SEARCH FOR DOUBLE BETA DECAY PROCESSES OF124XE WITH XENON100 &XENON1T

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Driven by the search for dark matter particles the XENON project installed its next stage multi-ton experiment XENON1T, which will probe the spin-independent-WIMP-nucleon cross section down to $2x10^{-47}cm^2$. Besides its main purpose different particle physics topics can be addressed.

One example are double beta decay processes of the natural isotope ^{124}Xe. It is expected to decay via two-neutrino double electron capture (2νECEC). Due to its Q-value of 2864keV the positron including processes $2\nu EC\beta^+$ and $2\nu\beta^+\beta^+$ are also allowed. In absence of an etection there is only a lower limit to the respective half-life

(e.g. > $4.7x10^{21}$yr for 2νECEC).

With its fiducial mass of one ton XENON1T will be the most sensitive detector for these decays to date and detection the 2νECEC and $2\nu EC\beta^+$ decays is within reach providing information on nuclear matrix element (NME) models. In addition to these standard model processes the detection of a neutrinoless decay (e.g. 0νECEC) would hint towards physics beyond the Standard Model and could shed light on the neutrino mass and a Majorana nature of neutrinos. For a possible resonance enhancement of this decay, the half-life predictions are ranging from 10^{24}yr to 10^{31}yr illustrating the uncertainty for calculations of the NME involved in this decay as well as the unknown neutrino mass value.

Until XENON1T data are available, the search for all processes can be performed in the data of its predecessor XENON100, which could compete with existing searches. This work is supported by BMBF under contract number 05A14PM1 and DFG (GRK 2149).