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## Cross section of the ${}^{13}C(\alpha,n){}^{16}O$ reaction at low energies in the framework of LUNA collaboration

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The Laboratory for Underground Nuclear Astrophysics (LUNA) is an experiment located in deep underground at Gran Sasso National Laboratories (LNGS). Its mission is to study charged-particle induced nuclear reactions of astrophysical interest.

This is an unique experiment that combines low environmental background and an intense and long term stable proton or alpha beam. The combination of these two peculiarities allowed in the last decades to provide valuable contributions to our present understanding of primordial nucleosynthesis, as well as stellar hydrogen and helium stellar burning.

In this framework, very recent measurements were performed for the direct measurement of the  ${}^{13}C(\alpha,n){}^{16}O$  reaction cross section.

This process constitutes the dominant neutron source for the main s process, responsible of nucleosynthesis of half on nuclides heavier that iron, in low mass stars of thermally pulsing Asymptotic Giant Branch. For the first time, the LUNA experiment developed a low intrinsic background neutron detector that combined with a detailed Low Level Counting analysis and an accurate target monitoring allowed to measure the  ${}^{13}C(\alpha,n)^{16}O$  cross section with unprecedented results, reaching the edge of the Gamow peak with an overall uncertainty of 20% at maximum.

In this talk I will present the LUNA experiment, focusing the attention techniques that led the cross section results of the  ${}^{13}C(\alpha,n){}^{16}O$  reaction, illustrating the new reaction rate and its astrophysical implications.

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