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Neutrino mass measurements with beta decay experiments

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Abstract content

Summary

The neutrino mass plays an important role in particle physics and cosmology. In recent years the detection of neutrino flavour oscillations proved that neutrinos carry mass. However, oscillation experiments are only sensitive to the mass-squared difference of the mass eigenvalues. Beta-decay experiments provide a model-independent way to determine the absolute neutrino mass by measuring the end-point region of the energy spectrum of decay electrons with high accuracy. The best upper limits on the neutrino mass so far have been set to 2.2 eV by two experiments in Mainz and Troitsk using tritium as a beta emitter. The generation of tritium beta-experiments, the KATRIN experiment, is currenty built in Karlsruhe/Germany by an international collaboration of about 120 scientists. The KATRIN collaboration intends to improve the sensitivity by one order of magnitude to 0.2 eV. Measurements are planned to start in 2012 for a period of about five years. The investigation of a second isotope (Rhenium-137) is being persued in Italy by the international MARE collaboration using micro-calorimetrs to measure the beta spectrum. The technology needed to reach 0.2 eV sensitivity is still in the R phase which is expected to take another 10 years. This talk will review the present status of single beta-decay neutrino-mass experiments.

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