Brief Introduction to Plasma Ion Source Research in SNU (Seoul National University)

1. H- Ion Source
2. Helicon Plasma Ion Source
3. Local Sheath Plasma
4. Constricted DC Plasma Ion Source

Yeong-Shin Park, Young-Hwa An, Bong-Ki Jung, Jung-Jeung Tang, Yoon-Jae Kim†, Hwa-Dong Jung†,

and Y. S. Hwang

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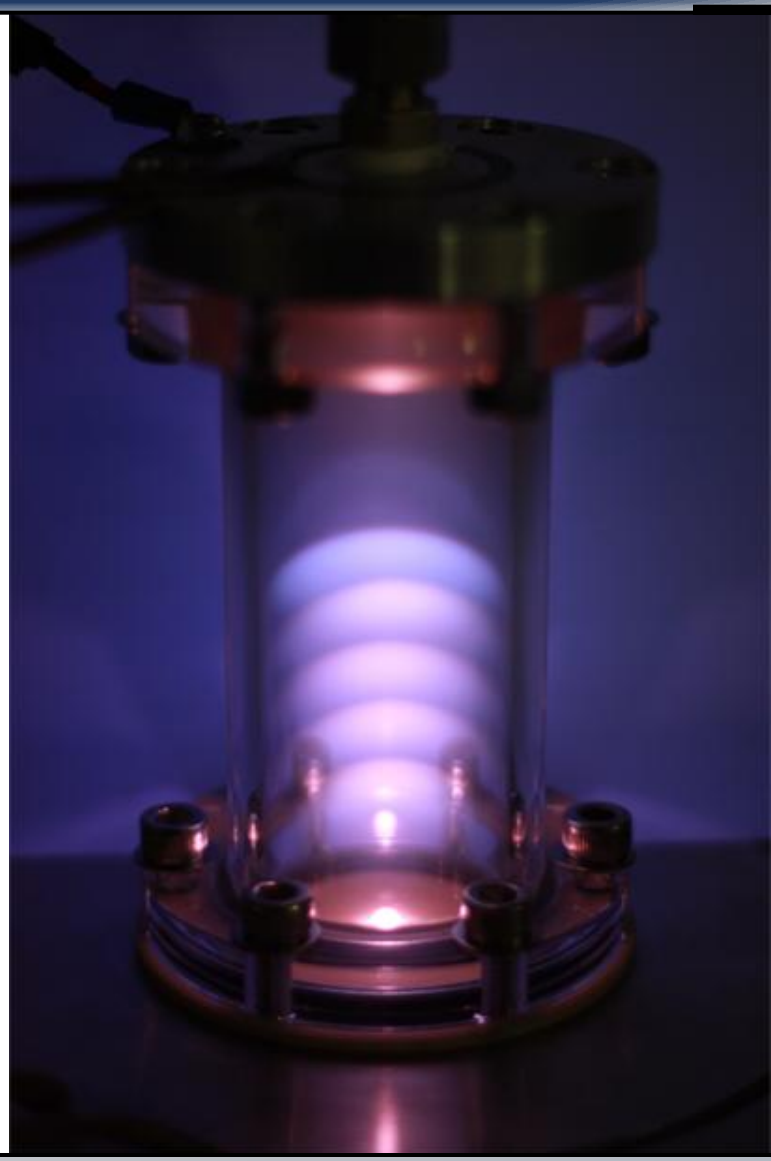
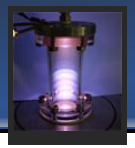
NUPLEX, Dept. of Nuclear Eng., Seoul National University
Gwanak _ 599 Gwanak-ro, Gwanak-gu, Seoul 151-742, Korea

† Currently at Samsung Electronics, Ltd., Co.

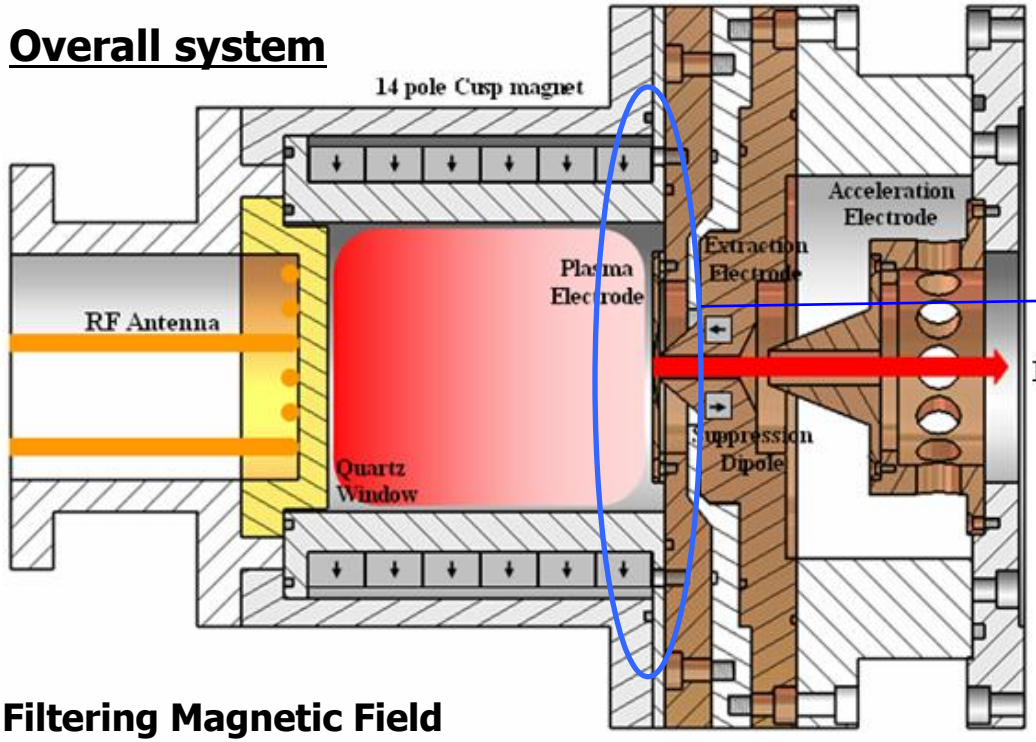
yhwang@snu.ac.kr



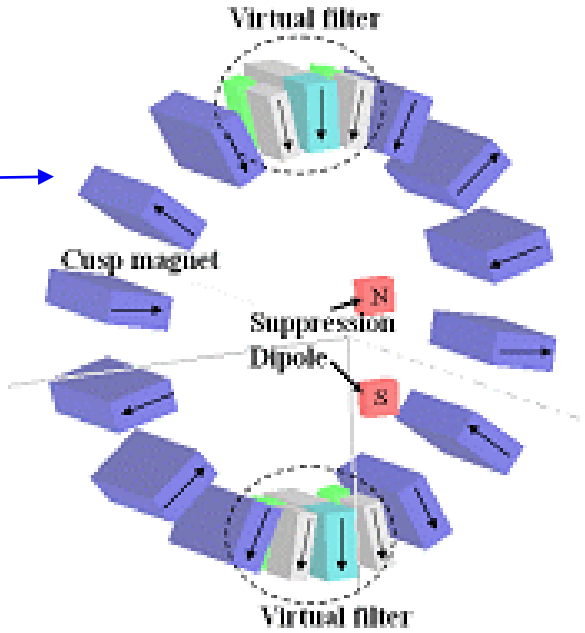


1. H- Ion Source
Ext. RF Antenna, Cs free, CW operation, Volume Production

Overall system



Structure of Virtual Filter



Filtering Magnetic Field

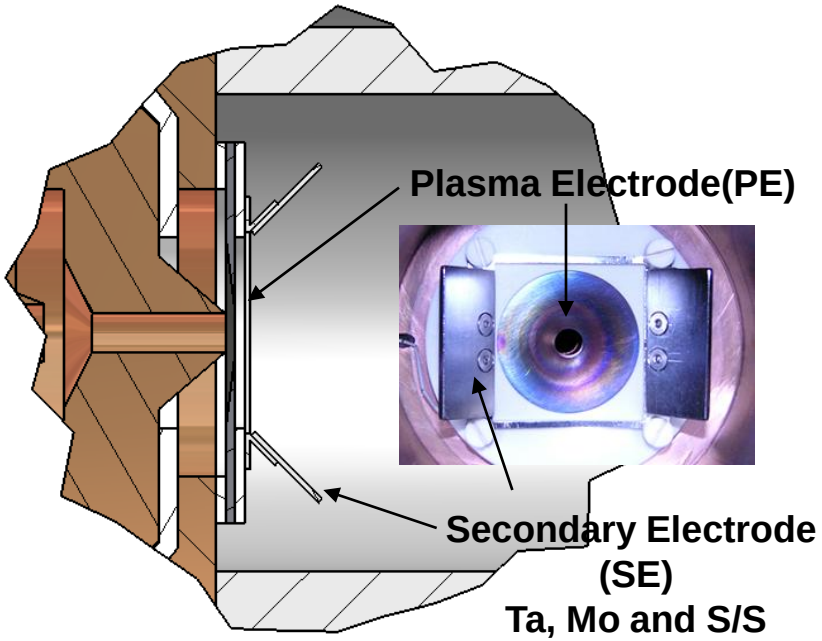
150~210G = 60~120G (Virtual Filter) + 90G (Dipole Magnet _ fixed)

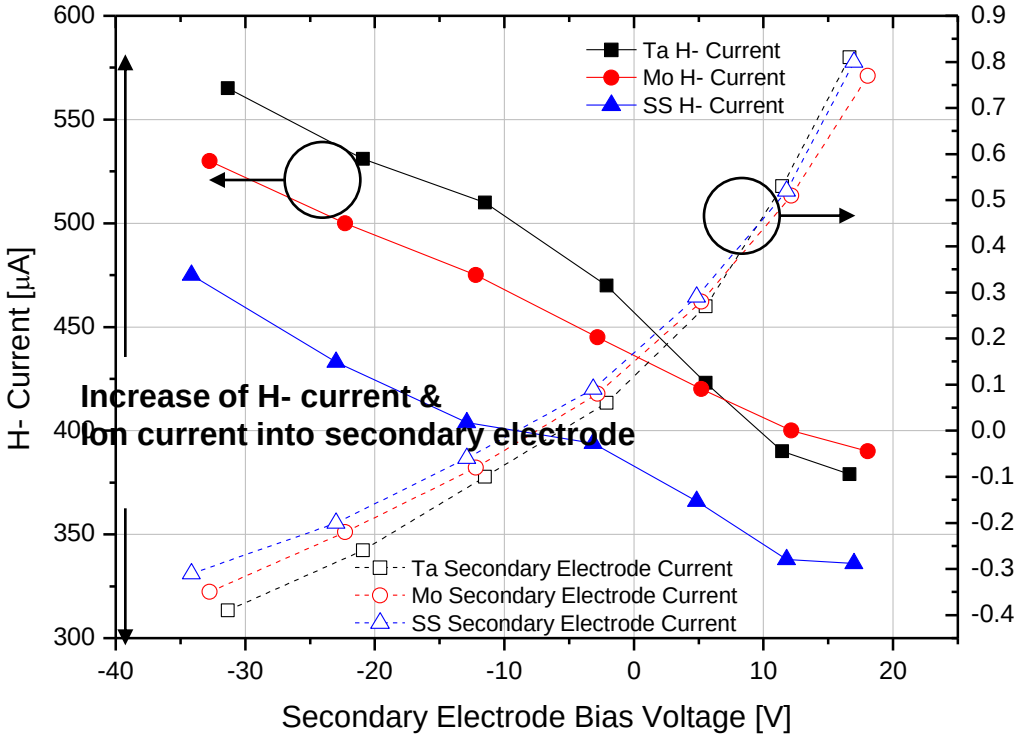
H- ion source using RF TCP plasmas

- Volume production H- ion source
- Longtime CW operation with ext. RF antenna
- No contamination, Cs free H- ion source

RF Power : 1 kW (13.56 MHz, CW)
H- Current : 1.2 mA
Aperture Dia. : 8mm

1. H- Ion Source
Surface effect : H- current is largest with Tantalum SE





Positive ions are converted into vibrationally excited molecules with aids of metal surfaces.

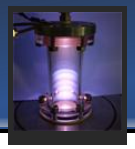
$H + H/surface \rightarrow H_2(v'')$

$H_3^+ + surface \rightarrow H_2(v'') + H$

$H_2^+ + surface \rightarrow H_2(v'')$

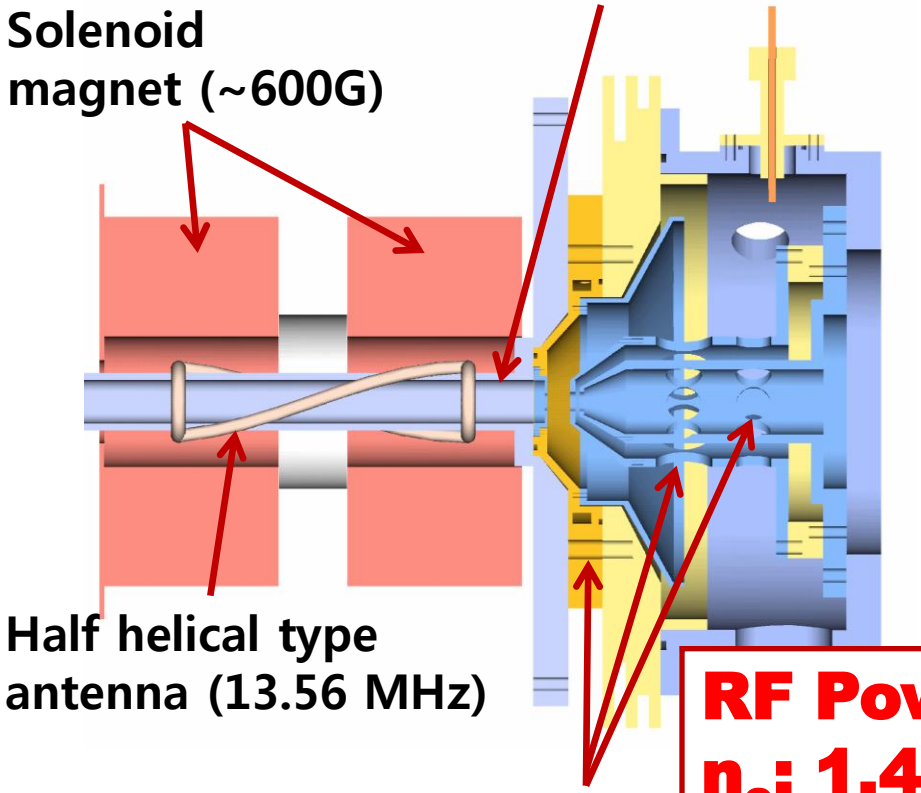
H- current profile and secondary electrode current as a function of secondary electrode bias voltage with various SE material (1.2sccm flow rate, 0V PE bias voltage)

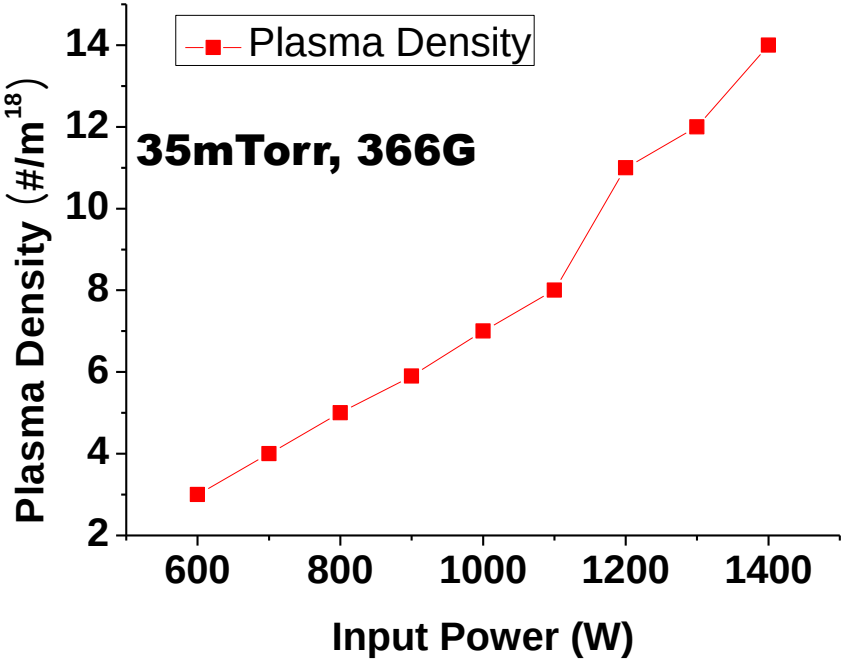
- **H- current increases with more negative secondary electrode bias voltage.**
- **Ta > Mo > S/S**



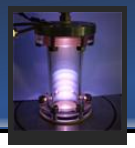
2. Helicon Plasma Ion Source
High Current, High Plasma Density, High Monatomic Ratio

Quartz tube
(inner: 20mm, length: 300mm)



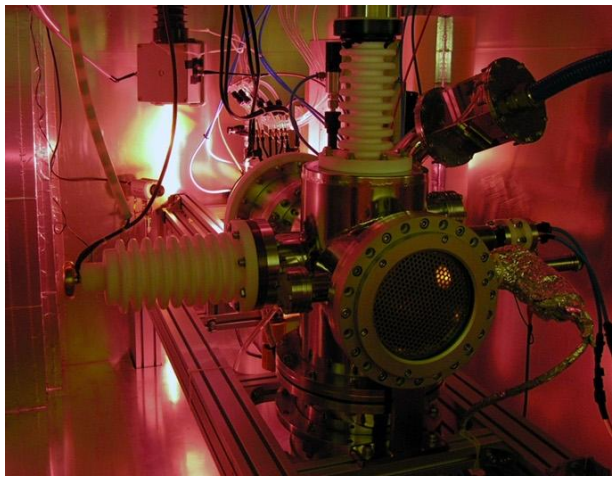


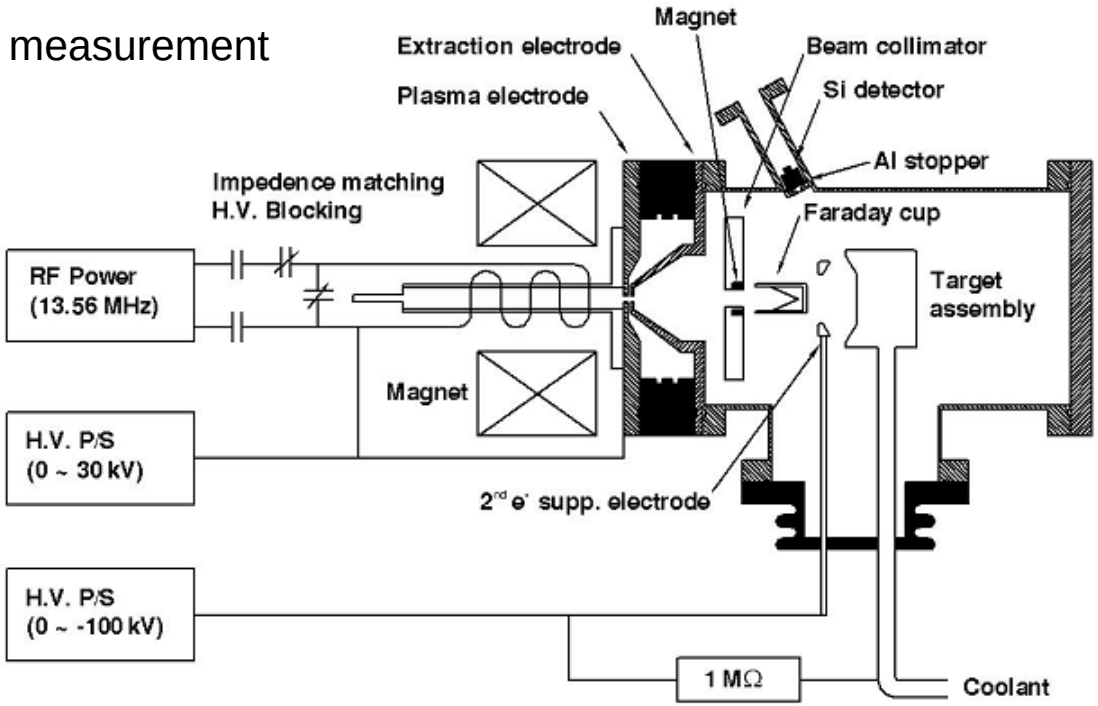
RF Power: 1.3 kW
n_e: 1.4x10^{13} cm^{-3}
Max. H^+ Current: 50 mA
Max. Curr. Density: 640 mA/cm^2



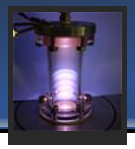
2. Helicon Plasma Ion Source Adopted in a Beam-Target type Neutron Generator

- DD 2.5MeV NG (SNU) - Structure
  - RF driven helicon plasma ion source
  - Ti drive-in target
  - Si detector for proton measurement
  - He-3 detector for neutron measurement

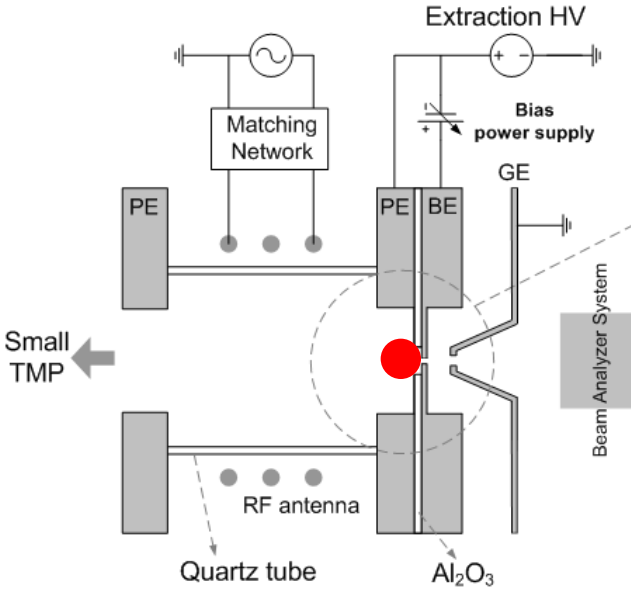


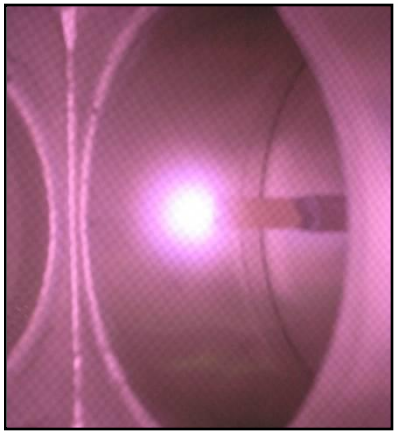


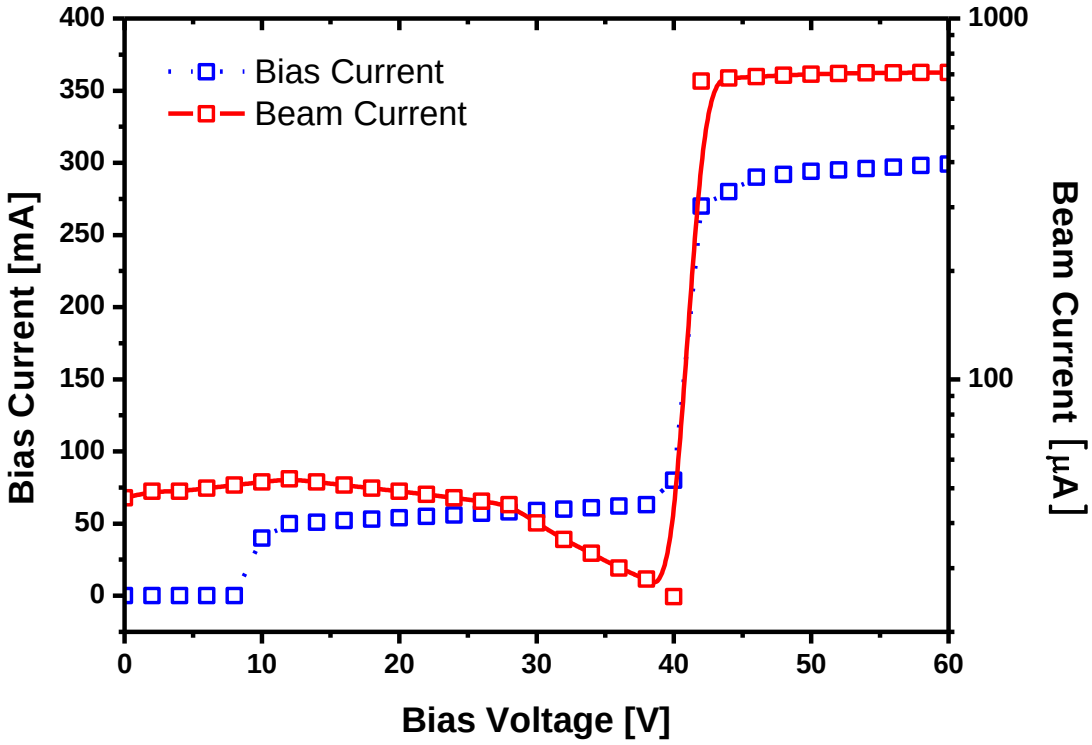
Maximum Neutron yield of 2 x 10^8 n/s
@ 97.5keV, 7.6mA deuteron beam



3. Local Sheath Plasma enhances Beam Current drastically with high efficiency



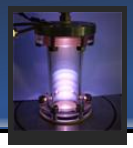




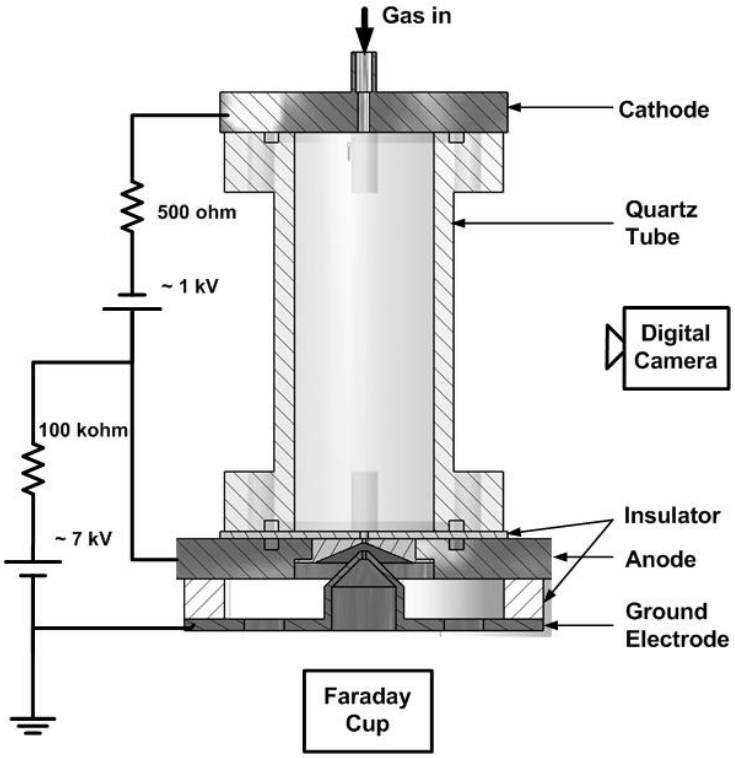
Beam Current Density Increases

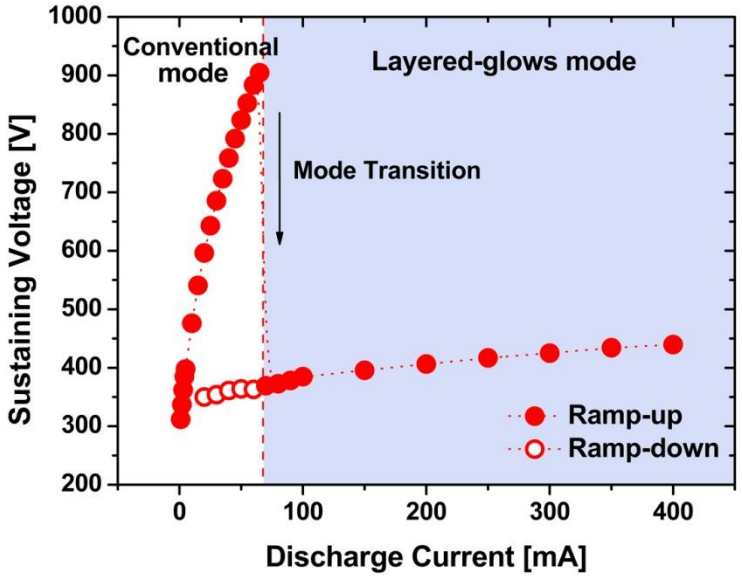
with **generation of LSP**

with respect to **Bias Current**
rather than RF power for ICP



4. Hollow Anode Plasma Ion Source with Layered Glows
DC powered, High Power Efficiency, Simple.





DC Power : 175 W
H^+ Current: 2.5 mA
over 300 mA/cm²