

**R10 (Laser Ion Source (LDRD 23-007)):** Further contacts with potential users of the neutrons to better understand the future requirements.

# High repetition rate Li Laser Ion Source for neutron beam production

Objectives:

Stable liquid target production

Heating system design

Optimization of laser irradiation condition

Parameters: Laser energy, spot size, focal length

Number of Li ions vs tolerance to surface fluctuation

Observation of stable Li ion production

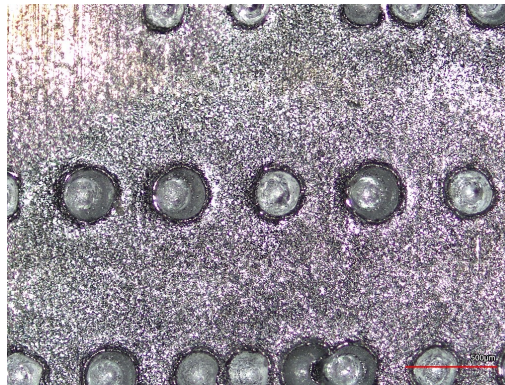
PI: Shunsuke Ikeda ,Takeshi Kaneshue, Masahiro Okamura

# Liquid target system for high repetition rate

Final Goal: 100 mA peak, 100-1kHz rep rate, 10 - 100 uA average,

Problem: Limitation of rep. rate  $\sim$  1 Hz with solid target,

- moving target every laser shot,
- Limitation of rep rate and lifetime,

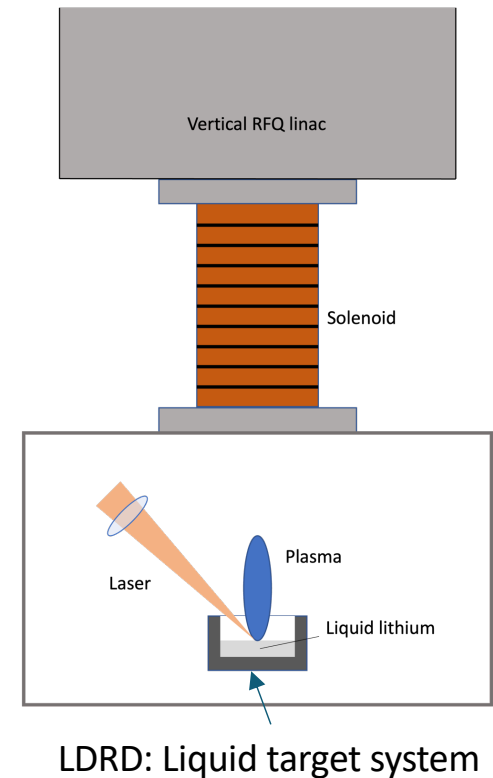


Proposed solution: Liquid target

- Surface recovers itself,
- Same spot every shot.

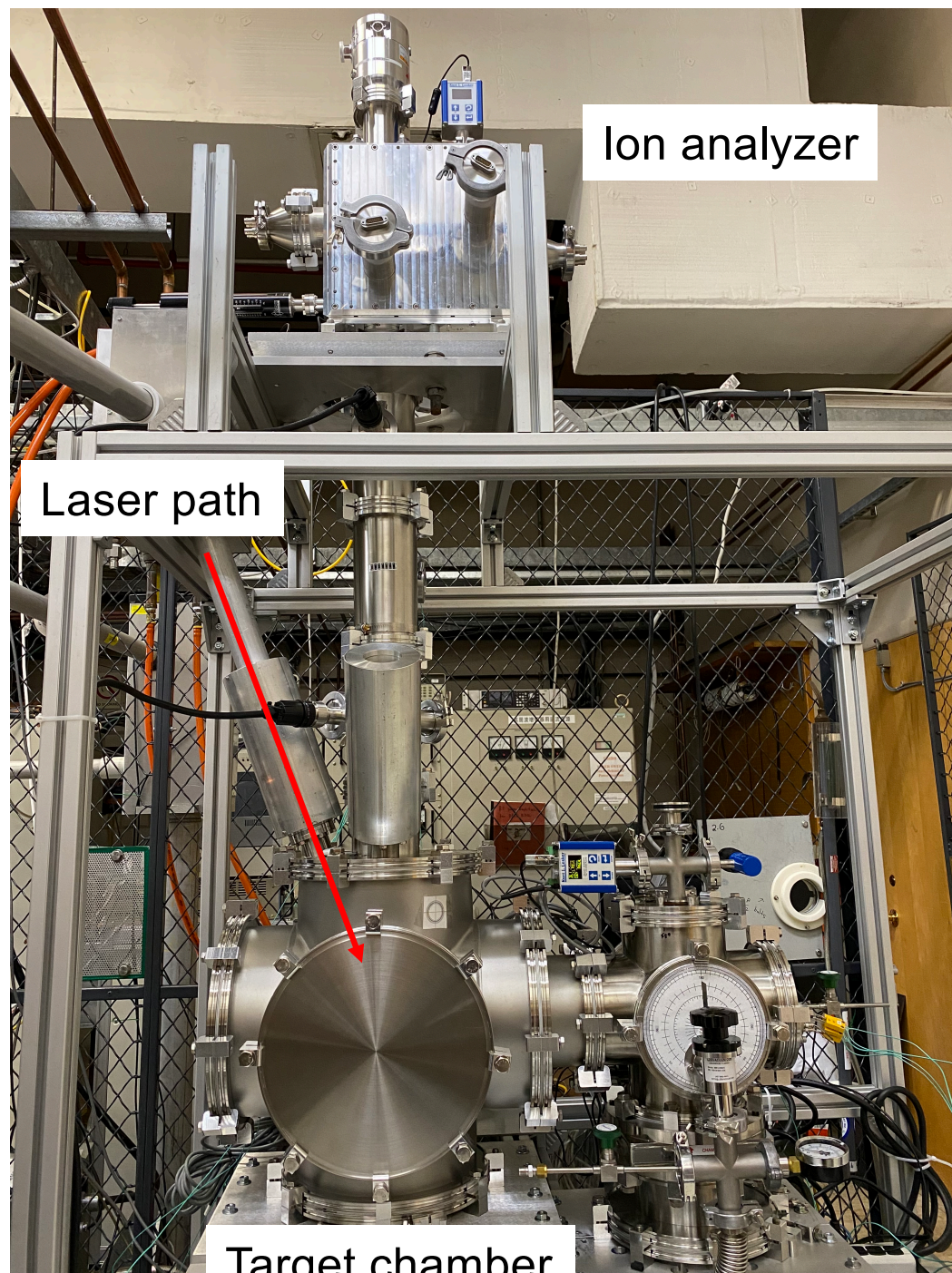
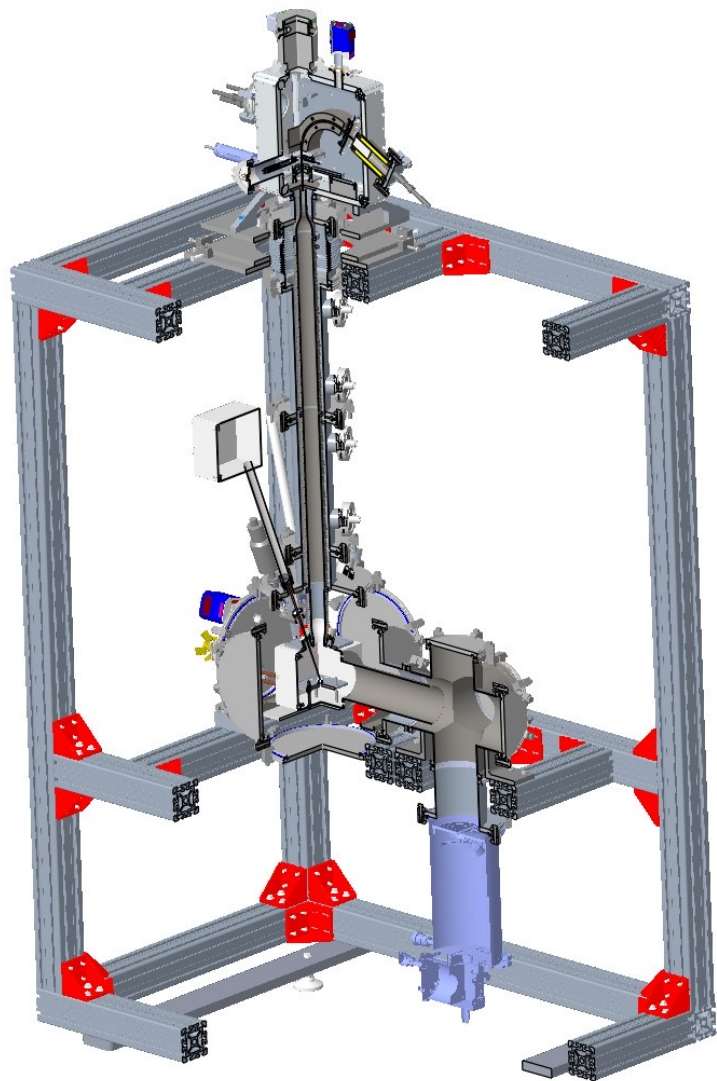
Static liquid target in a crucible

- easier to produce defined surface with simpler setup



LDRD Goal: Establishment of a liquid target system for a demonstration machine.

# Research results and accomplishments



Ion analyzer

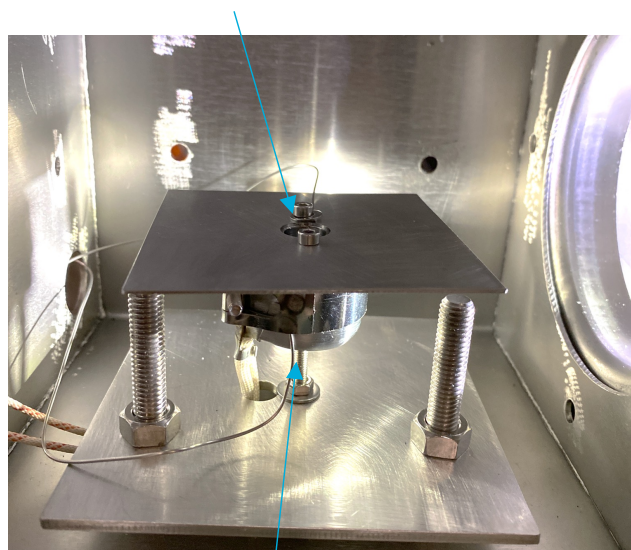
Laser path

Target chamber

Cryopump

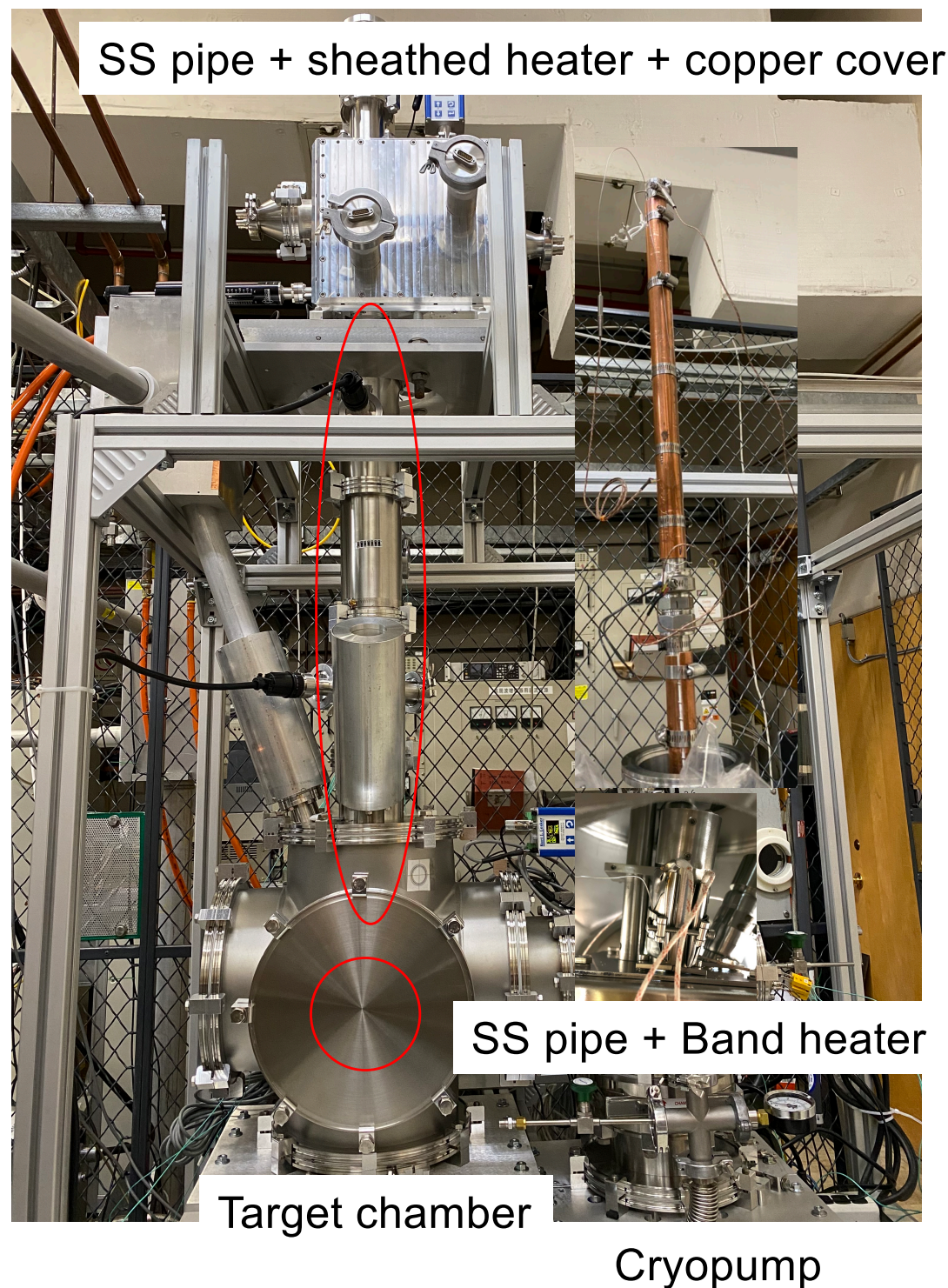
# Research results and accomplishments

Crucible (Mo) in target chamber



Band heater

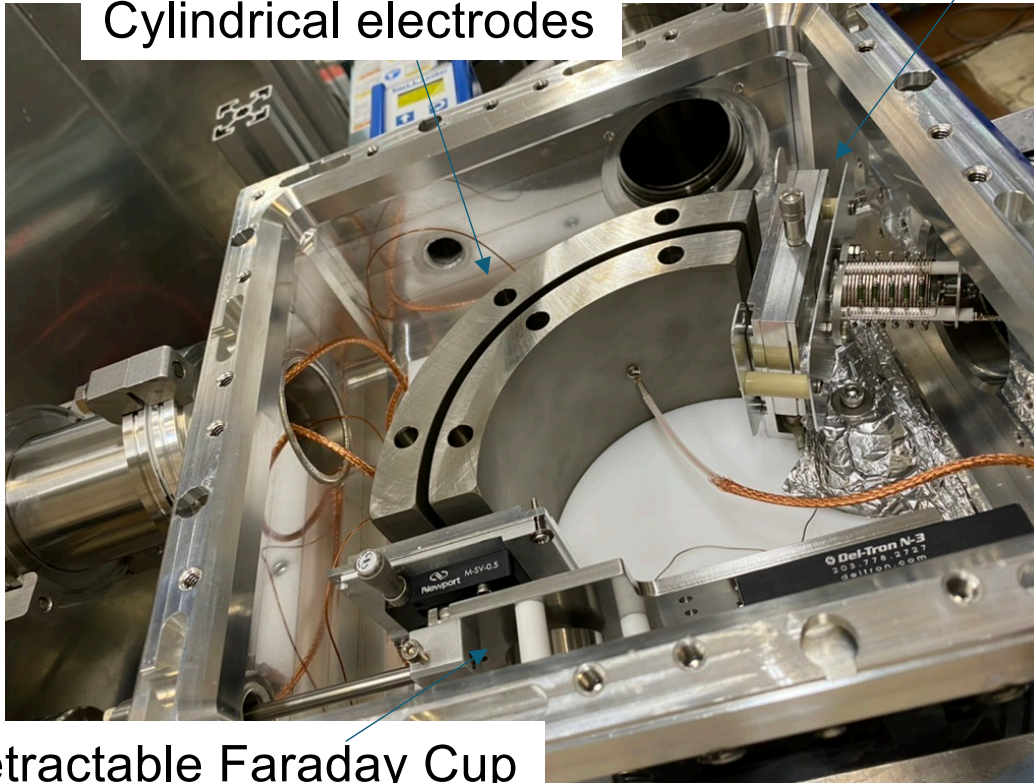
Heating crucible and vertical pipes to 200° C in sufficient vacuum was confirmed.



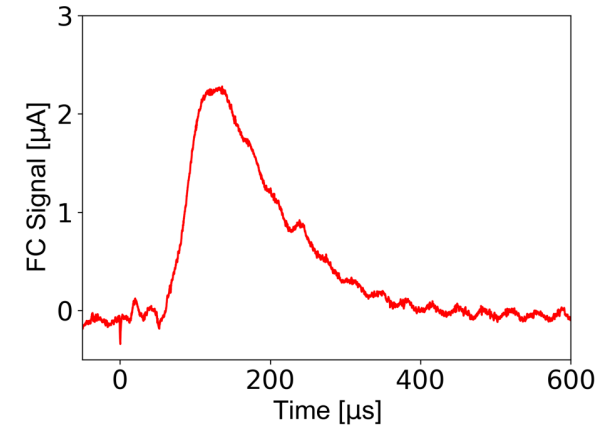
# Research results and accomplishments

Secondary electron multiplier

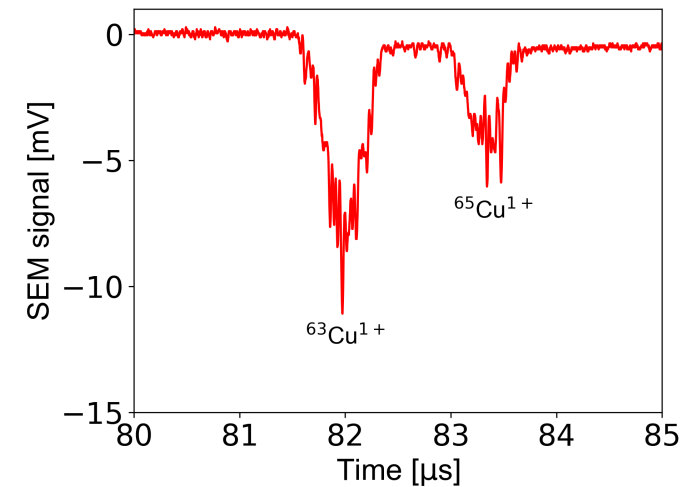
Cylindrical electrodes



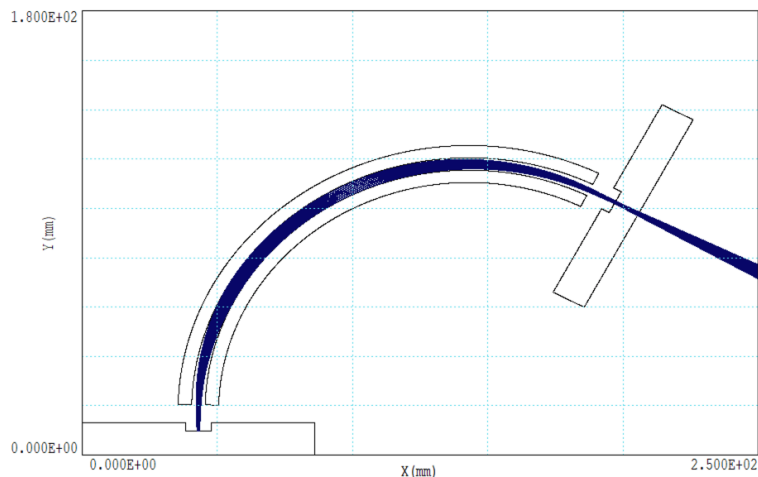
Retractable Faraday Cup



Faraday cup signal



Separation of copper isotopes  
= sufficient resolution for lithium  
plasma



# Summary

- Entire system has been built,
- Reviews for lithium handling and laser were done,
- EIA was tested with copper isotopes and showed sufficient resolution,
- Ready for lithium experiment.