HK 34: Fundamental Symmetries I

Time: Thursday 13:45–15:00 Location: AM 00.021

Group Report HK 34.1 Thu 13:45 AM 00.021

The P2 experiment at MESA — Sebastian Baunack[1], Maarten Boonekamp[4], Boris Gläser[1], Shruti Gudla[1], Jayanta Naik[1], Rahima Krini[1], Frank Maas[1,2,3], Moran Neher[1], Tobias Rimke[1], Paul Schöner[2], Siddharth Thakker[1], and •Malte Wilfert[1] — [1]Institut für Kernphysik, Johannes Gutenberg-Universität Mainz — [2]Helmholtz-Institut Mainz, Johannes Gutenberg-Universität Mainz — [3]PRISMA+ Cluster of Excellence, Johannes Gutenberg-Universität Mainz — [4]IRFU, CEA, Université Paris-Saclay, Gif-sur-Yvette, France

The weak mixing angle $\sin^2\theta_W$ can be measured in parity violating elastic electron-proton scattering. The aim of the P2 experiment is a very precise measurement of the weak mixing angle with an accuracy of 0.15% at a low four-momentum transfer of $Q^2 = 4.5 \cdot 10^{-3}\,\mathrm{GeV}^2$. In combination with existing measurements at the Z pole with comparable accuracy, this comprises a test of the standard model with a sensitivity towards new physics up to a mass scale of 50 TeV. The experiment is being set up at the MESA accelerator in Mainz. In this talk, the motivation and challenges for this measurement will be discussed together with the current status of the construction of the P2 experiment.

Group Report HK 34.2 Thu 14:15 AM 00.021

The Mu2e experiment at Fermilab: a status report in view of the first data taking phase — •Anna Ferrari, Stefan E. Mueller, Oliver Knodel, and Reuven Rachamin for the Mu2e-Collaboration — Helmholtz- Zentrum Dresden-Rossendorf, Dresden, Germany

The Mu2e experiment, which is currently entering the final installation phase at the Fermi National Accelerator Laboratory in USA, will search for the charged-lepton flavor violating neutrino-less conversion of negative muons into electrons in the field of an aluminum nucleus. A conversion signal would require physics beyond the Standard Model, and the aim of Mu2e is to reach a single-event sensitivity four order of magnitude better than previous experiments. This can be achieved through an efficient production and transport of the muon beam, a rigorous control of all backgrounds that could mimic the monoenergetic conversion electrons, and an accurate normalization of the signal events. The present status of the Mu2e experiment will be presented, while the main detector subsystems has been installed at their final locations inside the Mu2e hall, and the strategies of the first data taking period have been defined.

HK 34.3 Thu 14:45 AM 00.021

High-precision Q-value measurements for neutrino physics using the JYFLTRAP Penning trap — •Jouni Ruotsalainen[1], Elina Kauppinen[1], Anu Kankainen[1], Tommi Eronen[1], Maxime Mougeot[1], Vikas Kumar[1], Jouni Suhonen[1,2], Jenni Kotila[2,3], Zhuang Ge[1], and Marek Stryjczyk[1] — [1]University of Jyväskylä, Department of Physics, Accelerator Laboratory, P.O. Box 35(YFL) FI-40014 University of Jyväskylä, Jyväskylä, Finland — [2]International Centre for Advanced Training and Research in Physics (CIFRA), P.O. Box MG12, 077125 Bucharest-Măgurele, Romania — [3]Finnish Institute for Educational Research, University of Jyväskylä, P.O. Box 35, Jyväskylä FI-40014, Finland

In this contribution, I will present the results and conclusions of the precise Q-value measurements of the $^{110}\mathrm{Ag}^m$ beta decay, and ^{104}Ru and ^{122}Sn double-beta decays, and the utilized JYFLTRAP double Penning trap system at the University of Jyväskylä, Finland. These nuclides are possible candidates for future experiments studying the mass of the neutrino and whether the neutrino is its own antiparticle. In collaboration with the nuclear theory group at the University of Jyväskylä, the half-lives of the decays were calculated to determine the feasibility of observing these decays. While the $^{110}\mathrm{Ag}^m$ was determined to be a suitable candidate for neutrino mass measurements, the half-lives of ^{104}Ru and ^{122}Sn neutrinoless double-beta decay were estimated to be too long for the decays to be observed with current experimental sensitivity.