# Nuclear astrophysics at n_TOF: focus on neutron sources in stars

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The neutron time-of-flight facility n_TOF at CERN has been producing relevant nuclear data for science and technology since 2001. It consists of two neutron beam lines for time-of-flight measurements, located at 185 and 19 m from the neutron-producing target, respectively; and one irradiation station for activation measurements. So far, a considerable amount of important (n,γ) reactions for nuclear astrophysics, and in particular for the s process, have been studied.

The s process is responsible for the production of about half of the elemental abundances beyond iron that we observe today. The s-process nucleosynthesis takes place either in massive stars, where the $^{22}$Ne(α,n)$^{25}$Mg reaction is the main neutron source, or in low mass Asymptotic Giant Branch stars, where the neutrons are provided by the $^{13}$C(α,n)$^{16}$O and the $^{22}$Ne(α,n)$^{25}$Mg reaction.

The study of n+$^{25}$Mg and n+$^{16}$O gives important constraints for the yet uncertain reaction rates of the relevant neutron sources. In addition, during the production of heavy elements, $^{25}$Mg is one of the most important neutron poison via neutron capture, in competition with $^{56}$Fe.

In this presentation I will provide a detailed description of the n_TOF facility, and the performed and planned activities related to the $^{13}$C(α,n)$^{16}$O and the $^{22}$Ne(α,n)$^{25}$Mg neutron reaction sources of the s process.