LABORATÓRIO DE INSTRUMENTAÇÃO
E FÍSICA EXPERIMENTAL DE PARTÍCULAS
partículas e tecnologia

Ciências ULisboa
Faculdade de Ciências da Universidade de Lisboa

Precision mass dependence studies of α-nuclear potentials: elastic α-scattering on ^{116,118}Sn

D. Galaviz

ChETEC-INFRA GA Meeting

Dresden, September 18th 2025

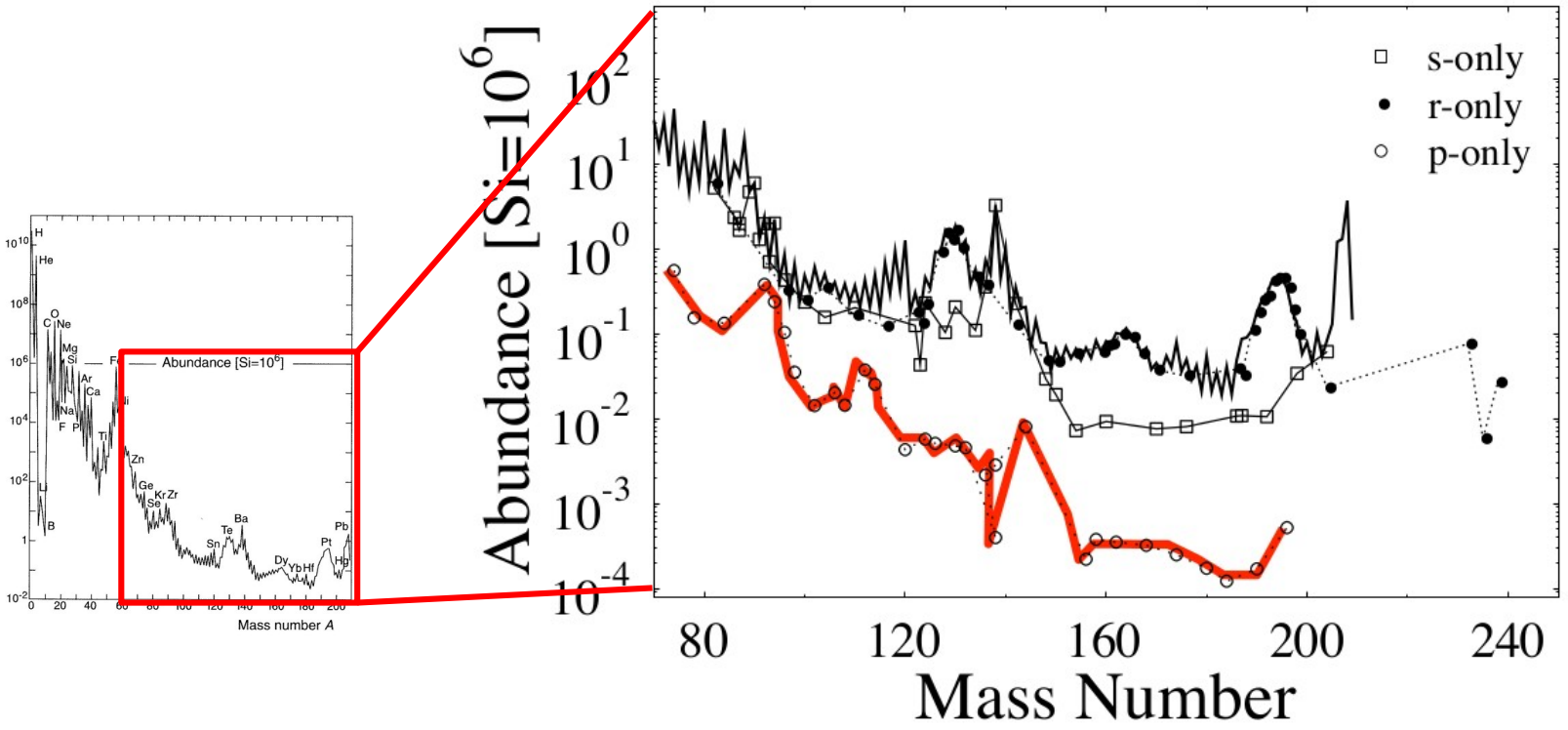
Overview

- Motivation:
  - **p-process** nucleosynthesis
  - **α-nuclear potentials** along Sn-isotopic chain
- Proposed **experiment** and setup
  - Targets
  - Detector config. & DAQ
- **Results** and comparison to global potentials
- **Summary and Outlook**

Motivation

p-nuclei nucleosynthesis

p-nuclei

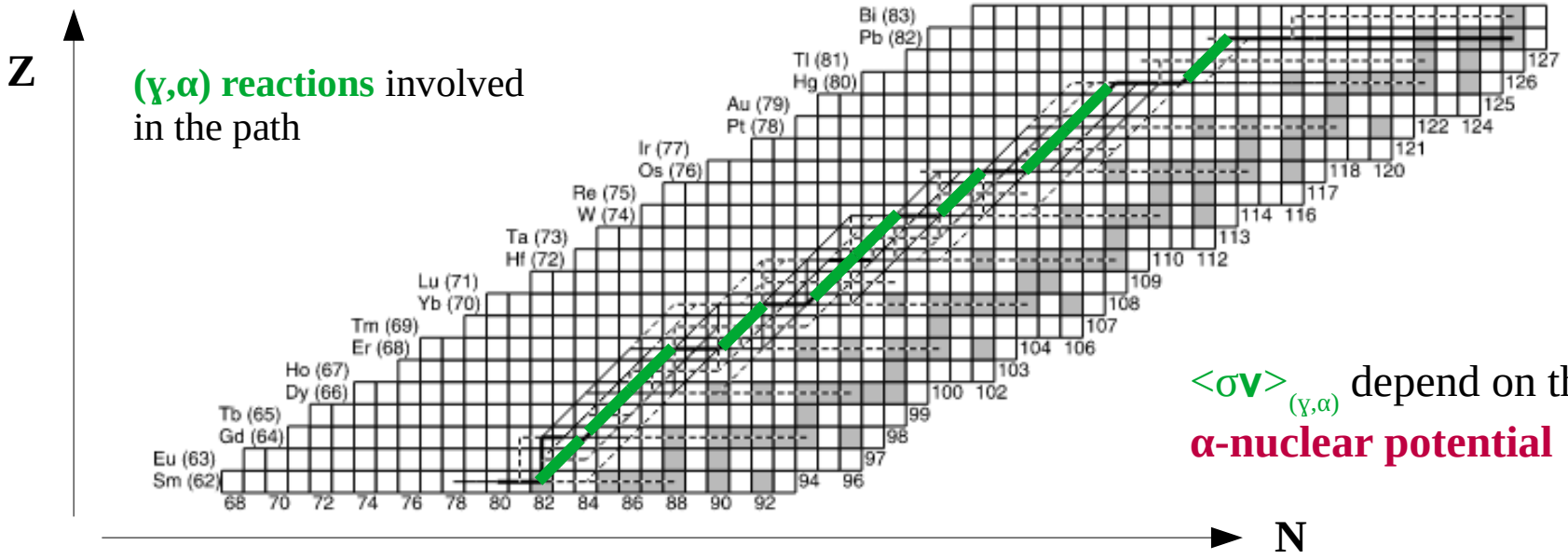

Abundance [Si=10^6]
Mass number A
Abundance [Si=10^6]
s-only
r-only
p-only
Mass Number

p-process nucleosynthesis

Sensitivity studies of **p-process** nucleosynthesis point out the strong dependence of the **α-nuclear potential** in the production of **heavy p-nuclei**

W. J. Rapp et al., Astrophys. J 653, 474 (2006)

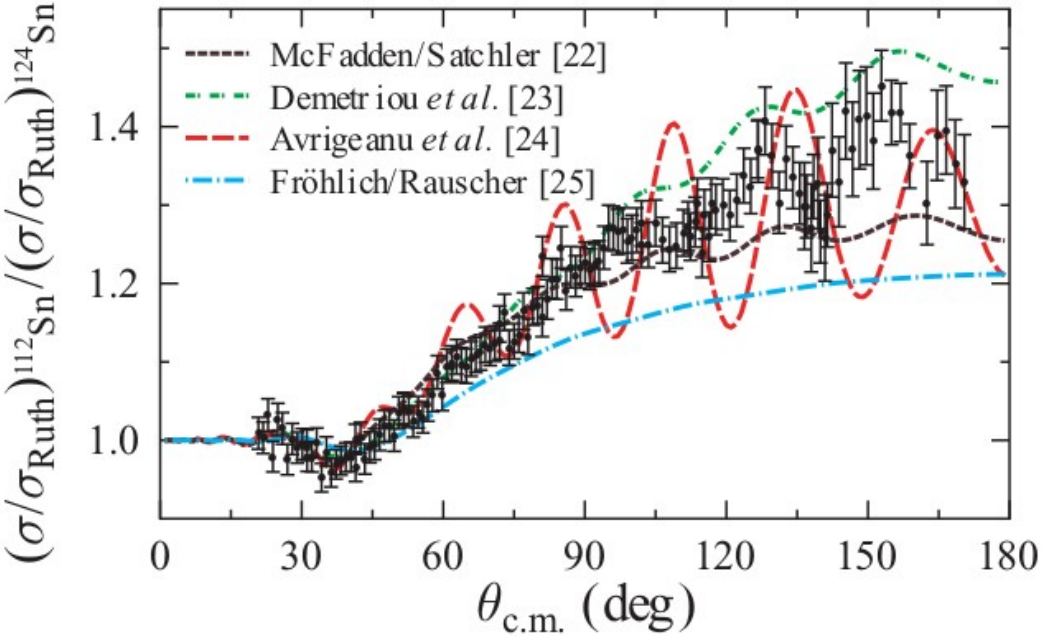
(γ,α) reactions involved in the path



$\langle \sigma v \rangle_{(\gamma,\alpha)}$ depend on the **α-nuclear potential**

Why Sn-isotopes?

α-nuclear potential mass dependence in stable **Sn** isotopes



D. Galaviz et al, Phys. Rev. C 71, 065802 (2005)

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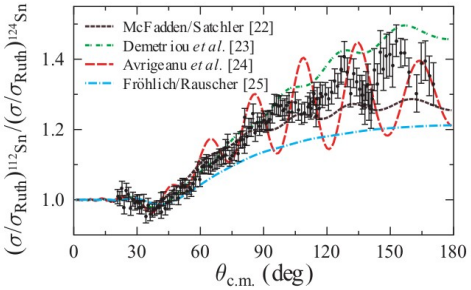

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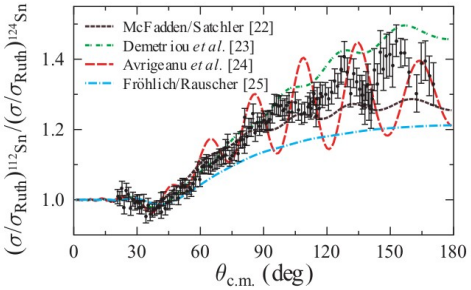

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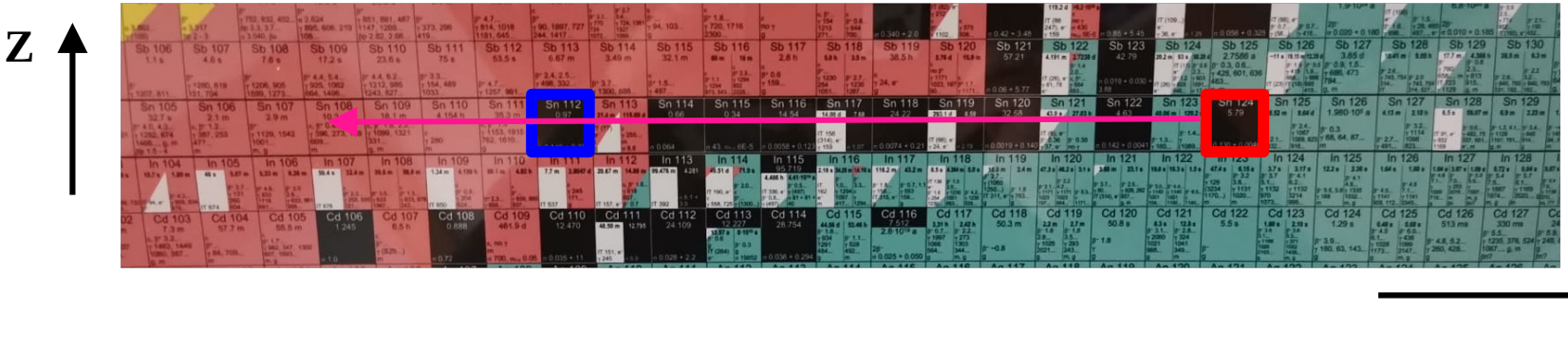

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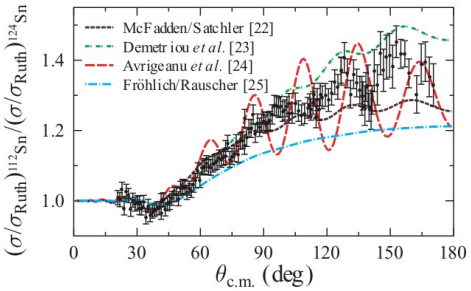

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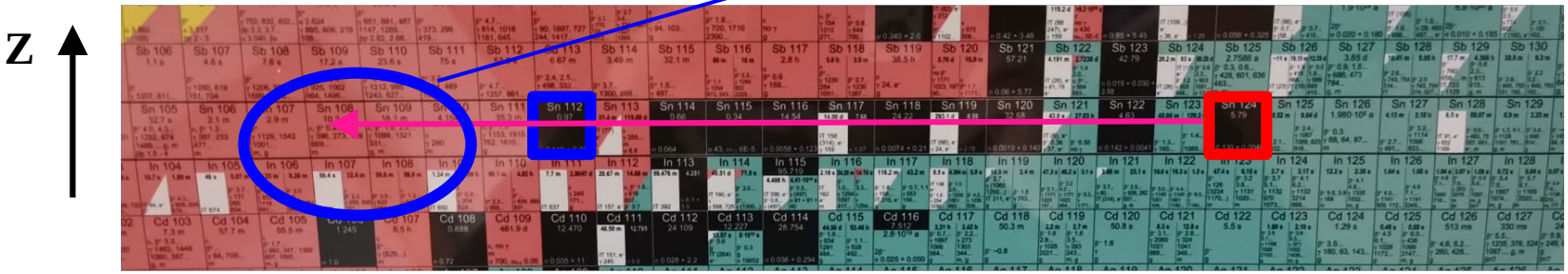
IS698: **α** elastic **scattering** in **inverse kinematics** on **^{108,109,110}Sn**



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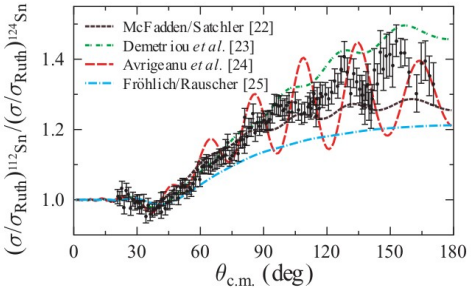

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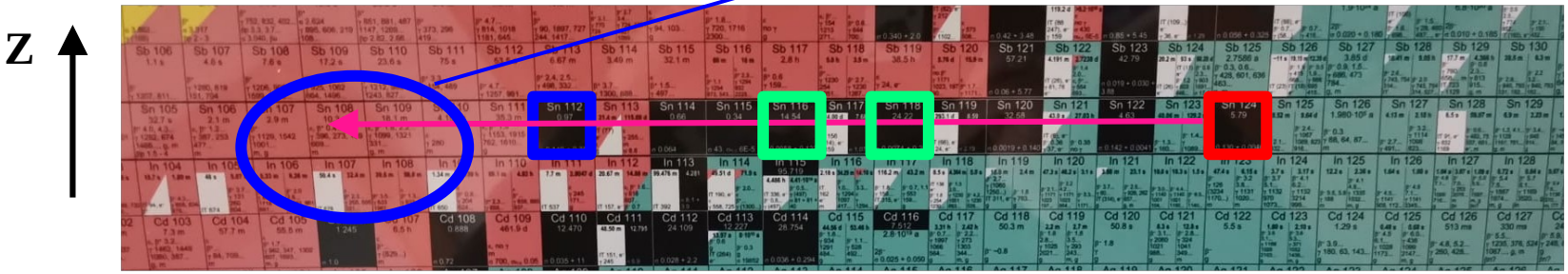
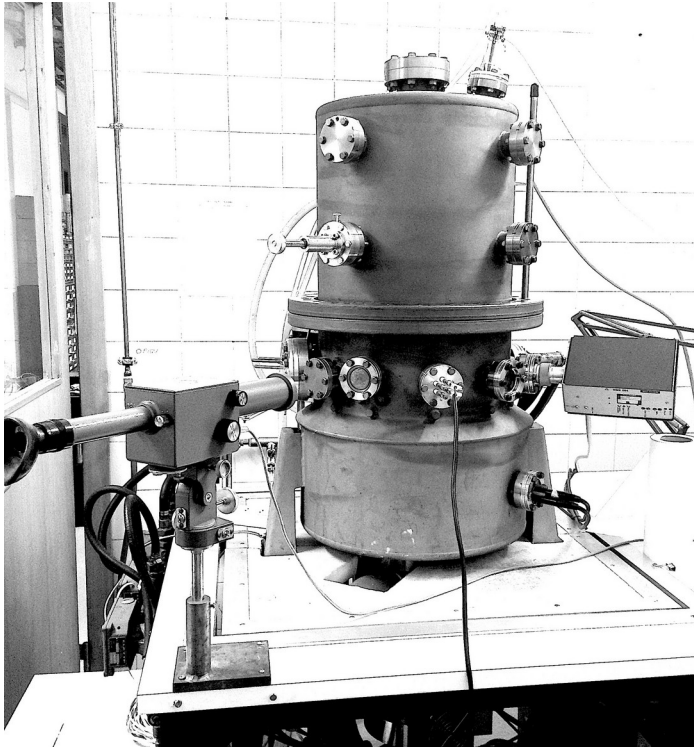


^{116}Sn and **^{118}Sn** could greatly help tune extrapolations

Proposed Experiment

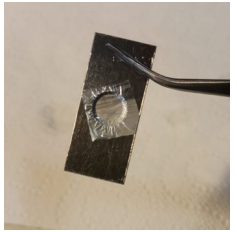
Targets and Setup

Targets



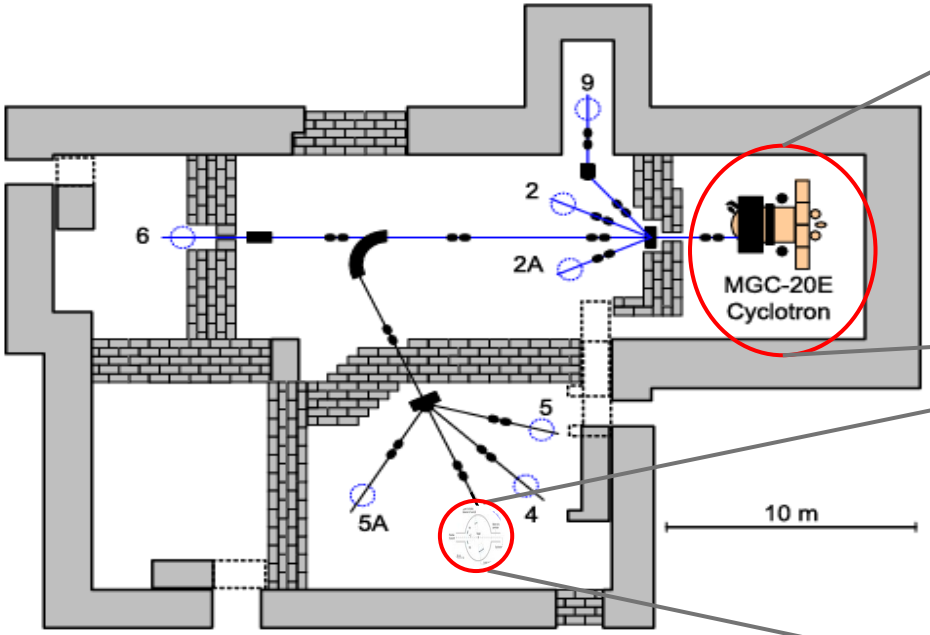
Target **D**esign **L**aboratory (**TDL**)

- Hydraulic bell-shaped steel <u>evaporator</u>
- <u>Two pairs</u> of electrodes
- Highly enriched **self supporting targets**:
  - ^{208}Pb (1-2 mg/cm^2)
  - **^{116,118}Sn** (0.3-0.5 mg/cm^2)



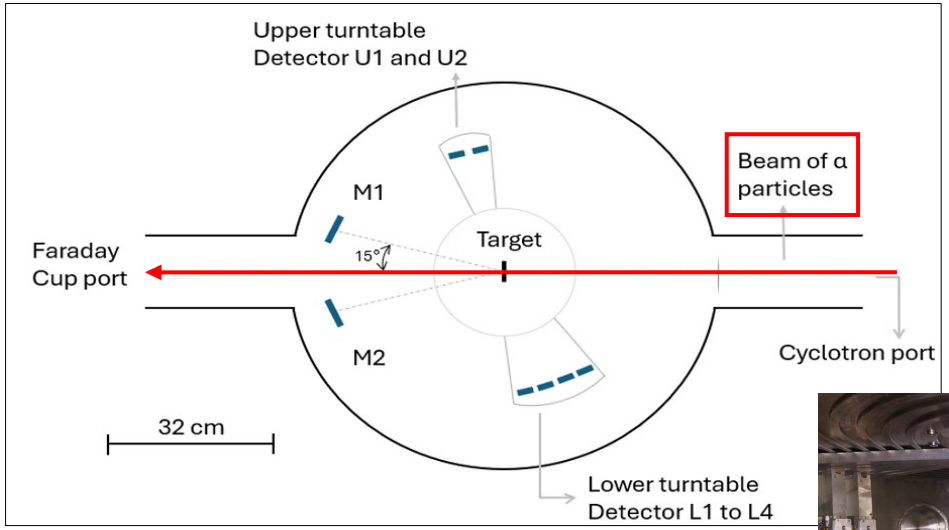
ATOMKI

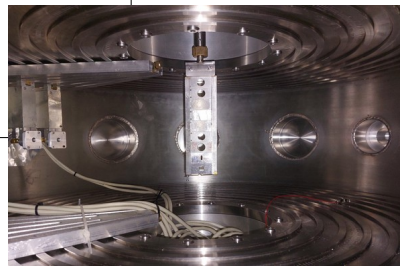
Cyclotron provides **α-particle** beams up to **20 MeV**



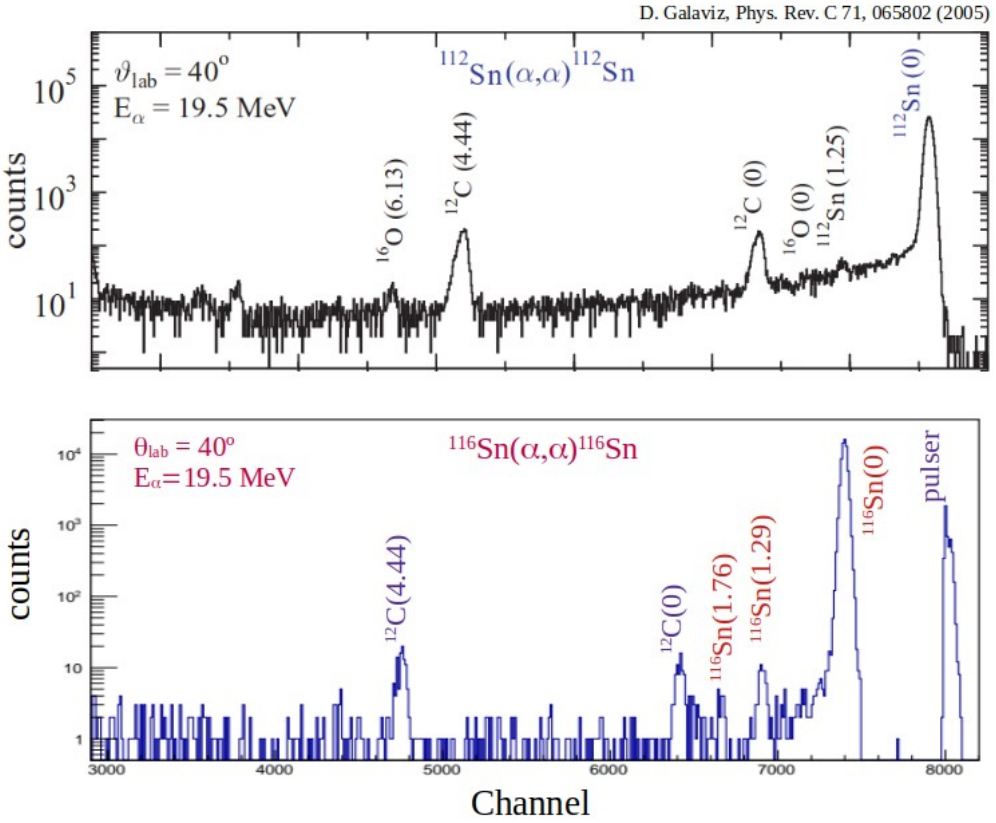
ATOMKI

New detectors and **upgraded data acquisition**





Online spectra



Proposed Experiment:

Two energies:
17 and **19.5 MeV**

X

Two isotopes:
^{116}Sn and **^{118}Sn**

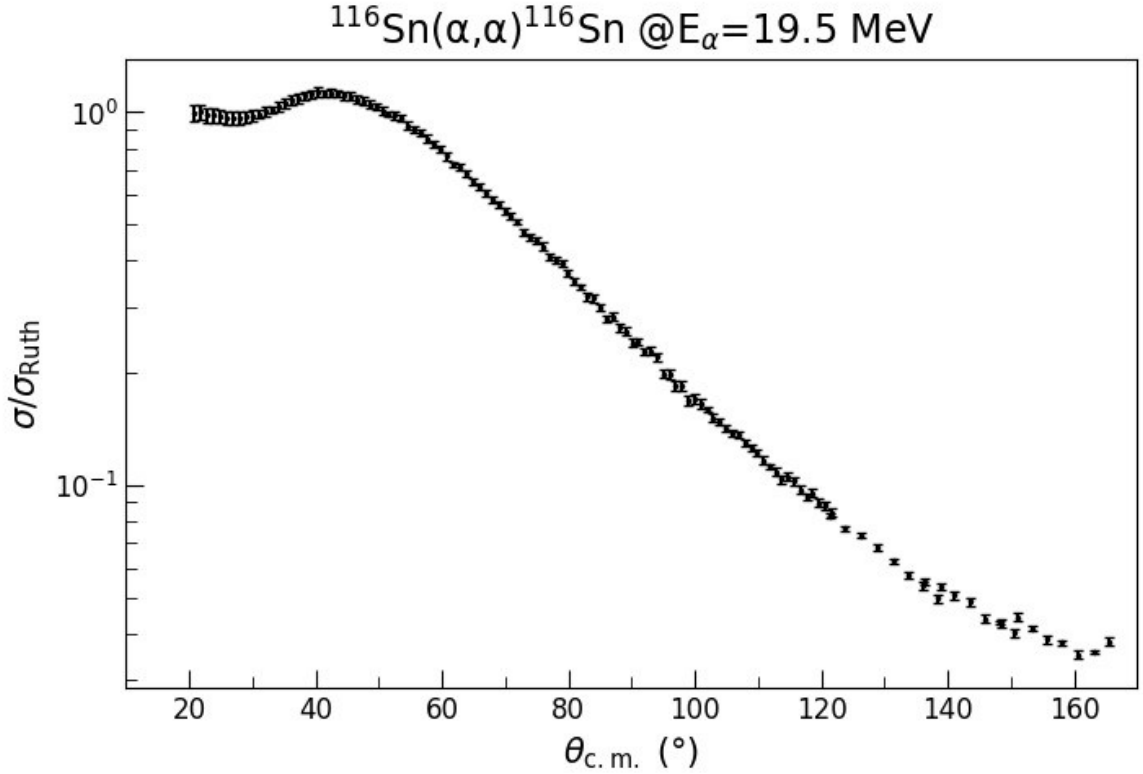
=

Four angular distributions

Results

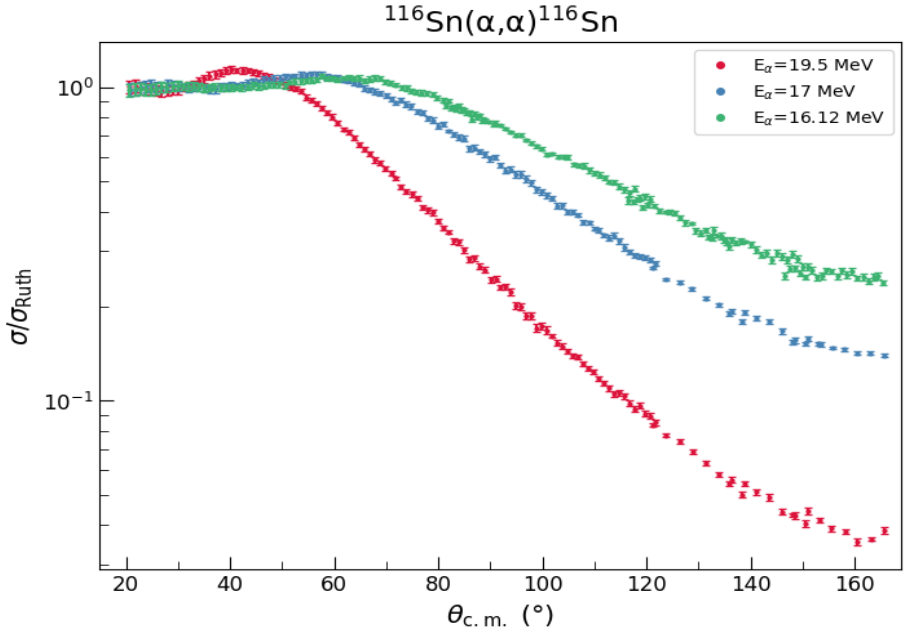
And comparison to global models

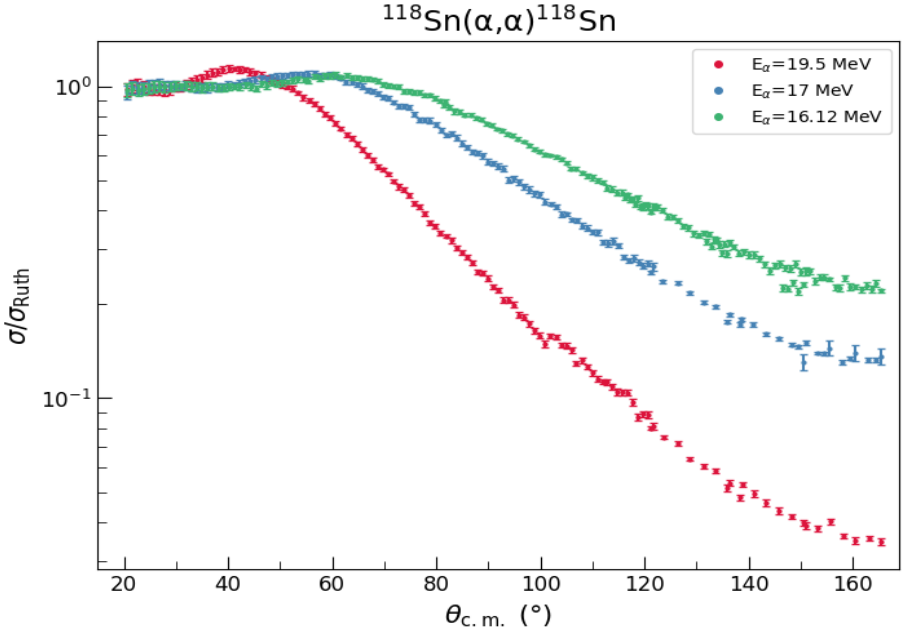
Elastic scattering angular distributions



Elastic scattering angular distributions

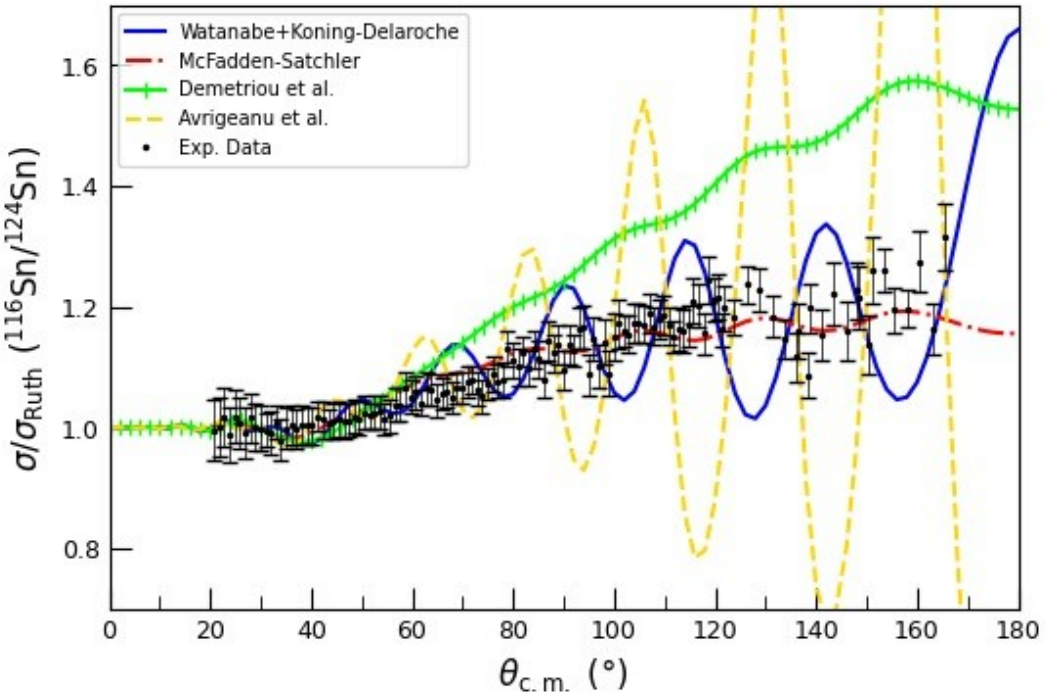
Six angular distributions → Three energies: **16.1, 17 and 19.5 MeV** **X** Two isotopes: **^{116}Sn** and **^{118}Sn**

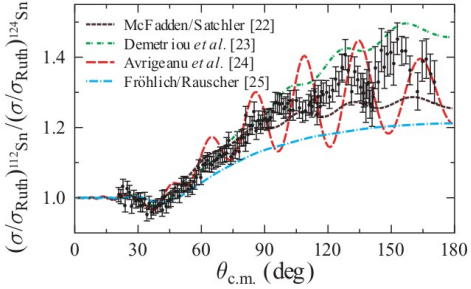




Elastic scattering angular distributions

Cross section ratios
(various possibilities)





Work almost finished

Summary and Outlook

Outcomes from TNA

- Successful TNA-funded experiment: **4 participants** from Portugal
- Master Thesis defense: **Raquel Nunes**

- Work presented at **Russbach** NA school
- **Journal Publication** well advanced

Thanks for the support! (Obrigado)