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eV scale sterile neutrino sensitivity analysis in KATRIN

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KATRIN has recently reported a direct sub-eV upper bound on the neutrino mass from tritium beta-decay spectrum measurements. Along with the neutrino mass search, KATRIN has published recent results on searching for a fourth neutrino with a mass in the eV-range using the precision beta-decay spectra.

The fourth neutrino mass-eigenstate introduces an additional branch into the tritium β -spectrum which manifests as a kink in the differential spectrum. The position and amplitude of this kink correspond to the sterile neutrino mass m_4 and effective mixing angle $\sin^2(\theta) = |U_{e4}|^2$, respectively. In this work sensitivity studies to light sterile neutrinos based on new science runs and the effect of systematic uncertainties are presented. A grid scan is performed in the $[m_4^2, \sin^2(\theta)]$ 2-D plane using the fitting tool “KaFit” and neural network “Netrium” and sensitivity contours are calculated within this parameter space. The obtained sensitivity is compared to current results and anomalies in the field of light sterile neutrinos.

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