

## First Commissioning Results of the n\_TOF Facility at CERN

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Abstract. n\_TOF, the new neutron time of flight facility at CERN, is now operational and has been commissioned.

PACS. PACS-key New facility – PACS-key Neutron time of flight

The n\_TOF facility at CERN [1], [2] is an intense source of neutrons obtained by spallation induced by 20 GeV/c protons delivered by the proton synchrotron booster on a massive lead target (80 cm × 80 cm × 40 cm) followed by a layer of water (5 cm) that serves as moderator. The source is followed by a 185 m flight path. Two collimators are installed at distances of 140 m (diameter 11 cm) and 178 m (diameter 2 cm). A sweeping magnet is installed at 145 m for deviating the charged particles produced by spallation. In order to determine the real parameters of the installation and compare them with the ones resulted from simulations in the design phase, two campaigns of measurements have been devoted to the commissioning. Three different determinations of the neutron flux have been made for energies below 200 keV: using the method of double activated foils of gold (capture resonance at 4.9 eV), using a <sup>6</sup>Li doped detector (BC702 type) and using a <sup>235</sup>U fission chamber. For the high energy part, a plastic scintillator and <sup>238</sup>U and <sup>235</sup>U fission chambers have been used. In the first campaign, measurements have been done for the un-collimated beam, with the first collimator in place and with the full collimating system. The beam profile has been determined both after the first and second collimator. The results of various measurements are coherent with each other and indicate that n\_TOF can provide an isothermal flux over a wide energy range (from 0.5 eV up to 10<sup>4</sup> eV) with an integral value of 10<sup>5</sup> n/cm<sup>2</sup>/proton burst of 7 × 10<sup>12</sup> protons for the actual configuration of the collimating system. For illustrating the quality of the data taken, Fig. 1 shows a zoom on the <sup>235</sup>U fission chamber results. For comparison, reference data for the <sup>235</sup>U fis-

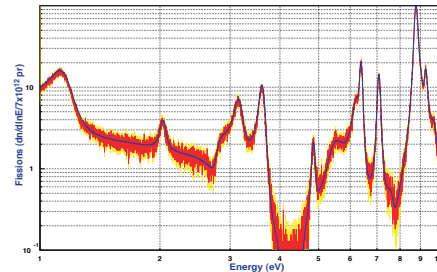


Fig. 1. A portion of the <sup>235</sup>U fission cross-section measured in the commissioning compared to the data base (full line)

sion cross section taken from the ENDF-B/VI data base are indicated with a continuous line. A careful monitoring of the target temperature as a function of the incident proton beam intensity has been performed. The maximum steady state temperature for a regime of 5 pulses of 7 × 10<sup>12</sup> protons within a super-cycle of 16.8 s was 80°C. In conclusion, the preliminary results of the commissioning measurements indicate a good agreement between the measured parameters and the designed ones. The installation is operational and the physics measurements have already started.

### References

1. Neutron TOF Facility (PS 213) Technical Design Report, CERN/INTC/2000-004, 11 February 2000
2. Proposal for a Neutron Time of Flight Facility, CERN/SPSC 99-8, SPSC/P 310, 17 March 1999