T 50: Detectors V (Misc.)

Time: Wednesday 16:15–17:15 Location: VG 1.102

T 50.1 Wed 16:15 VG 1.102

Progress and Results of the AMoRE: Exploring Neutrinoless Double-Beta Decay with Molybdate Scintillators — •Cagla Mahanoglu, Christian Enss, Andreas Fleischmann, Daniel Hengstler, Ashish Jadhav, Ioana-Alexandra Nitu, Christian Ritter, Andreas Reifenberger, Daniel Unger, and Loredana Gastaldo — Kirchhoff Institute for Physics, Heidelberg University

The Advanced Molybdenum-based Rare process Experiment (AMoRE) aims to search for neutrinoless double-beta ($0\nu\beta\beta$) decay of the ^{100}Mo isotope using molybdate scintillating crystals. This rare nuclear process, if observed, would confirm the Majorana nature of neutrinos, provide insight into the absolute neutrino mass scale, and reveal new physics beyond the Standard Model. The experiment makes use of metallic magnetic calorimeter (MMC) sensors to achieve high energy resolution and efficient particle discrimination. AMoRE operates in three phases: AMoRE-Pilot (1.887 kg detector, 0.886 kg of ^{100}Mo), AMoRE-I (6 kg array of ^{100}Mo-enriched crystals), and AMoRE-II (large-scale 200 kg array at the Yemilab underground facility). Results from AMoRE-Pilot set a limit on the half-life of $T_{1/2} > 9.5 \times 10^{22}$ years. In AMoRE-I, a new lower limit of $T_{1/2} > 3.0 \times 10^{24}$ years (at the 90 percent confidence level) was achieved. The aim of AMoRE-II is to reach a sensitivity of $T_{1/2} > 6 \times 10^{26}$ years, which would cover the entire inverted Majorana neutrino mass hierarchy range of (15-46) meV. This talk will highlight the current status of the AMoRE, innovative advancements in detector design and optimization of analysis techniques.

T 50.2 Wed 16:30 VG 1.102

Strong-field QED measurement tests at FACET-II using new electron detector concept — •Luke Hendriks[1,3], Antonios Athanassiadis[1,2], Louis Helary[1], Ruth Magdalena Jacobs[1], Jenny List[1], Gudrid Moortgat-Pick[2], Evan Ranken[1], Ivo Schulthess[1], Matthew Wing[1,3], and E320 Collaboration[4] — [1]Deutsches Elektronen-Synchrotron (DESY), Hamburg, Germany — [2]Universität Hamburg, Hamburg, Germany — [3]University College London (UCL), London, United Kingdom — [4]SLAC National Accelerator Laboratory, Menlo Park, California, United States

Strong-Field Quantum Electrodynamics (SFQED) is an emergent field of physics, where conventional quantum electrodynamics calculations become non-perturbative due to a strong electromagnetic background field. This gives rise to non-linear Compton scattering and non-linear Breit-Wheeler pair production. Advances in laser technology have made it possible to explore this field, by colliding photons from a high-intensity laser with a high-energy electron beam. One of the experiments that will measure SFQED phenomena is LUXE, an experiment planned at DESY. Part of LUXE is its electron detection system (EDS), which will measure high rates of electrons coming from electron-laser interactions. It consists of a segmented straw Cherenkov detector, and a scintillator screen and camera set-up. A prototype of the EDS has recently made measurements with E320, an SFQED experiment at the FACET-II facility at SLAC, where it measured non-linear Compton scattering. This talk will discuss the prototype of the EDS and the first results obtained from the measurements at E320.

T 50.3 Wed 16:45 VG 1.102

Current status of the Mu2e experiment at Fermilab — •Stefan E. Müller, Anna Ferrari, Oliver Knodel, and Reuven Rachamin for the Mu2e-Collaboration — Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany

The Mu2e experiment, which is currently under construction at the Fermi National Accelerator Laboratory near Chicago, will search for the neutrinoless direct conversion of a muon to an electron in the field of an aluminum nucleus, aiming at a sensitivity four orders of magnitude better than previous experiments. The observation of a signal would imply the violation of charged lepton flavor, and hint at physics beyond the standard model.

The design and status of the Mu2e experiment and its detector subsystems will be presented. With the large superconducting solenoid magnets guiding the muons finally arriving on site at Fermilab, the experiment enters an exciting phase of its construction towards data taking.

T 50.4 Wed 17:00 VG 1.102

On the Production and QA of the Mu3e Tile Detector — •Küpperbusch Jan for the Mu3e-Collaboration — Kirchhoff-Institut für Physik, Heidelberg, Deutschland

The Mu3e experiment aims to find or exclude the occurrence of the decay $\mu^+ \to e^+e^-e^+$ with a sensitivity of $\mathcal{O}(10^{-15})$ in phase I and $\mathcal{O}(10^{-16})$ in phase II. In order to achieve this, the Mu3e experiment will be conducted at the Paul-Scherrer-Institute (PSI) utilizing the high rate muon beam (10^8 Hz in Phase I).

The Scintillating Tile Detector is one of the timing detector systems aiming to perform with a resolution of $< 100\,\mathrm{ps}$ and is located at the two outer stations. It consists of organic scintillators precisely milled into tiles with a surface profile of roughly $5 \times 5\,\mathrm{mm}^2$. The tiles are wrapped in highly-reflective foil, glued to a Silicon Photomultiplier (SiPM) and read out by the MuTRiG, an application-specific integrated circuit (ASIC) which was developed for the Mu3e timing systems. Individual Channels are geometrically grouped onto separate PCB matrices hosting 4×4 channels, which simplifies production, calibration and quality assurance.

The talk will report on the quality assurance measurements of around 3200 individual channels including bare characterization of the SiPMs, as well as measurements of the finite assembled matrices with scintillator tiles.