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Absolute Neutrino Mass

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Since the discovery of neutrino oscillation we know that neutrinos have non-zero masses, but we do not know the absolute neutrino mass scale, which is as important for cosmology as for particle physics. The direct search for a non-zero neutrino mass from endpoint spectra of weak decays is complementary to the search for neutrinoless double beta-decay and analyses of cosmological data.

The next generation experiment KATRIN, the Karlsruhe Tritium Neutrino experiment, is under commissioning. It will improve the best current limits from the tritium beta decay experiments by one order of magnitude down to 200 meV probing the region relevant for structure formation in the universe. KATRIN uses a strong windowless gaseous molecular tritium source combined with a large acceptance and high energy resolution MAC-E-Filter as electron spectrometer. In October 2016 KATRIN celebrated "first light": For the first time electrons from a photoelectron source were flying from the very rear over the full beamline of 70m length to the detector. In July 2017 KATRIN is performing an intensive calibration campaign with Kr-83m conversion electrons from the windowless gaseous source (still without tritium) and a condensed source.

To overcome the problem that KATRIN is using a close to opaque source already to obtain the required statistics, new technologies are developed to potentially improve the sensitivity on the neutrino mass: Project 8 is performing spectroscopy of the synchrotron radiation of gyrating electrons in a KATRIN-like source; ECHO, HOLMES and NuMECS are investigating the endpoint region of the electromagnetic deexcitation spectrum of Ho-163 electron capture with arrays of high energy resolution cryo-bolometers.

In this talk data from the commissioning of KATRIN and an outlook on the tritium data taking starting 2018 will be presented as well as a report on other up-coming direct neutrino mass approaches.

Author: WEINHEIMER, Christian Philipp (Westfaelische Wilhelms-Universitaet Muenster (DE))

Presenter: WEINHEIMER, Christian Philipp (Westfaelische Wilhelms-Universitaet Muenster (DE))

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