LERHI / NUC-RIA
Activity Report

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Braga, Jornadas LIP 2020

February 15th, 2020

Outline

R^{3}B@FAIR

- Commissioning
- Phase-0
- Exclusive γ tests

→ Halo Nuclei

INVERSE-ALPHA

- α-potential

→ Hi-ISOLDE

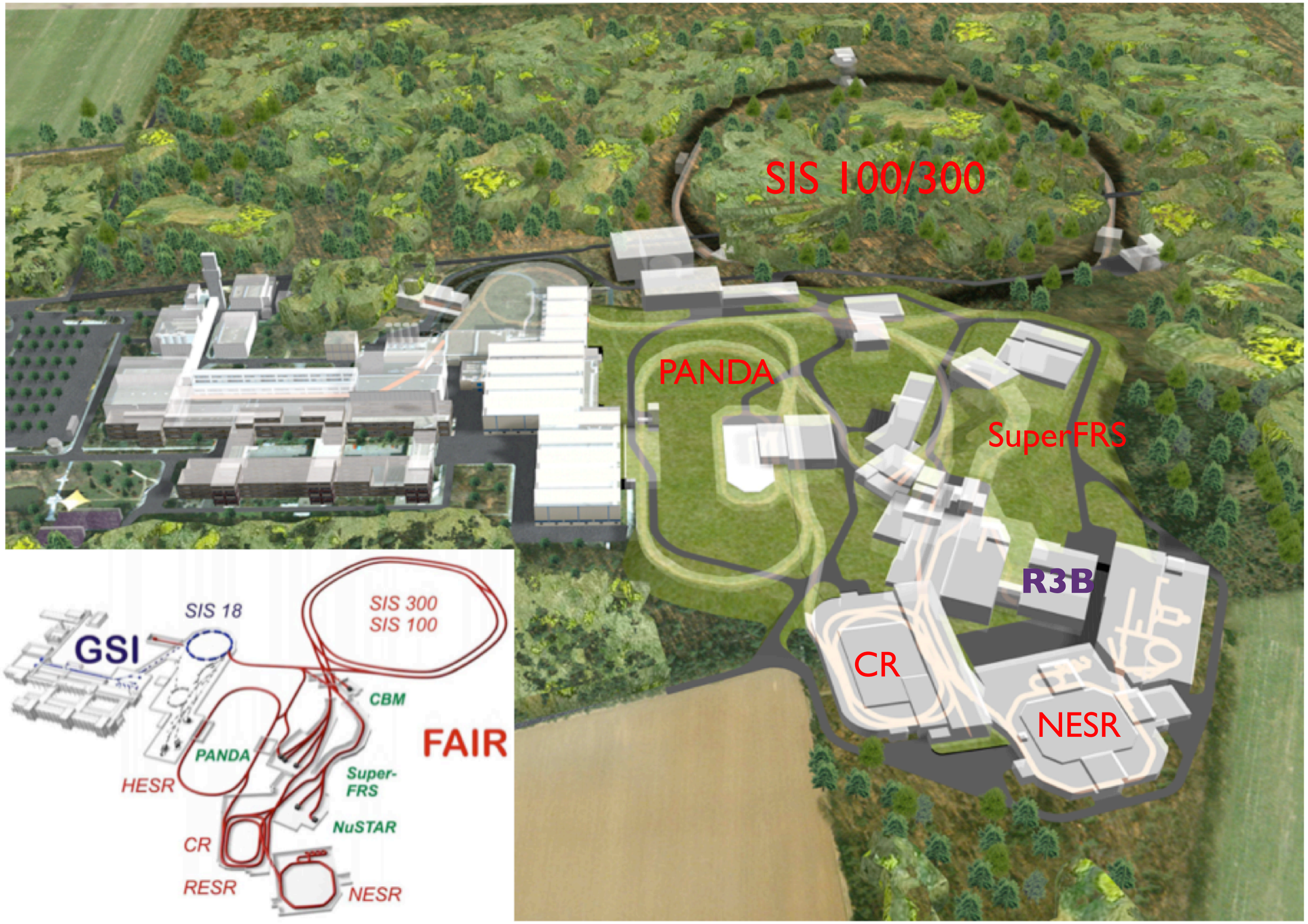
PIGE

- ^{35}Cl(p,p'γ)^{35}Cl
- VMC/GEANT4

→ ^{118}Sb(p, γ)^{119}Sn

Summary

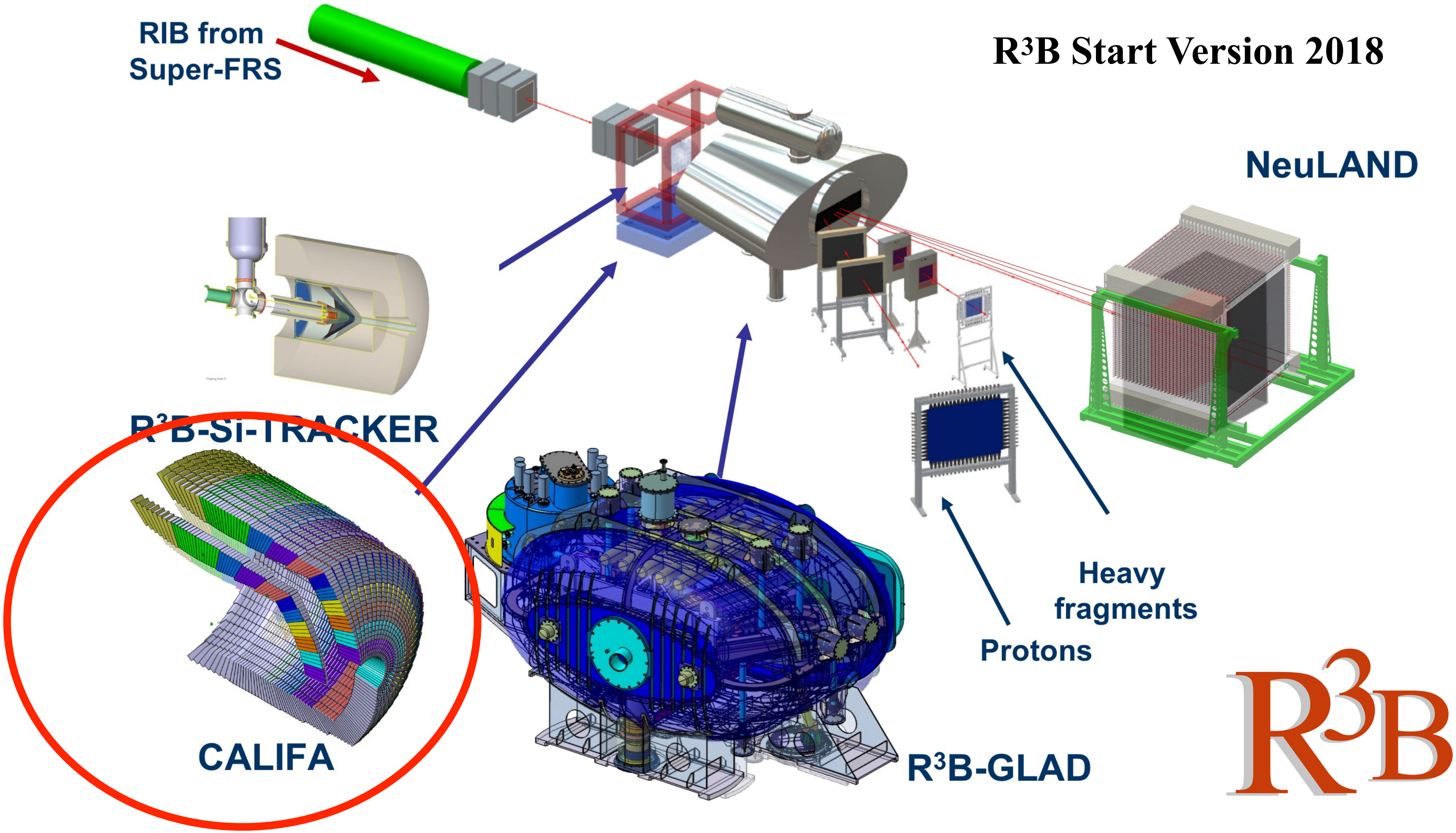
- Unique facility



Production of **relativistic** **exotic beams** never studied before

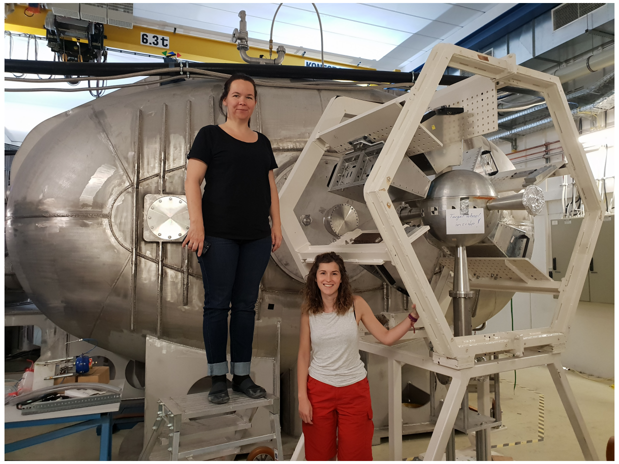
R^{3}B @ FAIR

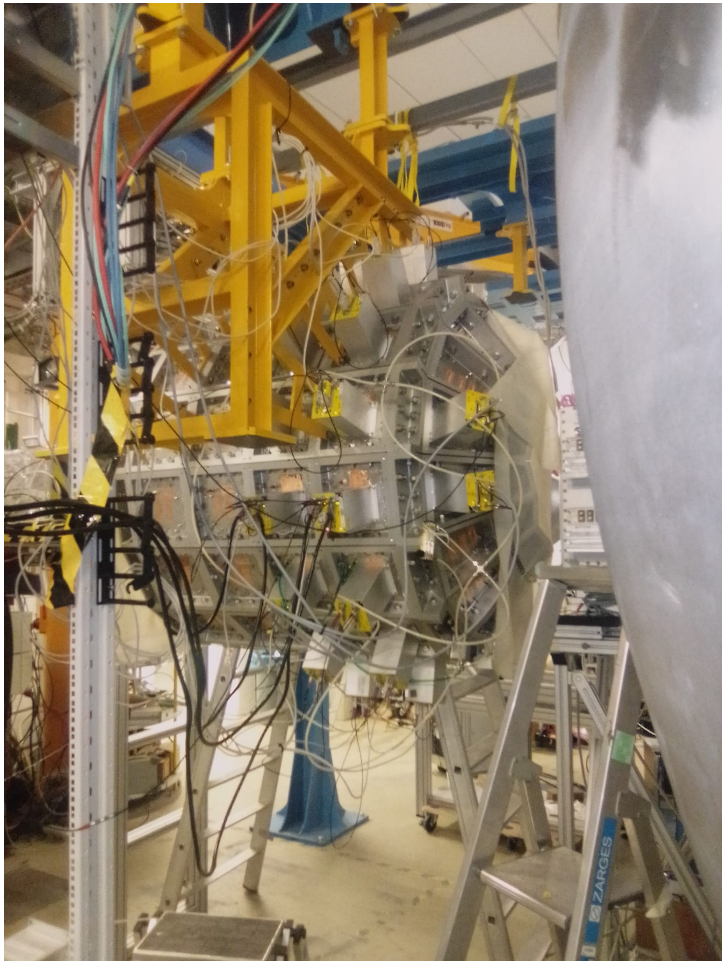
Reactions with Relativistic Radioactive Beams

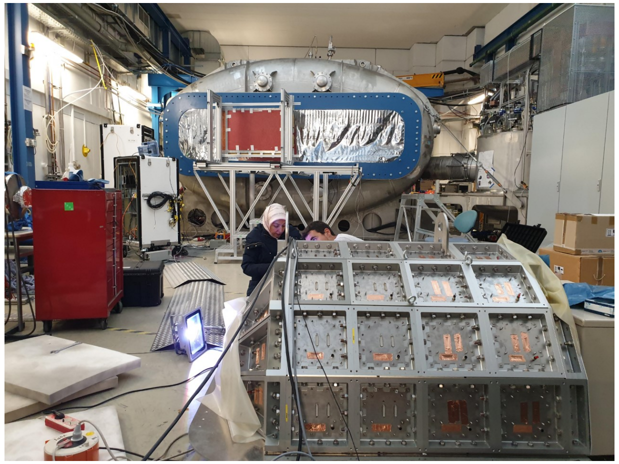


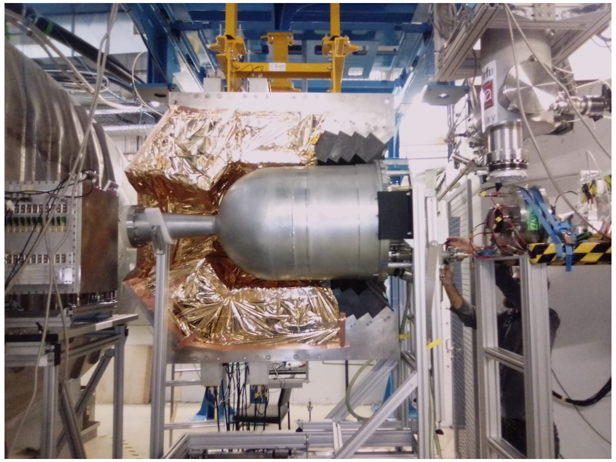
Towards Phase-0

First experiments **in 2020**





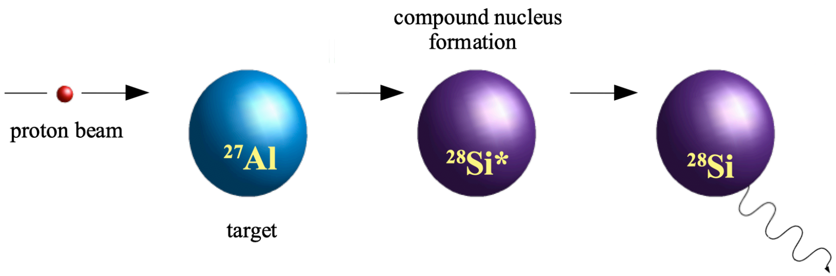




CAVE is closed! Ready for first real **EXPERIMENT**!!!!

CALIFA Benchmark @ Lisbon

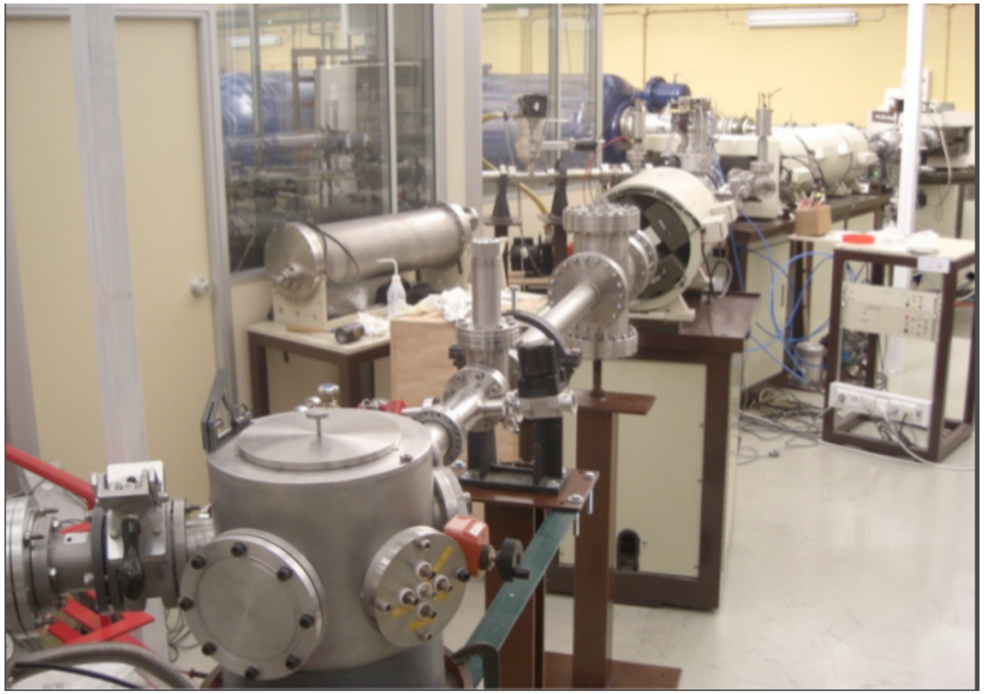
$^{27}Al(p,\gamma)^{28}Si$



to produce **γ > 10 MeV**
to challenge
CALIFA barrel segments

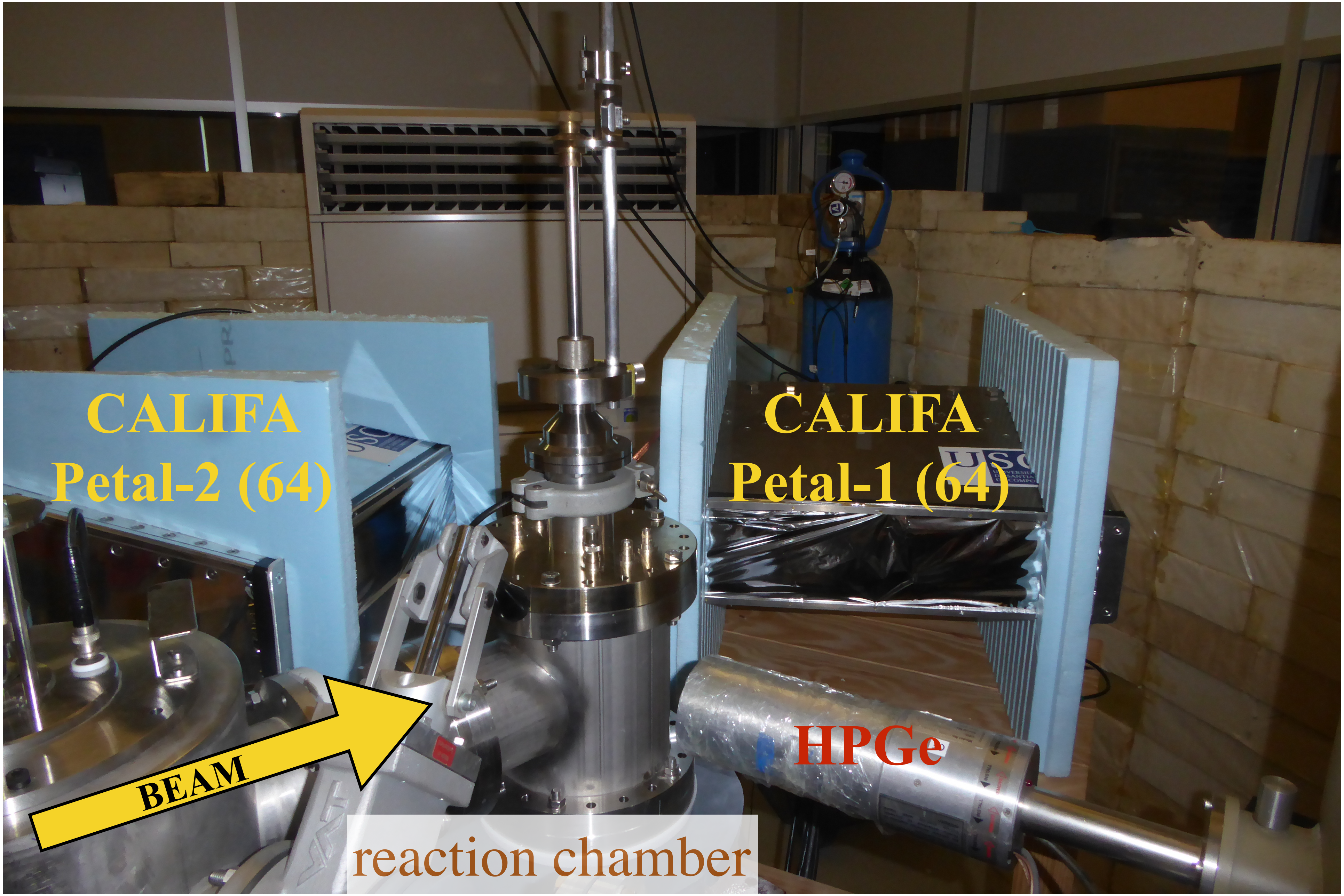
Q-value: 11.59 MeV

Nuclear reaction line @ tandem accelerator LATR-CTN



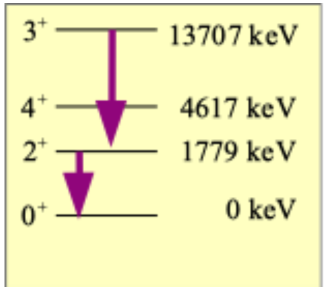
More Information under
http://www.ctn.tecnico.ulisboa.pt

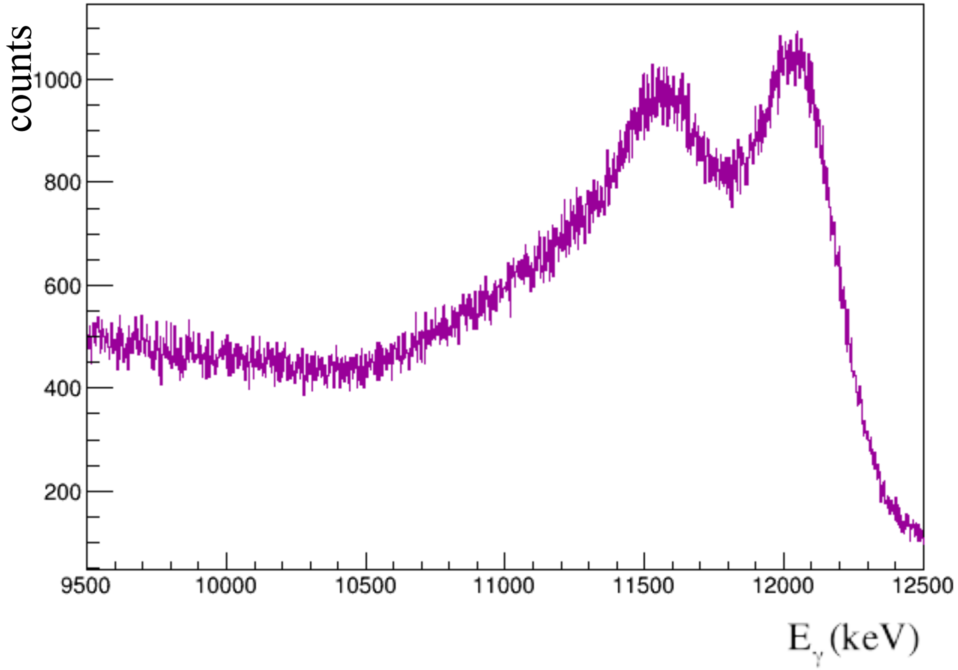
CALIFA Benchmark @ Lisbon

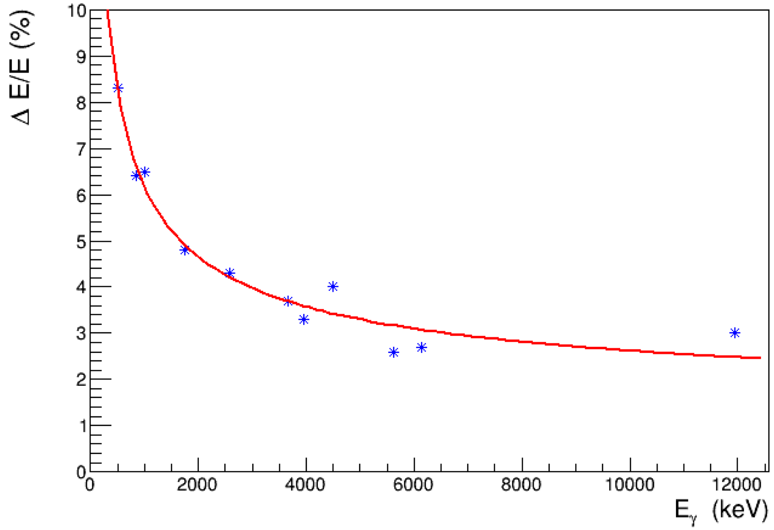


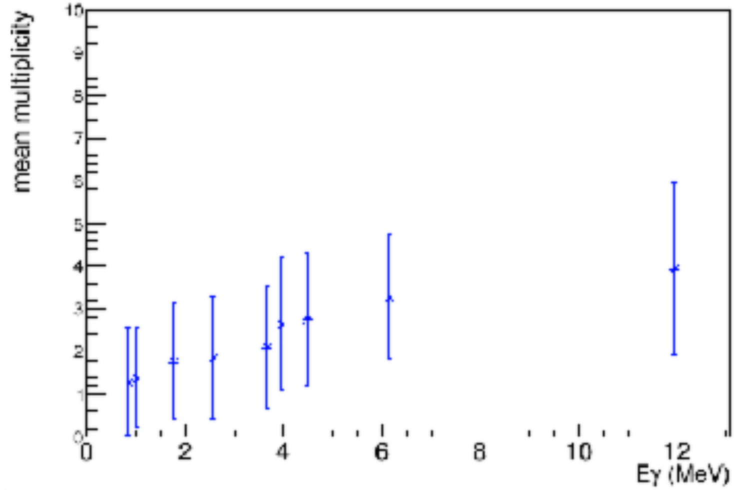
Calorimetric response

$^{27}Al(p,\gamma)^{28}Si$





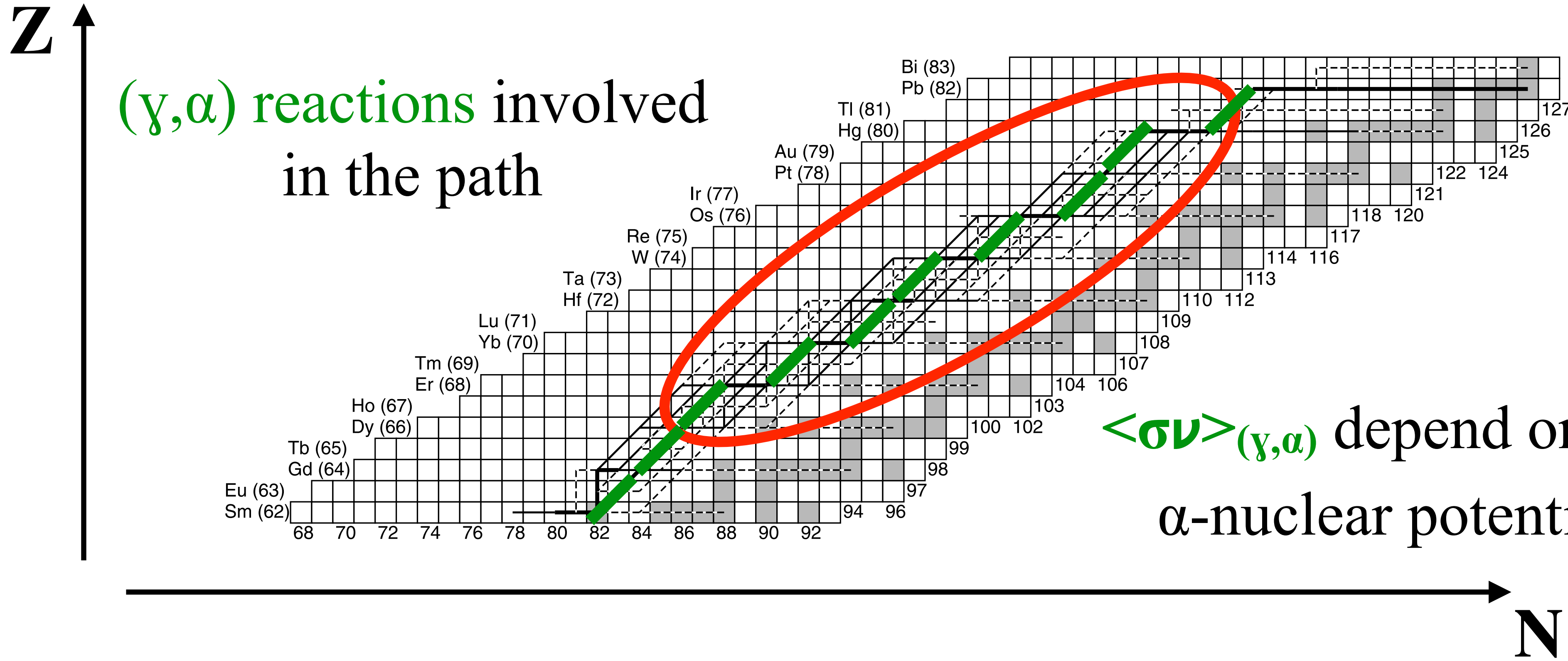




INVERSE-ALPHA

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

(ɣ,α) reactions involved in the path



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

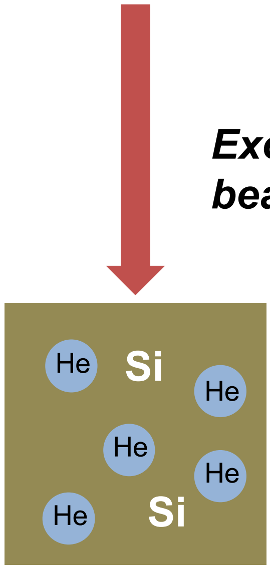
W. J. Rapp *et al.*, Astrophys. J 653, 474 (2006)

INVERSE-ALPHA

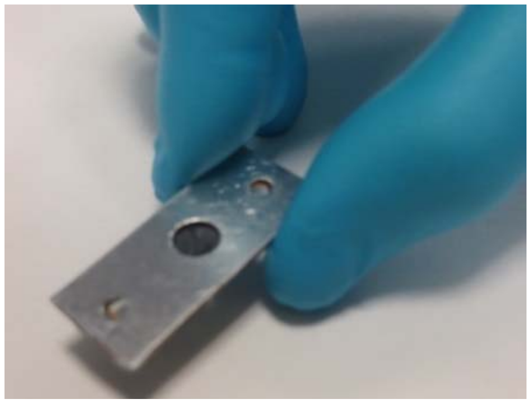
Novel **Helium Targets** developed at **Seville**

Development of He solid targets for nuclear reaction experiments

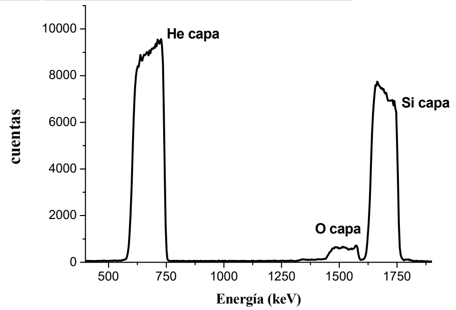
	GODINHO et al. (MS)	Vanderbist et al. (Ionic Implant.)	Raabe et al. (Ionic Implant.)	Ujic et al. (Ionic Implant.)
Metal (10^{15} at/cm^2)	**9250 (Si)**	1200 (Al)	4200 (Al)	1200 (Al)
He (10^{15} at/cm^2)	**4060**	275	270	130
O (10^{15} at/cm^2)	**700**	60	100	??



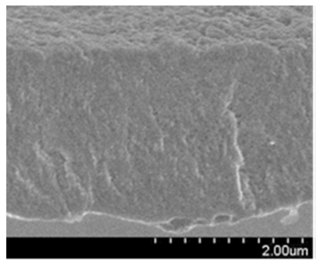
Exotic beam



Self-supported Si:He target



RBS spectrum of Si:He target using 2,0 MeV protons and 165° scattering angle



SEM corss section of the Si:He target

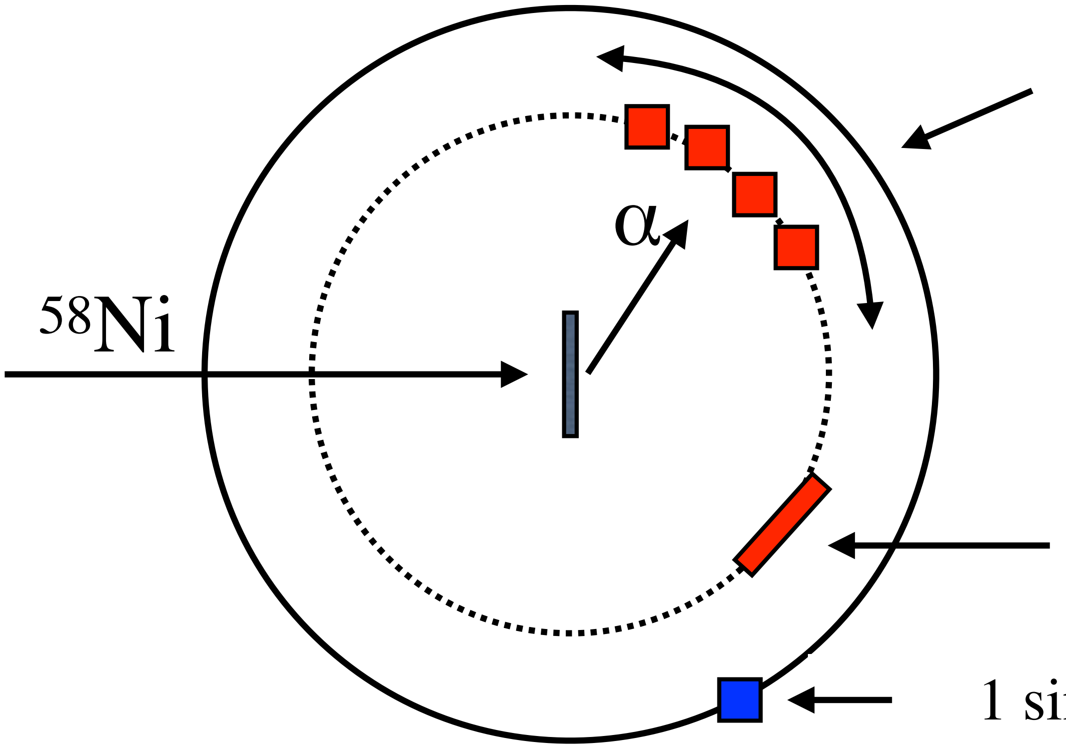
Adopted from F. J. Ferrer, Univ. Seville

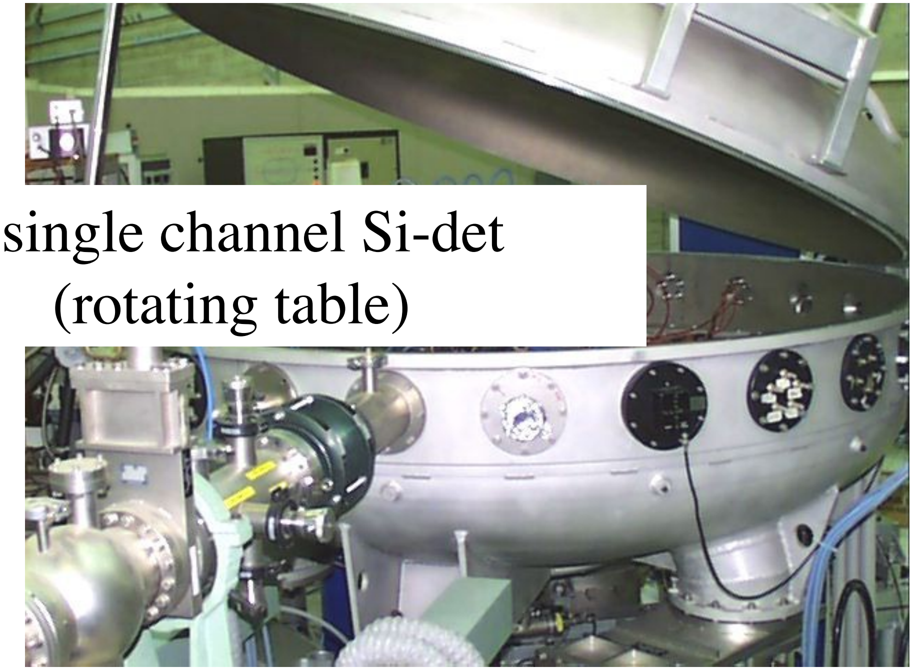
INVERSE-ALPHA

Proposal lead by **LIP**, approved with **highest priority**!

Scheduled to run **March - 2020**

Experiment at the CT2000 scattering chamber



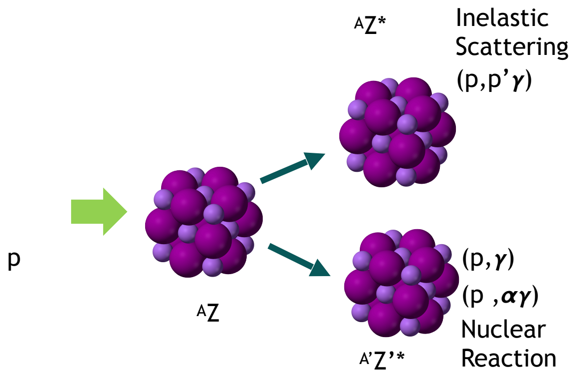


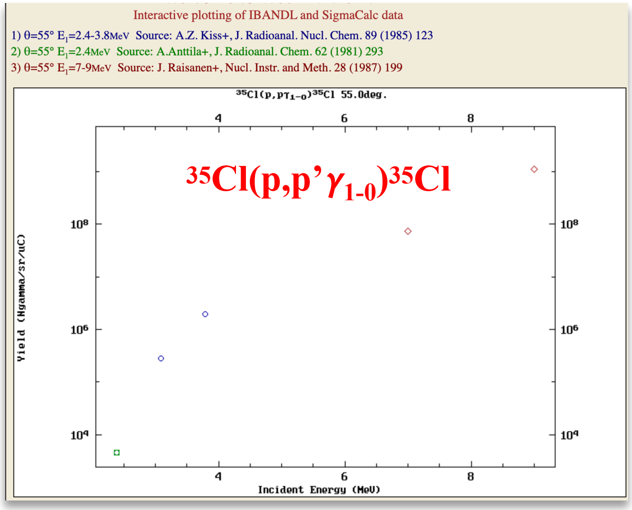
4 single channel Si-det (rotating table)

1 DSSD at fixed position

1 single channel Si-det (fixed at 60°)

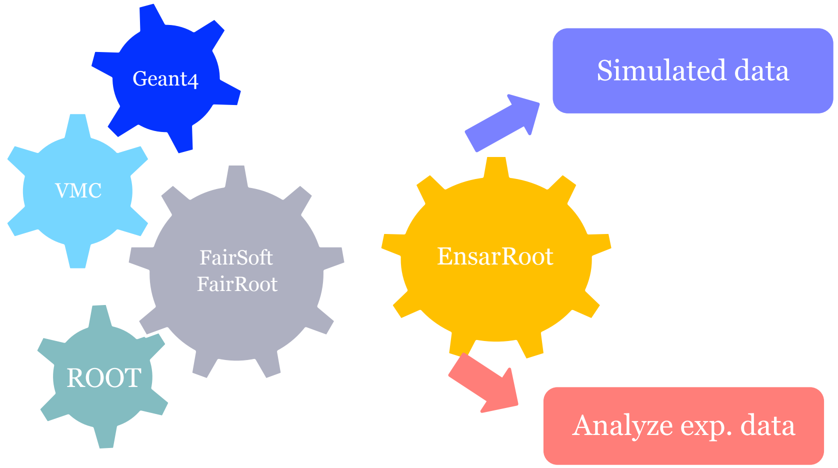
PIGE Studies: stable Cl isotopes





https://www-nds.iaea.org/exfor/ibandl.htm

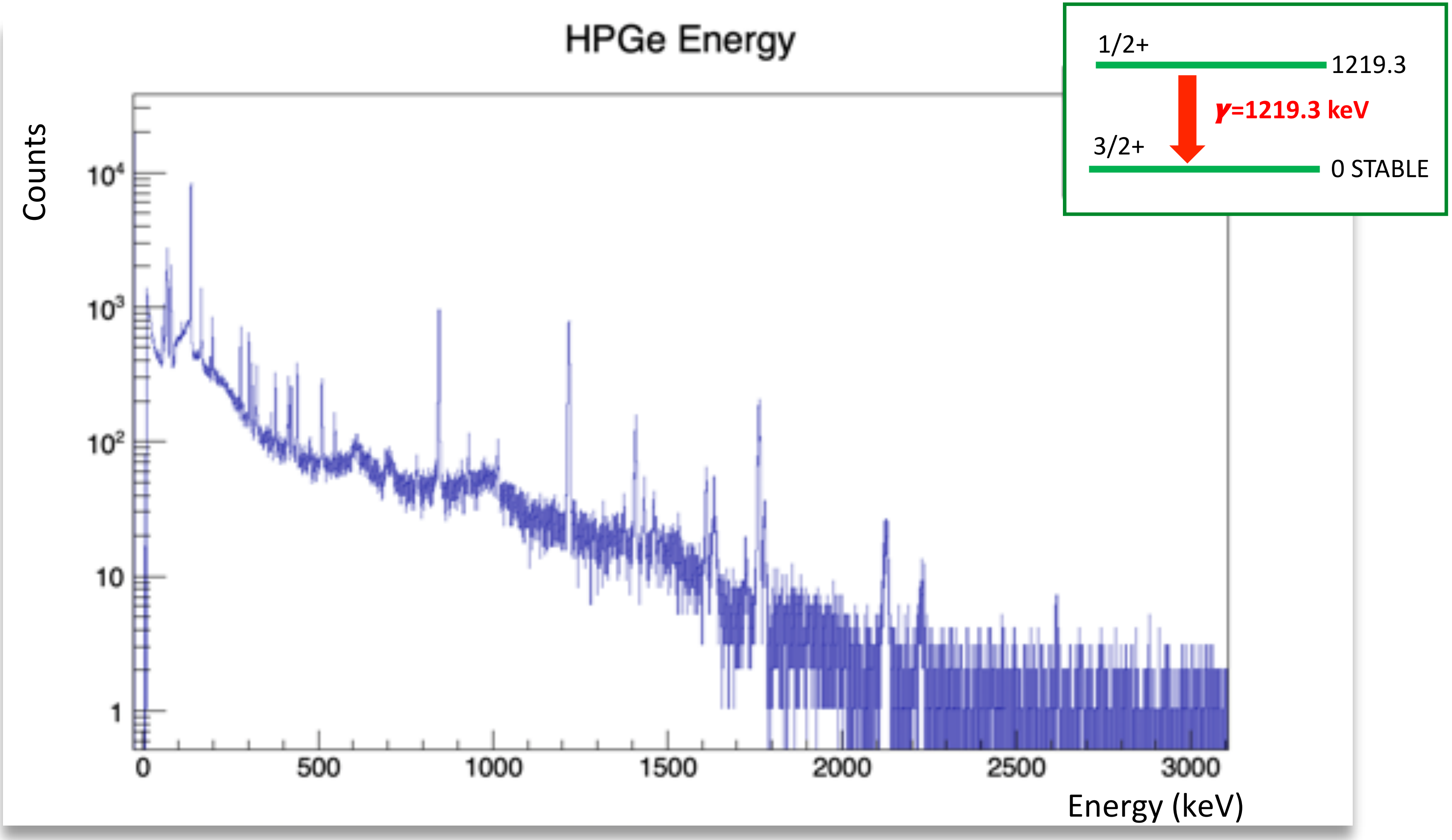
ENSAR2



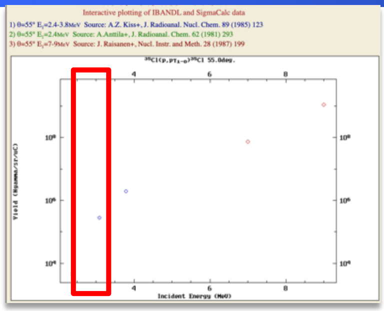
https://github.com/EnsarRootGroup/EnsarRoot

LIP Thin Film & Target Lab

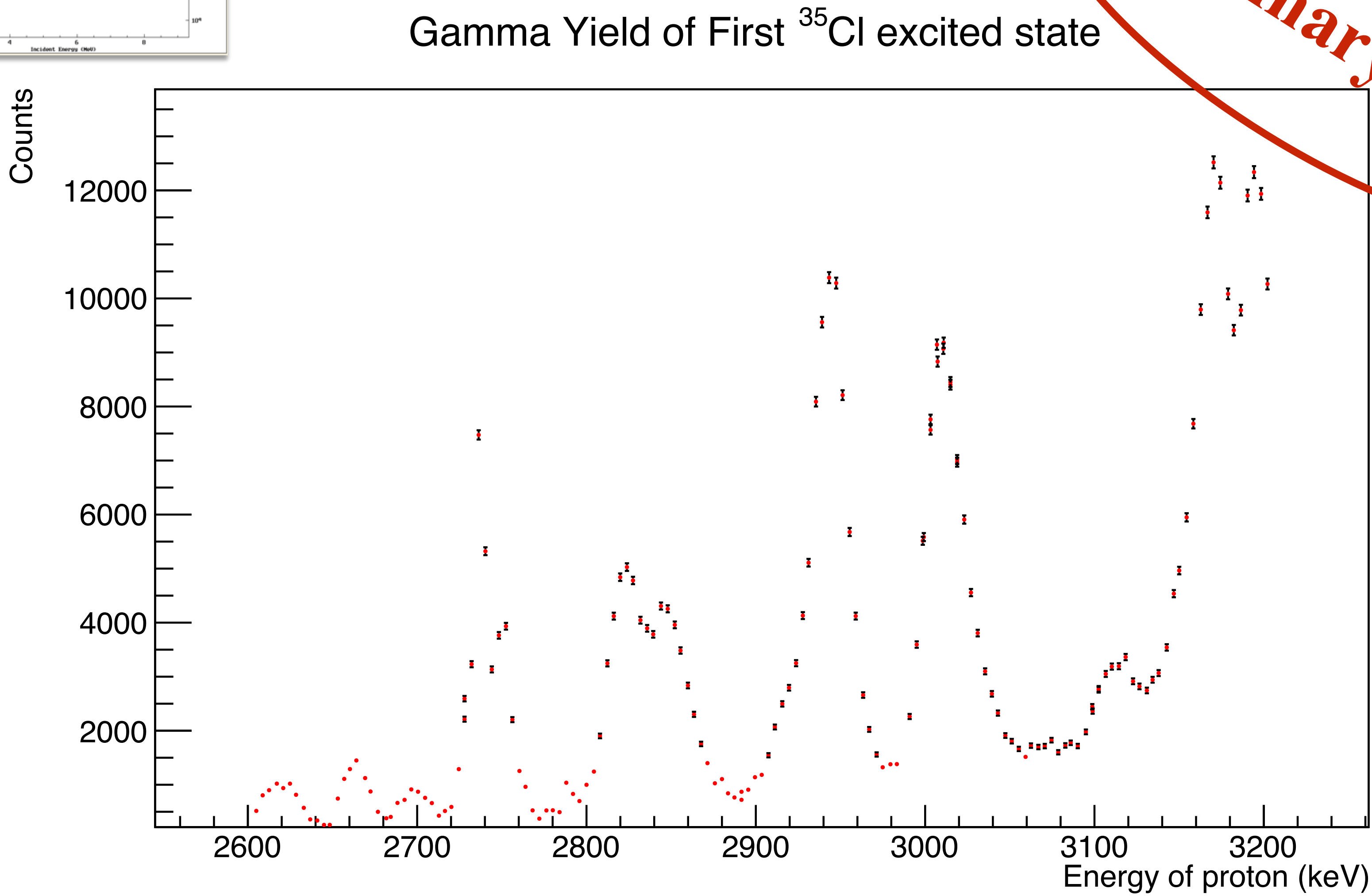
PIGE Studies: $^{35}Cl(p,p'\gamma_{1\text{-}0})^{35}Cl$



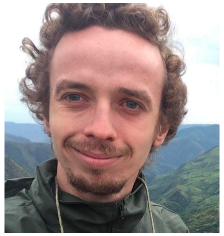
PIGE Studies: Resonance Pix



Preliminary Results



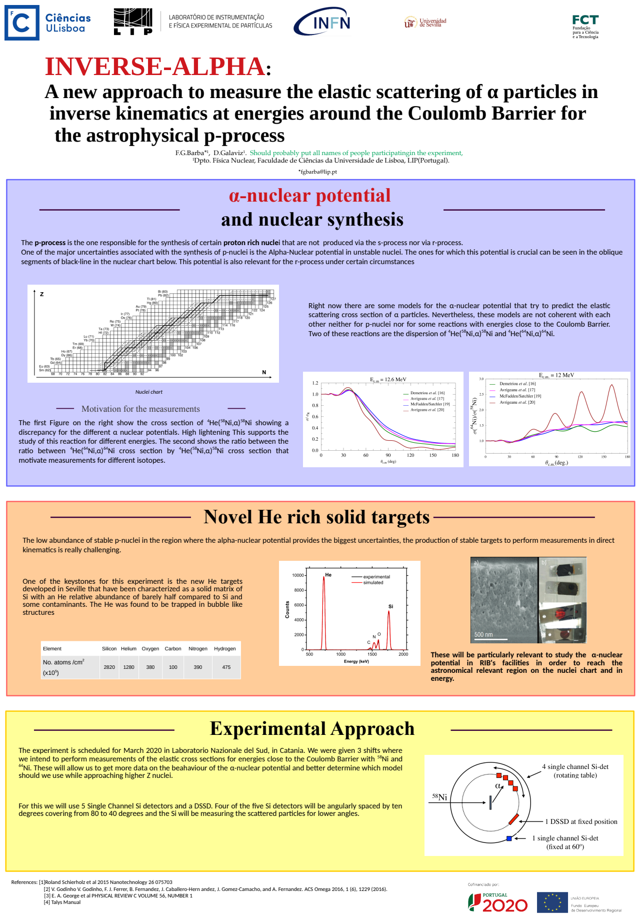
Activities

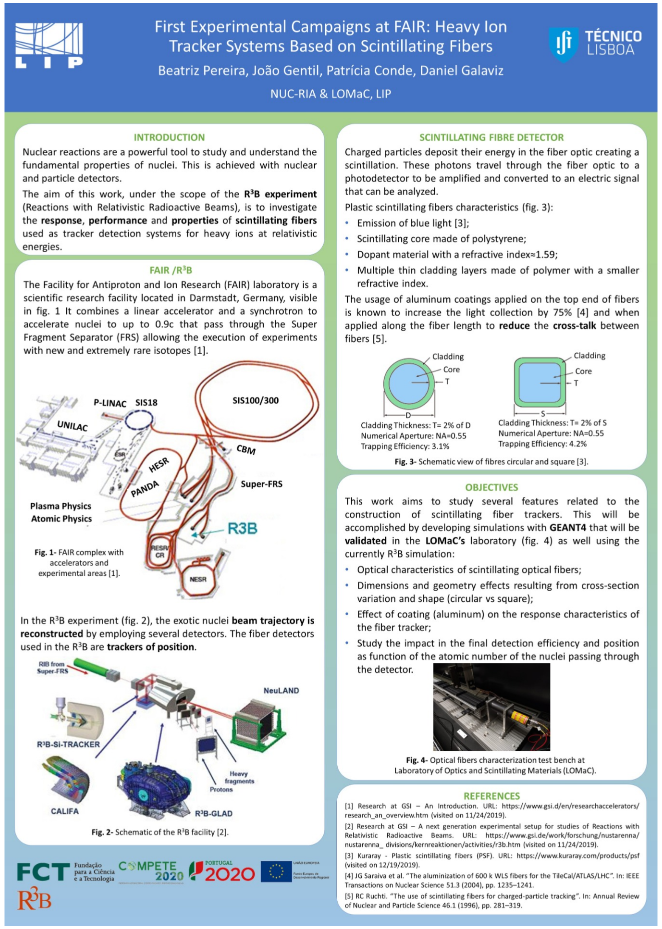


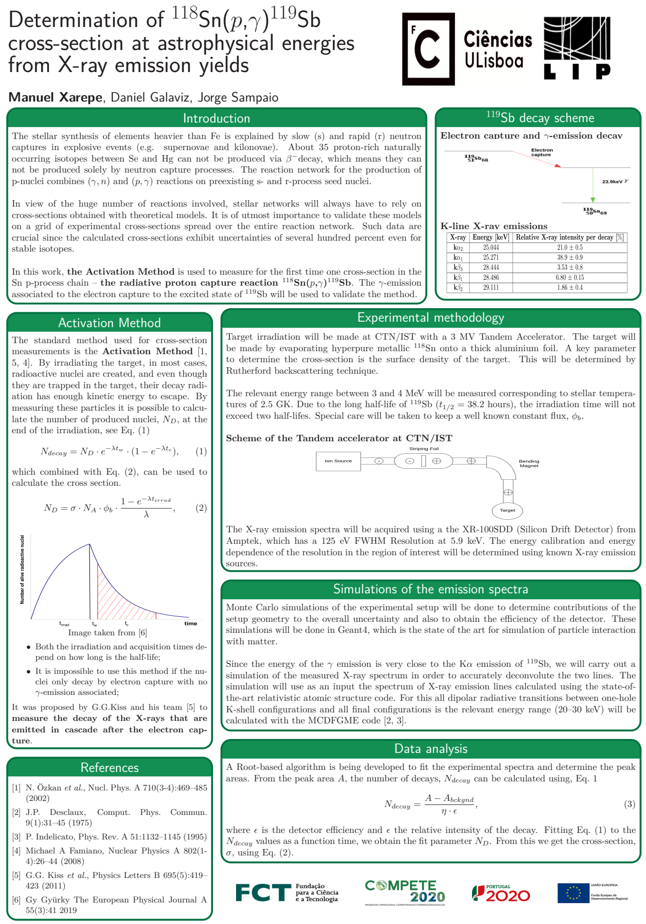
INVERSE-ALPHA

R3B Fibers

^{118}Sn(p,g)^{119}Sb







Summary

- Past **joint efforts** and **future perspectives** (Phase-0 @ FAIR)
- Importance of **Alpha potentials**
- Applications of **PIGE**

NUC-RIA @ LERHI

Low Energy Reactions with Hadrons and Ions

Daniel Galaviz

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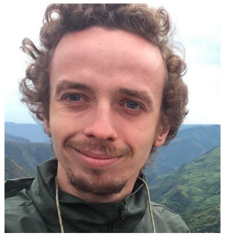
Paulo Velho

Pamela Teubig

Elisabet Galiana



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Ricardo Pires

José Nunes