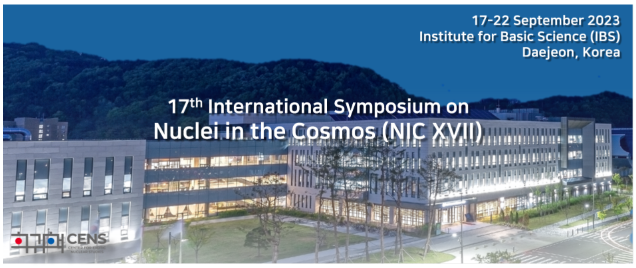

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The 12C(p,g)13N reaction S-factor and Er = 422 keV resonance study at Felsenkeller facility.

Tuesday, 19 September 2023 18:05 (5 minutes)

The ^{12}C(p,γ)^{13}N is the kick off reaction of the CNO cycle, active in massive star core Hydrogen burning and RGB and AGB star H-shell burning, at typical temperatures between 0.02 and 0.1 GK. The ^{12}C(p,γ)^{13}N reaction plays a key role in many scenarios, being the ^{13}N decay one of the solar neutrino source and the main responsible for the ^{13}C pocket in AGB stars, crucial ingredient for s-process. Moreover the ^{12}C/^{13}C abundance ratio, observed in presolar grains, stellar atmosphere and in the interstellar medium, is a powerful tracer of mixing processes and of the Galactic chemical evolution.
Extrapolation of the ^{12}C(p,γ)^{13}N reaction S-factor down to astrophysical energies is dominated by the direct capture contribution and the tail of a broad resonance at E_r = 422 keV. Data below 400 keV are poorly constrained, with available data scattering in a 30\% band. Moreover a recent measurement performed at LUNA reported results in tension with literature data. Concerning the 422 keV resonance only few extensive studies are available in literature, resulting in poorly constrained resonance parameters, as radiative width and energy, which were proved to be crucial in determining the transition from CNO to Hot CNO cycle, active in explosive scenarios.
A new direct measurement was performed at the shallow underground Felsenkeller facility in the energy range E_{cm} = 320-620 keV, allowing to extensively study the 422 keV resonance and to overlap with LUNA range. The experiment was performed irradiating two evaporated carbon targets with 10 μA molecular beam. The γ-rays from ^{12}C(p,γ)^{13}N reaction were detected by mean of five HPGe detectors, located at different angles to check also the angular distribution.
In the talk details of the experimental setup, analysis and preliminary results will be described.

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