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The New Deep-underground Direct Measurement of $^{22}\text{Ne}(\alpha, \gamma)^{26}\text{Mg}$ with EAS γ : a feasibility study

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The reaction $^{22}\text{Ne}(\alpha, \gamma)^{26}\text{Mg}$ is associated with several questions in nuclear astrophysics, such as the Mg isotope ratio in stellar atmospheres and the nucleosynthesis of elements beyond Fe through its competition with the neutron source $^{22}\text{Ne}(\alpha, n)^{25}\text{Mg}$.

Due to the low stellar energies and therefore very low cross section, direct experiments have been only able to provide upper limits below a strong resonance at 832 keV.

The purpose of the EAS γ project is to perform the first direct measurement of the $^{22}\text{Ne}(\alpha, \gamma)^{26}\text{Mg}$ in the range of astrophysical interest below 600 – 800 keV and the remeasurement of the important 832 keV resonance.

The measurement will be performed at Laboratori Nazionali del Gran Sasso and will be carried out using a high α particle current delivered by the newly commissioned LUNA MV accelerator.

Moreover, its position underground and additional passive shielding will reduce the γ -background, drastically increasing the sensitivity over the state of the art. The γ -rays produced in the reaction will be detected by a NaI scintillator array surrounding a windowless, recirculating gas target.

I will present the current status of the project and the preliminary results of NaI detector array simulation and characterisation.

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