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Nucleosynthesis in the cosmos: The ^{26}Al case

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Nucleosynthesis is an ongoing process in the cosmos which take place in various astrophysical environments such as massive stars, core-collapse supernovae or novae. One of the most famous example of evidence in the continuity of the process was the discovery of γ-ray from radioactive 26Al in 1982 [1]. More recently, an all-sky map of this characteristic 1809-keV γ-ray shows a distribution of 26Al in favor of massive stars and supernovae as the main progenitors [2]. Nevertheless, observational data are not enough to define precisely the source of production of 26Al and 14 to 29% of the total observed 26Al abundance are expected to have a nova origin [3].
In order to have a more precise picture of the different possible scenario, the 25Al(p, γ)26Si reaction has been studied in nuclear facilities. This reaction has a direct influence on the abundance of 26Al, by bypassing the 25Mg(p, γ)26Al reaction responsible of the production of the 26Al cosmic γ-ray emitter.

In this contribution, I'll present results which illustrate two complementary experimental domains: Mass measurement and gamma-ray spectroscopy. In 25Al(p, γ)26Si reaction, the proton capture is dominated by resonant capture to a few states above the proton threshold in 26Si. The mass value of 25Al and 26Si have an exponential contribution to the total resonant proton capture rate in 26Si. The mass of 25Al has been precisely determined via Penning traps measurement in the IGISOL facility at the university of Jyvaskyla in Finland [5]. Additionally, a recent experiment at Argonne National Laboratory in USA was performed to identify the resonant states in 26Si via γ-ray spectroscopy study using the unique GRETINA+FMA setup. This experiment came in complement to a recent spectroscopy study of the 26Si mirror nucleus, 26Mg, where a previously unaccounted l=1 resonance in the 25Al +p system was observed [5].

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