

LNGS SEMINAR SERIES

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Recent results in the theory of double beta decay

Neutrinoless double beta decay is of fundamental importance for determining the Majorana, or Dirac, nature of the neutrino and for confirming a nonzero value of its mass as established by neutrino oscillation experiments. The half-life for this process is given in terms of a phase space factor (PSF), a nuclear matrix element (NME) and a function containing physics beyond the standard model. In this talk, recent results in the calculation of NME and PSF for double beta decay with and without the emission of neutrinos ($2\nu\beta\beta$ and $0\nu\beta\beta$) will be presented. Results for $0\nu\beta\beta$ will include both light and heavy neutrino exchange. Limits on the average neutrino mass, $\langle m_\nu \rangle$, resulting from recent experiments, KamLAND-Zen (2012), EXO (2012) and GERDA (2013), in combination with the calculated NME and PSF, will be given. Remaining problems in the calculation of NME, especially those related to the renormalization of the axial vector coupling constant, g_A , in nuclei, will be mentioned, and their impact on $0\nu\beta\beta$ searches discussed.

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