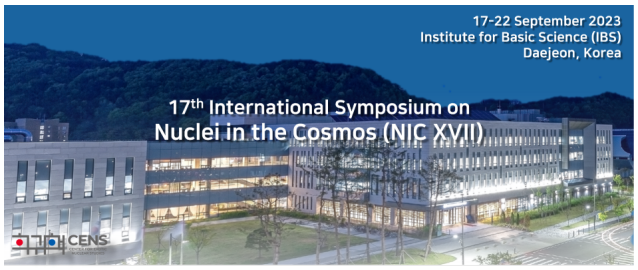

Contribution ID: **99** Type: **Poster**

The first direct measurement of the $65\,keV$ resonance strength of the $^{17}\mathrm{O}(p,\gamma)^{18}\mathrm{F}$ reaction at LUNA

Tuesday, 19 September 2023 17:25 (5 minutes)

The $^{17}\mathrm{O}(p,\gamma)^{18}\mathrm{F}$ reaction plays a crucial role in Hydrogen burning via CNO cycle. In particular at temperatures of interest for HBB in AGB stars ($20\,\mathrm{MK} < \mathrm{T} < 80\,\mathrm{MK}$) the main contribution to the astrophysical reaction rate comes from the poorly constrained $E_R = 65\,\mathrm{keV}$ resonance. The strength of this resonance has only been determined through indirect measurements. The LUNA (Laboratory for Underground Nuclear Astrophysics) developed a new high sensitivity setup to measure this resonance directly.

The new setup is located at LNGS, where the cosmic ray background is reduced by several orders of magnitude. The residual background was further reduced by installing a devoted shielding made of 10 cm lead and 4 cm borated polyethylene. A 4π BGO detector was coupled with a target chamber and target holder of Aluminum, to increase the efficiency. The beam induced background contribution was precisely determined by collecting more than 300 C on $\mathrm{Ta}_2(^{18}\mathrm{O})_5$ targets.

With more than 400 C accumulated on $\mathrm{Ta}_2(^{17}\mathrm{O})_5$ targets the LUNA collaboration has performed the first direct measurement of the 65 keV resonance strength: this is the weakest resonance ever directly measured. In this contribution the improved experimental setup, the analysis procedure and preliminary results will be presented.

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Session Classification: Poster session (Nuclear reaction rates and stellar abundances)

Track Classification: Nuclear reaction rates and stellar abundances