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MC Simulations of the dector response to low energy electrons for KATRIN

The Karlsruhe Tritium Neutrino experiment (KATRIN) derives the mass of the electron anti-neutrino with a sensitivity of 0.2 eV/c2 (90% C.L.) in a model-independent way from the measured energy spectrum of tritium β-decay electrons. The energy resolution of ΔE = 0:93 eV for the electrons with energy 0 < E < 18.6keV is provided by a large MAC-E spectrometer which acts as a highpass flter. The focal plane detector (FPD) is a large silicon PIN diode detecting the electrons transmitted by the spectrometer.
A full Monte Carlo simulation was developed to simulate the detector response of silicon to low-energy electrons taking into account elastic (relativistic partial wave expansion) and inelastic scattering (full dielectric formalism), ionization, the Auger cascade and surface barrier effects. In the resulting energy spectra, dead layer, backscattering and bulk plasmon effects can be observed. In the future the simulation can also be adapted for e.g. germanium or aluminum.
An overview of the simulation and good agreement with experimental data will be presented. This work has been partially supported by funds of the DFG (SFB / Transregio 27 “Neutrinos and Beyond”).

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