Contribution ID: **338** Type: **Oral Presentation**

The neutron Time-Of-Flight facility, n_TOF at CERN: Status and perspectives

n_TOF, at CERN, is the neutron time-of-flight facility dedicated to the study of neutron-induced reactions for fundamental and applied nuclear research. With high-precision neutron cross-section data, n_TOF plays a crucial role in addressing key questions in nuclear astrophysics and for innovation in advanced nuclear technologies. In nuclear astrophysics, experiments performed at n_TOF provide essential insights on the nucleosynthesis processes, such as the s-process responsible for formation of the chemical elements in stars. In nuclear technology, n_TOF contributes to the study of isotopes relevant for reactor design, nuclear waste transmutation, and radiation shielding. Furthermore, the facility investigates aspects linked to medical and space
applications, including neutron therapy and radiation effects on electronics.

Established in 2001, n_TOF utilizes a high-intensity, pulsed neutron beam produced by spallation reactions, where 20 GeV/c protons from the CERN Proton Synchrotron (PS) impact on a lead target. The resulting neutron flux spans a wide energy spectrum, from thermal to GeV energies, enabling measurements with high accuracy and resolution over an extensive range.

The facility comprehends two areas suitable for time of flight measurements. EAR1, with a 185-meter flight path, is optimized for high-resolution time-of-flight measurements. EAR2, with the 20-meter beamline, is designed for high-flux applications, fundamental for low mass and short-lived radioactive samples or low cross section reactions. These complementary stations allow for different experimental conditions optimized for specific measurements, such as neutron capture, neutron-induced fission, elastic, inelastic and charged-particle emission reactions. NEAR is the novel experimental area, placed at about 3 meters from the spallation target, designed for spectral-averaged cross section measurements via activation, when a time-of-flight measurement is not possible.

Recent developments at n_TOF include upgrades of the spallation target to enhance neutron production efficiency, improvements in experimental techniques, and expanded research programs addressing emerging scientific challenges.
In this contribution, an overview of the status of the facility, the ongoing experimental activities and the planning of future projects will be presented.

Author: MANNA, Alice

Presenter: MANNA, Alice

Session Classification: Parallel session

Track Classification: Accelerators and Instrumentation