Probing the neutrino mass scale — first results of the KATRIN experiment

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How small is the neutrino mass? This seemingly simple, yet fundamental open question bears an important relevance for current research topics from cosmology to elementary particle and astroparticle physics.

Precision measurements of the kinematics of weak decays offer a direct and nearly model-independent approach to measure the neutrino mass scale. The Karlsruhe Tritium Neutrino experiment (KATRIN) is searching for the minute imprint of the neutrino mass in the endpoint region of the tritium beta-decay spectrum. KATRIN employs a high-intensity gaseous molecular tritium source and a high-resolution electrostatic filter with magnetic adiabatic collimation to target a neutrino-mass sensitivity of 0.2 eV/c^2, thus improving on previous experiments by an order of magnitude, after a total of five years of data-taking.

In this talk I will present the results of the first science run of KATRIN which took place in spring 2019. This initial data set of a few weeks allows KATRIN to improve the direct neutrino mass bound by about a factor of 2 already. It gives promising perspectives on the long-term data harvest to exploit KATRIN's neutrino mass sensitivity goal and to open up further interesting science channels in the search for physics beyond the Standard Model.