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Searching for sterile neutrinos at the keV scale with the KATRIN experiment

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The KATRIN experiment is designed to measure the neutrino mass m by analysing the endpoint region of the tritium β spectrum. KATRIN has set the world best limit of m < 0.45 eV (90% C.L.) from the combined analysis of the first five measurement campaigns.
Using the same data sets, KATRIN has recently published new results in the search for sterile neutrinos at the eV scale, complementing reactor and radioactive source experiments.
With an endpoint of 18.6 keV, tritium also offers high potential for extending KATRIN's physics programme, mainly by searching for sterile neutrinos at the keV scale. Such a project requires the measurement of the entire β spectrum. However, the current KATRIN detector is not designed to handle the higher count rate that occurs over such a wide energy range.
Equipped with a new, faster detector called TRISTAN, KATRIN aims to search for keV sterile neutrinos across the entire tritium β spectrum with a sensitivity on the active-sterile mixing down to 10^{-6}. TRISTAN, a multi-pixel device based on Silicon Drift Detector technology, is currently in production and will be installed in the KATRIN beamline in 2026.
In this talk, I will present the latest results on the development of the TRISTAN detector, as well as the challenges involved in developing a model of the full tritium β spectrum in order to perform a high-sensitivity keV sterile neutrino search with KATRIN.

Collaboration you are representing

KATRIN

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