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Study of the E_alpha = 395 keV resonance of the 22Ne(alpha,gamma)26Mg reaction at LUNA

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The 22Ne(alpha,gamma)26Mg is the competitor of the 22Ne(alpha,n)25Mg in AGB stars. The 22Ne(alpha,n)25Mg is an efficient source of neutrons for s-process in medium masses AGB.

There is significant uncertainty in the 22Ne(alpha,gamma)26Mg thermonuclear reaction rate. This has been clearly remarked by the presence of this particular reaction in the COST Action called ChETEC (CA16117) that includes the 22Ne(alpha,gamma)26Mg among the nuclear reactions with great impact on stellar nucleosynthesis.

At the energies of the LUNA400kV accelerator a narrow resonance in the 22Ne(alpha,gamma)26Mg reaction has been claimed.

This resonance should be at energy E_alpha= 395 keV and it has been studied only with indirect methods leading to a range of possible values for its resonance strength from 10^{-9} to 10^{-15} eV.

At LUNA (Laboratory for Underground Nuclear Astrophysics) this resonance can be studied directly, thanks to a high efficiency setup, composed by a 4\pi-BGO detector and a windowless gas target filled with neon gas enriched in the 22Ne isotope to 99.99%. This setup has been already used in a previous experiment for the study of the 22Ne(p,gamma)23Na reaction, and in April-June 2018 a new measurement campaign will be performed.

Thanks to its position inside the Laboratory of Gran Sasso, LUNA already benefits from a reduced background and in particular a factor one thousand for the neutron component. Still this remains the most important source of background in the region of interest for the 22Ne(alpha,gamma)26Mg. A new borated polyethylene shielding will be implemented to reduce the neutron contamination due to the environmental background in order to reduce this contribution by an additional order of magnitude.

The poster will show the experimental setup, background, and preliminary data.

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