Contribution ID: **14** Type: **Contributed talk**

New results on proton captures on neon isotopes at LUNA

Monday 16 September 2024 15:25 (15 minutes)

The NeNa-MgAl cycles are involved in the synthesis of Ne, Na, Mg, and Al isotopes. The $^{20}\mathrm{Ne}(p,\gamma)^{21}\mathrm{Na}$ reaction is the slowest reaction of the NeNa cycle and it controls the speed at which the entire cycle proceeds. The $^{21}\mathrm{Ne}(p,\gamma)^{22}\mathrm{Na}$ has a relevant role in the production of the radioactive isotope $^{22}\mathrm{Na}$ that is interesting for novae and supernovae. Presently, the $^{20}\mathrm{Ne}(p,\gamma)^{21}\mathrm{Na}$ and $^{21}\mathrm{Ne}(p,\gamma)^{22}\mathrm{Na}$ are carrying larger uncertainties and therefore their reaction rate is affecting the production of the elements in the NeNa cycle and the astrophysical sites of interest.
At the temperatures of interest for AGB stars and novae where the the NeNa cycle play a important role, the $^{20}\mathrm{Ne}(p,\gamma)^{21}\mathrm{Na}$ is dominated by the direct capture component and the $366\,\mathrm{keV}$ resonance, while the $^{21}\mathrm{Ne}(p,\gamma)^{22}\mathrm{Na}$ reaction is governed by several resonances at $E_p = 126 - 350\,\mathrm{keV}$. The experiments have been carried out at LUNA (Laboratory for Underground Nuclear Astrophysics), by using the intense proton beam delivered by the LUNA $400\,\mathrm{kV}$ accelerator and a windowless differential-pumping gas target. The products of the reaction were detected with two high-purity germanium detectors. The first results on those two reaction together with a detailed evaluation of their astrophysical impact will be presented.

Primary author: CACIOLLI, Antonio (University and INFN of Padova)

Presenter: CACIOLLI, Antonio (University and INFN of Padova)

Session Classification: Plenary Session