

High Energy Physics - Experiment

Neutrino masses and Neutrinoless Double Beta Decay: Status and expectations

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Two most outstanding questions are puzzling the world of neutrino Physics: the possible Majorana nature of neutrinos and their absolute mass scale. Direct neutrino mass measurements and neutrinoless double beta decay (0 ν DBD) are the present strategy to solve the puzzle. Neutrinoless double beta decay violates lepton number by two units and can occur only if neutrinos are massive Majorana particles. A positive observation would therefore necessarily imply a new regime of physics beyond the standard model, providing fundamental information on the nature of the neutrinos and on their absolute mass scale. After the observation of neutrino oscillations and given the present knowledge of neutrino masses and mixing parameters, a possibility to observe 0 ν DBDD at a neutrino mass scale in the range 10-50 meV could actually exist. This is a real challenge faced by a number of new proposed projects. Present status and future perspectives of neutrinoless double-beta decay experimental searches is reviewed. The most important parameters contributing to the experimental sensitivity are outlined. A short discussion on nuclear matrix element calculations is also given. Complementary measurements to assess the absolute neutrino mass scale (cosmology and single beta decays) are also discussed.

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