T 38: Neutrino Physics III

Time: Tuesday 16:15–18:00 Location: VG 3.103

T 38.1 Tue 16:15 VG 3.103

ESS Neutrino Super Beam Plus (ESSνSB+) Target Test Facility(ETTF) - R&D Setup — •Rishabh Moolya and Tamer Tolba — Institut für Experimentalphysik, Universität Hamburg

The ESSνSB+ Target Station will consist of a target-horn system operating under an intense 1.25 MW proton beam power, derived from the nominal 5 MW proton beam with a 14 Hz frequency provided by the European Spallation Source (ESS) Linac. An ESSνSB+ Target Test Facility (ETTF) is planned to be located at the Mechanical Measurements Lab (MML) in ESS, building upon the successful ESS Target Helium Experiments at LTH (ETHEL).

The ESSνSB+ target features a packed bed of titanium (Ti) spheres cooled with pressurized helium gas to withstand the substantial power deposition expected in the target bulk. Due to the granular structure of the target bulk, numerical CFD modeling of the thermodynamic behavior of the cooling system and target pellets is highly complex and necessitates experimental validation. The primary objective of this R&D setup is to address the challenges in simulating the mechanical and thermodynamic behavior of the target cooling system.

The proposed setup will include: a booster compressor, an electric heater, a test vessel, and a cooling heat exchanger with water on the secondary side. Current status of the commissioning of the prototype target system and the results of the aforementioned studies will be presented.

T 38.2 Tue 16:30 VG 3.103

Neutrino oscillations parameters estimation with NOvA and T2K public data — •Sofia Lonardi — Ludwig-Maximilians-Universität (LMU), Theresienstraße 37, 80333 Munich, Germany — Technical University Munich (TUM), James-Franck-Strasse 1, 85748 Garching, Germany

Neutrino flavour oscillations are a promising open window into physics beyond the standard model. Numerous experiments provide a way to estimate the angles of the mixing matrix and the mass differences. Most parameters have been determined with increasing precision and agreement between different experiments, nevertheless, some questions still need to be addressed regarding the mixing angle Θ_{23} and the CP phase δ_{CP} dependence on the neutrino mass ordering. Notably, T2K and NOvA experiments show contrasting tendencies depending on the measurement channel. This study focuses on NOvA and T2K: new independent analyses are performed using publicly accessible data, and the official results are reproduced to demonstrate their validity. The parameters are estimated through likelihood maximization, and agreements and tensions between the two datasets are evaluated in a joint fit. This talk will explain the individual data analysis chains and the global fitting setup, discussing the obtained results in the broader context of the global neutrino oscillations landscape.

T 38.3 Tue 16:45 VG 3.103

Detection of neutrons produced in neutrino-nucleus interactions — •Asit Srivastava — Johannes Gutenberg - Universität Mainz

T2K is a long-baseline experiment which measures parameters of neutrino oscillations. This can be done by analysing the interaction of neutrinos closer to the point of beam production and 295 km downstream. The detector located near the source of beam production, called ND280, primarily includes the interactions of neutrinos with carbon nuclei. The particles produced as a result of the interactions deposit energy in ND280 which is used to characterise the incoming neutrino flux and neutrino cross-sections before oscillations occur.

Out of all the particles produced in typical neutrino interactions, neutrons are by far the most challenging to detect since they are electrically neutral and do not leave a visible track in the detector. As a result, they provide uncertainties in identifying the interactions happening in the detector and measuring cross-sections. ND280 has a newly installed Super Fine-Grained Detector (SFGD) made of plastic scintillator cubes. The upgraded detector capable of better position resolution and 3D reconstruction opens up the possibilities of improving the efficiency of neutron detection. Presence of a neutron is established using cuts on energy deposits and hence, possible neutron candidates, such as based on time of flight, kinetic energy of the candidate and the separation of energy deposit from the interaction vertex. This talk will go through neutron selection and how neutrons can help in understanding nuclear effects better.

T 38.4 Tue 17:00 VG 3.103

Exploring CEvNS with the NUCLEUS Experiment — •Raimund Strauss for the NUCLEUS-Collaboration — Technische Universität München, München, Deutschland

The NUCLEUS experiment aims to the first detection of coherent elastic neutrino nucleus scattering (CEvNS) at a nuclear reactor, exploiting an innovative detection system that consists of a 10g cryogenic detector setup made of CaWO4 and Al2O3 crystals. These target detectors are capable of reaching O(10 eV) energy thresholds, making it possible to measure nuclear recoils induced by CEvNS. The detectors will be surrounded by a twofold system of instrumented cryogenic vetoes, an external passive shielding and a muon veto to improve the identification and discrimination of backgrounds. NUCLEUS has recently demonstrated the successful operation of the neutrinos target detectors in coincidence with the other sub detectors of the experiment in the so called Long Background Run, performed in the shallow underground laboratory UGL located at TUM university in Munich. The experiment is now ready for the relocation to the Chooz-B nuclear power plant in the French Ardennes. This talk will provide an overview of the experiment's current status, focusing on the latest developments and milestones achieved.

T 38.5 Tue 17:15 VG 3.103

Exploring coherent elastic neutrino-nucleus scattering: status of the NUCLEUS experiment — •Chloé Goupy for the NUCLEUS-Collaboration — Max Planck Institute for Nuclear Physics (MPIK), Heidelberg, Germany

The first detection of coherent elastic neutrino nucleus scattering (CEvNS) at a nuclear reactor remains to be achieved, especially because the corresponding nuclear recoils lie in the O(100 eV) energy regime which is difficult to measure with conventional detection technologies, and also because of the unfavorable background conditions nuclear power plant environments generally offer.

To overcome these obstacles, the NUCLEUS experiment aims to develop an innovative detection system using cryogenic detectors made of CaWO4 and Al2O3 crystals capable of reaching O(10 eV) energy thresholds. These target detectors will be surrounded by a twofold system of instrumented cryogenic vetoes, an external passive shielding and a muon veto to improve the identification and discrimination of backgrounds.

At present, the experiment is under commissioning in the shallow underground laboratory at the Technical University of Munich (TUM), and the relocation to the Chooz-B nuclear power plant in the French Ardennes in underway. In this talk, I will provide an overview of the experiment's current status, focusing on the latest developments and milestones achieved.

T 38.6 Tue 17:30 VG 3.103

Investigation of rear wall candidates for keV sterile neutrino search at KATRIN — •Kerstin Trost, Dominic Batzler, James Braun, Robin Grössle, Philipp Haag, Elizabeth Paine, Marco Röllig, Marius Schaufelberger, Marie Schäfer, and Michael Sturm — KIT

The search for keV sterile neutrinos at the KArlsruhe TRItium Neutrino (KATRIN) experiment is set to start in 2026, measuring the full energy range of the tritium beta-decay spectrum. This novel approach introduces additional systematic uncertainties that must be addressed to ensure reliable results. A key challenge is mitigating the major systematics associated with electron backscattering and radioactive contamination of the rear wall. This talk introduces current concepts for rear wall optimization and discusses experimental efforts to validate these designs. Specifically, the (de)contamination behavior of potential rear wall materials such as beryllium and micro-structured silicon tested with the TRACE experiment is presented. This work is supported by the Helmholtz Association and by the Ministry for Education and Research BMBF (grant numbers 05A23PMA, 05A23PX2, 05A23VK2 and 05A23WO6)

T 38.7 Tue 17:45 VG 3.103

Rear Wall concepts for keV sterile neutrino search at KATRIN — •Rudolf Sack for the KATRIN-Collaboration — Karlsruhe Institute of Technology - KIT

From 2026 on KATRIN will search for keV sterile Neutrinos with a differential electron energy measurement of the Tritium beta decay. The unwanted effects of the Rear Wall, such as electron backscattering, are thought to be the leading systematic effect. This talk will explain the requirements for new rear wall materials and design concepts. Further the talk will highlight our most promising concepts and present our performed characterization measurements.