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https://uni-due.zoom-x.de/j/64228670246?pwd=RjVQeFNIUkRKRkpiNVpKYXhJaFNLdz09 (gilt für alle Vorträge)

Weighing the lightest matter particle: Direct measurements of the neutrino mass

Prof. Dr. Kathrin Valerius, Institute of Astroparticle Physics, Karlsruhe Institute of Technology (KIT)

The neutrino mass remains one of the last unknowns among the fundamental parameters of nature. Its value is not only crucial for theories beyond the Standard Model of elementary particles, but also for understanding the formation of structure in the universe. Unlike neutrino oscillation studies, which probe only mass differences, direct measurements are required to determine the absolute neutrino mass scale.
Such measurements rely on high-precision kinematic studies of weak decays. In recent years, the field has entered a new era: advances in detector technology have enabled significant progress in calorimetric measurements of electron capture in holmium-163, while novel frequency-based techniques have been developed to probe the β-spectrum of tritium. These experiments push the limits of energy resolution, overall instrument precision, and stability for long-term measurements.
The current flagship experiment, KATRIN, employs an intense gaseous tritium source together with a high-resolution electrostatic spectrometer. It has now achieved a sensitivity of 0.45 eV/c^2 and continues to accumulate data. This talk will review the present landscape of direct neutrino-mass searches, highlight the underlying measurement technologies, and discuss perspectives for further advances in the coming years.