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## Physics, Astrophysics and advanced nuclear technologies at CERN n\_TOF: present and future

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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. More in detail, neutron-induced reaction cross sections of interest to: 1. Astrophysics (both Big Bang and stellar Nucleosynthesis); 2. emerging nuclear technology and related safety (fission and fusion as well as transmutation of nuclear waste); 3. Neutron capture therapy (treatment of cancer with neutrons) and 3. basic Nuclear Physics (nuclear interaction, nuclear structure effects on fission, excited states) have been reported on more than 100 isotopes, so far.

After two years of facility upgrades, the scientific program will restart this summer. Several challenging time-of-flight experiments are foreseen on stable and radioactive samples in the two existing measurement stations. In particular, the 185 m beam line feeds the first experimental area (EAR1), where high-resolution measurements can be performed. While EAR2, placed approximately 20 m on top of the spallation target, provides a factor 50 higher neutron flux, while maintaining a good energy resolution. In this contribution I will present a selection of physics cases together with the related experimental setup. In fact, several detection systems are currently available at n\_TOF for radiative capture, fission and charged particle (in the exit channel) reactions.

Finally, I will present some ideas of possible future experiments that could become feasible thanks to the availability of a new irradiation station (named NEAR station) now being built close to the neutron-producing target. The possibility to produce sample material at the present or upgraded ISOLDE facility and then irradiated at the NEAR station will represent, therefore, a great opportunity for synergy between these two CERN facilities.

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