Laser ionized beams ALTO

Anahi Segovia Miranda

Workshop on R&D for new ISOL beams at SPIRAL 1 and ALTO

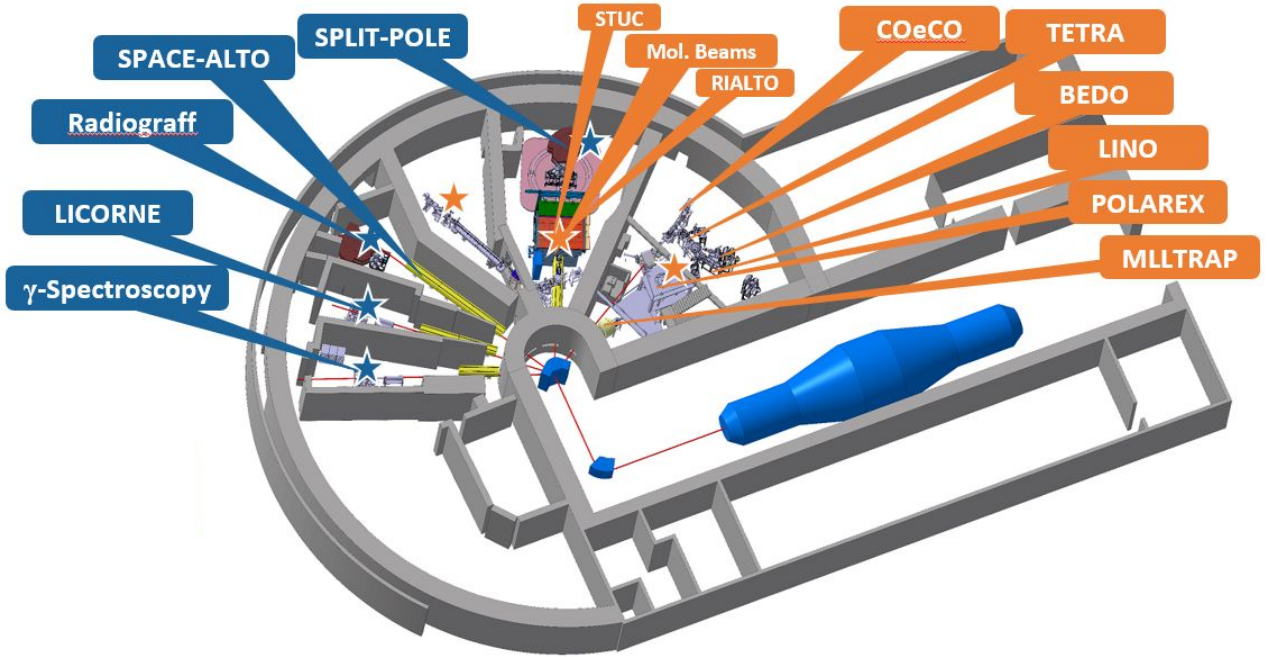
11/03/2025

Outline

- ALTO Facility
- RIALTO system
- Laser ionized beams
- Zn production
- Perspectives

ALTO Facility
(Accélérateur Linéaire et Tandem d'Orsay)

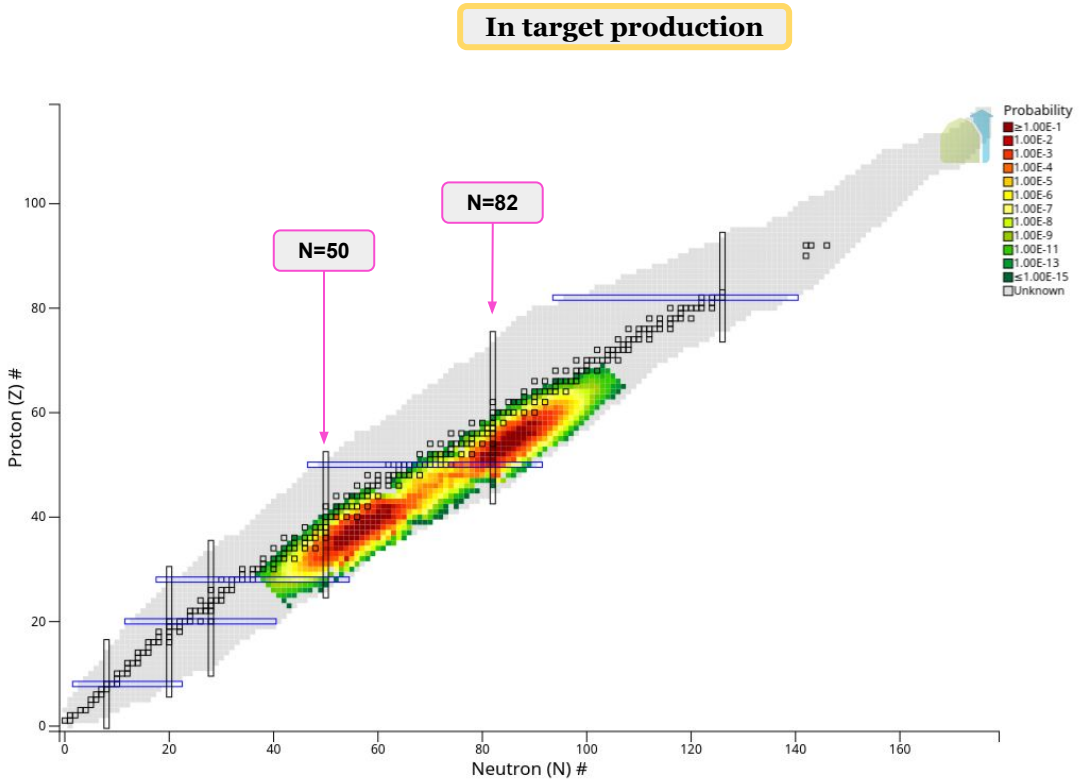
- 10 μA Electron beam accelerated at 50 MeV on a UCx target to produce **neutron-rich** radioactive nuclei by **photofission** of uranium.



Photofission

Interesting regions for fission fragments:

- Nuclei near neutron shell closures: N = 50 and N = 82.
- Nuclei at the boundary of the deformation region with N > 60.



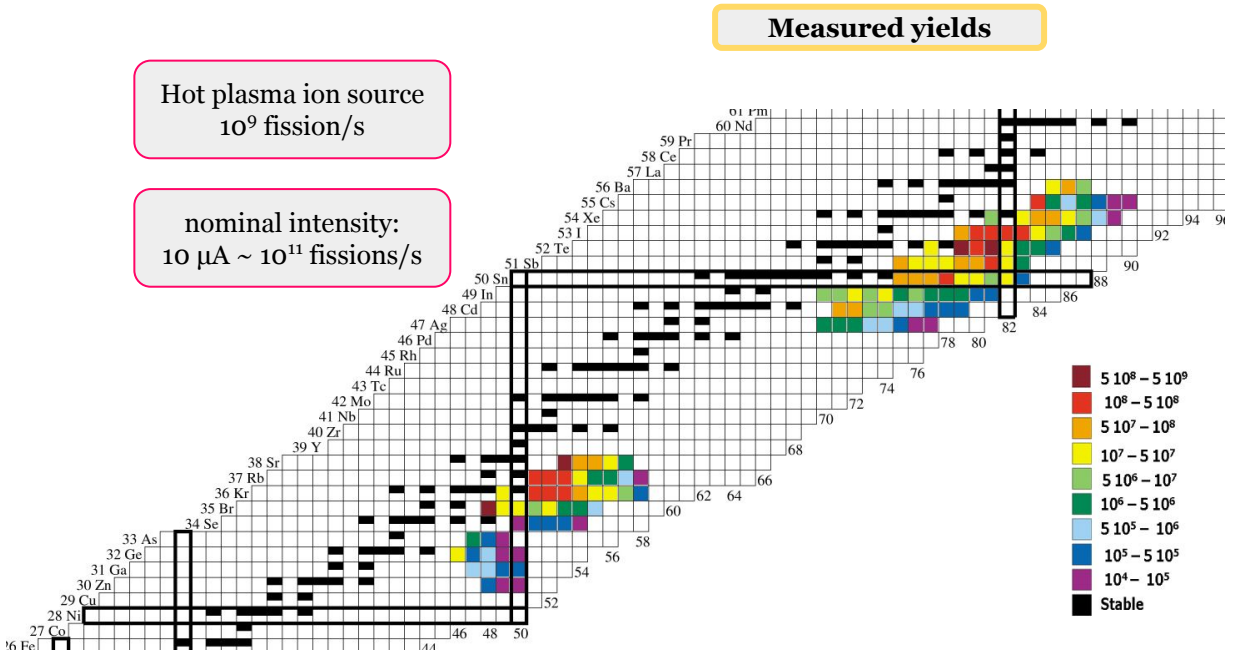
Photofission at ALTO

Interesting regions for fission fragments:

- Nuclei near neutron shell closures: N = 50 and N = 82.
- Nuclei at the boundary of the deformation region with N > 60.

Hot plasma ion source
10^9 fission/s

nominal intensity:
10 μA ~ 10^{11} fissions/s



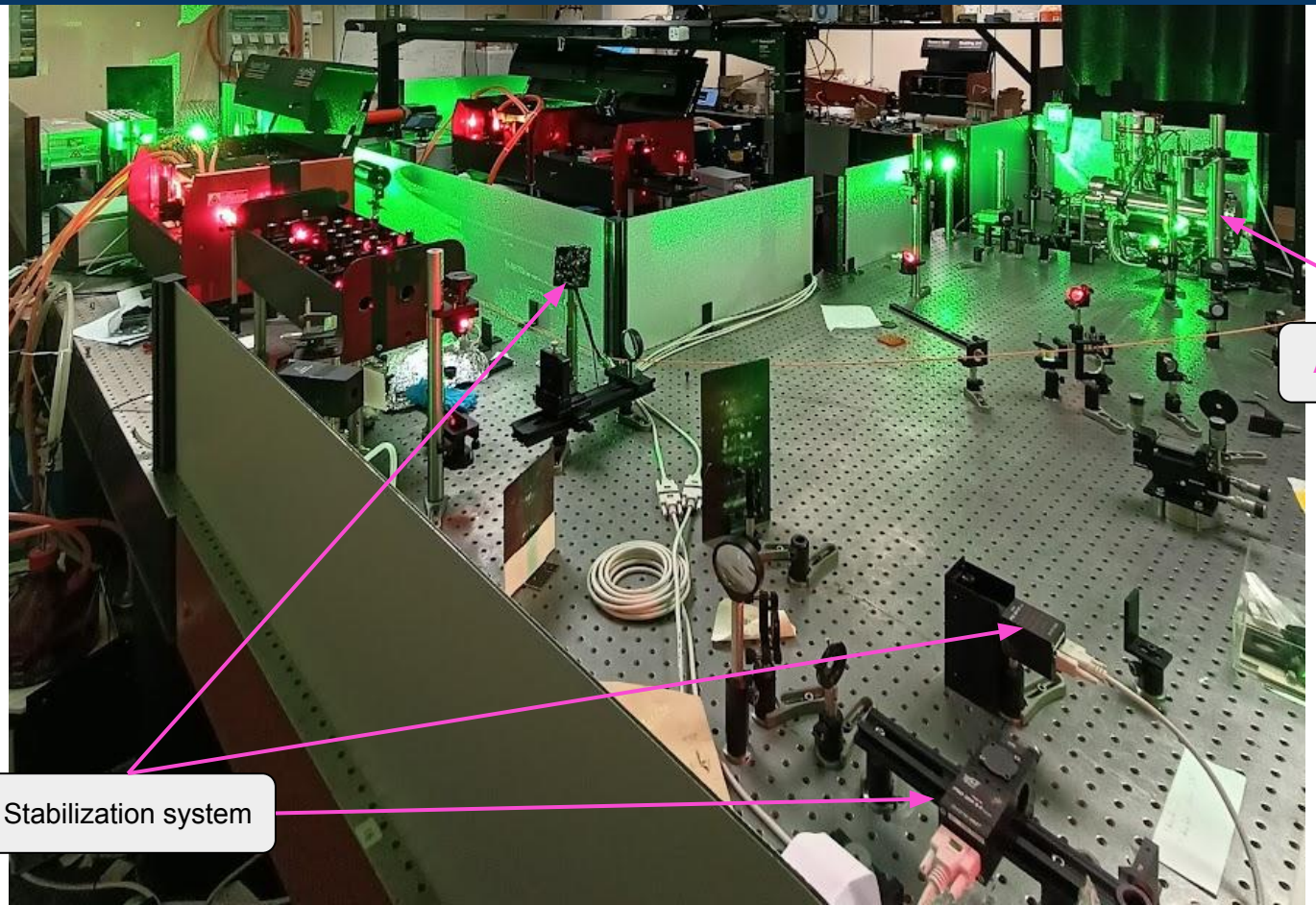
F. Ibrahim, et. al., Nuclear Physics A, 787(1):110–117, 2006.

Resonance Ionization laser ion source at ALTO (RIALTO)

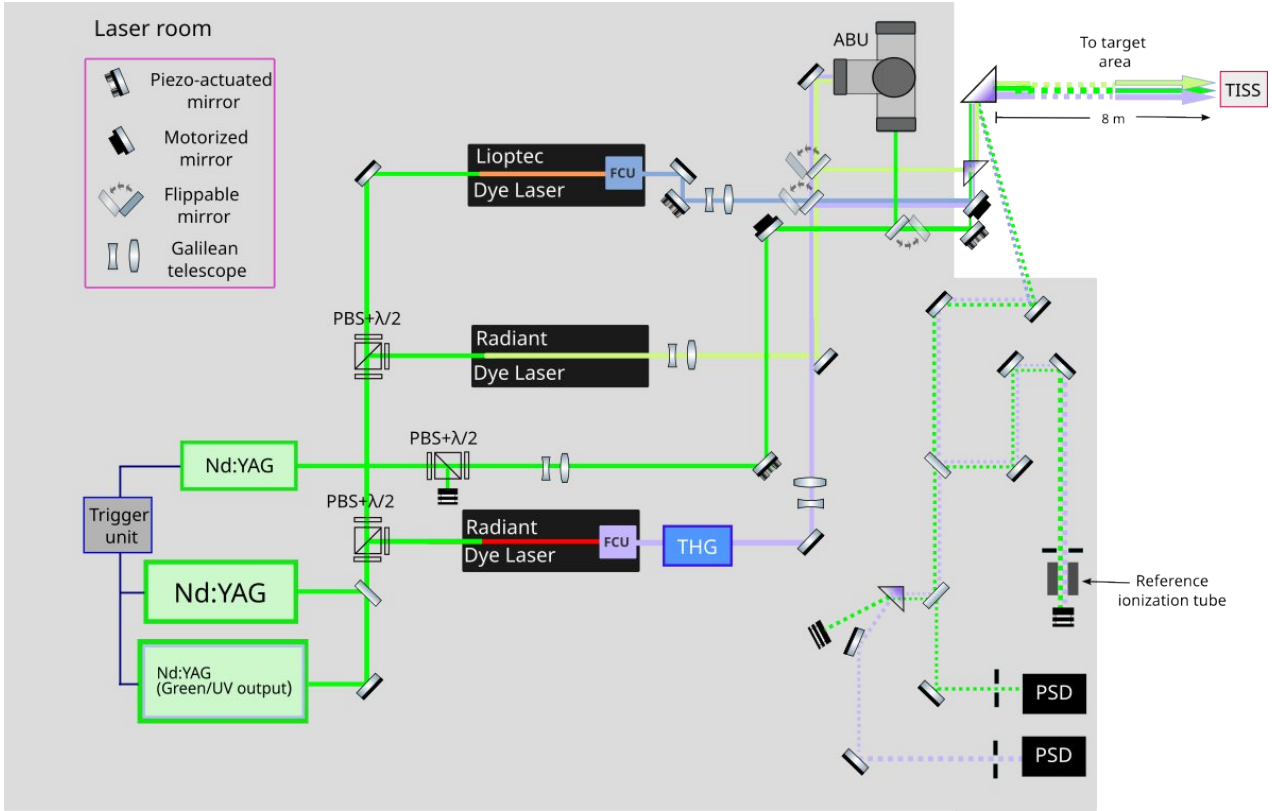
High power
Nd:YAG

Dye lasers

Resonance Ionization laser ion source at ALTO (RIALTO)

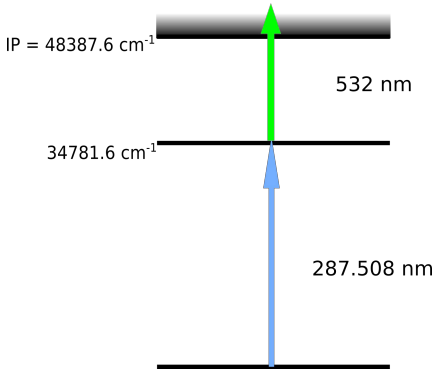


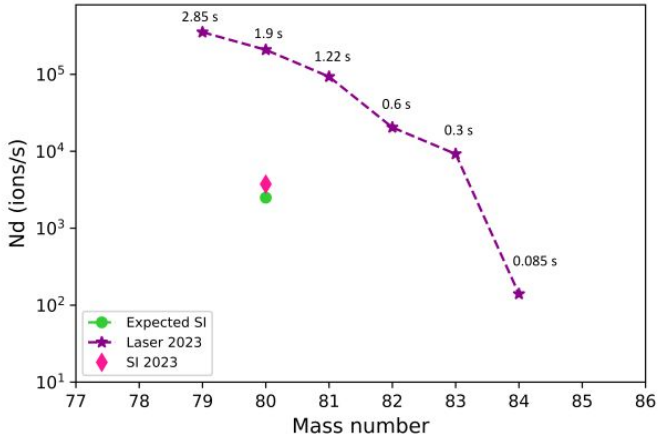
Resonance Ionization laser ion source at ALTO (RIALTO)



Laser ionized beams at ALTO

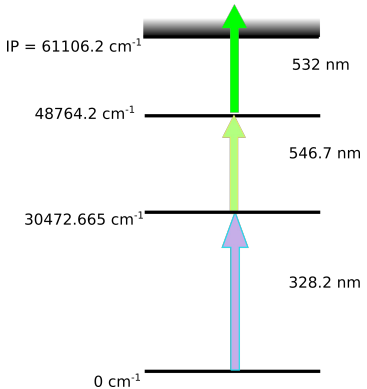
Ga

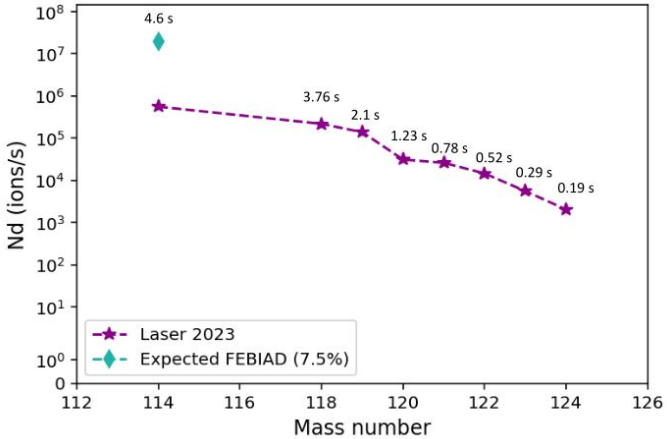




Ionization efficiency
0.5%

Ag

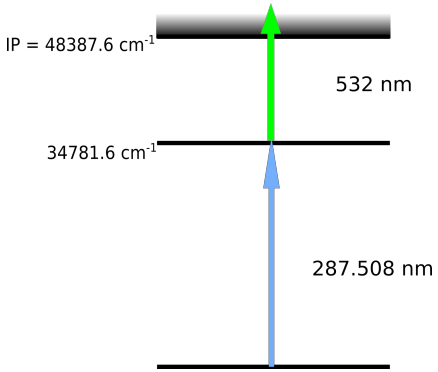




Ionization efficiency
0.21%

Laser ionized beams at ALTO

Ga



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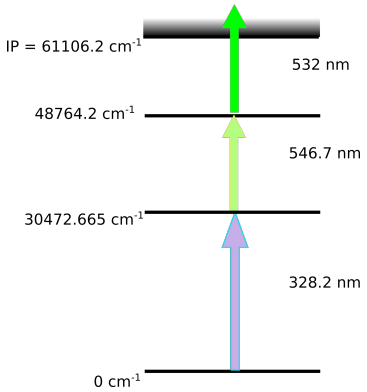
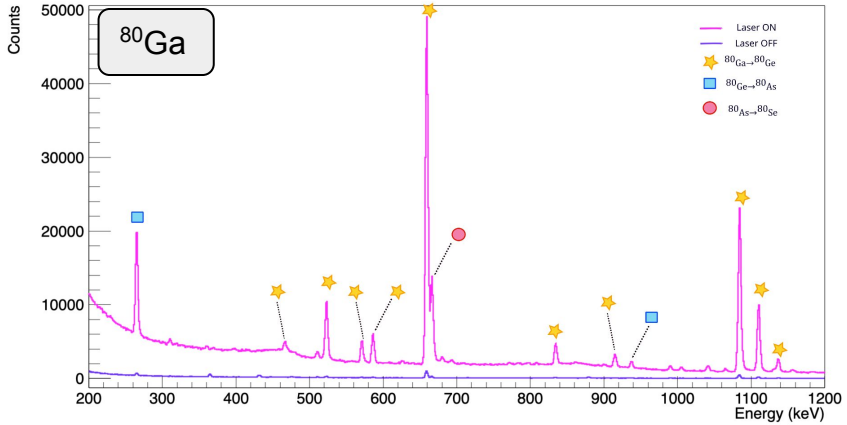
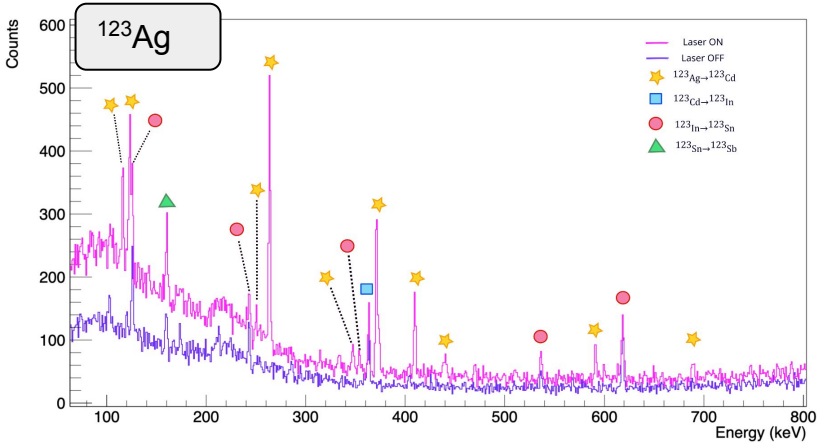


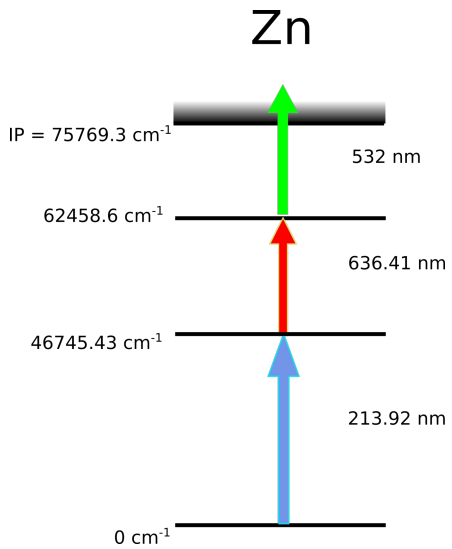


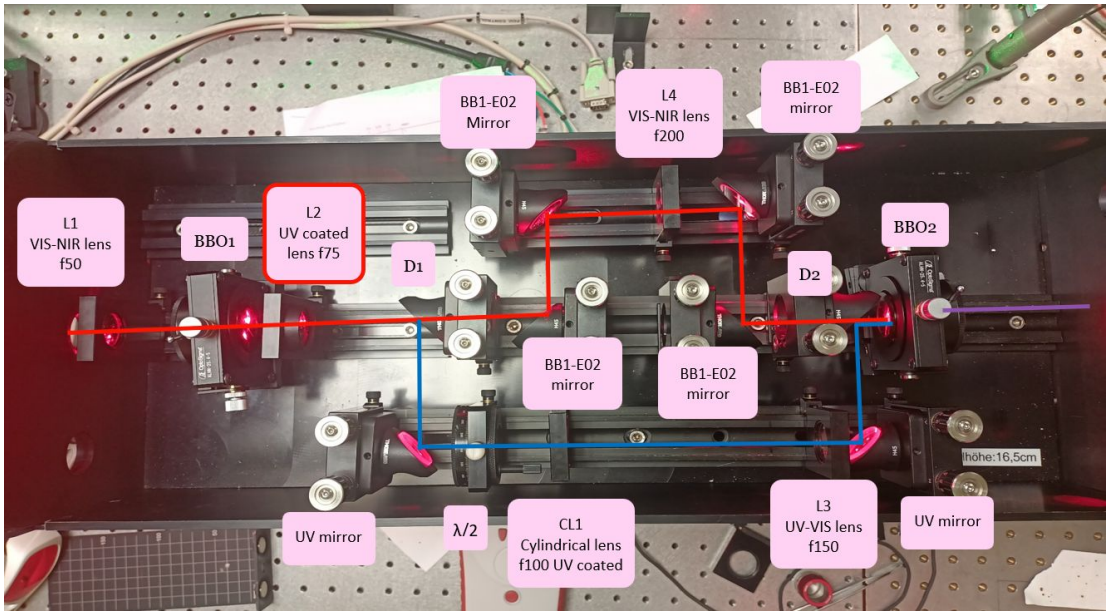


Zn development

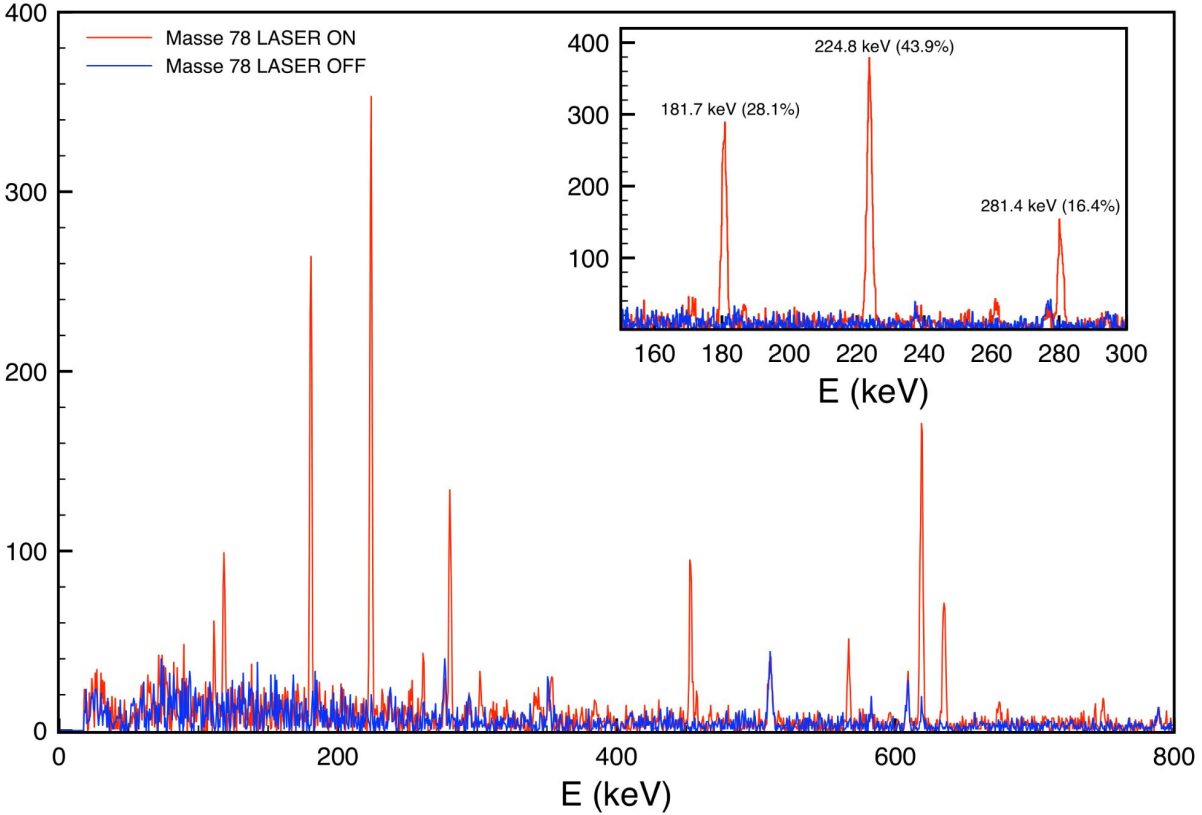
Neutron-rich Zn program

- Monster (February 2025)

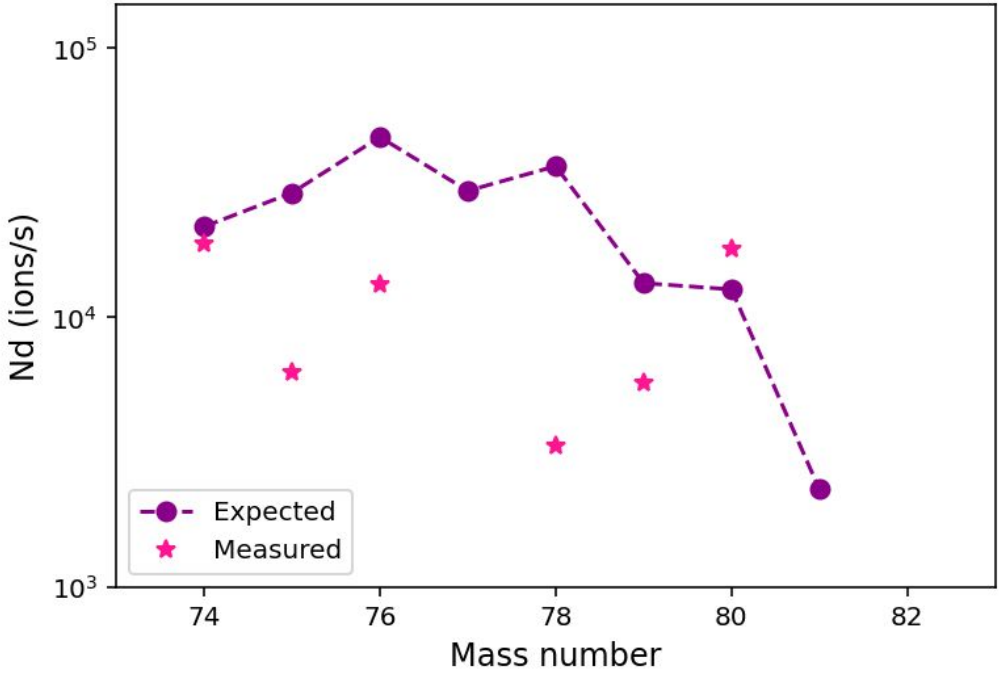




Radioactive Zn production 2025

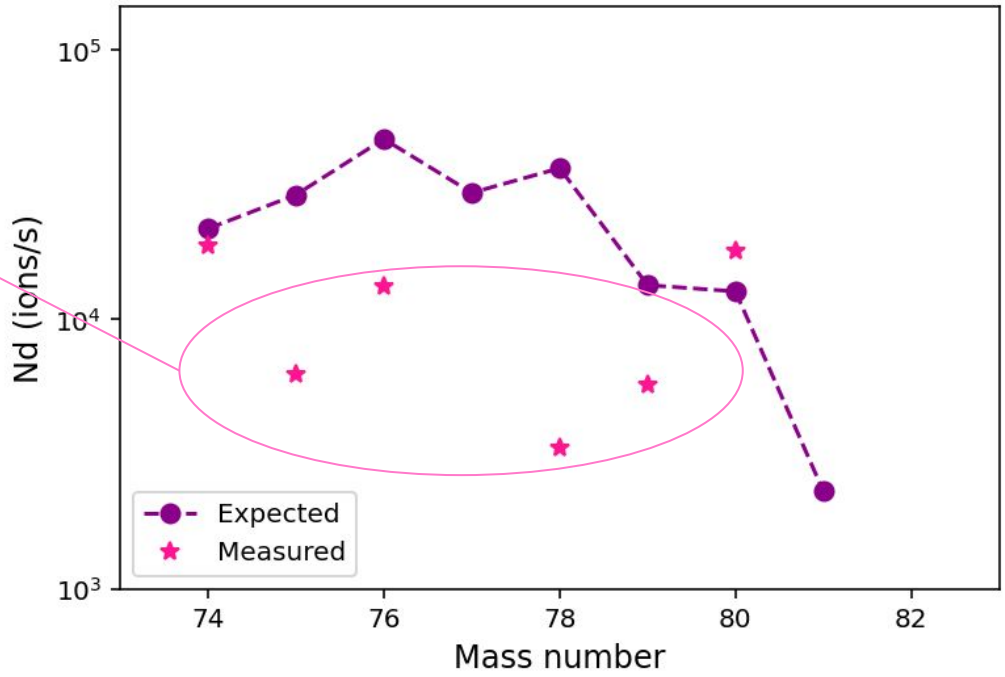


Zn yields at ALTO

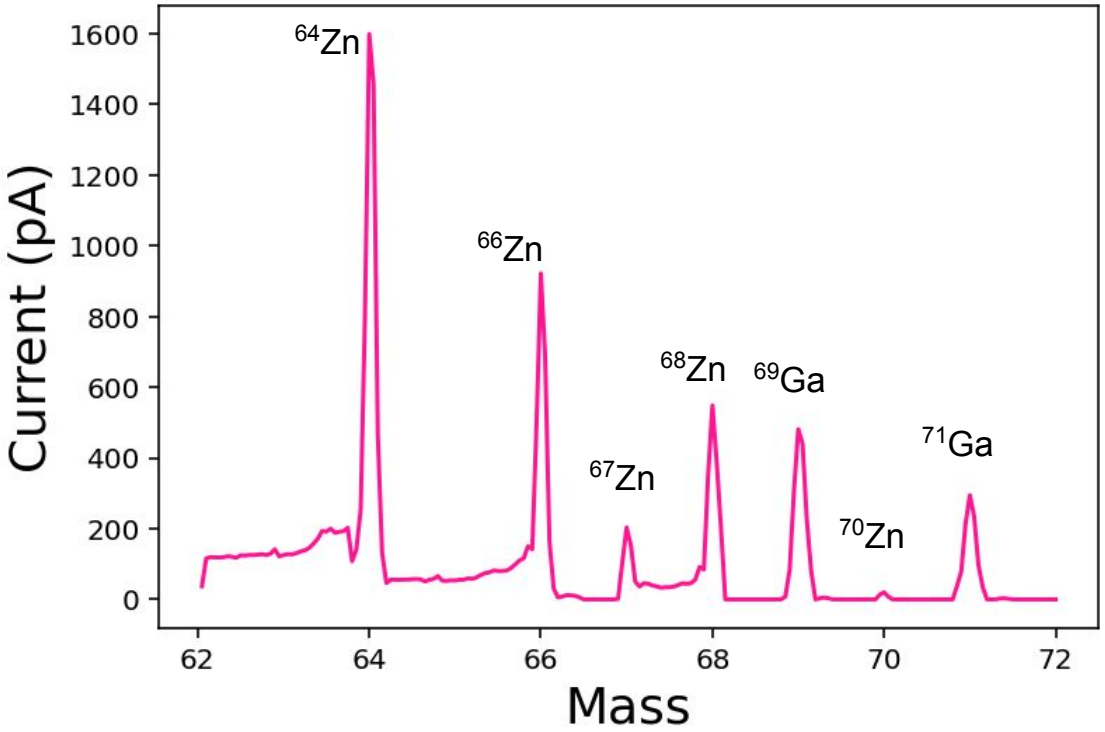


Zn yields at ALTO

unsure about transport efficiency



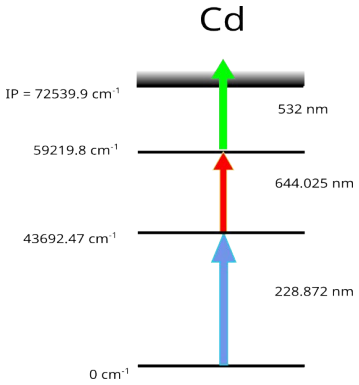
Perspectives



- Quartz ionization tube

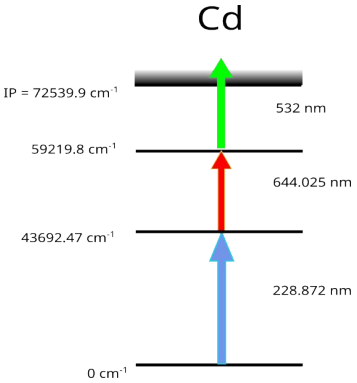
Perspectives

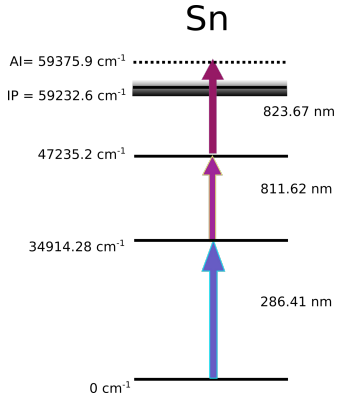
- Future beams
  - 2025 BEDO/COeCO



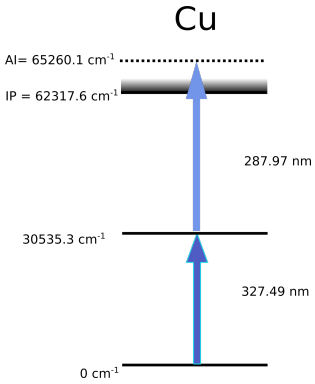
Perspectives

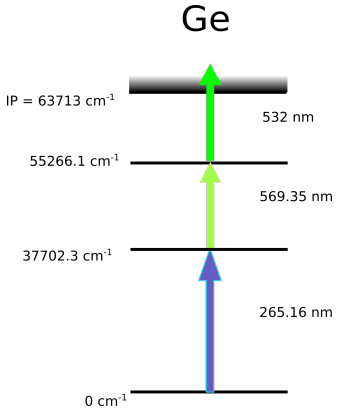
- Future beams



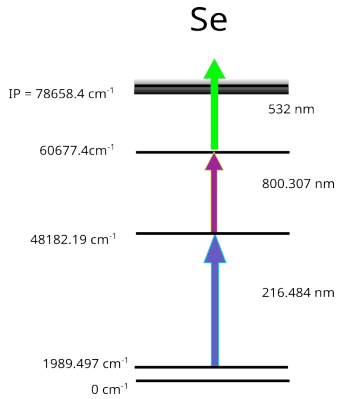


COeCO

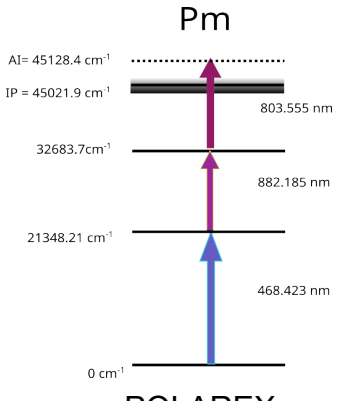




BEDO



MLLTRAP



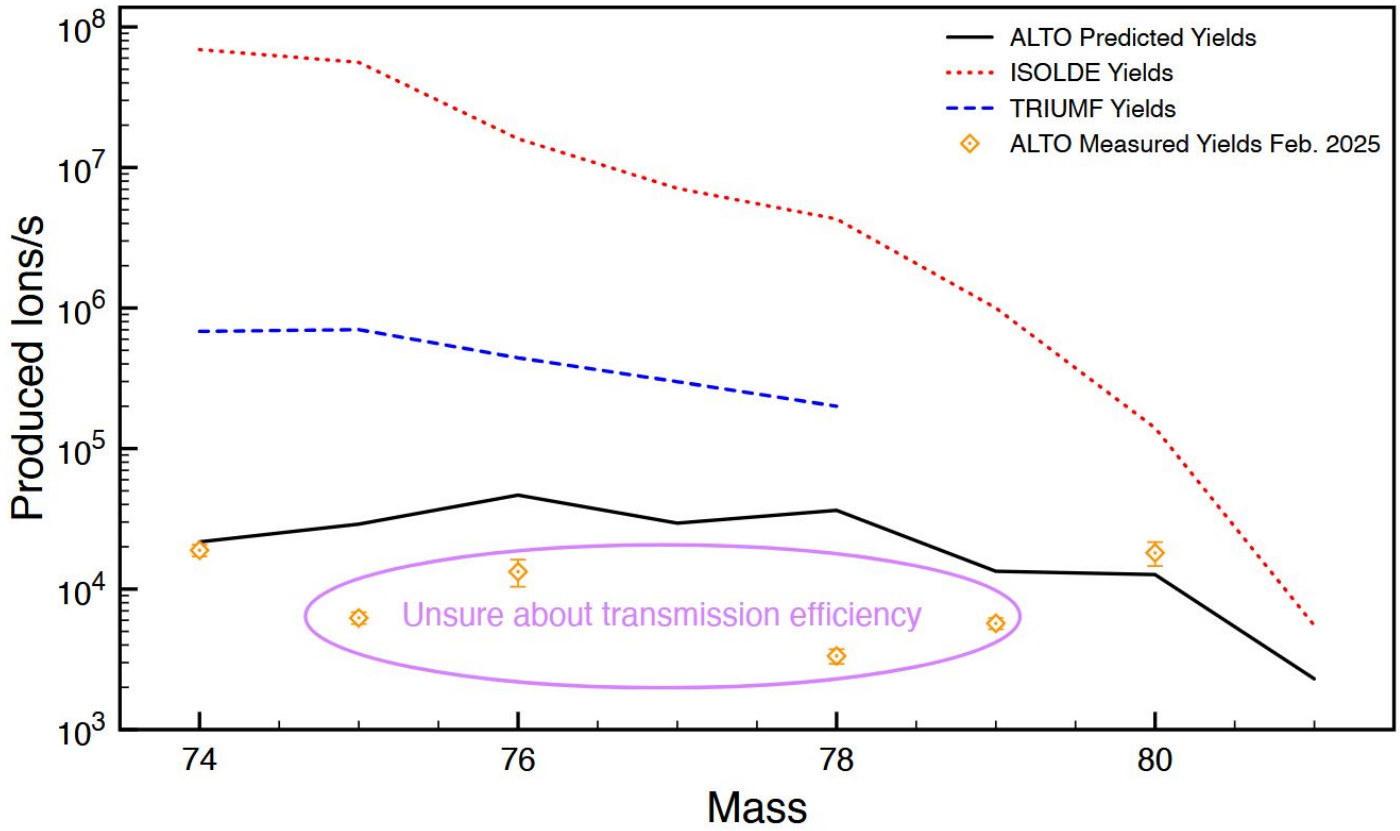
POLAREX

Acknowledgments

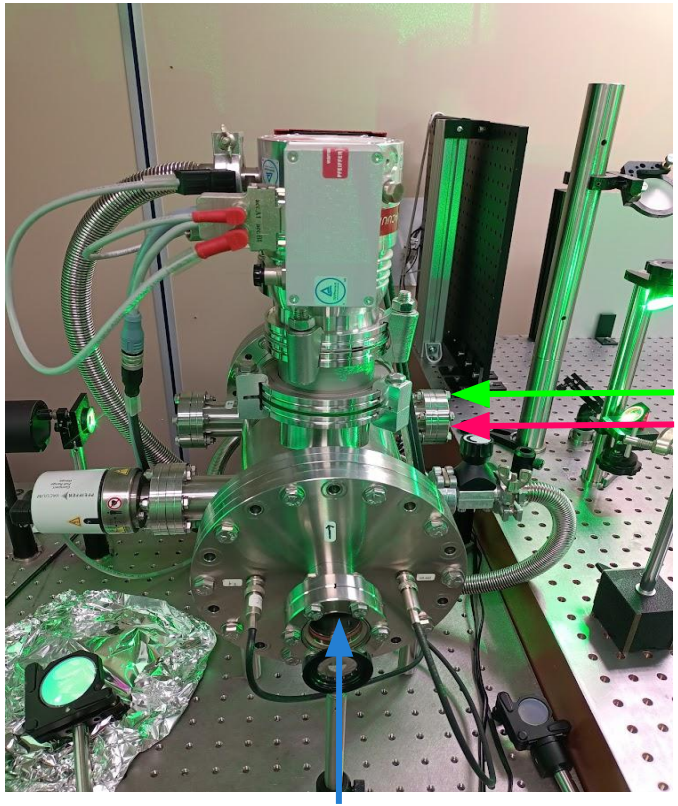
- ALTO team
- FIIRST team

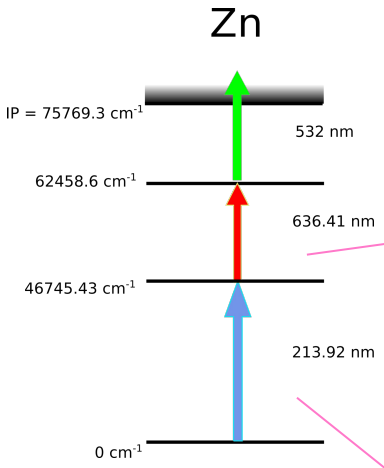
Thank you for your attention

Zn yields


ALTO Predicted Yields
ISOLDE Yields
TRIUMF Yields
ALTO Measured Yields Feb. 2025
Unsure about transmission efficiency
Produced Ions/s
Mass
10^8
10^7
10^6
10^5
10^4
10^3
74
76
78
80

Zn offline test





- 30 mW UV