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Neutrino mass measurements with the KATRIN experiment

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Neutrino mass measurements are crucial for understanding fundamental physics, as neutrinos are among the most abundant in the universe. Traditionally, neutrinos were thought to be massless, but experiments have shown they do possess a small mass. Determining this mass is challenging due to their weak interactions with matter.

The Karlsruhe Tritium Neutrino (KATRIN) experiment is a leading effort in this field. Located at the Karlsruhe Institute of Technology (KIT) in Germany, KATRIN aims to measure the effective mass of electron neutrinos with unprecedented precision. It uses the beta decay of tritium to detect the energy of emitted electrons. By analyzing the endpoint of the beta decay spectrum, KATRIN can infer the neutrino mass. The experiment has already set an upper limit of 0.8 eV/c^2 with 5% of the total expected data.

This talk will give a brief overview of neutrino mass investigations with an emphasis on the operation of the KATRIN experiment and the analysis of a larger data set with 25% of the KATRIN data showing improvements in signal-to-background ratio and systematics, leading to a new upper limit of the neutrino mass.

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