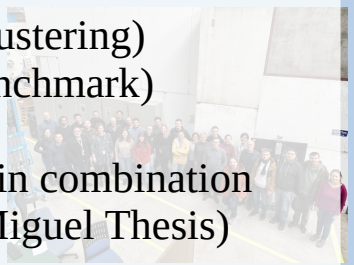
NUC-RIA Plans 2024

Physics @ R³B

- **RPC** included in experiments

S091 (SRCs clustering)
S118 (R³B Benchmark)

Exploring **RPC** use in combination with **CALIFA** (D. Miguel Thesis)



DAQ and **analysis** contributions.

- Prepare for **2025** Physics campaign
  - ★ Hypernuclei

- Funding application submitted: ~**250 k€**

Nuclear Astrophysics

Nuclear Reactions

HIE-ISOLDE @ CERN

- ★ **New poposals** for ISOLDE-CERN before LS3

- ★ **Execute Experiments @ small scale facilities:** (Seville-Debrecen-Lisbon)

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EURO-LABS

IANNA

Explosive Modelling

- Atomic calculations:
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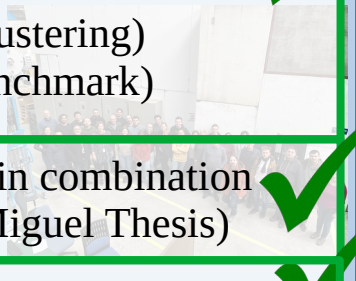

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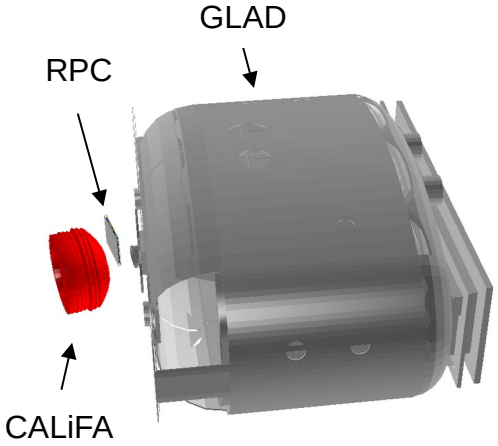
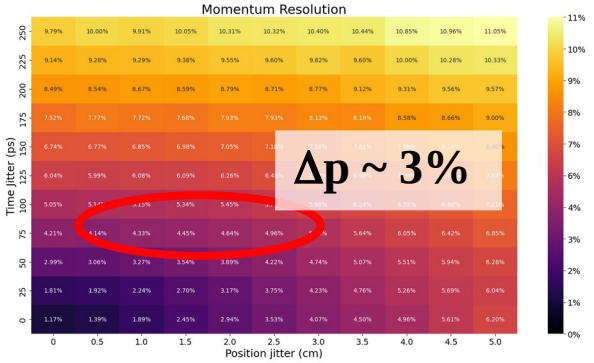


Measuring light charged particles with RPCs

Punch-through particles measured with high resolution via ToF

500 MeV/u - Proton



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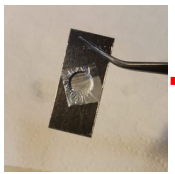
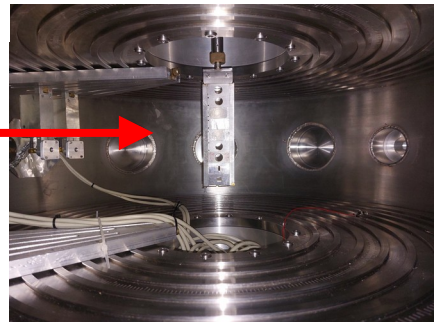
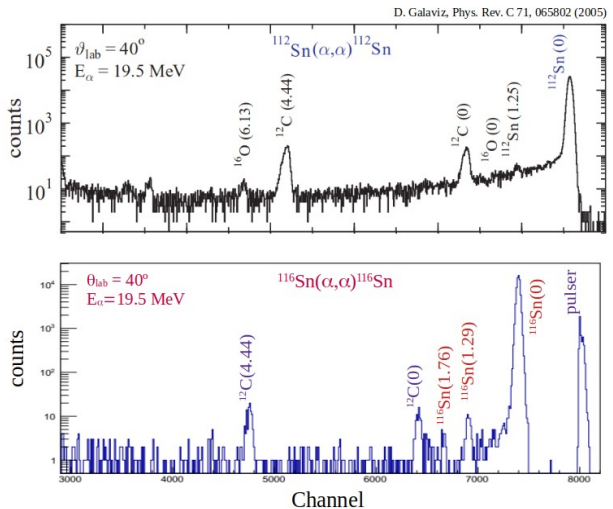
NUC-RIA Activities 2024





Elastic scattering ^{116,118}Sn(α,α)^{116,118}Sn



Nuclear Astrophysics

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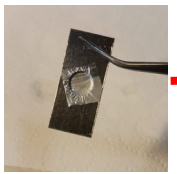
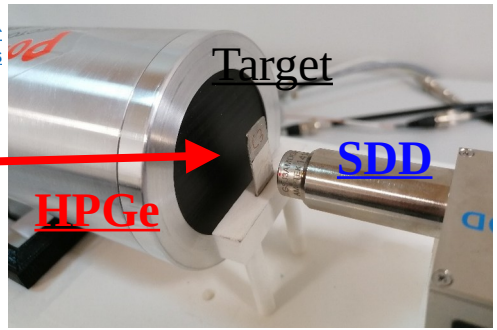
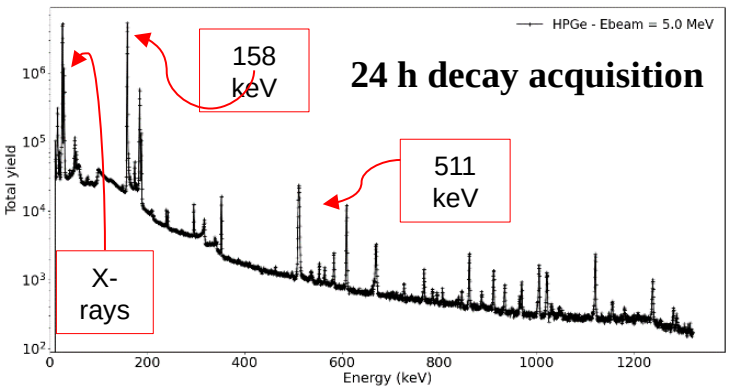
NUC-RIA Activities 2024

Centro Nacional de Aceleradores





Activation $^{116}Sn(p,\gamma)^{117}Sb$



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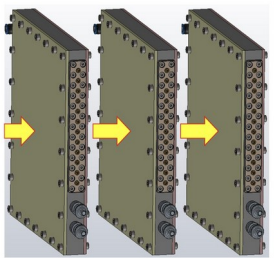
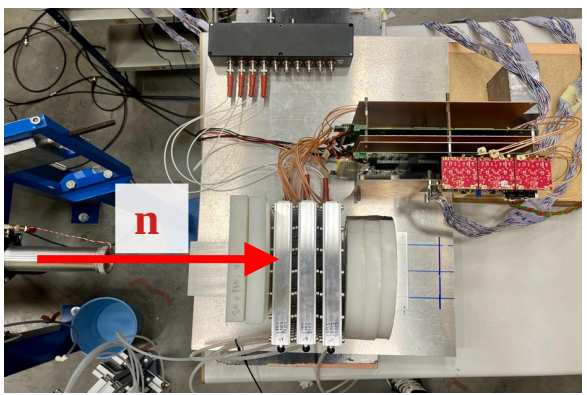
NUC-RIA Activities 2024

Accelerator and Research reactor Infrastructures for Education and Learning

Detector exposed to **epithermic** and **fast** neutrons





Nuclear Astrophysics

Nuclear Reactions

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EURO-LABS

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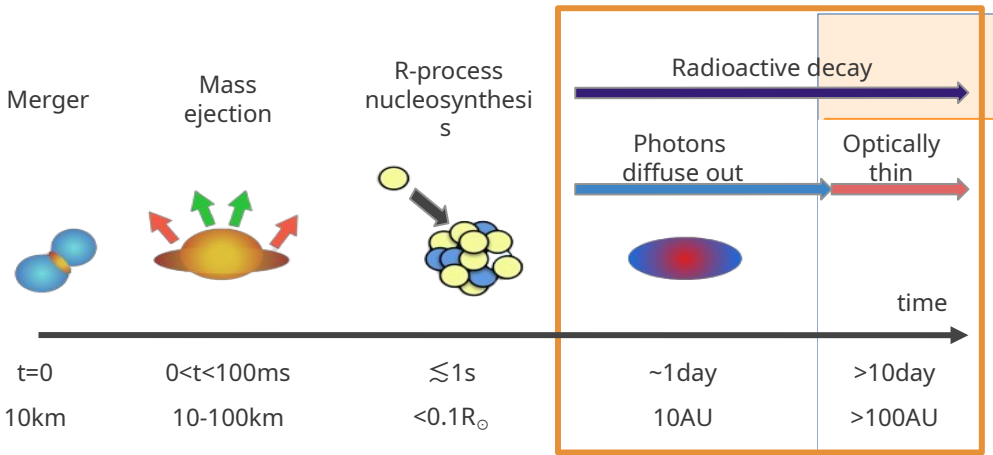
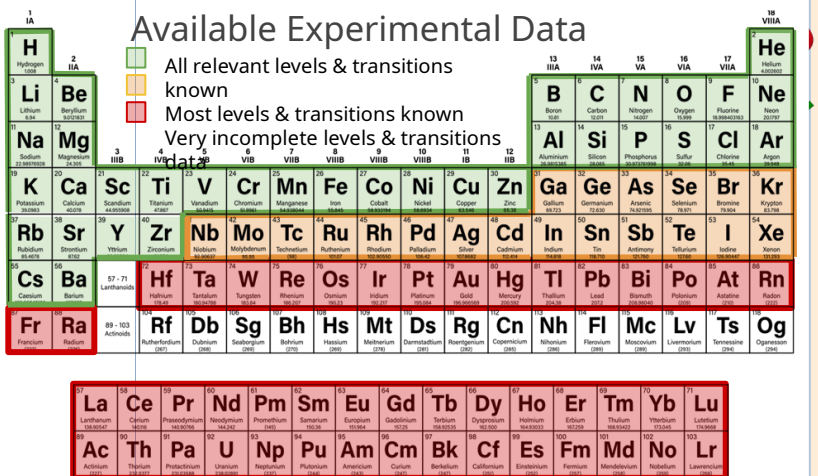
NUC-RIA Activities 2024

Nuclear Astrophysics



→ Opacity of the ejecta dominated by photon absorption by **atomic lines**

→ **Accurate atomic data** is crucial for modeling these events



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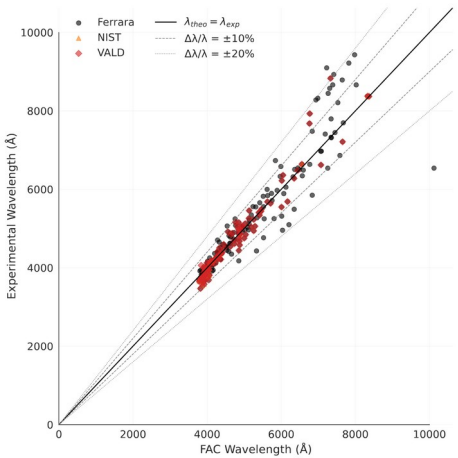
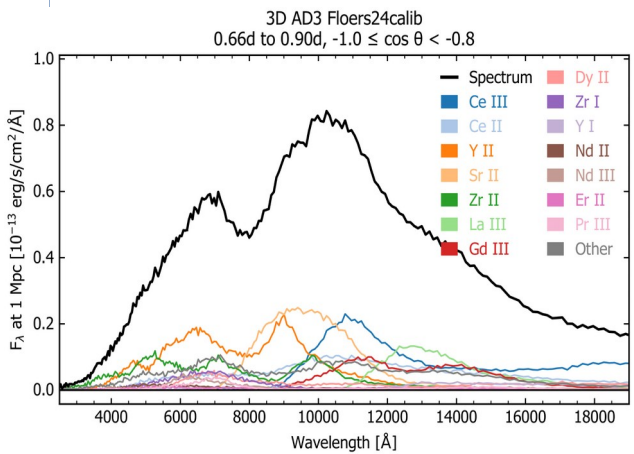
NUC-RIA Activities 2024

Nuclear Astrophysics

- Developed a method to improve atomic calculations using Sequential Model-Based Optimization (R F. Silva + 25, arXiv:2502.13250v1, accepted in PRA)
- Predicted **direct impact of new atomic data** in opacities (Floers +25, in prep.) and simulations of kilonovae spectra
- Current effort on calculating additional processes (electron-impact, recombination…) cross sections for **complete modelling and identification of spectral features**





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NUC-RIA People 2024

Senior

D. Galaviz

L. Peralta

J. Sampaio

J. M. Pires Marques

P. Teubig

P. Velho

Ph.D.

R. F. Silva

F. Afonso

M. Xarepe

C. Coelho

F. Barba

M.Sc.

R. Pires

M. Paulino

R. Nunes

D. Miguel

C. Felgueiras

L. Leitão

A. Vicente

B. Amorim

B.Sc.

P. Copeto

T. Campante

+

1-2 LIP Summer Students

NUC-RIA People 2025

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P. Velho

Ph.D.

R. F. Silva

F. Afonso

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J. Graça

J. A. Jantarada

M.Sc.

R. Pires

T. Campante

M. Paulino

R. Nunes

C. Felgueiras

A. Vicente

L. Leitão

P. Copeto

D. Garcia

B.Sc.

D. Encarnação

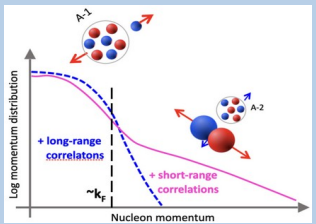
+

5-7 LIP Summer Students

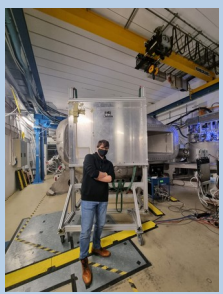
NUC-RIA Plans 2025

Physics @ R3B

- Finish analysis on **SRCs** on exotic nuclei (PhD Thesis **M. Xarepe**)



- **Light ion** measurement using tRPCs: experiment **S249** (M.Sc. Thesis **P. Copeto**)



- Preparations for 2026 campaign: $^{3}_{\Lambda}H$

Nuclear Astrophysics

Nuclear Reactions

HIE-ISOLDE @ CERN

- ★ Grant Application for **ISRS** ISOLDE-CERN
- ★ Experiment preparations at **INFN/LNS** (2025/26)
- ★ Target developments: **fundamental** and **applied** sciences

EURO-LABS

Explosive Modelling

- **r-process nuclei** production in Kilonovae
- ★ **Atomic parameters** for non-LTE modeling
- ★ **PhD and M.Sc. Thesis** ongoing
- Explosive **nuclear reaction network** studies (collaboration with Konkoly Observatory, Budapest)

NUC-RIA SWOT

Strength

- Strong **international collaboration** experience.
- Expertise in instrumentation, data analysis, particle transport simulations, and nuclear astrophysics.
- Proven track record of participation in **experiments** at various radioactive and stable beam accelerator institutes.
- Combination of experimental and theoretical work

Opportunities

- International participation offers visibility and potential to attract **young researchers**.
- Opportunities to expand current collaborations to other institutes.
- Participation in **International Networks** (EUROLabs, ChETEC-Infra, IANNA,...) offers growth opportunities.

Weaknesses

- **Limited funding**, which may prevent the group from effectively contribute to the construction of new detection systems in international collaborations.
- **Limited** number of **senior researchers**, with strong teaching commitments.
- Lack of postdoctoral researchers in the group

Threats

- Inability to effectively participate in next-generation facilities like **FAIR** or **ISOLDE** may endanger future involvement.
- Lack of funding may be an obstacle to student retention and recruitment of senior researchers, hindering group growth and sustainability.