

IDEAS³ status

Identification and DEcay Assisted by S³

Project context and current design

Léo Plagnol

ID station @ S³-LEB :

- Enhance isotope identification capabilities
- Benefits for other spectroscopy experiments :
 - Production measurement
 - Contaminants with similar masses can be identified

Detailed β -decay spectroscopy

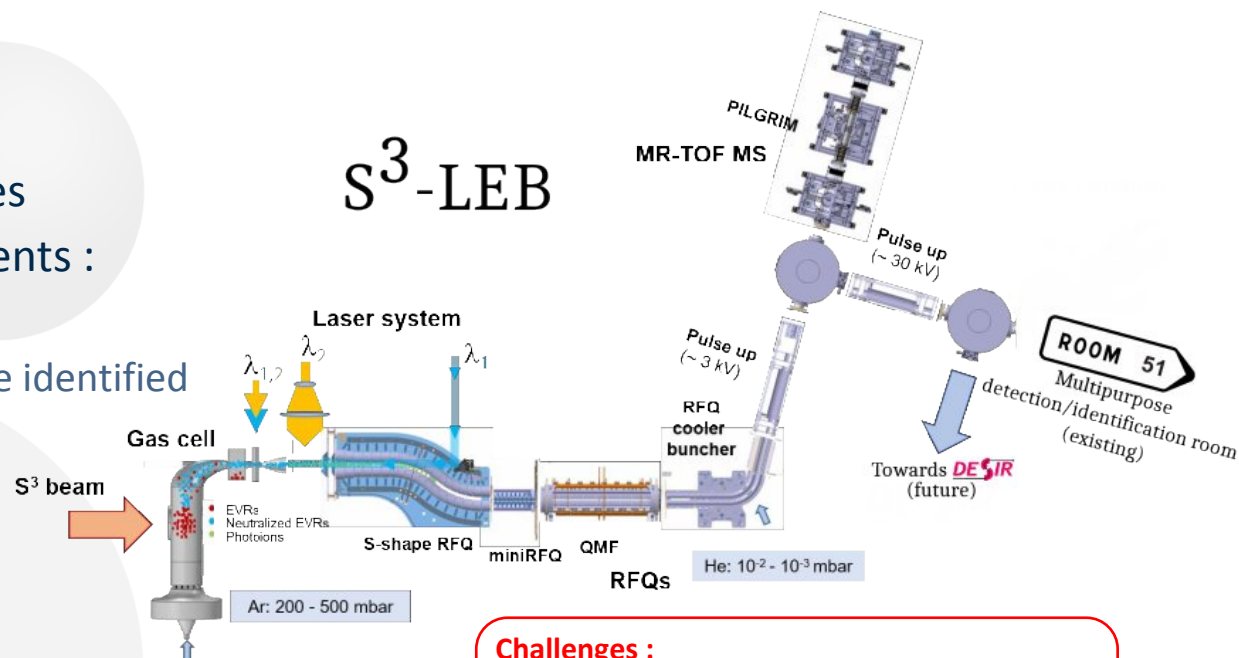
- Powerful technique (narrow lines)
- Benefits from :
 - Beam purification
 - Isomer selection
- Complementarity with SEASON :

SEASON

- Alpha-oriented detection
- Windmill system

IDEAS³

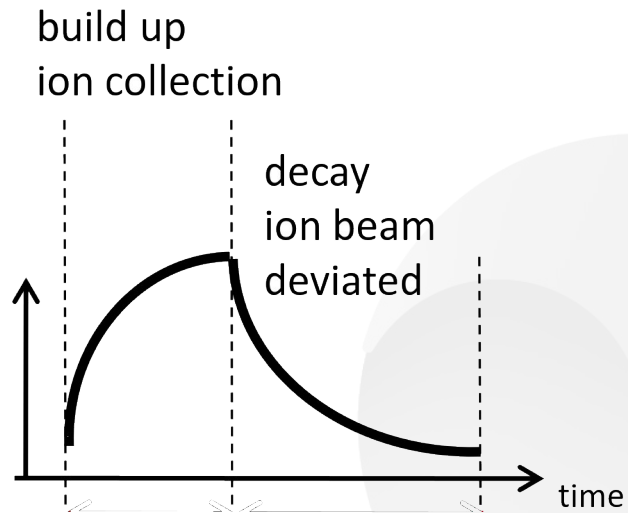
- Gamma-oriented detection
- Tape system suitable for more intense beams



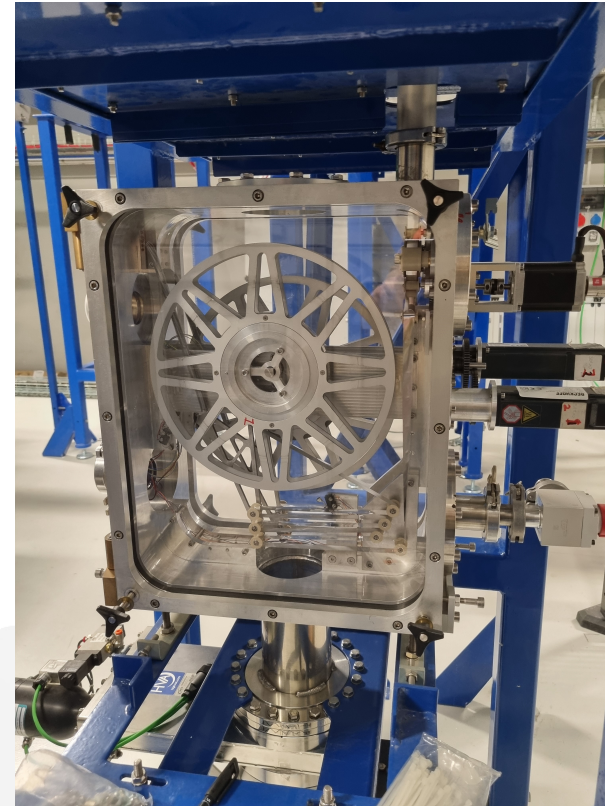
Challenges :

- **Simplicity :**
 - Installation
 - Repairing
 - Use & analysis (plug-and-play)
 - few electronic channels
- **Modularity**
 - Adaptation to needs

- Beam collected on a tape

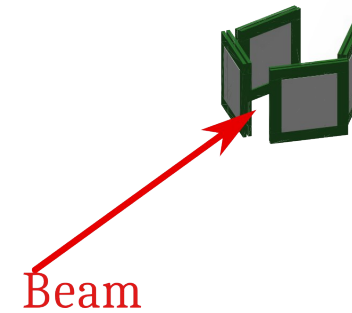


- Tape system below the beam line
- Based on latest design



Tape transport
system @
SPES (same
design)

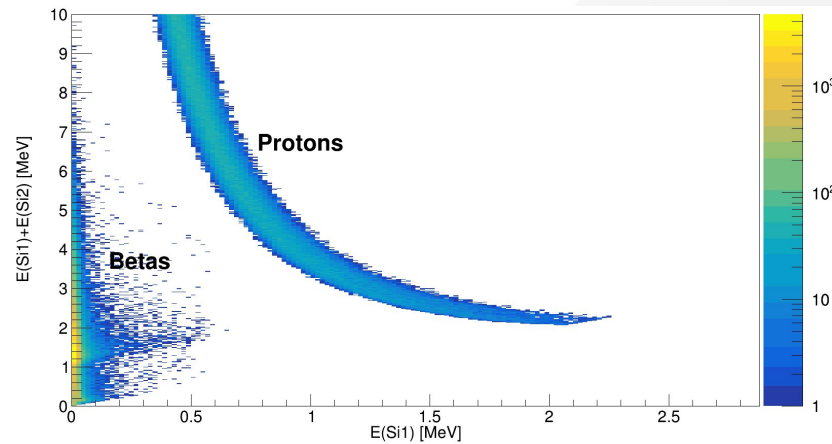
- Beam collected on a tape
- Multiple observables :
 - β^+ & particle tagging & β -delayed protons :
 - 4 Silicon telescopes



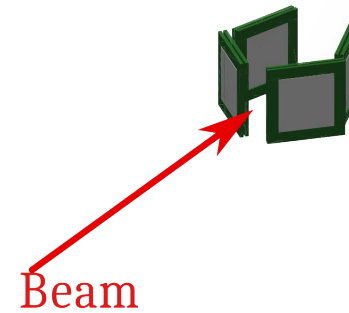
Silicon geometry :

- Maximise the efficiency (here ~28% total)
- Not in front of X-ray detectors
- Thickness $\leftrightarrow$ sensitivity

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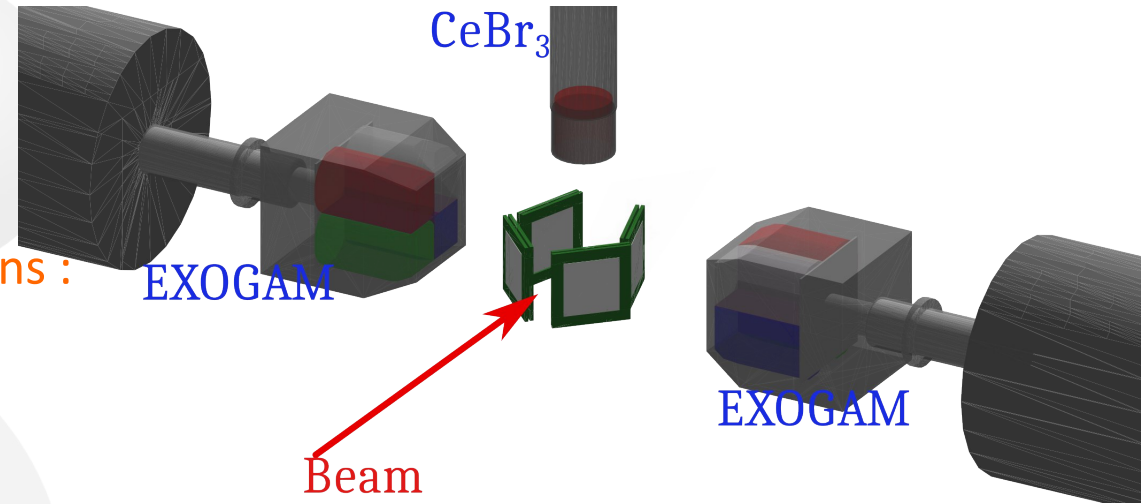
E- ΔE method thanks to
Silicon telescopes



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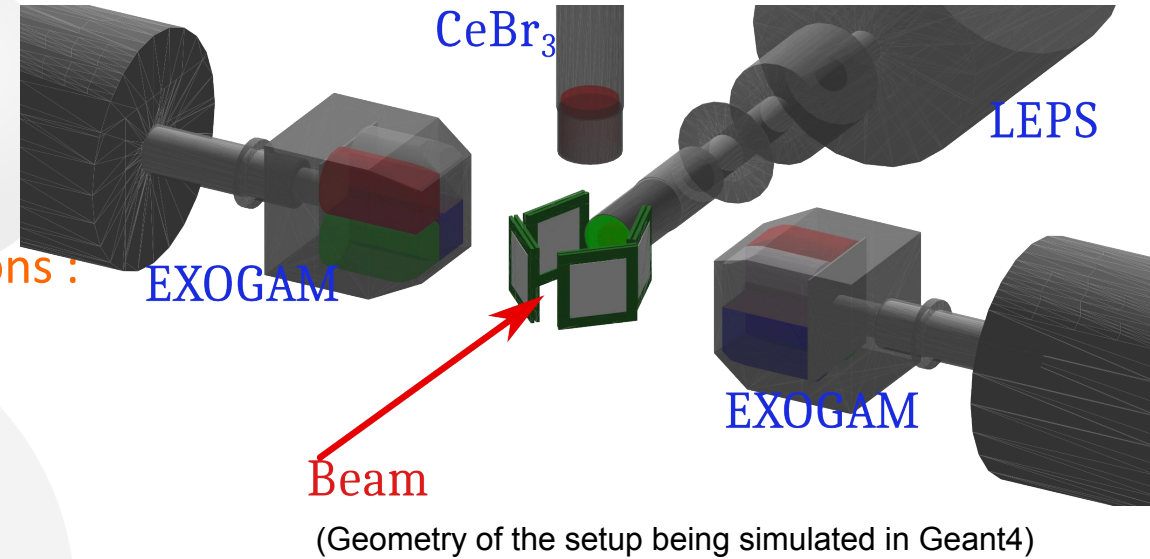
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 - Gamma-spectroscopy
 - HPGe (Exogam)
 - CeBr₃ (HE)



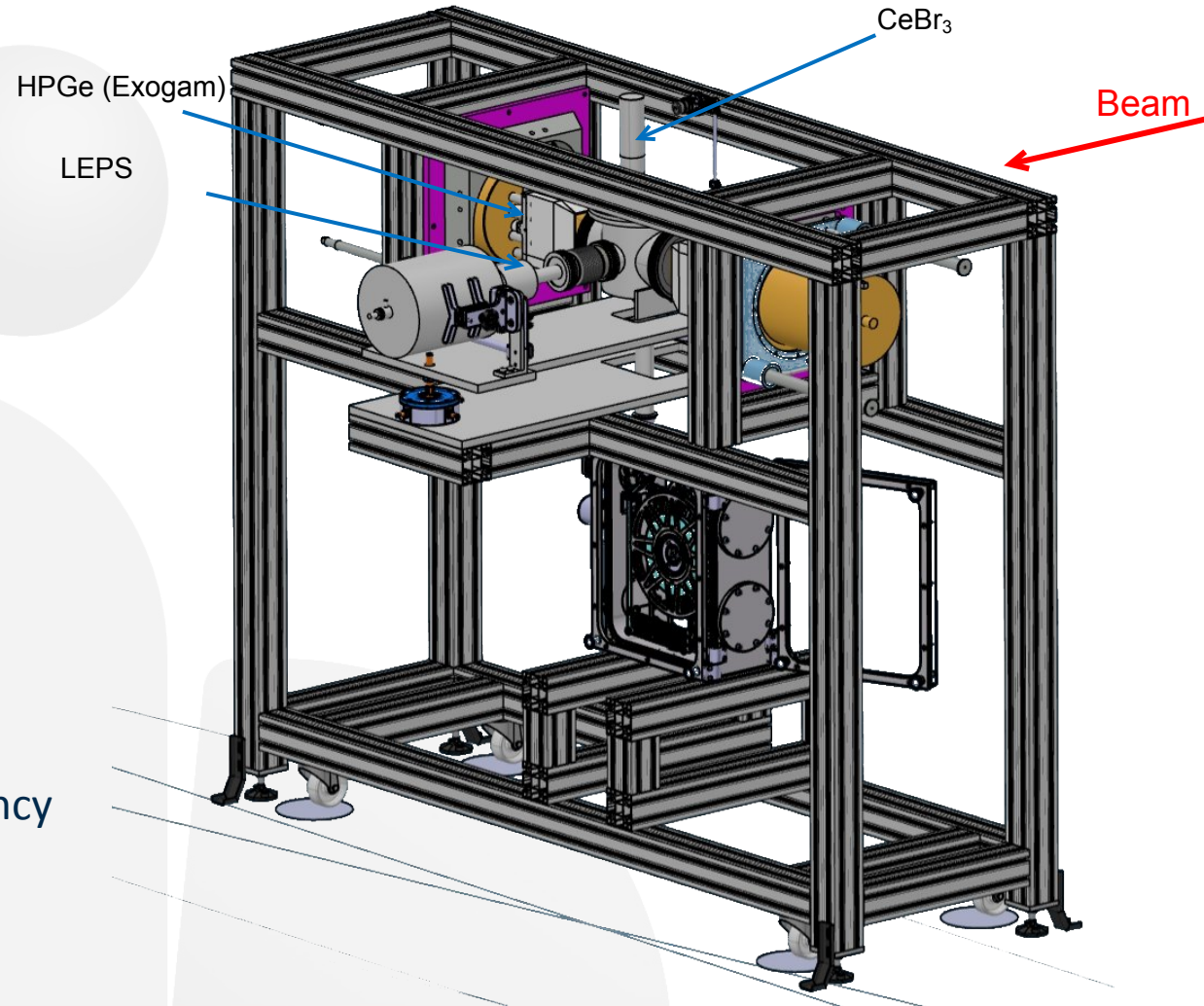
Gamma-ray detectors :

- Other types of detectors supported

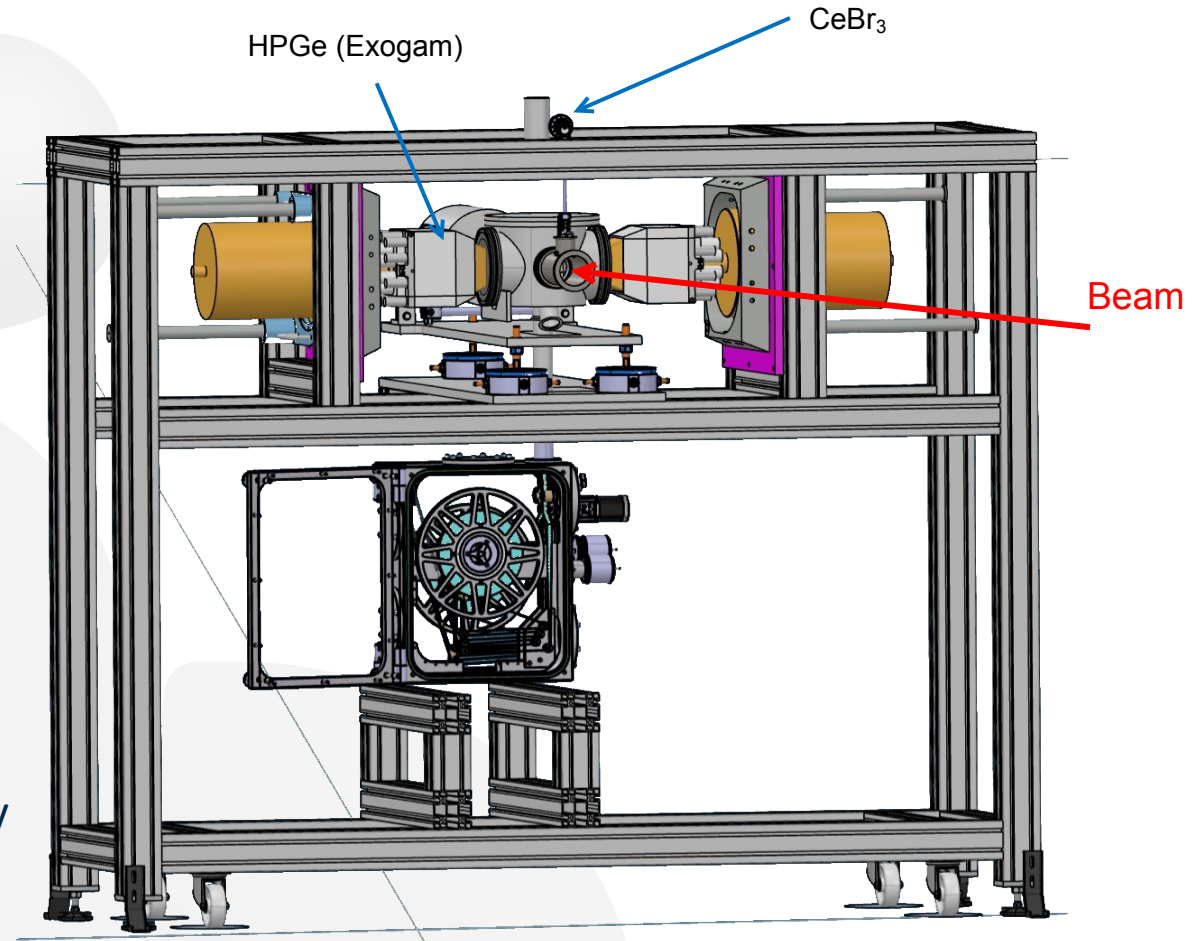
- Beam collected on a tape
- Multiple observables :
 - β^+ & particle tagging & β -delayed protons :
 - 4 Silicon telescopes
 - Gamma-spectroscopy
 - HPGe (Exogam)
 - CeBr_3 (HE)
 - X-ray spectroscopy & IC tagging
 - Planar Germanium detector (LEPS)



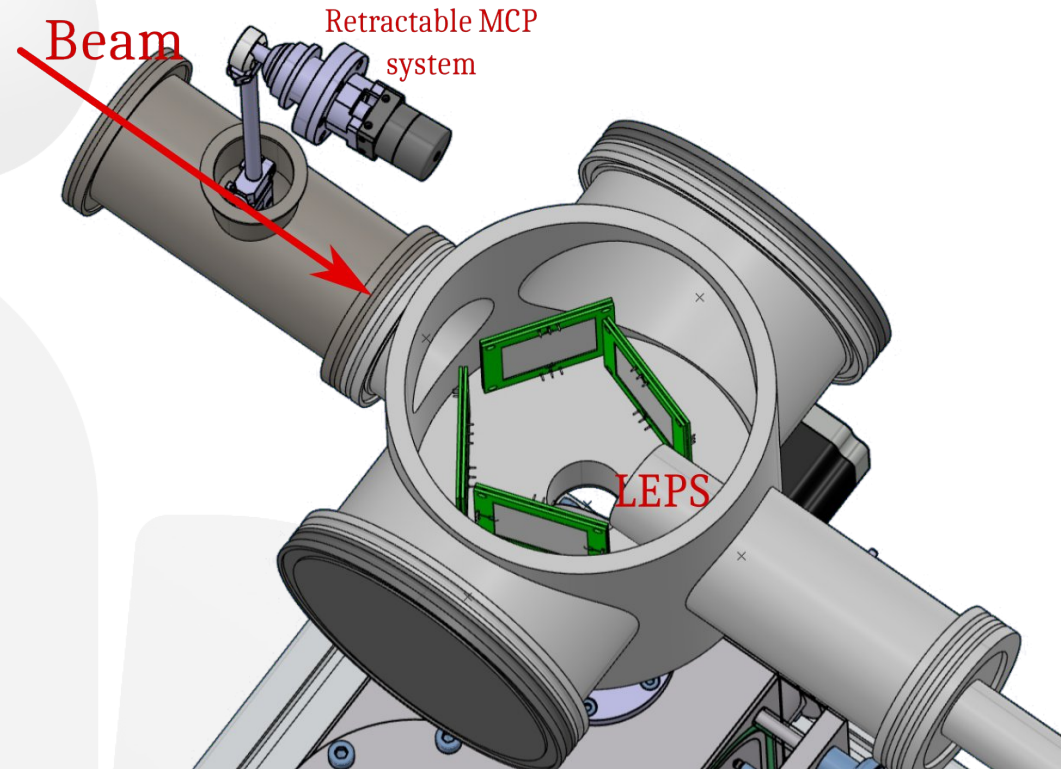
- Mechanical design in progress
 - Work of Matthieu Brière
- Focus on :
 - Compactness
 - Accessibility
 - Modularity
- Rely on GANIL only for Ge cooling
- Future improvement on the way :
 - Source insertion for calibration/efficiency



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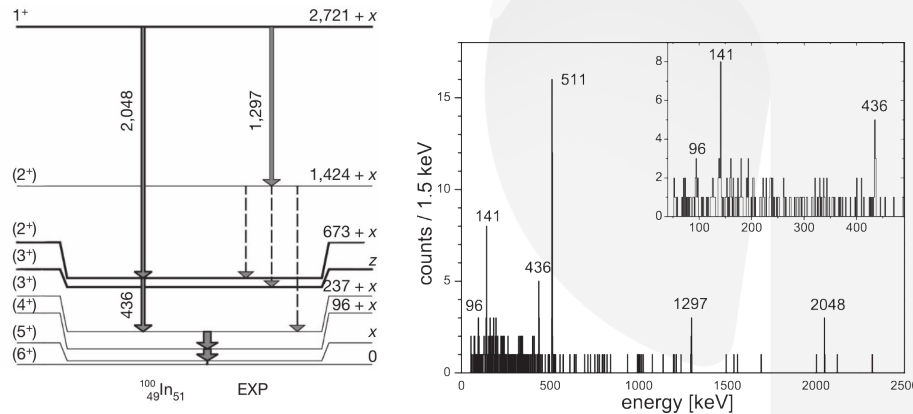


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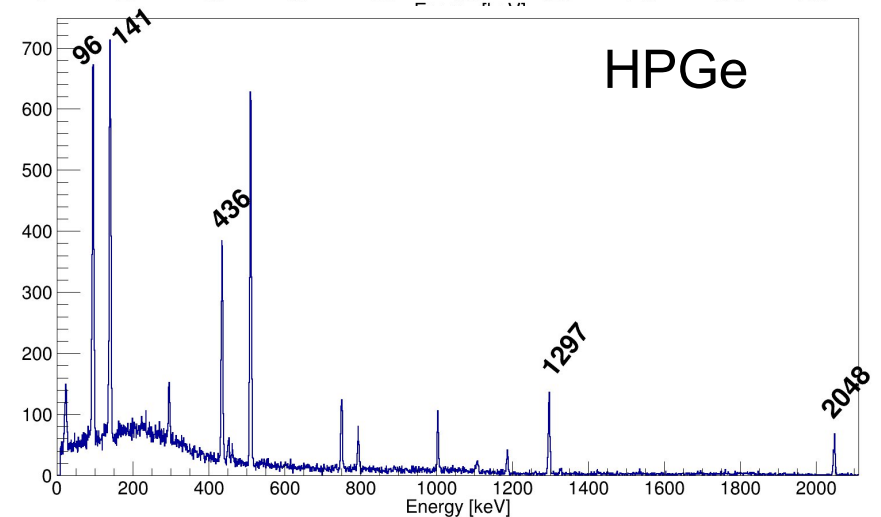
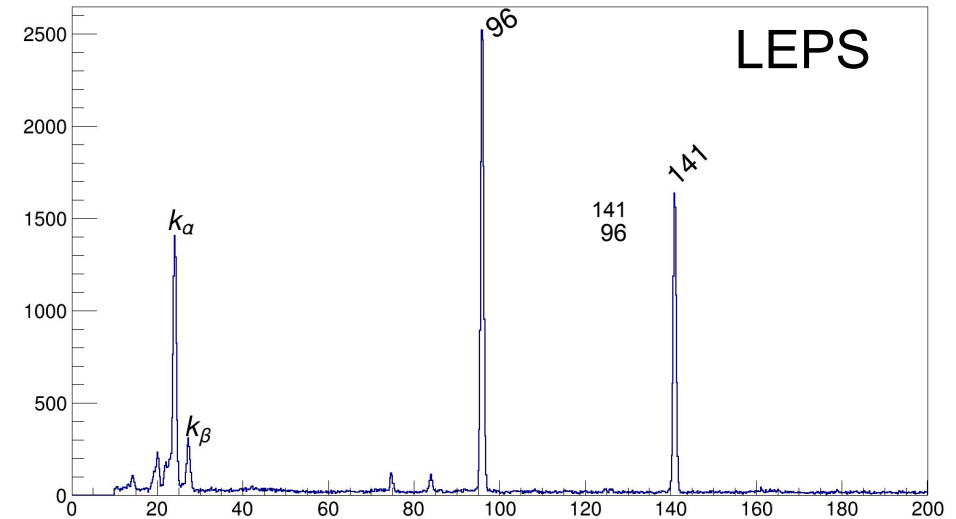


Closer view of the Al vacuum chamber

- **NPTool framework :**
 - Modular
 - Simulation & analysis framework
- Need to benchmark on known cases (difficult for βp)
- Example of gamma spectroscopy capabilities
(10^6 events ^{100}Sn beta decay $\sim$ a day @ $S^3\text{-LEB}$)



Hinke et al., Nature 486, 641-345 (2012)

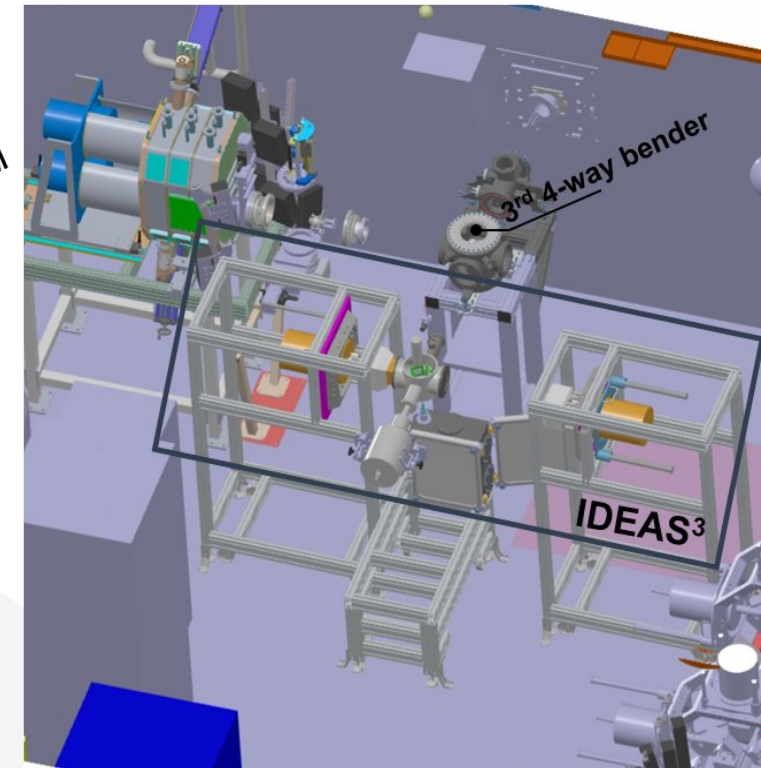
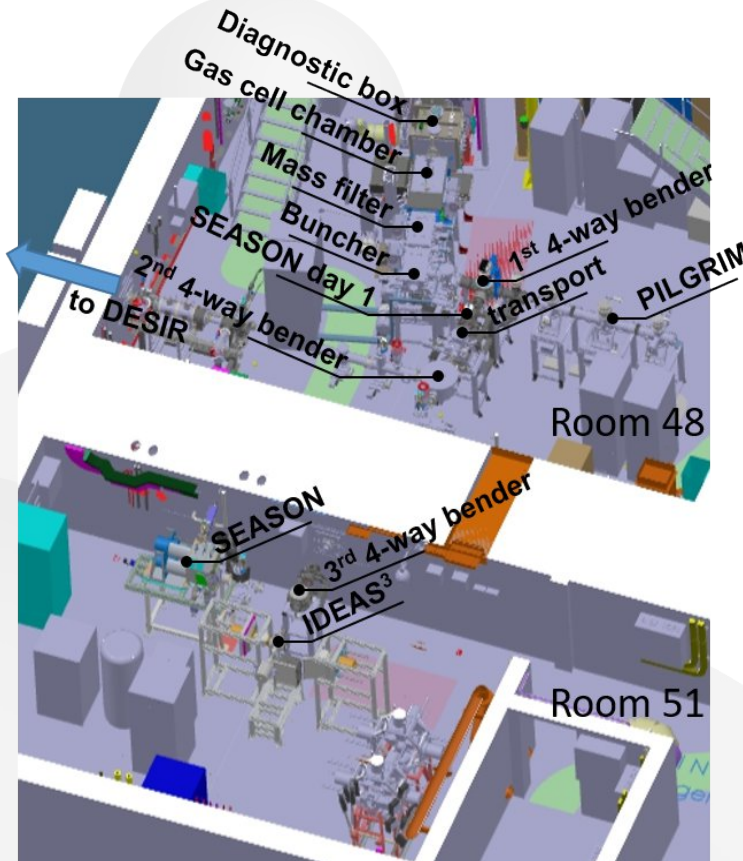


Position :

- Room 51
- 0 deg from 3rd bender

Planning :

- Summer 2025 :
 - Blueprints
 - Tape station ready
- Late 2025 :
 - Testing and mounting
- Early 2026 (S³ commissioning)
 - Mounted @ GANIL



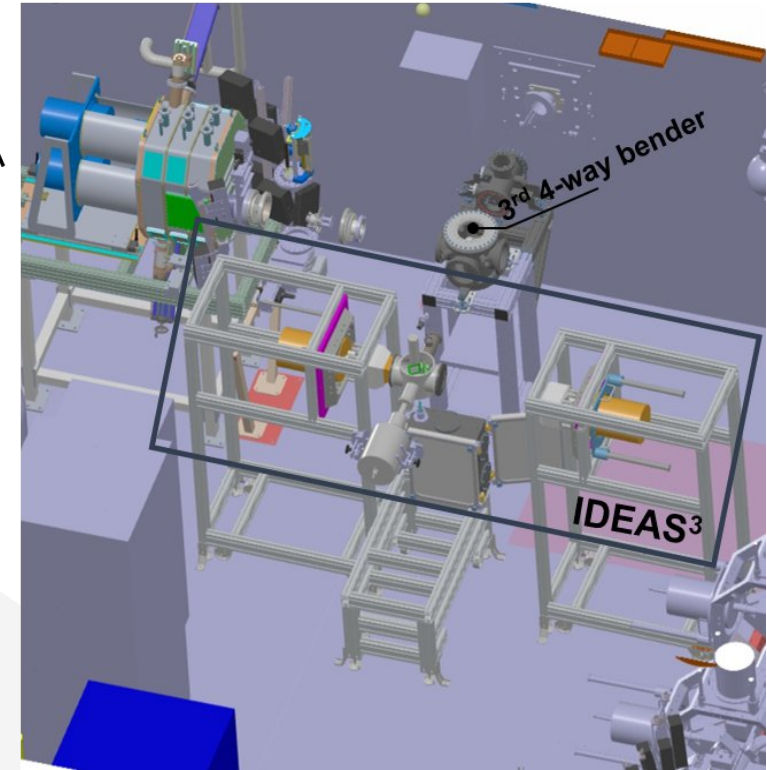
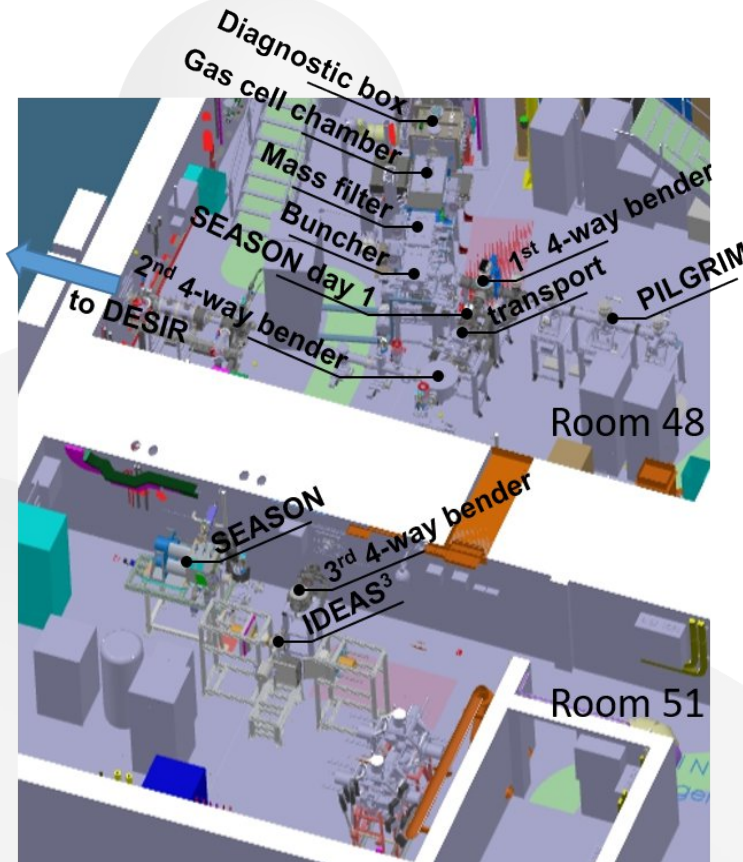
Preliminary room layout

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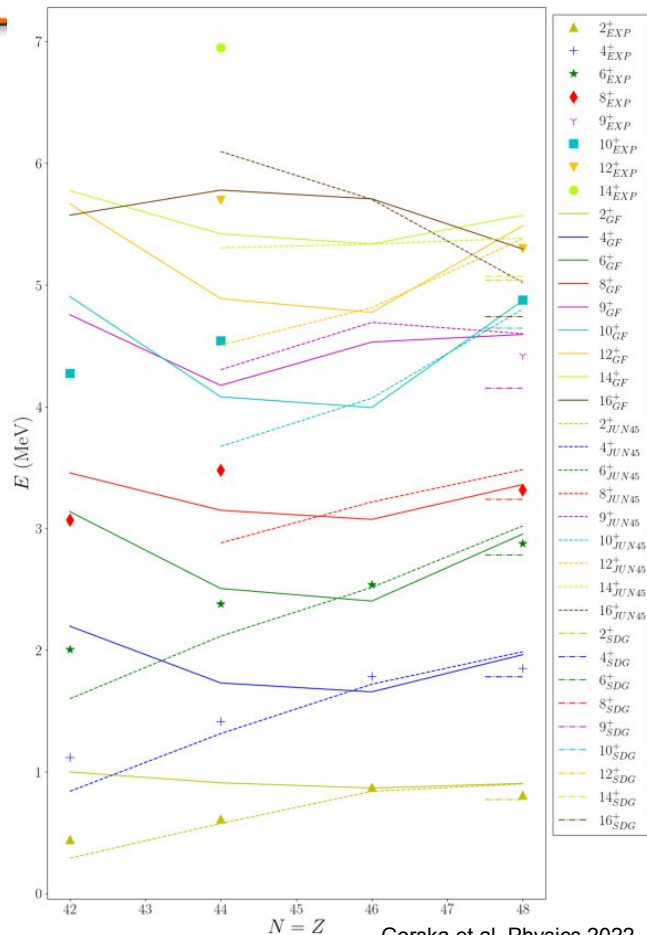
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THANK YOU

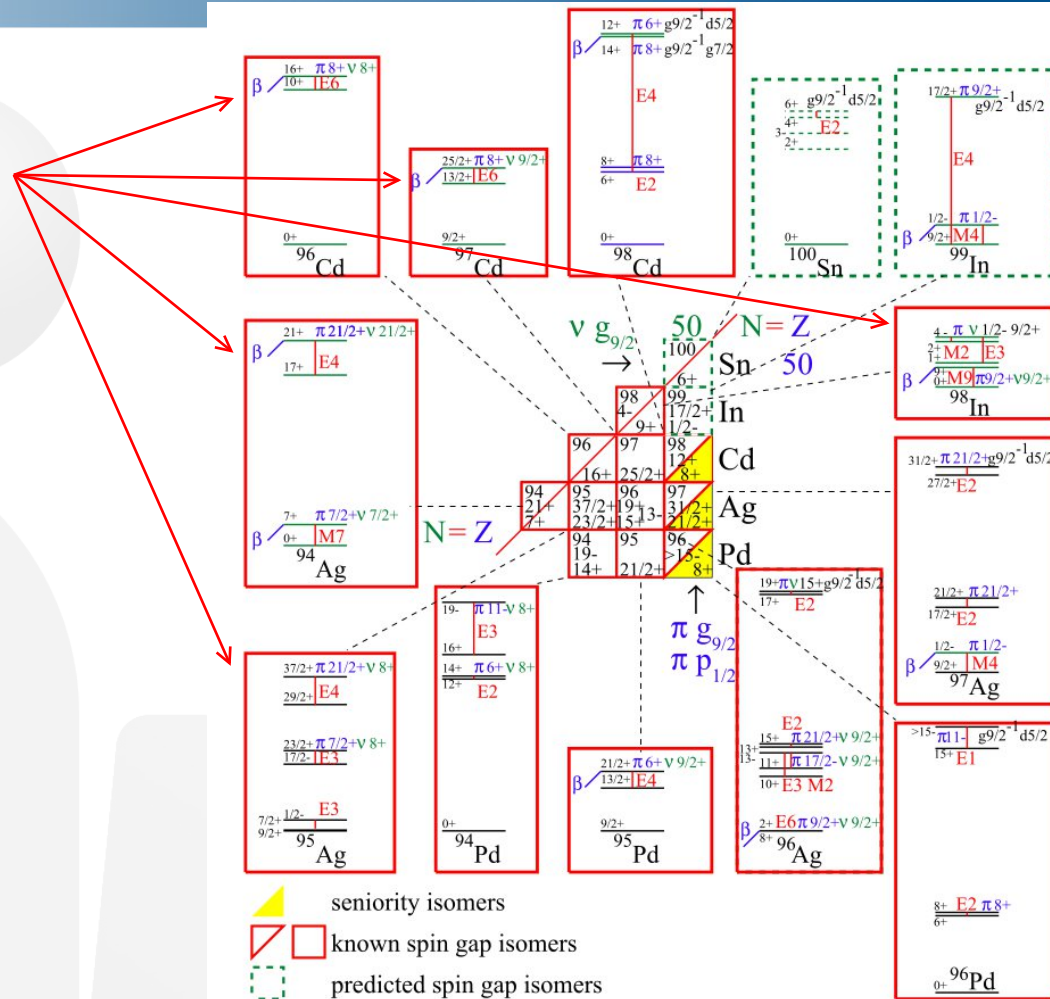
Backup

Isomers @ $Z < 50, N < 50$



Gorska et al. Physics 2022, 4, 364-382

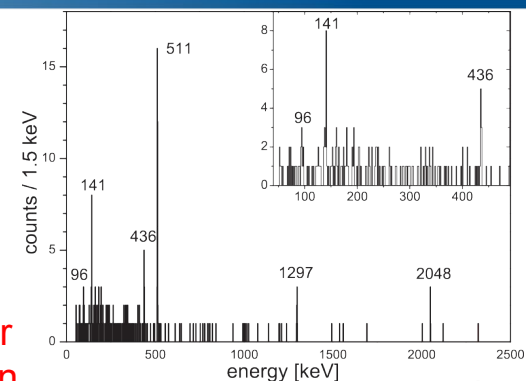
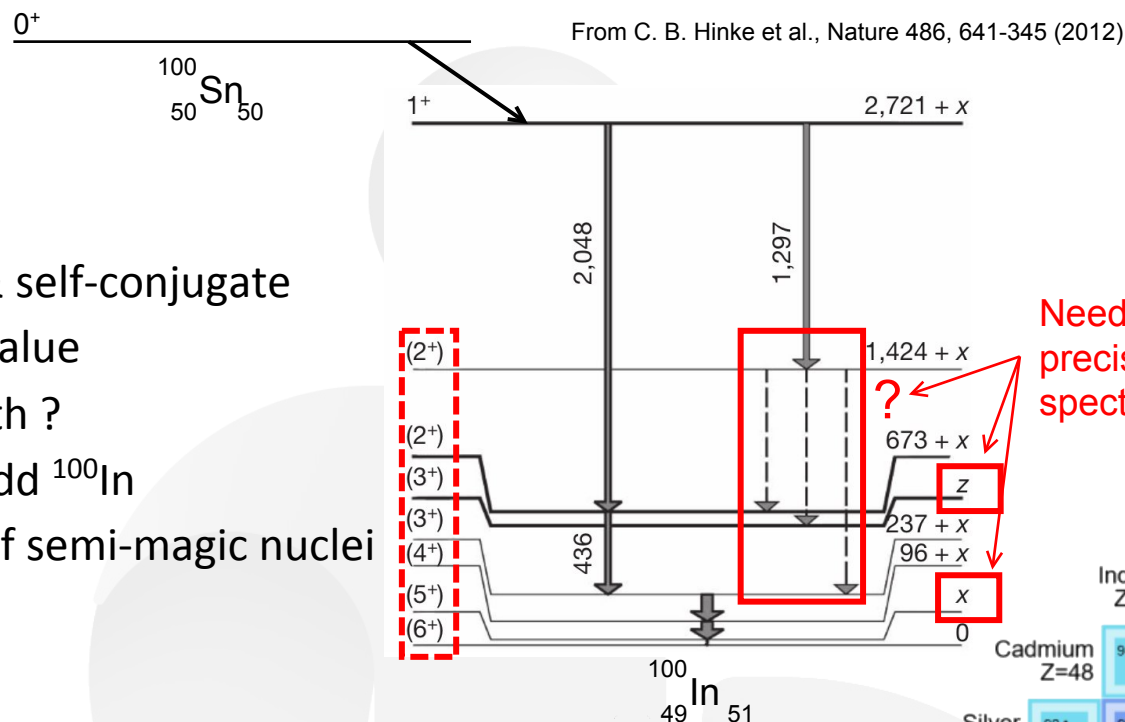
Unknown
excitation
energy !



Faestermann et al. Prog Part Nuc Phys 69 (2013) 85

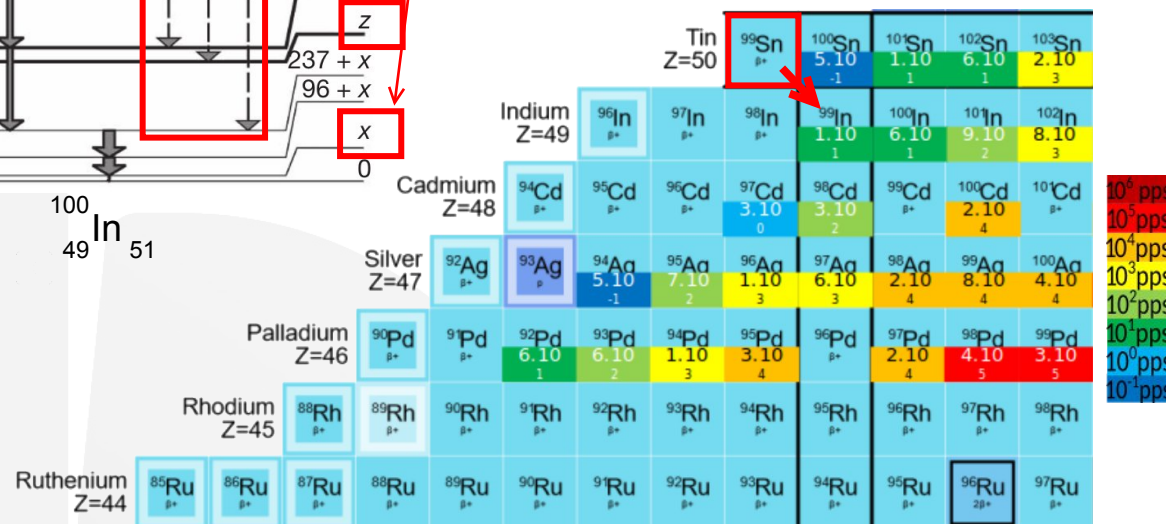
- ^{100}Sn :
 - Doubly magic & self-conjugate
 - Lowest $\log(ft)$ value
 - β -decay strength ?
 - States in odd-odd ^{100}In
 - Longest chain of semi-magic nuclei
- Region $N=Z$:
 - p-n pairing
 - Seniority isomers
 - Shape coexistence ($Z < 50$)
 - Low-energy intruders
 - rp-process

➡ **S³-LEB : a unique place for studying the ¹⁰⁰Sn region !**



Need for precision spectroscopy !

α -clusters ?



From <https://u.ganil-spiral2.eu/chartbeams/>