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Double Beta Decay of Zr96 using NEMO-3 and Calorimeter R&D for SuperNEMO

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Using 911 days of data from NEMO-3, a world best 2vBB decay half-life of Zr96 has been measured to be [2.36 +/-0.17(stat) +0.17 -0.14(syst)] x 10ˆ19 yr. The obtained limit on the 0vBB decay half-life at the 90% confidence level is 8.5 x 10ˆ21 yr which leads to the limit on the effective Majorana neutrino mass < 7.4 - 20.3 eV, using the RQRPA and pnQRPA nuclear models. SuperNEMO is a next-generation double beta decay experiment based on the successful tracking plus calorimetry design approach of the NEMO-3. SuperNEMO can study a range of isotopes, the baseline isotopes are Se82 and possibly Nd150. The total isotope mass will be 100-200 kg. A sensitivity to a 0vBB half-life greater than 10ˆ26 years can be reached which gives access to Majorana neutrino masses of 50-100 meV. One of the main challenges of the SuperNEMO R&D is the development of the calorimeter with an energy resolution of 4% FWHM at 3 MeV (Q(bb) value of Se82). This unprecedented milestone has been achieved using low density plastic scintillator coupled to high quantum efficiency photomultiplier tubes.

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