Search for the neutrino mass scale - the KATRIN experiment

Prof. Dr. Christian Weinheimer

Institut für Kernphysik, Universität Münster

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.

Today the most stringent direct limits on the neutrino mass originate from investigations of the electron energy spectra of tritium beta-decay.

Currently the Karlsruhe Tritium Neutrino experiment KATRIN is under commissioning. It will improve the best limit from the tritium beta decay experiments at Mainz and Troitsk of 2 eV by one order of magnitude probing the region relevant for structure formation in the universe. KATRIN uses a strong windowless gaseous molecular tritium source combined with a huge MAC-E-Filter as electron spectrometer.
In October 2016 KATRIN celebrated "first light": For the first time electrons from a photoelectron source were transported over the full KATRIN beamline of 70m length. Data from the commissioning phase of KATRIN and an outlook on the tritium data taking starting end of 2017 will be presented.

In addition to an introduction to the field and a report on the KATRIN experiment an outlook on other up-coming direct neutrino mass approaches will be given.