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EURO-LABS

EUROpean Laboratories for Accelerator Based Science
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MILESTONE REPORT

WP2 – TA TO RIs DELIVERING NEUTRON BEAMS

MILESTONE 7 – ALL PROVISION OF ACCESS OFFERED COMPLETED

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For more information on EURO-LABS, its partners and contributors please see <https://web.infn.it/EURO-LABS/>

The EUROpean Laboratories for Accelerator Based Science (EURO-LABS) project has received funding from the Horizon Europe programme dedicated to Research Infrastructure (RI) services advancing frontier knowledge under Grant Agreement no. 101057511. EURO-LABS began in September 2022 and will run for 4 years.

EXECUTIVE SUMMARY

This report summarizes the Transnational Access (TA) activities conducted under Task 2.3 of the EURO-LABS Work Package 2, which supports research at European Research Infrastructure facilities providing neutron beams.

*Access was delivered in accordance with the Grant Agreement (GA), with strong demand from the user community. One facility could not deliver any RIB during the reporting period, while one other facility had no eligible application. The total number of Access Units provided was **39773** whilst the number expected to be provided by the facilities in this Work Package at the time of writing of the Grant Agreement was **23036**. Note that some facilities are, in addition to the provision of Radioactive Ion beams presented here, also providing Stable Ion beams or Neutrons or in some cases all three. The number expected to be provided referred to is the TOTAL for the facility. The total number of supported projects carried out by the facilities was **221**, attended by a total of more than **1500** users, of which well over **800** received support from EURO-LABS. The active facilities provided stable beam conditions, specialized experimental setups, and technical support necessary for high-precision studies.*

The research activities addressed several of the key scientific challenges highlighted by NuPECC Long Range Plan for European Nuclear Physics, including the study of nuclear structure far from stability, the investigation of fundamental symmetries and interactions, the development of precision measurements for physics Beyond the Standard Model (BSM), showing that radioactive ion beam facilities are essential European Research Infrastructures. The programme strengthened collaboration between European laboratories and external user groups, facilitating knowledge exchange and training especially of early-career researchers.

SUMMARY OF ACCESS PROVISION

The participating facilities include CERN/n_TOF, ALTO/LICORNE, GANIL/NFS, and the CLEAR Consortium (CNA-Seville). Notably, the INFN-LNL/LNS facility in Legnaro was unable to provide a neutron beam eligible for TA funding during the project.

- **CERN/n_TOF:** This facility provides a pulsed neutron beam with an extremely wide energy spectrum (sub-meV to GeV). During the project, it executed 40 funded experiments, including measurements on ^{241}Pu fission cross-sections and ^{94}Nb activation, utilizing its EAR1, EAR2, and the recently commissioned NEAR station.
- **ALTO/LICORNE (IJCLab):** Focused on naturally directional neutron beams, this facility supported research ranging from fundamental nuclear physics to applied health physics. Highlights include high-resolution spectroscopy of ^{238}U fission fragments using the ν -Ball2 spectrometer, which produced four scientific publications and supported four PhD theses.
- **GANIL/NFS:** As a compact neutron source, NFS utilizes intense proton and deuteron beams to produce energetic neutrons. Research activities included pioneer studies on Pygmy Dipole Resonance (PDR) using neutron inelastic scattering.
- **CLEAR/CNA-Seville:** This consortium provides access to neutron beams via the HISPANOS facility. Research portfolio includes environmental studies using Accelerator Mass Spectrometry (AMS), target development (e.g., He-rich targets), and neutron spectroscopy using the TENIS system.
- **Performance Indices**

The project delivered a total of 3436 effective Access Units (AUs) across 52 funded experiments, supporting 152 researchers. The n_TOF facility accounted for most of these metrics (2144 AUs, 40 experiments, 102 supported users). Overall, the initiative successfully facilitated international collaboration and provided essential training opportunities for early-career researchers.

All experiments planned and approved by the facilities' User Selection Committees have been performed and completed within the duration period of the EURO-LABS project.

The overall performance indexes for the facilities providing TA to neutron beams are summarized in Table 2.

Table 1 Summary of Performance Indices for Neutron Beams

	TOTAL	n_TOF2	GANIL/NFS	IJC Lab/ALTO	CLEAR/CNA
Effective AUs delivered:	3436	2144	736	336	220
Number of experiments funded:	52	40	5	3	4
Number of users supported:	152	102	21	14	15
All users participating in projects:	355	274	21	45	15