

# New half-lives measurements for r-process in $A \sim 225$ Po-Fr nuclei

Friday, July 26, 2024 9:45 AM (20 minutes)

The astrophysical rapid-neutron capture process (r-process) of explosive nucleosynthesis is responsible for the formation of half of the heavy nuclei above Fe [1]. Actinides are produced towards the end of this process, when the neutron flux is expected to be minimal, and it is supported also by fission processes. Given that the r-process path runs far away from the accessible species, in this heavy region of the chart of nuclides, experimental inputs on  $\beta$  decay for nuclei beyond  $N=126$  are particularly useful to test predictions of global nuclear models.

In this paper results from a recent experiment performed at GSI-FAIR (Darmstadt, Germany) within the HISPEC-DESPEC experimental campaign, as part of the FAIR Phase-0 program, will be discussed. The experiment populated  $220 < A < 230$  Po-Fr nuclei in a relativistic fragmentation reaction induced by a 1 GeV  $^{238}\text{U}$  beam. The species were selected and identified using the FRagment Separator (FRS) and implanted in the DEcay SPECTroscopy (DESPEC) station [2] to study their subsequent  $\beta$  decay. The DESPEC station is composed of a stack of Double Sided Silicon-Strip Detectors (DSSD) sandwiched between two plastic scintillator detectors, surrounded by a hybrid  $\gamma$ -detection array consisting of high-resolution HPGe and fast timing LaBr<sub>3</sub>(Ce). The extracted  $\beta$ -decay half-lives are discussed with the help of recent theoretical models to assess the impact of the measured values in the predictions of the r-process. Perspectives of future measurements in the region will be provided.

[1] M.R. Mumpower et al., Prog. Part. Nucl. Phys. 86 (2016) 86;

[2] A. K. Mistry et al., Nucl. Instrum. Methods Phys. Res. A 1033 (2022) 166662

**Presenter:** POLETTINI, Marta (University of Padova and INFN Padova)

**Session Classification:** Heavy Nuclei and Super Heavy Elements - Part 2