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Status of the Cylindrical IECF experiments at Kyoto University

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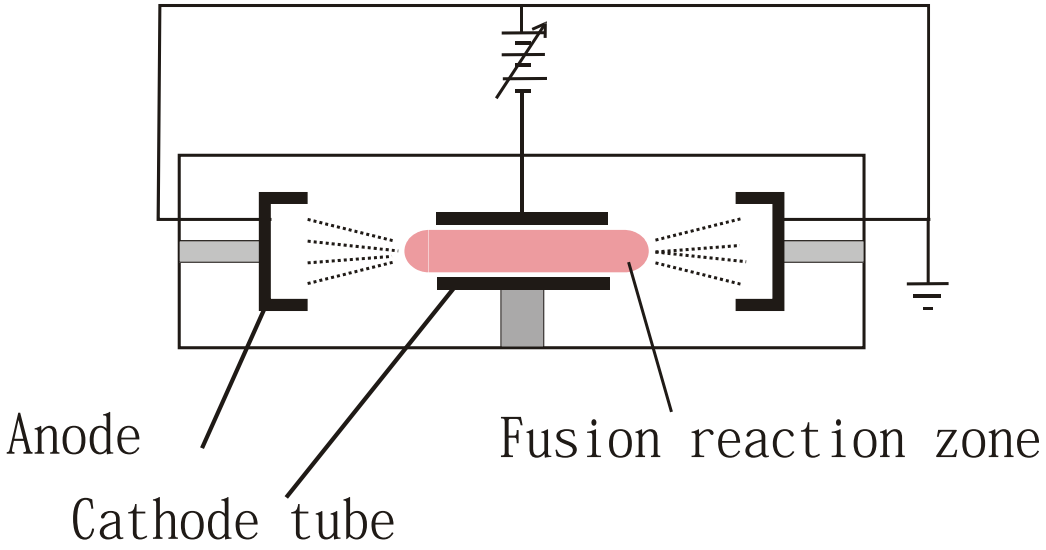
Outline of Talk

- C-IECF concept
- Experimental setup
- Results of last year
- Results after vacuum conditioning
- Summary
- Future plans

C-IECF Concept

Merits

- Long lifetime of ion
- Long lifetime of cathode
- Compact
- Solid



Schematic of Experimental Setup

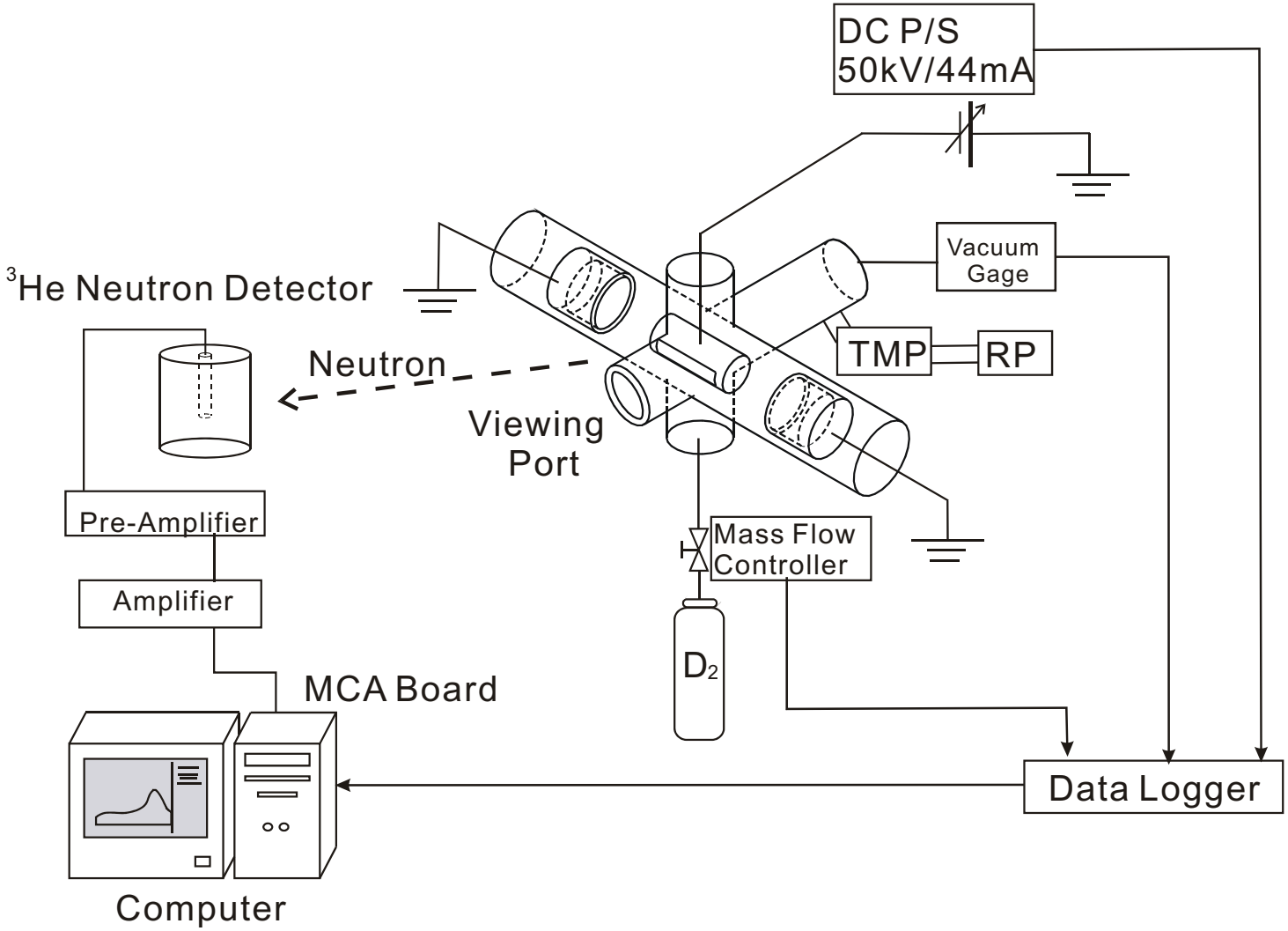
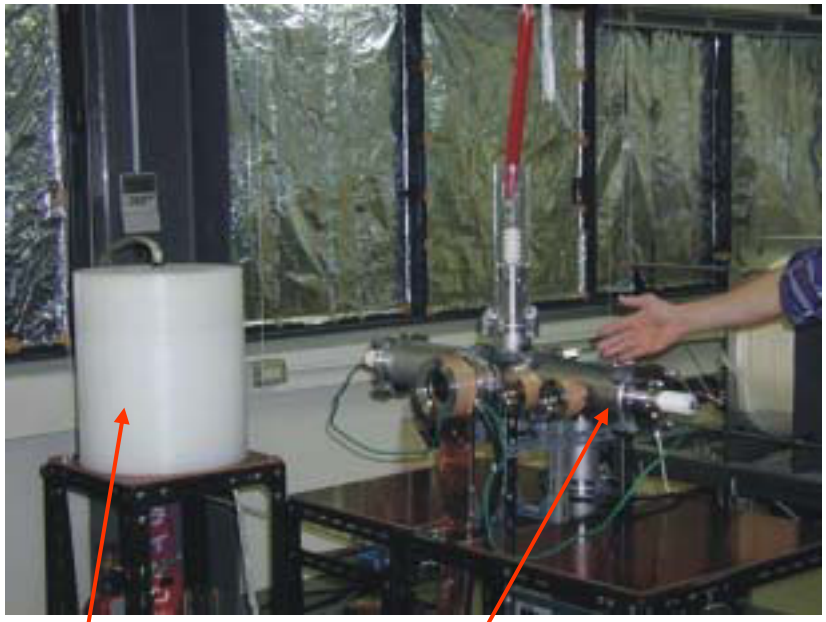


Photo of Setup



Chamber diameter :100mm

neutron counter

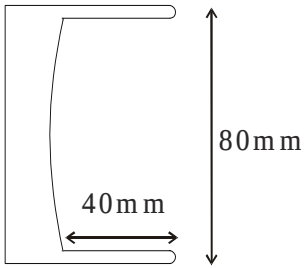
Data logger

P/S

PC

Electrodes

Anode



Cathode

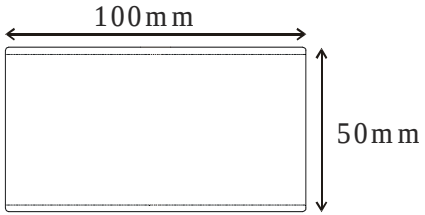
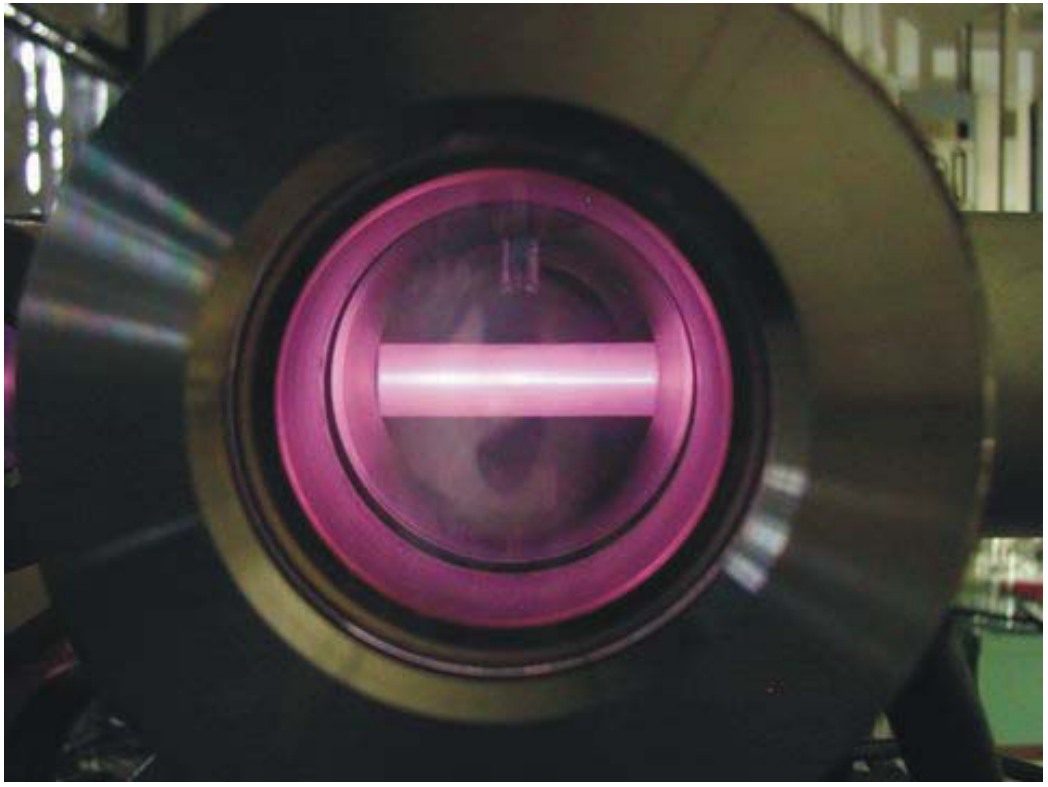
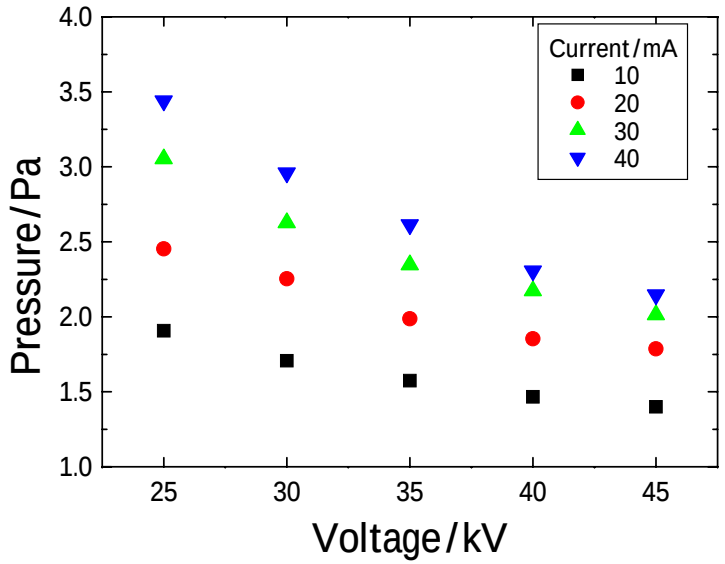


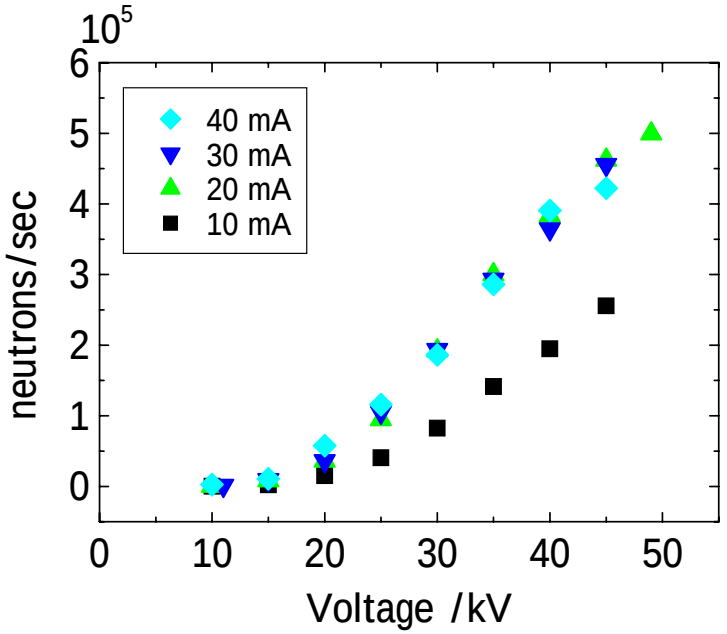
Photo of Discharge



30kV,10mA,1.8Pa (D_2)

Results of Last Year

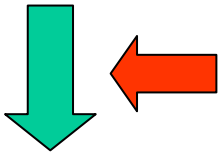




- Large current operation required high pressure
- NPR didn't increase with current over 20mA

Why ?

The more current, the more chamber heated



Cylindrical chamber is not warmed up immediately by discharge

Impurity affect discharge characteristic

Increase pressure

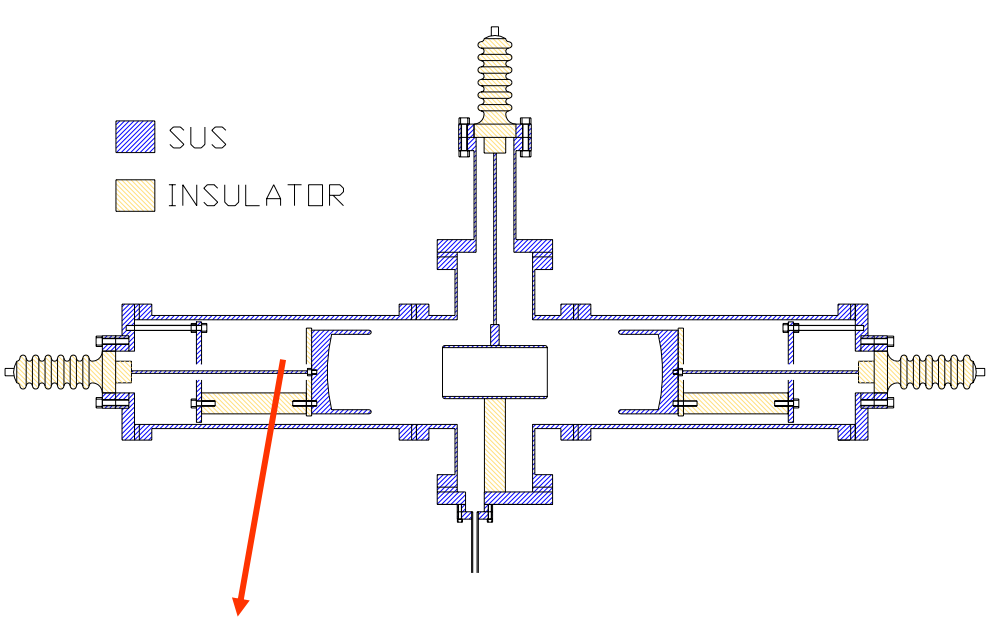
NPR didn't increase with current

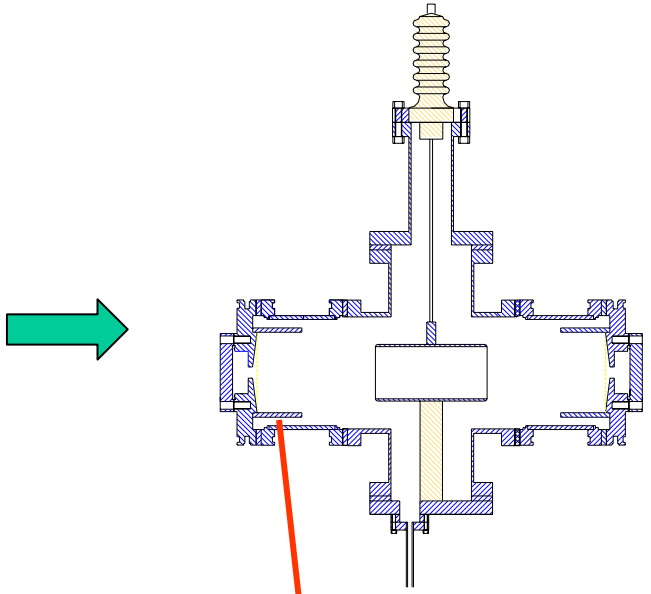
What we did

Careful conditionings

- Chamber cutoff
  - Cut off useless space
- Remove insulator
  - Suppress unexpected discharge
- Degas
  - Increase baking temperature and time

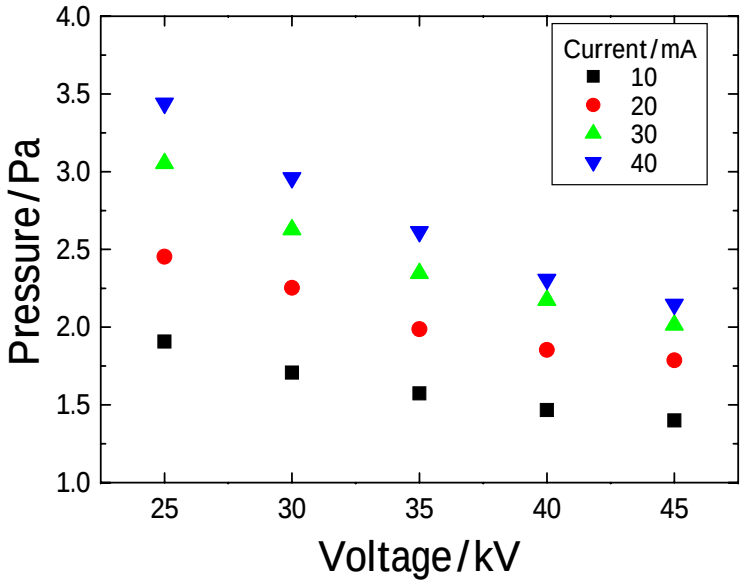
Chamber Cutoff



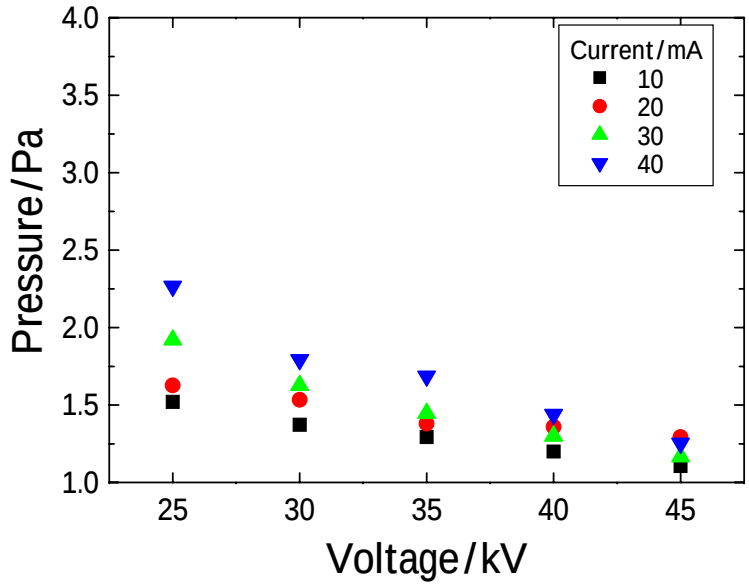


Discharge Improve

Before Conditioning

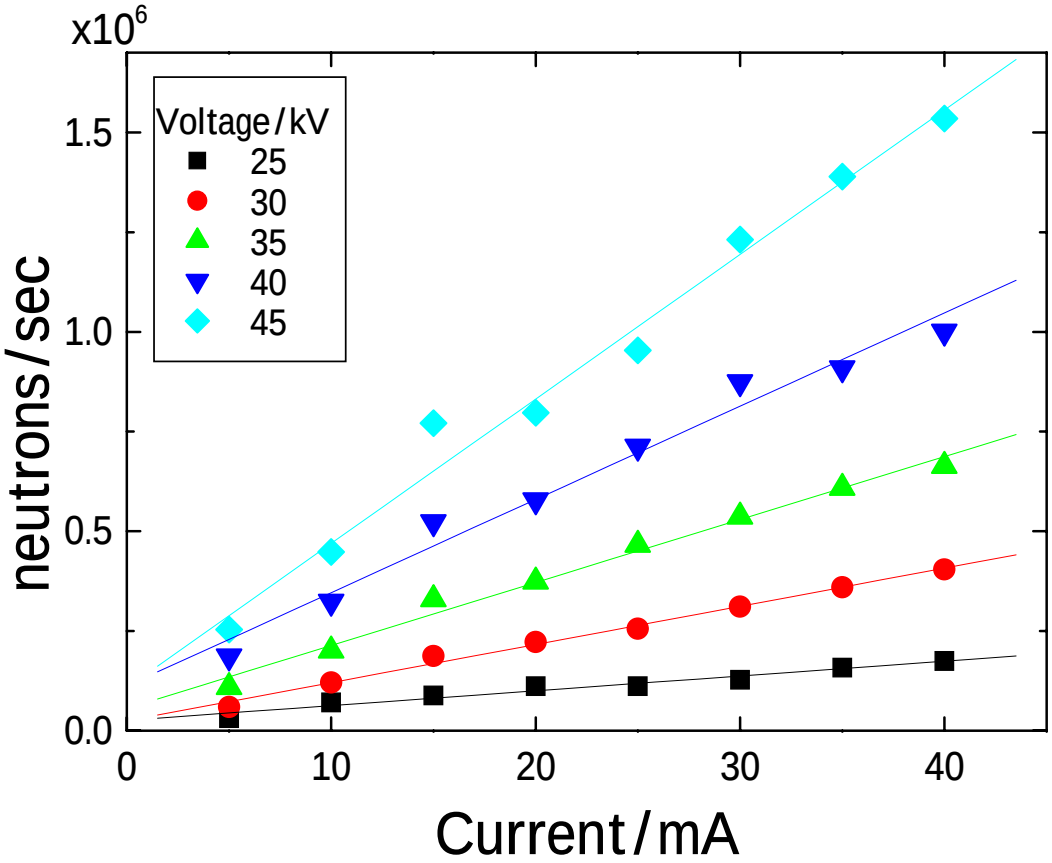


After Conditioning



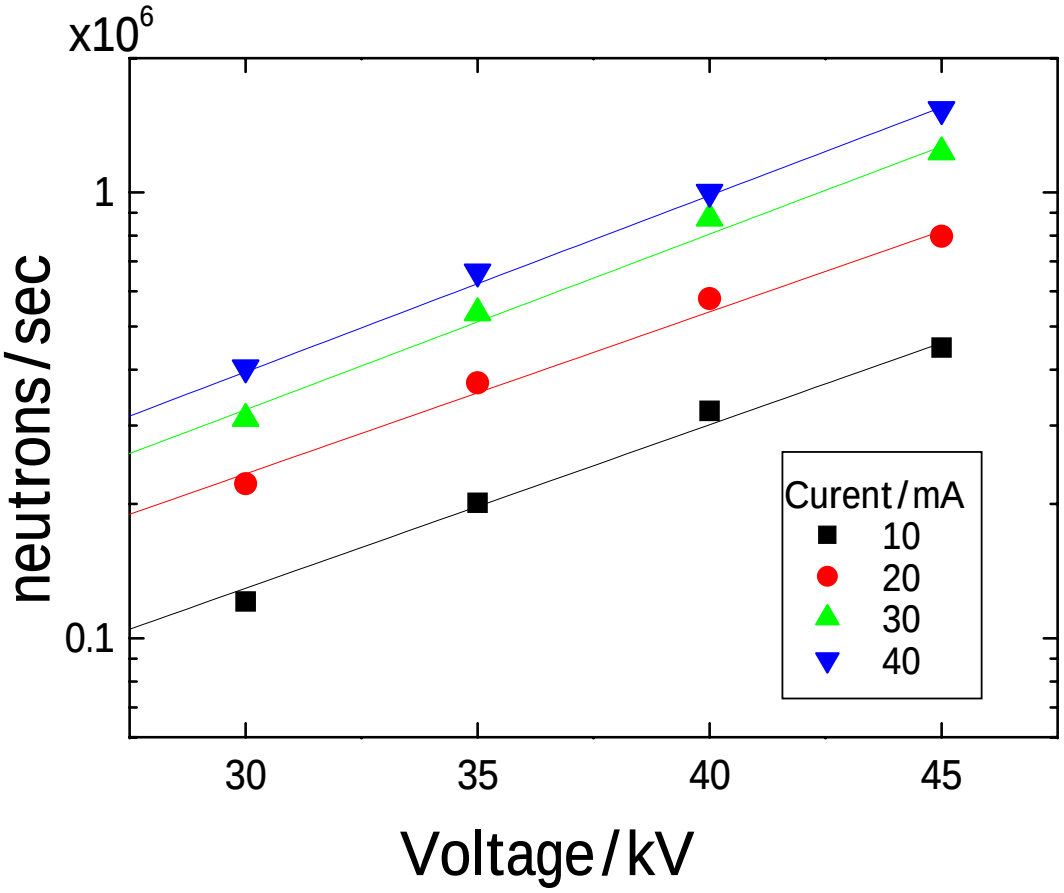
- Differences with current have decreased
- Convergence can be expected

NPR Characteristics(1)



NPR increases linearly with discharge current

NPR Characteristics(2)



NPR increases exponentially with voltage

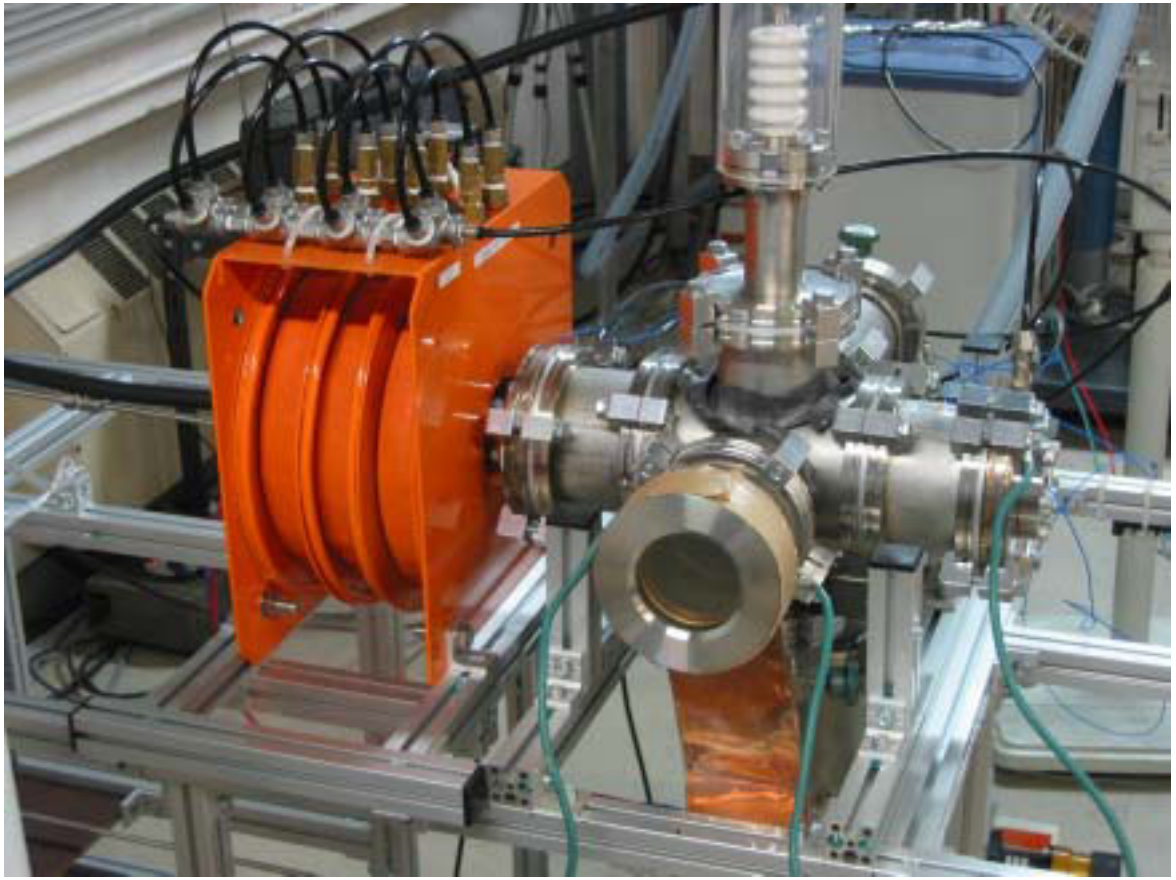
Summary

- Last year results
  - To keep the same voltage, we need increase pressure
  - NPR did not increase with current
- Conditioning
  - Remove insulators, chamber cutoff, degas
  - Discharge characteristic has improved
- NPR has increased
  - The maximum NPR is 1.8×10^6 neutrons/sec with 45kV, 44mA discharge at 1.2Pa
  - That is almost equivalent to those of other devices at the same parameters

Future Works

- In order to increase NPR
  - External ion source for low pressure operation

Photo of Ion Source



ECR Ion Source