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A Look at General Neutrino Interactions with KATRIN

The KATRIN experiment aims to measure the neutrino mass by precision spectroscopy of tritium β-decay. Recently, KATRIN has improved the upper bound on the effective electron-neutrino mass to 0.8 eV/c² at 90% confidence level [1] and is continuing to take data for a target sensitivity of 0.2 eV/c².
In addition to the search for the neutrino mass, the ultra-precise measurement of the β-spectrum can be used to probe physics beyond the Standard Model. In particular, general neutrino interactions (GNI) [2] can be investigated through a search for potential shape variations of the β-spectrum. For this purpose, all theoretically allowed interaction terms for neutrinos are combined in one effective field theory. This enables a model-independent description of novel interactions, which could provide small contributions to the weak interaction. Such potential modifications can then be identified in the KATRIN β-spectrum by means of energy-dependent contributions to the rate.

The talk will introduce the theoretical background of the general neutrino interactions, give an overview of the analysis method and present recent sensitivity studies.

[1] The KATRIN Collaboration. Direct neutrino-mass measurement with sub-electronvolt sensitivity. Nature Physics 18, 160–166, 2022.
[2] Ingolf Bischer and Werner Rodejohann. General neutrino interactions from an effective field theory perspective. Nuclear Physics B, 947, 2019.

Collaboration / Activity

KATRIN

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