Neutrino Physics

Prospects in double beta decay searches

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Neutrinos have recently provided us with the first tangible evidence of phenomena beyond the reach of our theory of the laws of particle physics, the remarkably predictive "Standard Model". The positive observation of neutrino oscillations in atmospheric neutrinos and in solar neutrinos gives new motivations for more sensitive searches. Unfortunately the oscillation experiments can only provide data on the mass differences of the neutrino mass-eigenstates. The absolute scale can only be obtained from direct mass measurements, ^{3}H end point measurements for example, or in the case of Majorana neutrinos, more sensitively by neutrinoless double beta decay. In fact, recently published constraints on the mixing angles of the neutrino mixing matrix make a strong case that if neutrinos are Majorana particles, there are many scenarios in which next generation double-beta decay experiments should be able to observe the phenomenon and measure the effective Majorana mass of the electron neutrino, which would provide a measure of the neutrino mass scale. The interest for next generation double beta decay experiments is growing up, for if the mass scale is below $\sim$ 0.2 eV, double beta decay may be the only hope for measuring it.
After a short theoretical overview, the general aspects pertaining to the different experimental approaches will be presented. In the context of their claimed sensitivity most of the proposed future experiments will be discussed.