Neutrino mass search with KATRIN

Dr. Kathrin Valerius
KIT, Karlsruhe

In the Standard Model neutrinos are considered to be massless particles. A wealth of neutrino oscillation experiments, however, yields irrefutable evidence that neutrinos carry a finite mass, thus giving us a glimpse at physics “beyond the Standard Model”.

Due to the smallness of neutrino masses, the determination of their absolute scale is a challenging experimental task. Precision measurements of the kinematics of weak decays - such as beta decay or electron capture - represent the only model independent approach to address this question in a laboratory experiment.

The most mature technique relies on the spectroscopy of tritium beta decay near its kinematic endpoint at 18.6 keV. The KArlsruhe TRItium Neutrino experiment (KATRIN) aims to improve the neutrino mass sensitivity obtained through this method by an order of magnitude to 200 meV/c2 (90% C.L.). To this end, KATRIN utilizes an ultra-luminous molecular gaseous tritium source, a differential and a cryogenic pumping section, a high-resolution electrostatic spectrometer of MAC-E filter type, and a multi-pixel silicon semiconductor detector. The experiment is currently being built up at the Karlsruhe Institute of Technology. This talk will present an overview of the status of the major components and report results from the ongoing commissioning of the spectrometer and detector section.