

## R-matrix analysis for the neutron source reaction $^{13}\text{C}(\alpha, n)^{16}\text{O}$

The  $^{13}\text{C}(\alpha, n)^{16}\text{O}$  reaction is the main neutron source for the slow-neutron-capture (s-) process in Asymptotic Giant Branch stars and for the intermediate (i-) process. Direct measurements at astrophysical energies in above-ground laboratories are hindered by the extremely small cross sections and vast cosmic-ray induced background. We performed the first consistent direct measurement in the range of  $E_{\text{c.m.}} = 0.24$  MeV to 1.9 MeV using the accelerators at the China JinPing underground Laboratory (CJPL) and Sichuan University. Our measurement covers almost the entire i-process Gamow window in which the large uncertainty of the previous experiments has been reduced from 60% down to 15%, and provides a more reliable reaction rate for the studies of the s- and i-processes.

A recent discovery from Notre Dame University (NDU) claims that our measurements above ground and underground has a different trend and they treat each measurement with different normalization factor. Thus, another experiment is performed in SCU and confirms that our measurement above ground and underground is consistent. With the newly performed experiment and differential cross section measurement performed by NDU, another R-matrix analysis is required for better extrapolation. In my poster, I will show the recent progress of R-matrix fitting.

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