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Measurements of neutron capture cross sections for nucleosynthesis at n_TOF: the cases of 64Ni(n, γ) and 30Si(n, γ)

Neutron capture reactions play an important role in nuclear astrophysics as they are at the base of the s-process and the r-process, the two main mechanisms of nucleosynthesis beyond the iron peak.
Neutron capture cross sections are therefore important inputs of stellar models. Their accurate knowledge is crucial to predict reliable stellar yields and isotopic abundances that, compared with the observations, can eventually constrain stellar properties not directly experimentally accessible.
For example, ^{64}Ni is among the seeds of the s-process and its capture cross section was found to significantly affect the predicted abundance of many isotopes produced afterwards in the s-process chain both in massive and in AGB stars. On the other hand, the neutron capture cross section of ^{30}Si is extremely important to explain the abundance of the Silicon isotopes measured in presolar SiC grains, disentangling the contributions of neutron-capture nucleosynthesis and galactic chemical evolution.
Since the data available in literature were scarce and discrepant for both isotopes, new time-of-flight measurements of ^{64}Ni(n, γ) and ^{30}Si(n, γ) have been performed at n_TOF facility, a pulsed white neutron source at CERN characterized by a wide neutron energy range, high instantaneous neutron flux and excellent energy resolution. Highly enriched samples have been used in the measurements.
The preliminary results show interesting discrepancies with respect to the cross sections recommended in the most recent releases of the evaluated nuclear data libraries. In particular, in both isotopes, huge resonances expected in the energy range of astrophysical interest are not observed. Therefore, a significant impact on the Maxwellian Averaged Cross Section (MACS) for astrophysical applications is expected.

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