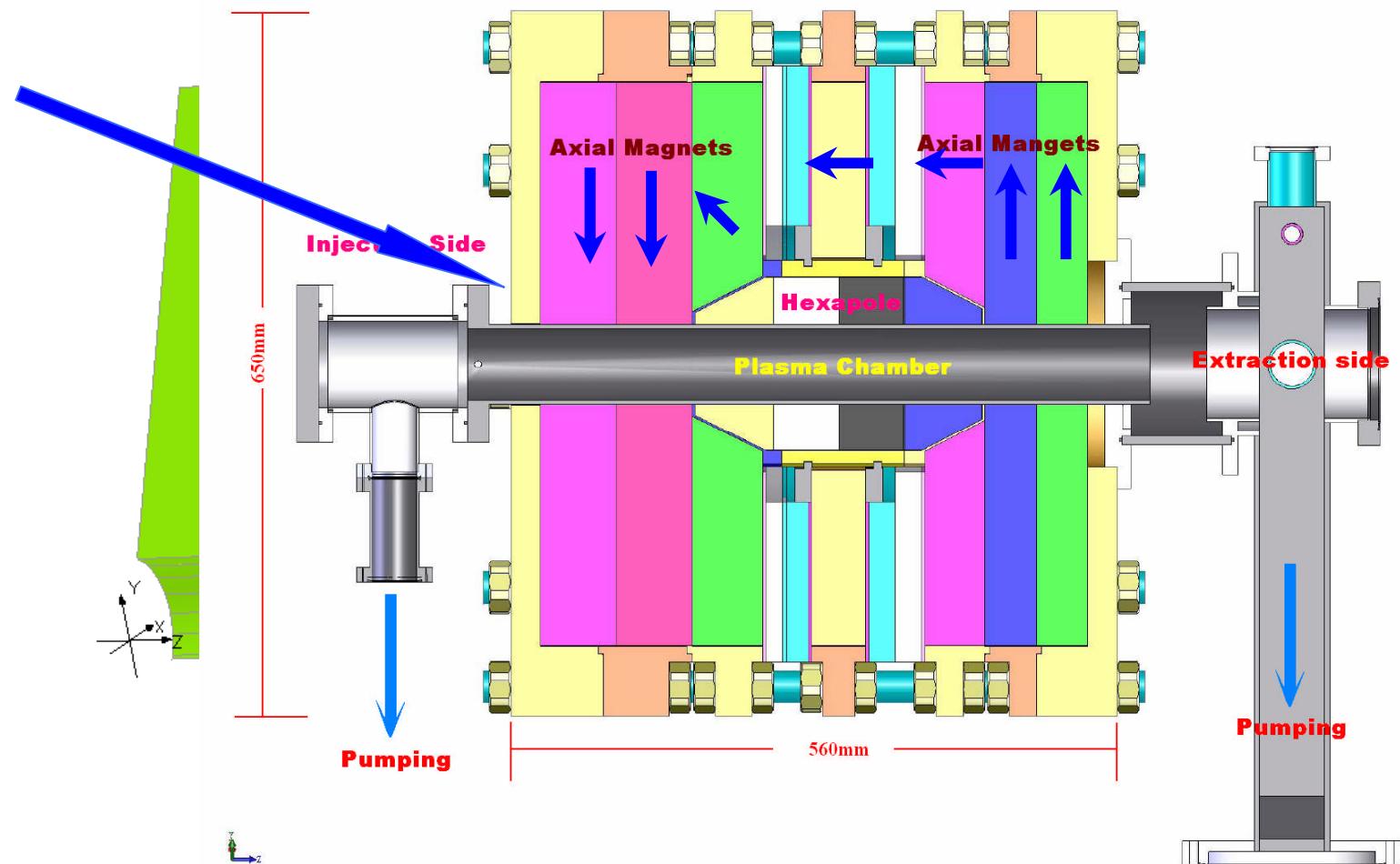
$$B_{\text{ext}} \sim 1.1 \text{ T}$$

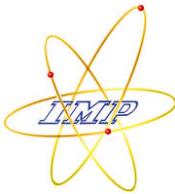
$$P_{\text{rf}} \sim 1.0 \text{ kW}$$

Chamber ID as large as possible
within reasonable cost and
fabrication possibility



Schematic Design



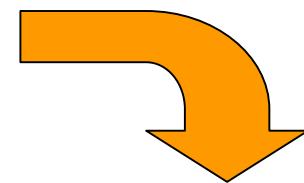


Magnet Fabrication

Blank cutting



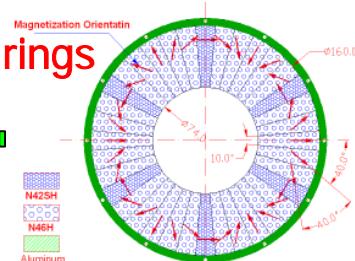
Gluing after
Being magnetized



12 big segments
~96 smaller pieces



4 hexapole rings



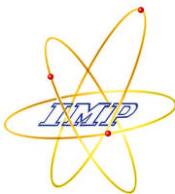
7 big
axial rings



Two glued
one bigger



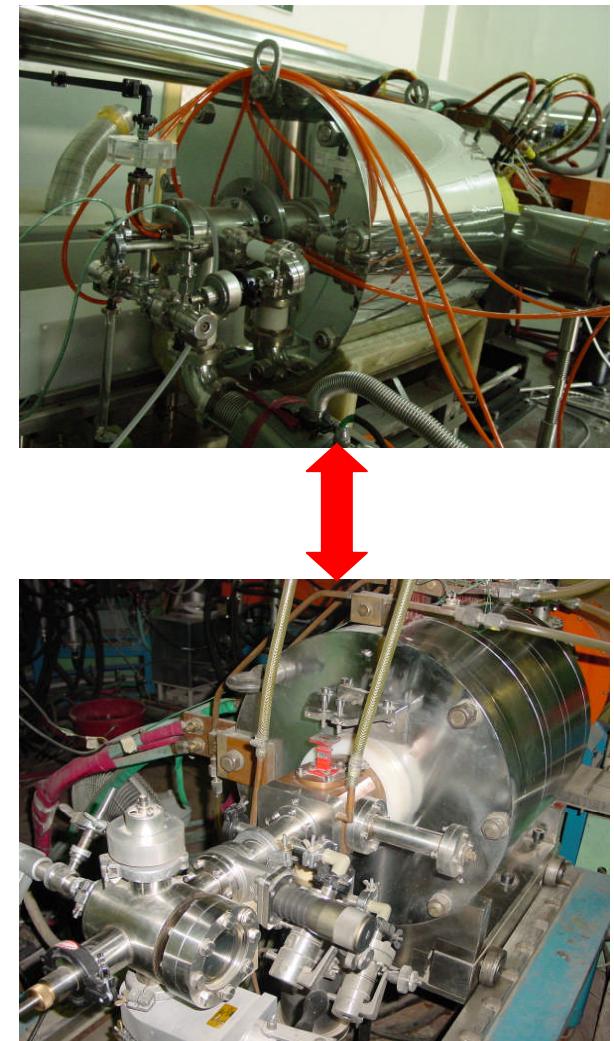
Totally 648 pieces in axial magnet rings , 216 pieces in hexapole magnet, precisely glued

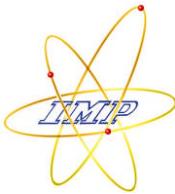


Typical Parameters

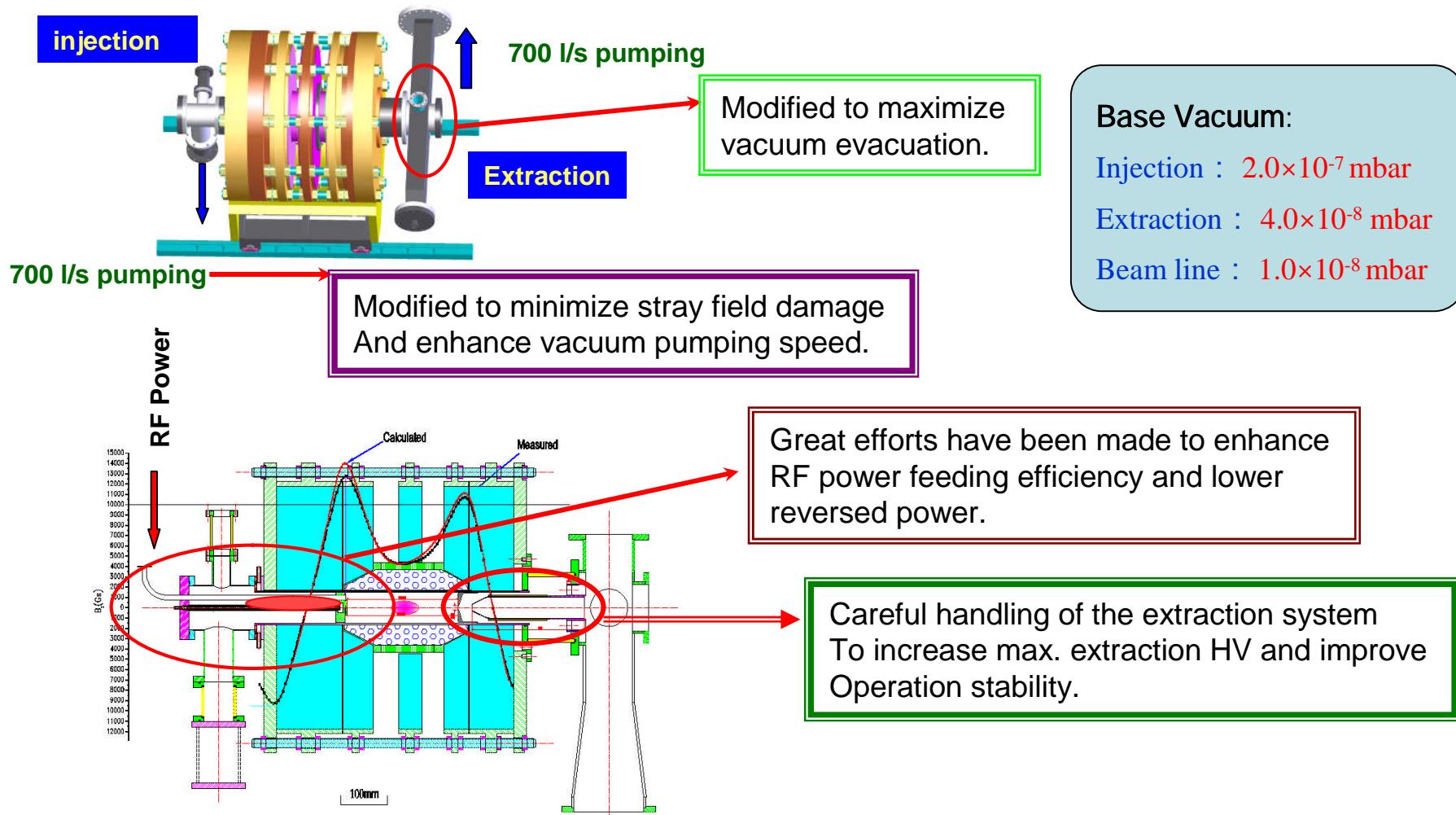
Comparison of the parameters

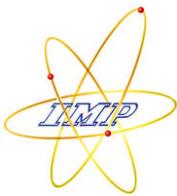
Parameters	LAPECR2	LECR2
Axial Mirror Peak (T)	1.28 (2.1), 1.07	1.5, 1.1
B_{\min} (T)	0.42	0.39
B_{rad} (T)	1.21	1.0
Hexapole Material (NdFeB)	36-segmented N45M	24-segmented N42
RF Frequency (GHz)	14.5	14.5
Feeding Mode	Off-axis Direct Feeding	Coaxial Feeding
L_{mirror} (mm)	255	300
L_{ecr} (mm)	100	86
Plasma Chamber ID (mm)	67	70
Chamber Material	316L SS	316 SS



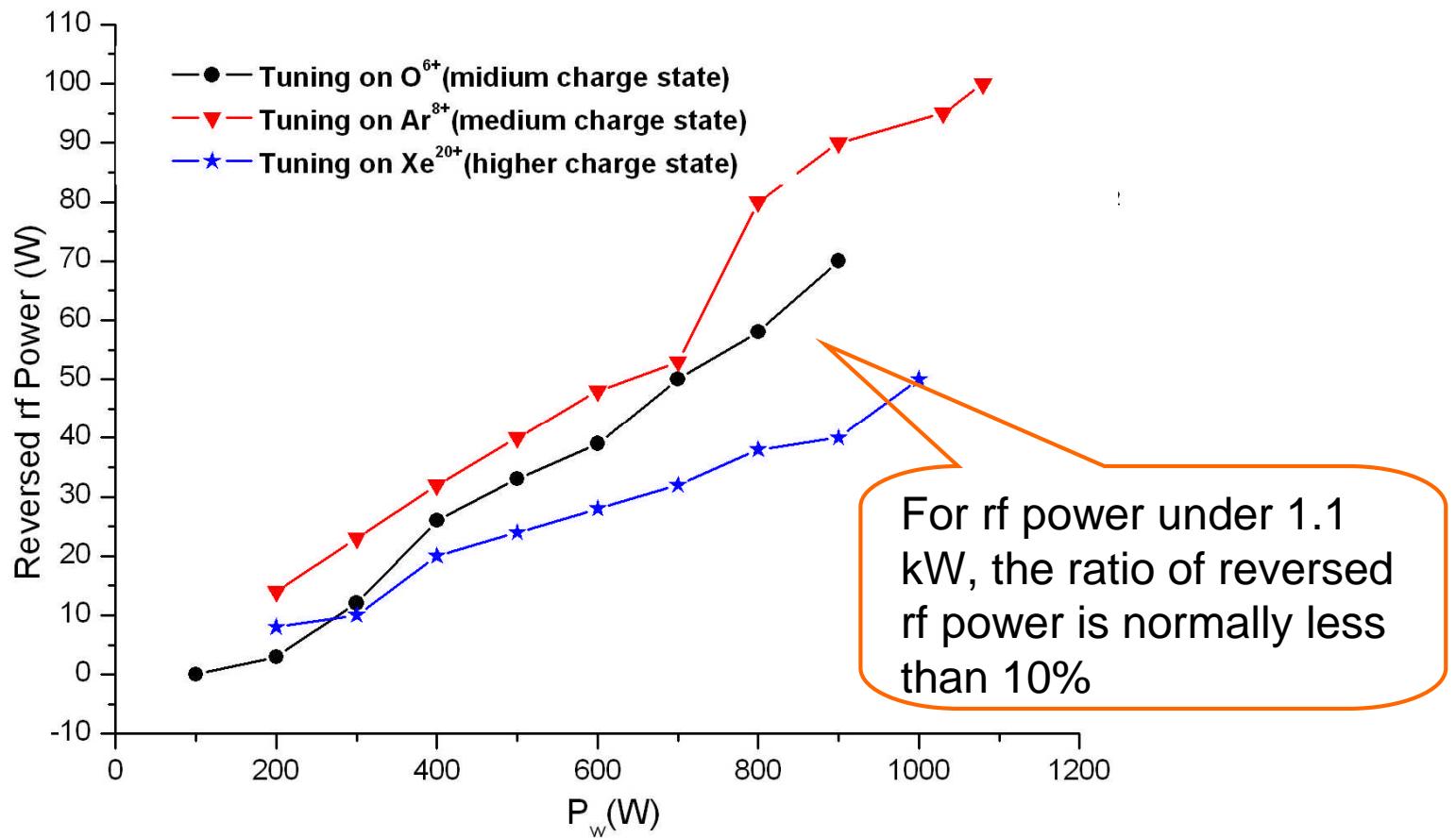


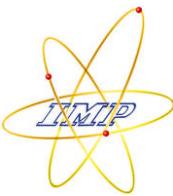
Problems and Solutions



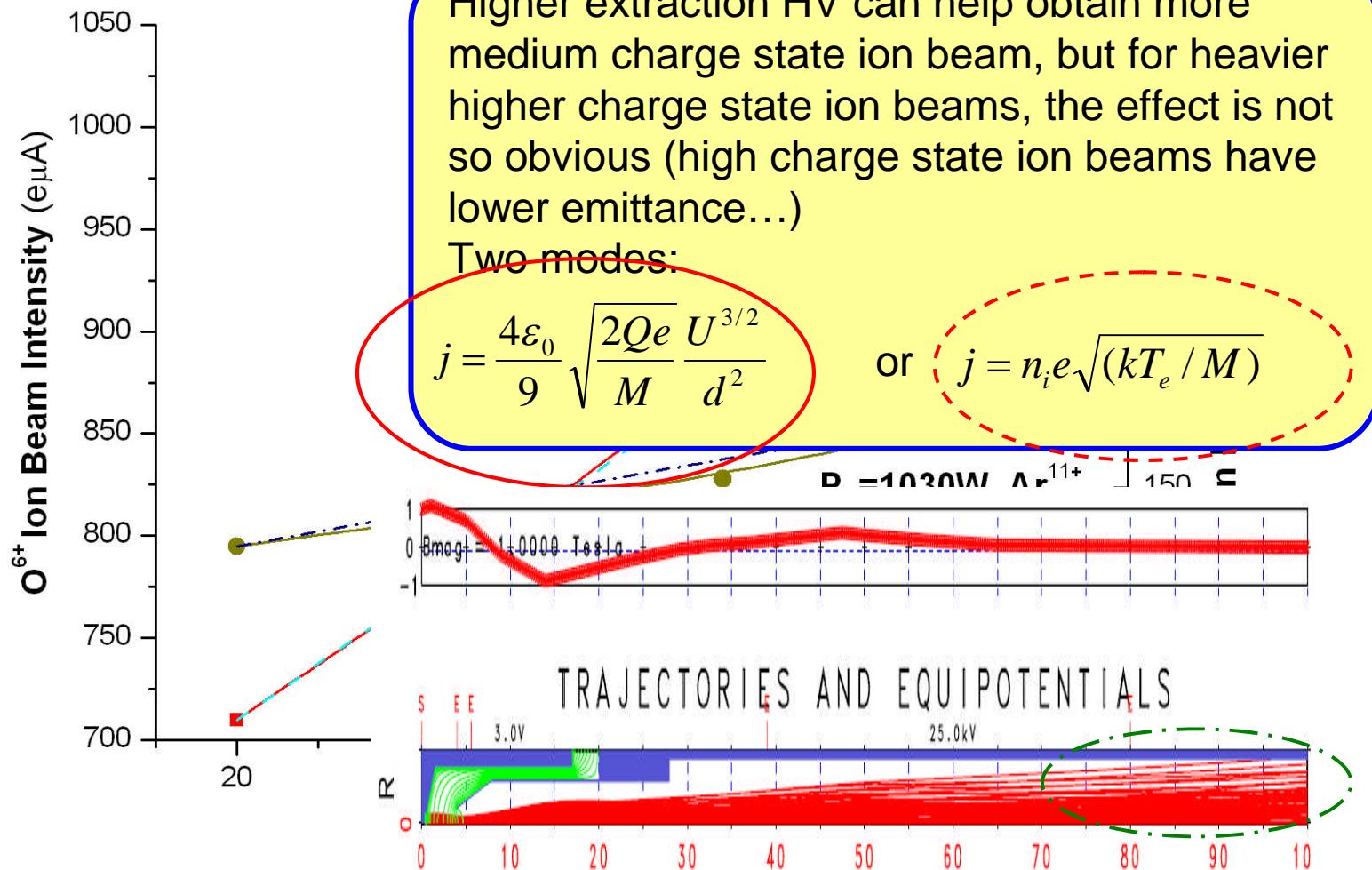


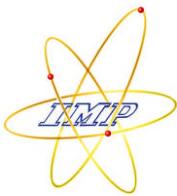
Commission Results (1)



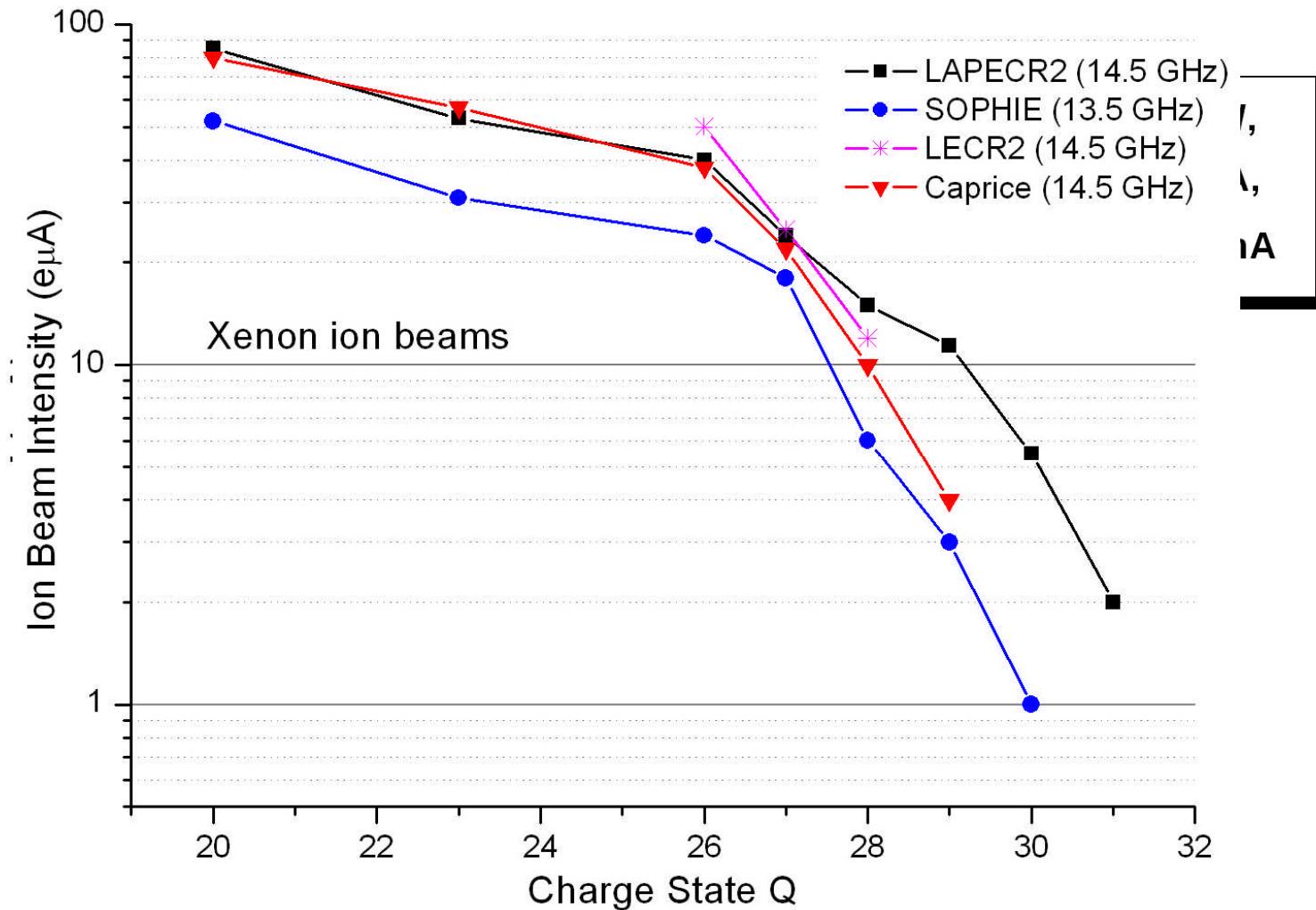


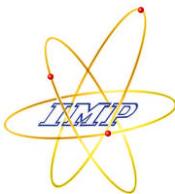
Commission Results (2)



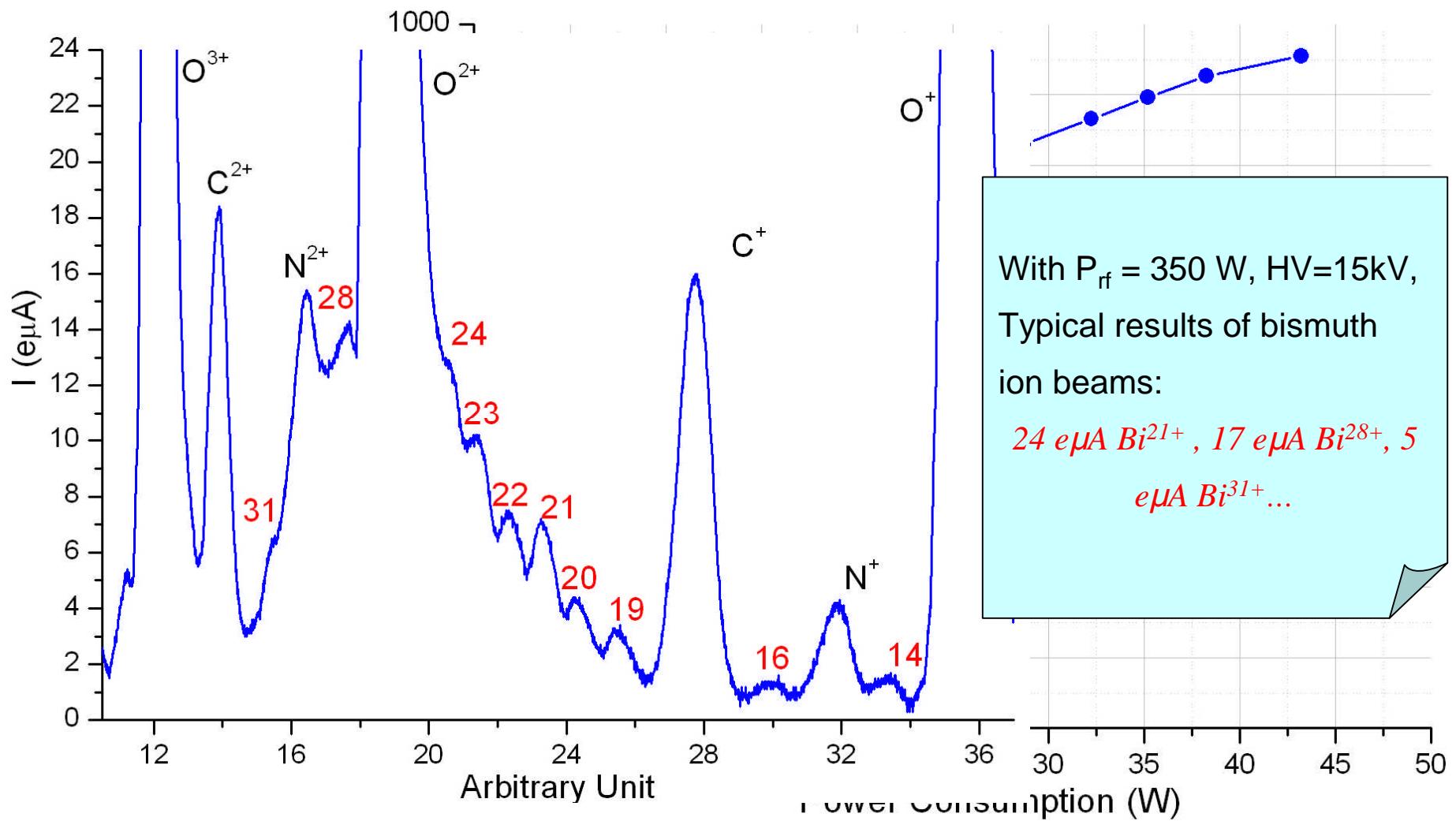


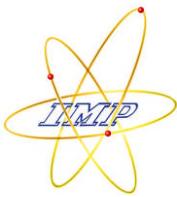
Commission Results (3)



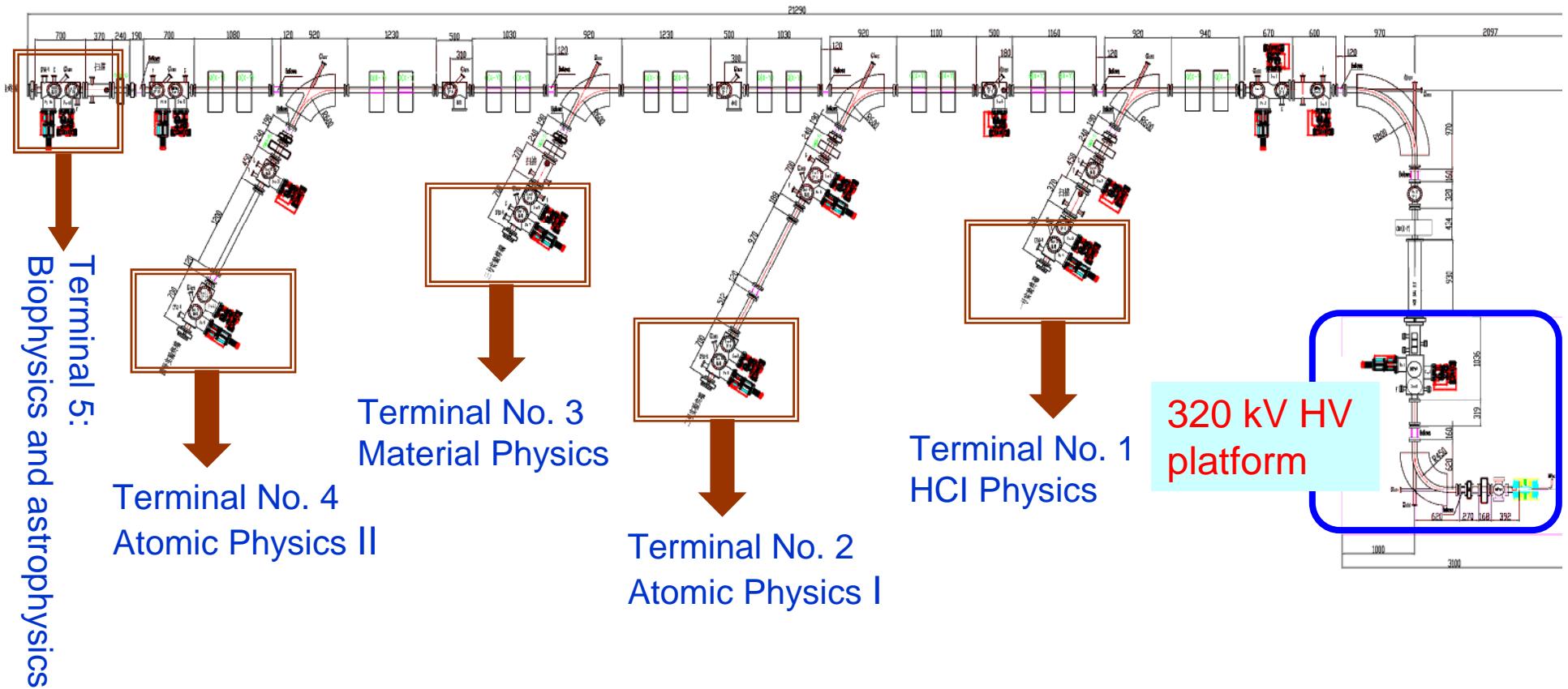


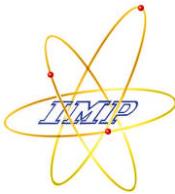
Metallic Ion Beam (preliminary)



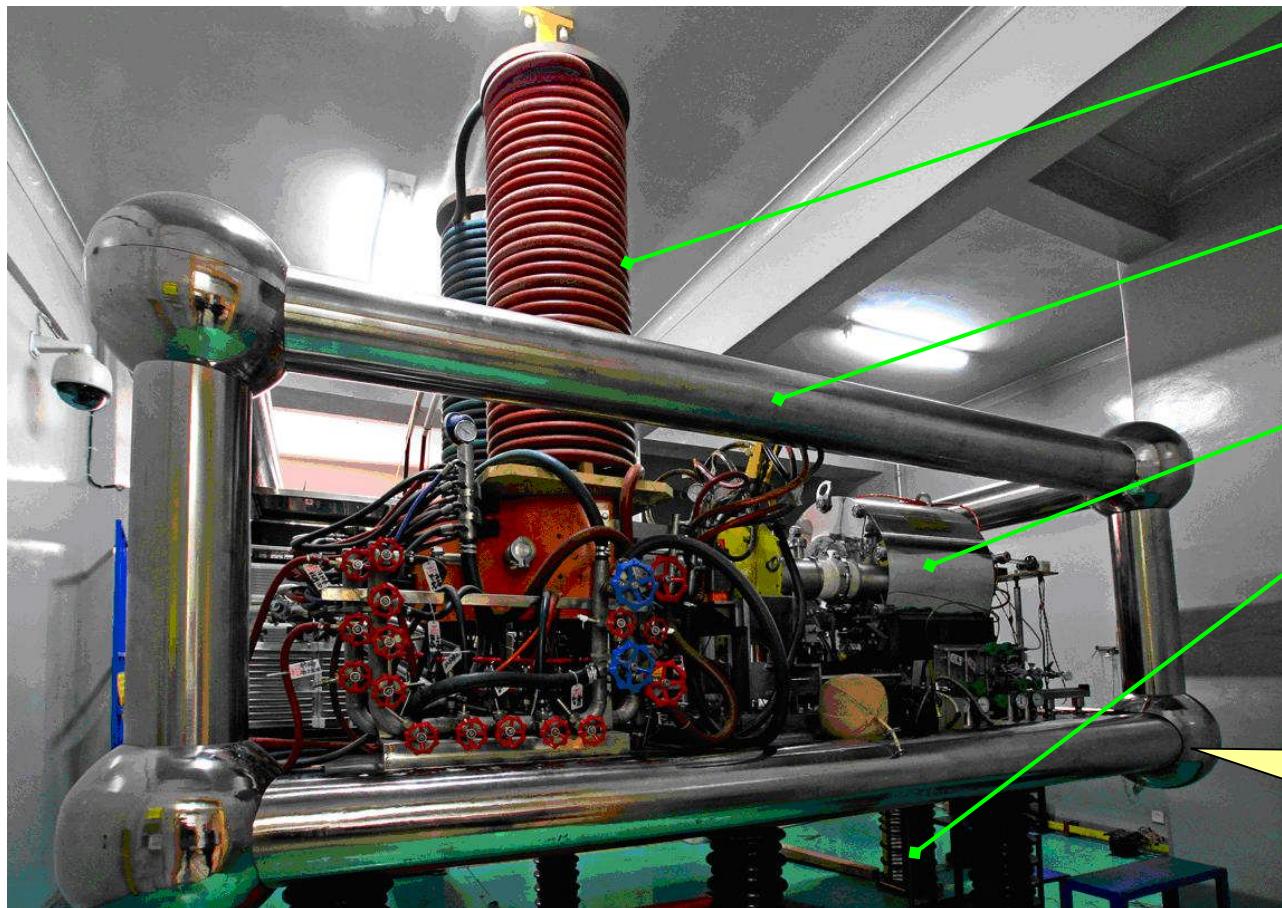


320 kV HV Platform (1)





320 kV HV Platform (2)



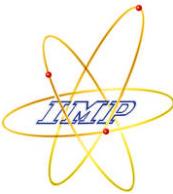
Water resistor columns

HV platform shielding electrode

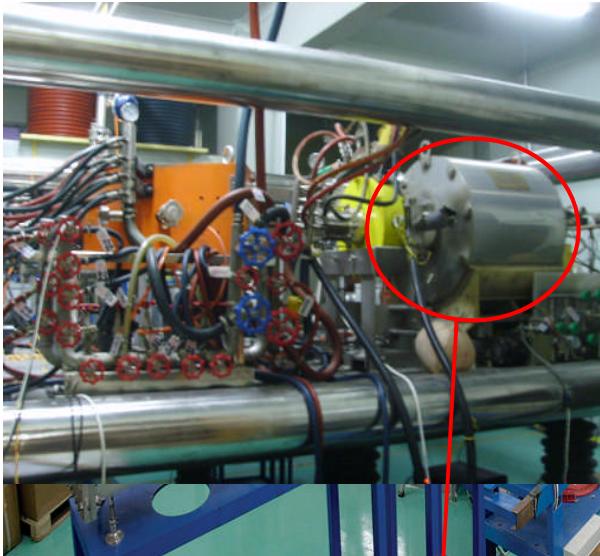
LAPECR2

Insulator columns

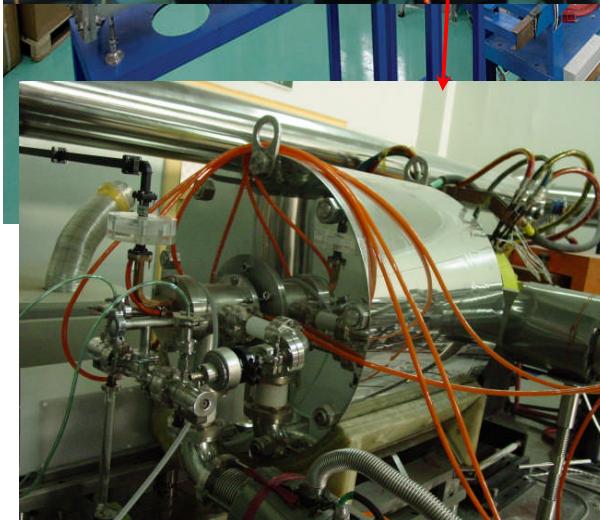
390 kV HV without ion beam has been successfully tested



320 kV HV Platform (3)

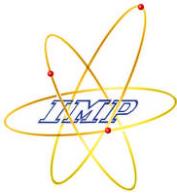


Energy Range :
5 keV/q~340 keV/q



Under service for
many physical
research studies

more than **11,500 hrs** for the commissioning of the HV platform and several physical experiments which covered **9,000 hrs**. The operation time with the platform HV biased is up to about **5,000 hrs**. The highest on-line operation HV applied is **320 kV**



Thanks for your attention!