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Direct measurement of 13C(a,n)16O reaction towards in the s process Gamow peak

The 13C(a,n)16O reaction is very important in astrophysical context. This reaction is the dominant neutron source for the synthesis of the main s-process component of heavy elements in thermally pulsing, low-mass AGB stars. The stellar temperature of s process in AGB translates to a Gamow window between 140 - 230 keV, far below the Coulomb barrier.

Various measurements of the low energy cross section of 13C(a,n)16O have been performed in the past, and while remarkable results have been achieved, ultimately the environmental background on the surface of the earth has been a limiting factor. The LUNA collaboration is currently performing a measurement of 13Ca,n)16O in the low-background environment of the LNGS, where the environmental neutron flux is reduced by over three magnitudes with respect to the surface.

In order to approach the Gamow peak of the 13C(a,n)16O reaction, 3He counters based high-efficiency, low background detector array was developed. However, the active suppression of the intrinsic background of the counters is becoming mandatory due to the nearly exponential drop of the cross section with decreasing energy using the Pulse Shape Discrimination (PSD) method.

In this talk, we introduce the main features of the low background experimental setup, especially the improved PSD method, and the current status of the experiment.

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