

Vulcano Workshop 2022 - Frontier Objects in Astrophysics and Particle Physics



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First Sub-eV Neutrino Mass Limit from the KATRIN Experiment

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The KATRIN experiment at the Karlsruhe Institute for Technology aims at a model-independent determination of the neutrino mass from the kinematics of tritium beta decay with a sensitivity of $0.2 \text{ eV}/c^2$ at 90% confidence level. For that purpose a high statistics, high precision measurement of the endpoint region of the energy spectrum of beta-electrons produced in the decay is performed. The electrons originate from a high-intensity windowless gaseous molecular tritium source and are analysed by a high-acceptance spectrometer of MAC-E-Filter type with eV resolution. A combined analysis of the first two measurement campaigns of the experiment recently allowed to extract the first sub-eV limit on the neutrino mass with $m_\nu < 0.8 \text{ eV}/c^2$ at 90% CL. This success has been made possible not only by the increased statistics obtained since the first science-run, but also by a reduction of systematic uncertainties contributed by the different sub-systems of the experiment. The presentation will provide an overview of the experimental apparatus and the analysis leading to the latest mass limit. The work of the presenter is funded by BMBF under contract number 05A20PMA.

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