

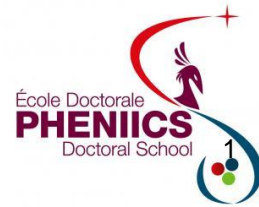
RIALTO, the laser ion source at ALTO: Production of Ag and Ga beams

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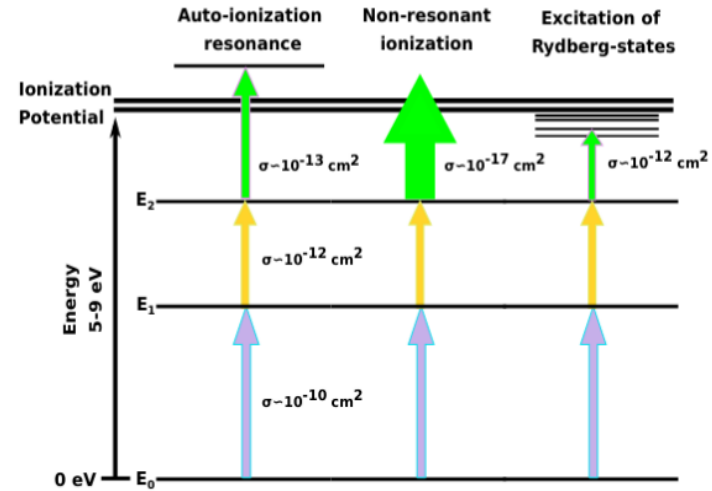
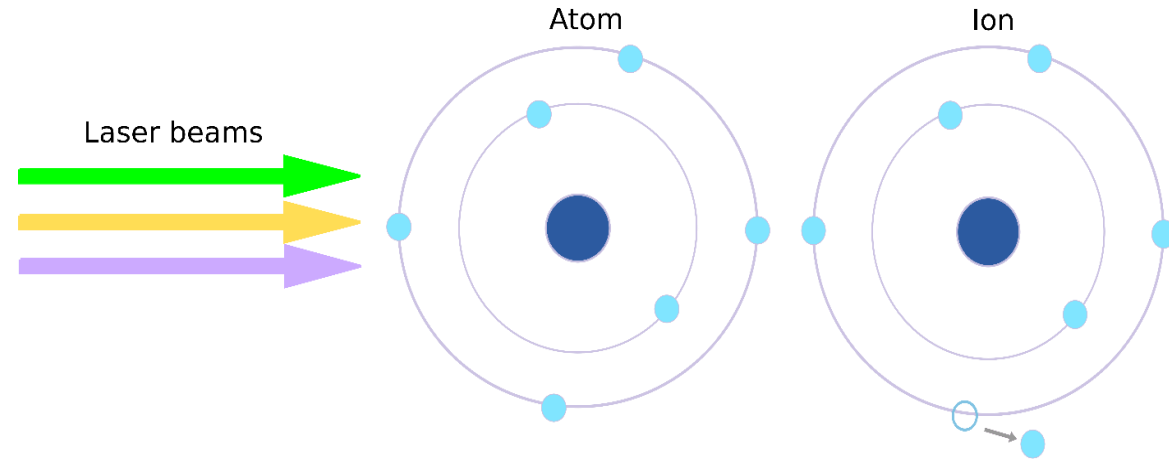
20/03/2023



Outline

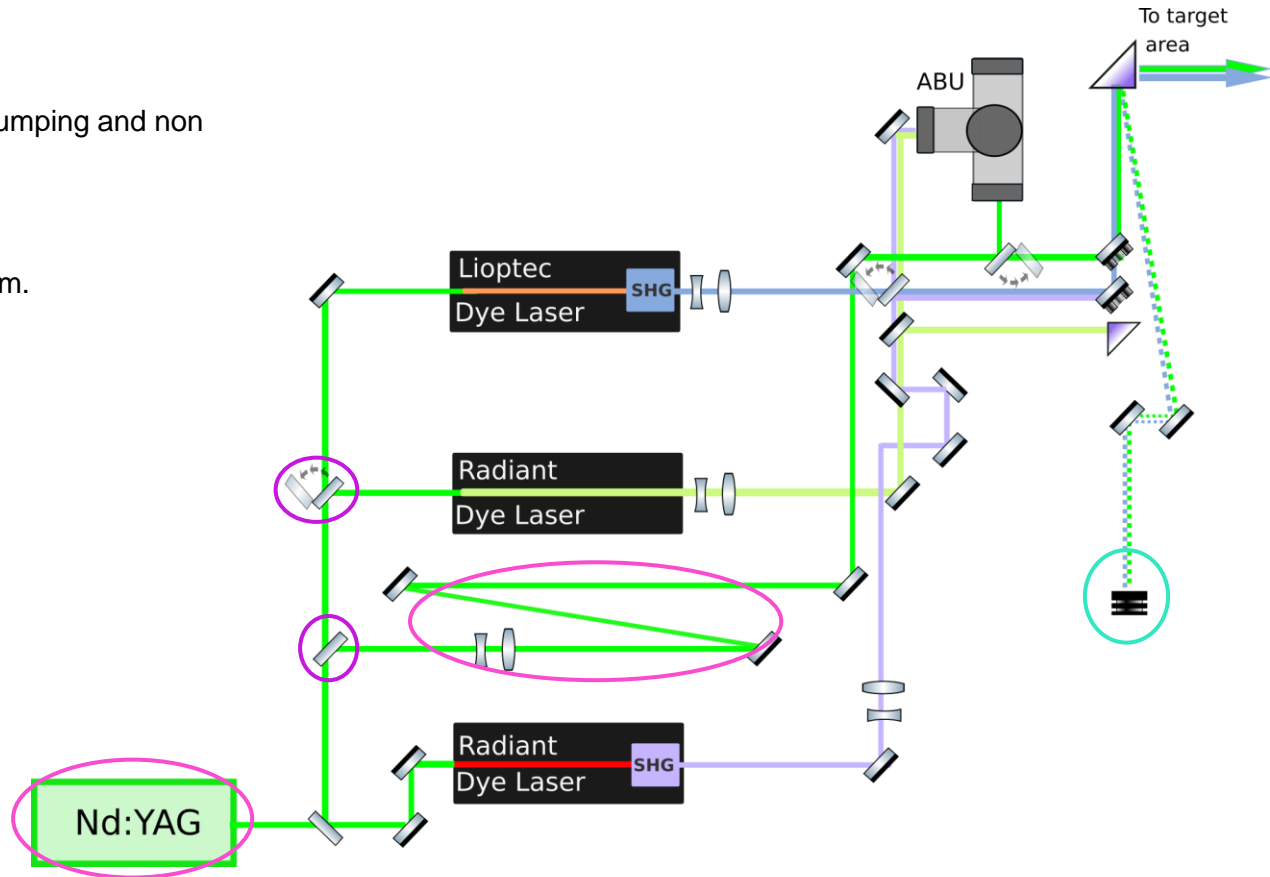
- ✿ Laser resonance ionization.
- ✿ Old layout of RIALTO and its needs.
- ✿ RIALTO upgraded system.
- ✿ Ag and Ga production
- ✿ Summary and outlook

Laser resonance ionization



RIALTO (old layout)

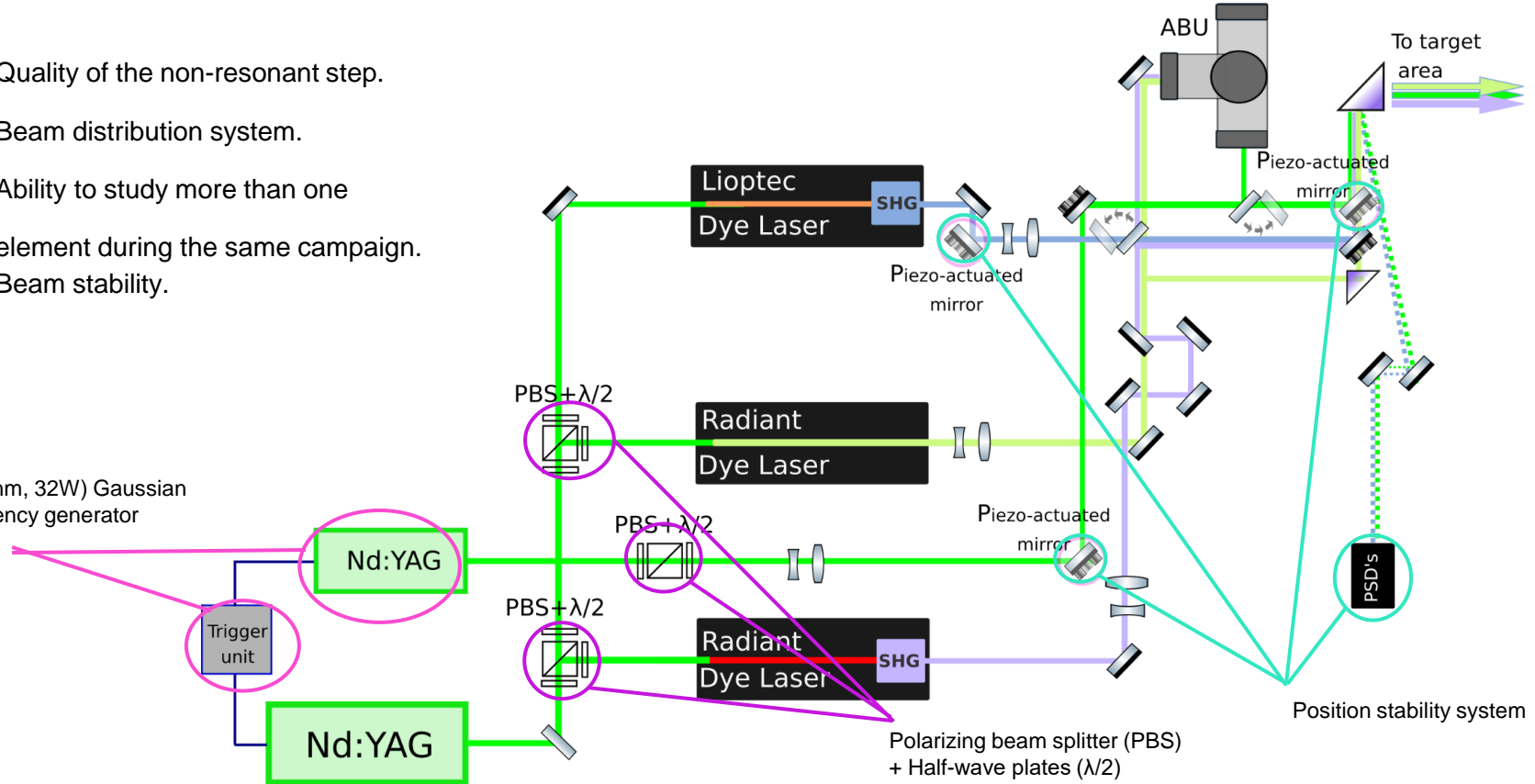
- ✿ Only one Nd:YAG for pumping and non resonant ionization.
- ✿ Beam distribution system.
- ✿ Beam stability.



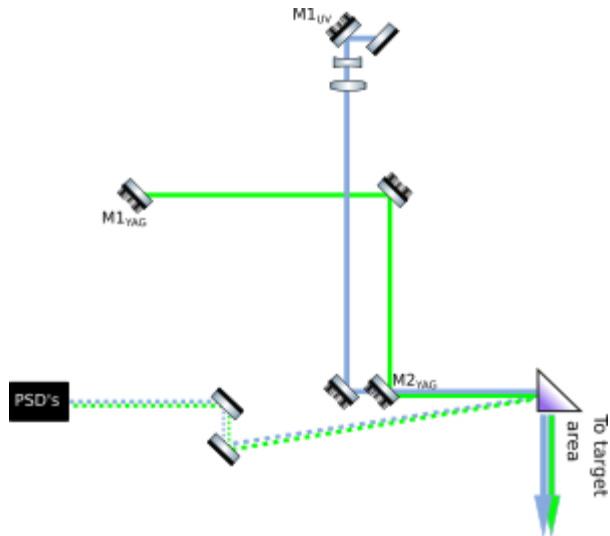
RIALTO current layout

- ✿ Quality of the non-resonant step.
- ✿ Beam distribution system.
- ✿ Ability to study more than one element during the same campaign.
- ✿ Beam stability.

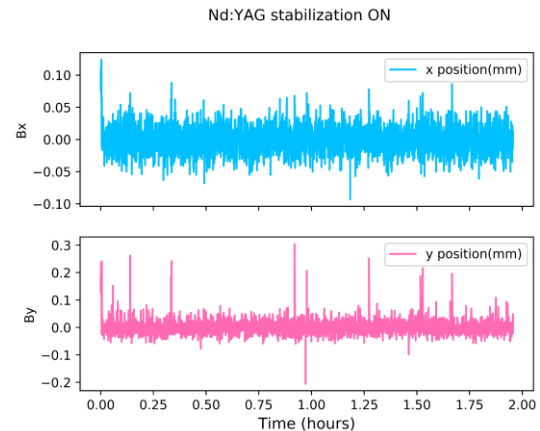
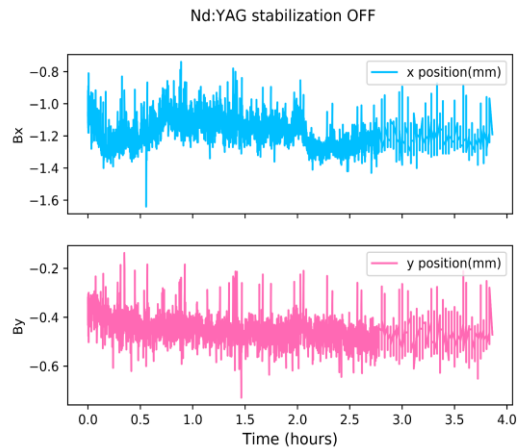
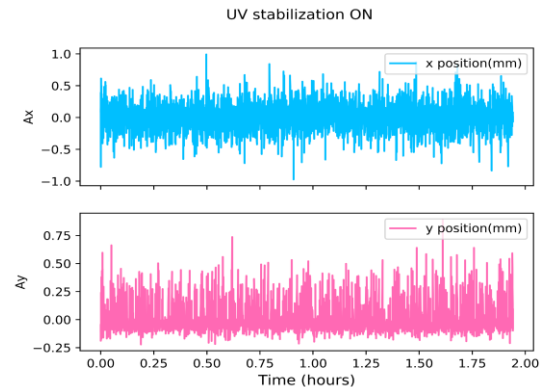
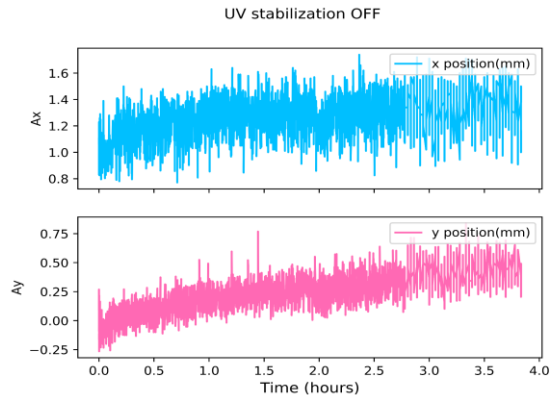
Nd:YAG (532 nm, 32W) Gaussian
External frequency generator



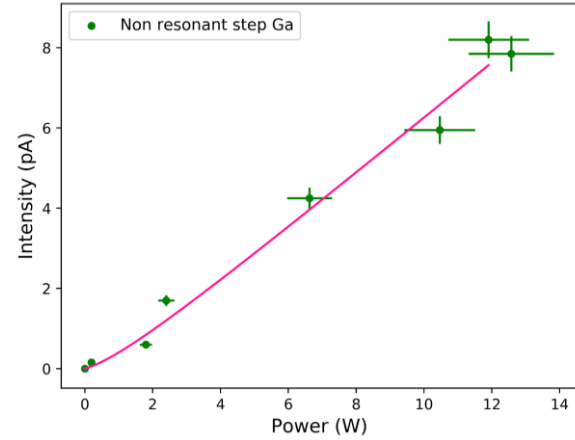
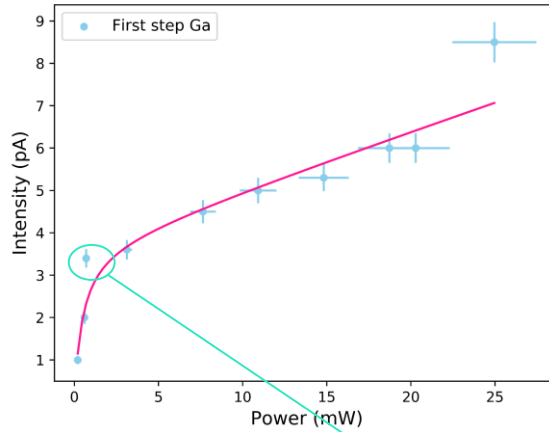
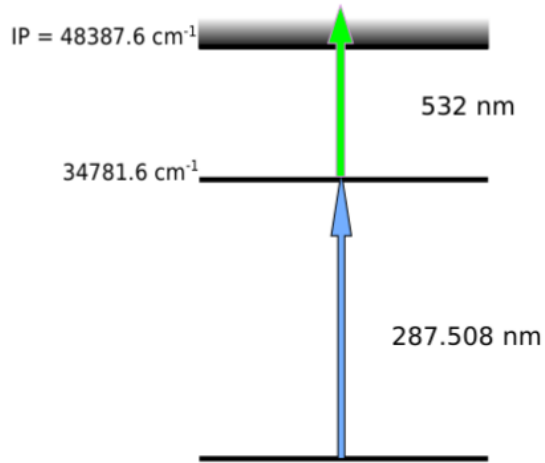
Stabilization system



Distance from laser output to ion source 20m



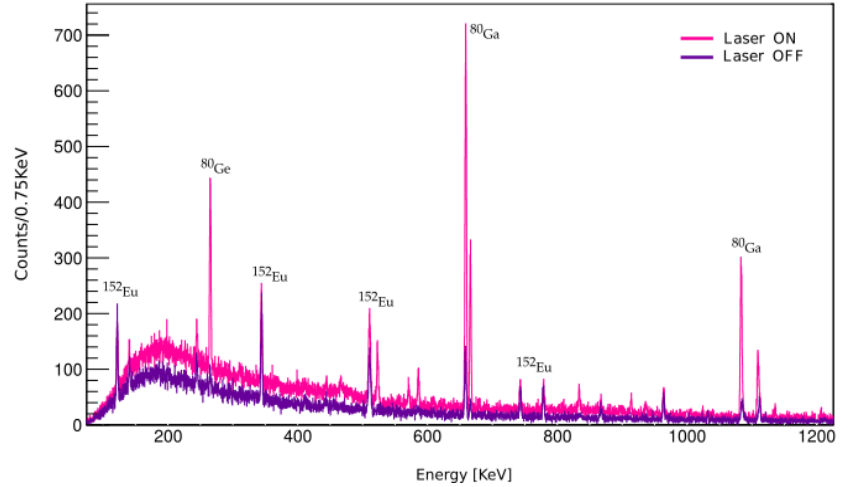
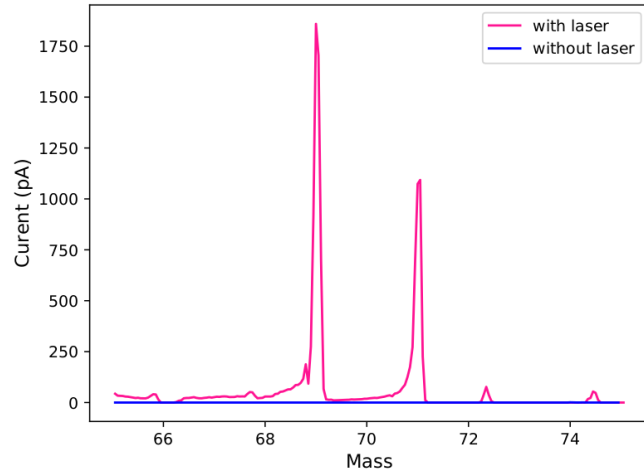
Ga ionization



	P_{Sat} [mW]	$P_{Max Available}$ [mW]
First step	0.473 ± 0.207	125
non resonant step	n/a	16500

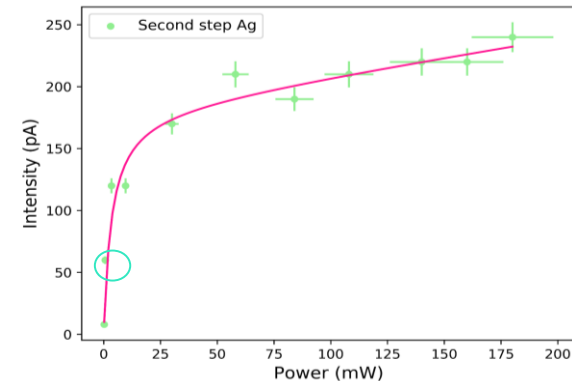
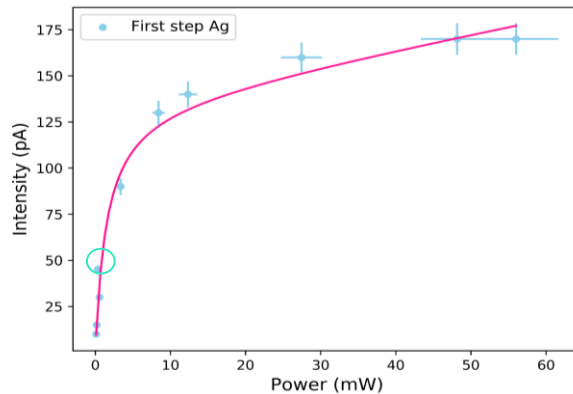
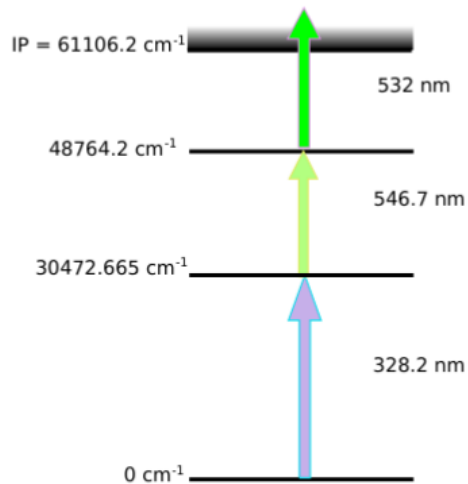
Ga production

⁶⁹ Ge 39.05 h $\epsilon = 100.00\%$	⁷⁰ Ge STABLE 20.57%	⁷¹ Ge 11.43 d $\epsilon = 100.00\%$	⁷² Ge STABLE 27.45%
⁶⁸ Ga 67.71 min $\epsilon = 100.00\%$	⁶⁹ Ga STABLE 60.108%	⁷⁰ Ga 21.14 min $\beta^- = 99.59\%$ $\epsilon = 0.41\%$	⁷¹ Ga STABLE 39.892%
⁶⁷ Zn STABLE 4.04%	⁶⁸ Zn STABLE 18.45%	⁶⁹ Zn 56.4 min $\beta^- = 100.00\%$	⁷⁰ Zn $\geq 2.3 \times 10^{17}$ y 0.61% 2 β^-

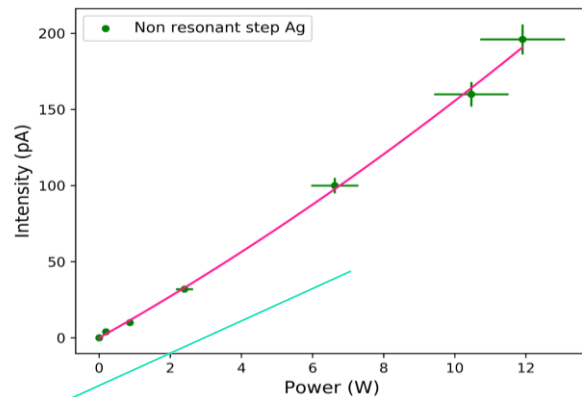


Laser ON-OFF effect. Gamma-ray spectrum recorded with HPGe detectors at the COeCO station for ⁸⁰Ga with surface ionization ion source (purple) and with the laser ionization (pink). Factor 8 enhancement with lasers.

Ag ionization

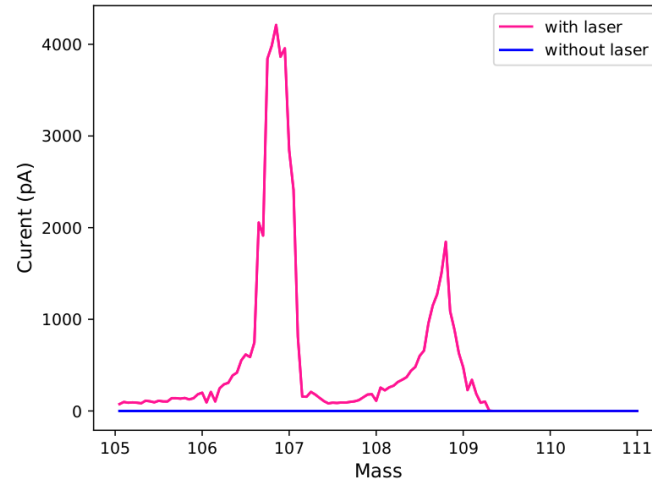
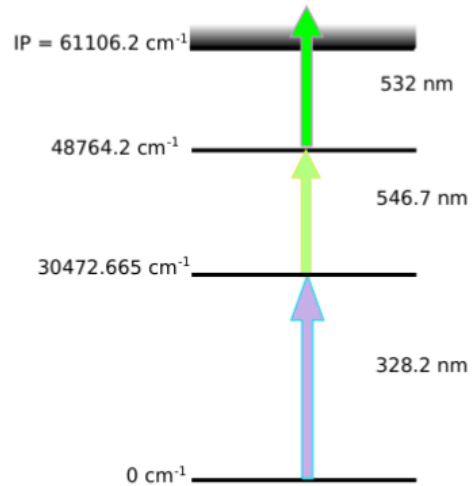


	P_{Sat} [mW]	$P_{Max Available}$ [mW]
First step	1.48 ± 0.44	73
Second step	3.45 ± 1.14	100
Non-resonant step	n/a	16500



Silver production

106Ag 23.96 min $\epsilon = 99.50\%$ $\beta^- < 1.00\%$	107Ag STABLE 51.839%	108Ag 2.382 min $\beta^- = 97.15\%$ $\epsilon = 2.85\%$	109Ag STABLE 48.161%
105Pd STABLE 22.33%	106Pd STABLE 27.33%	107Pd 6.5E+6 y $\beta^- = 100.00\%$	108Pd STABLE 26.46%



Summary and outlook

- ✿ We produced Ag and Ga beams using our upgraded laser ion source.
- ✿ Radioactive silver production.
- ✿ New Nd:YAG with UV output.
- ✿ Sb scheme development.