



Contribution ID: 120

Type: Poster

The TRISTAN detector upgrade for the keV sterile neutrino search with KATRIN

Wednesday, October 16, 2024 6:27 PM (2 minutes)

The KATRIN experiment's search for keV sterile neutrinos requires an upgraded detector system to perform precision electron spectroscopy at high count rates. The detector upgrade, the TRISTAN detector, is composed of 166-pixel silicon drift detector modules. Production and characterization of the first TRISTAN modules is summarized, and a detector energy resolution of < 300 eV (FWHM) for 20 keV electrons at rates of 10^5 counts per second is shown. Integration of the TRISTAN detectors into the KATRIN beamline are projected to provide sensitivity to sterile-to-active mixing of keV sterile neutrinos at the level of $\sin^2(\theta) \approx 10^{-6}$.

Application of the same detector technology in the search for axions, as the detector system for IAXO, and for measurement of the polarization of hard X-rays from Cygnus X-1, as part of the ComPol project, are also presented.

Summary

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Session Classification: Poster session leading into social dinner buffet