VACUUM PERFORMANCE OF THE KATRIN EXPERIMENT

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ABSTRACT

The absolute neutrino mass scale is one of the big open questions in particle physics, astrophysics and cosmology. A model independent, direct approach to determine the neutrino mass is the precise investigation of weak decays. The KArlsruhe TRItium Neutrino (KATRIN) experiment [1] is a large-scale experiment for the determination of the effective mass of electron anti-neutrinos with a sensitivity of 200 meV/c². It investigates the kinematics of electrons from tritium beta decay close to the endpoint of the energy spectrum with a high-resolution electrostatic spectrometer (energy resolution 0.93 eV at 18.6 keV).
The KATRIN measurement setup consists of a high luminosity windowless gaseous molecular tritium source, a differential and cryogenic pumped electron transport and tritium retention section, a tandem spectrometer section (pre-spectrometer and main spectrometer) for energy analysis, followed by a detector system for counting transmitted beta decay electrons. In order to minimize energy loss of signal electrons due to interactions with residual gas molecules, the pressure inside the main spectrometer – an ultra-high vacuum vessel with a length of 23.2 m and a volume of 1240 m³ - has to be maintained in the 10^{-11} mbar range.
This talk will give an introduction on the KATRIN experiment with the focus on the configuration, commissioning and performance of the main spectrometer vacuum system [2].

preferred format of presentation: oral

References

[1] KATRIN Collaboration, KATRIN design report, FZKA scientific report 7090 (2005) http://bibliothek.fzk.de/zb/berichte/FZKA7090.pdf
[2] KATRIN Collaboration, Commissioning of the vacuum system of the KATRIN Main Spectrometer, JINST 11 P04011 (2016)