Contribution ID: **0** Type: **not specified**

Direct measurement of the 22Ne(p,g)23Na reaction cross section at LUNA

The $^{22}\mathrm{Ne}(p,\gamma)^{23}\mathrm{Na}$ reaction takes part in the NeNa cycle of hydrogen burning, influencing the production of elements between $^{20}\mathrm{Ne}$ and $^{27}\mathrm{Al}$ in red giant stars, asymptotic giant stars, classical novae and type Ia supernovae.
The $^{22}\mathrm{Ne}(p,\gamma)^{23}\mathrm{Na}$ reaction rate is very uncertain because of a large number of tentative resonances in the Gamow window, where only upper limits were quoted in literature.
A direct measurement of the $^{22}\mathrm{Ne}(p,\gamma)^{23}\mathrm{Na}$ reaction cross section has been carried out at LUNA using a windowless differential-pumping gas target with two high-purity germanium (HPGe) detectors.
A new measurement with a 4π bismuth germanate (BGO) summing detector is ongoing.
During the HPGe phase of the experiment the strengths of the resonances at 156.2 keV, 189.5 keV and 259.7 keV have been directly measured for the first time and their contribution to the reaction rate has been calculated.
The decay scheme of the newly discovered resonances has been established as well and some improved upper limits on the unobserved resonances have been put.
The BGO detector with its 70\% γ-detection efficiency allows to measure the cross section at lower energy.
In order to further investigate the resonances at 105 keV and 71 keV, the BGO detector took data until the end of last year and the direct-capture component of the cross section has been measured as well.
In this contribution the adopted experimental techniques will be illustrated and the new LUNA preliminary results will be presented discussing their implications on the reaction rate.

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