

## Nuclei in the Cosmos (NIC XVII)



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# Astrophysically relevant Neutron induced reactions studied via THM

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Neutron induced reactions on unstable nuclei play a significant role in the nucleosynthesis of the elements in the cosmos. Their interest range from the primordial processes occurred during the Big Bang Nucleosynthesis up to the “stellar cauldrons” where neutron capture reactions build up heavy elements. In the last years, several efforts have been made to investigate the possibility of applying the Trojan Horse Method (THM) to neutron induced reactions mostly by using deuterium as “TH-nucleus”. Here, the main advantages of using THM will be given together with a more focused discussion on the  ${}^7\text{Be}(n,\alpha){}^4\text{He}$  “study case” and the  ${}^{14}\text{N}(n,p){}^{14}\text{C}$  reaction. The former reaction was studied via the THM application to the quasi-free  ${}^2\text{H}({}^7\text{Be},\alpha\alpha)p$  reaction and it represents the extension of the method to neutron-induced reactions in which an unstable beam is present. The  ${}^{14}\text{N}(n,p){}^{14}\text{C}$  reaction was studied via the  ${}^2\text{H}({}^{14}\text{N},p){}^{14}\text{C}$  experiment performed at INFN-LNS via a 50 MeV  ${}^{14}\text{N}$  beam provided by the INFN-LNS TANDEM accelerator. Preliminary results show the population of intermediate  ${}^{15}\text{N}$  excited states at astrophysical energies. These applications open new frontiers in the application of the method (i.e. the study of  ${}^7\text{Be}+d$  or  ${}^{11}\text{C}+\alpha$  reactions) extending its range of applicability for contributing to astrophysically relevant problems.

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