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## Measurement of statistical properties of interest for the nucleosynthesis of p-nuclei by vp-process

Nuclei beyond iron are mostly produced by neutron-capture processes (s-process and r-process). However, around 35 rare but stable nuclei, from  $^{74}\text{Se}$  to  $^{196}\text{Hg}$ , need another production mechanism, since they are situated on the neutron-deficient side of the stability valley. These are called p-nuclei. The main scenario for their production is photodisintegration of heavy, neutron-rich seed nuclei, in supernova environment with temperature reaching a few GK. However, this mechanism fails to explain the high abundance of some of the lightest p-nuclei, so other nucleosynthetic contributions are needed. One of the most promising scenarios is called vp-process: it consists of building the p-nuclei starting from the iron region in a proton-rich supernova environment, by proton captures helped by a neutrino flux. This flux indeed allows the late formation of neutrons and the occurrence of (n,p) reactions, by-passing the waiting points that would stop the building up of nuclei by proton capture alone.

Such process involves a large reaction network with exotic nuclei, and theory is needed to determine the corresponding reaction rates and extract the produced abundances. Theoretical calculations are usually based on the Hauser-Feshbach statistical model, where the cross sections depend on several nuclear properties such as optical potentials, level density and gamma strength.

We propose to determine the level density and gamma strength of some of the most crucial nuclei for the vp-process by applying the beta-Oslo method, where the nucleus of interest is produced by beta decay, and the consecutive gamma cascade is analyzed by TAS to extract the quantities of interest. For this purpose, we plan to use DESIR high-purity beams of radioactive nuclei and the new (NA)2STARS detection system, which couples existing arrays of scintillators already used for TAGS measurements (Rocinante, DTAS) with new LaBr<sub>3</sub> modules that will increase the spectroscopic capacity of the device.

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