



Contribution ID: 139

Type: **Contributed Oral**

Radioactive ion beam development at SPIRAL1-GANIL: recent progress and future developments

Wednesday, 10 September 2025 12:30 (20 minutes)

SPIRAL1 is a unique radioactive ion beam (RIB) production facility as it can operate with several primary beams and target materials for isotope production. The upgrade of the last decade also allowed ionizing isotopes of non-gaseous elements, considerably extending the number of possible RIBs.

We will review recent progress supported with experimental results and discuss on-going and planned future developments. We will focus on three key aspects:

- Three production test runs were performed with a FEBIAD source between 2023 and 2024. During these runs many metallic isotopes from K to Cs were ionized and measured, including ^{48}Cr , $^{56,57}\text{Ni}$, ^{55}Co and $^{52,53}\text{Fe}$. Furthermore, we will discuss studies that are currently being carried out for a new version of the FEBIAD assembly with a hotter target cavity to speed-up the extraction of refractory elements.
- A unique target ion-source (TIS) assembly, TULIP, was developed for high efficiency extraction of short-lived neutron-deficient isotopes. A surface-ionization version of the TULIP TIS was successfully tested in 2024 and a second test is planned for 2025. A FEBIAD version is currently being tested on the SPIRAL1 test bench.
- SPIRAL1 has only ever been operated with graphite targets, although target materials up to Nb are authorized by safety regulations. New target materials are being studied, with the goal to increase the production rate and beam intensity of many isotopes from various elements, ranging from Zn to Rb.

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Session Classification: Oral Session

Track Classification: Radioactive ion sources and charge breeders