

Lepton number density distribution of Majorana neutrinos and the pair productions of (anti-) neutrino pairs at low energies

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At low energies, the (anti-)neutrino pairs are produced and annihilated due to the effect of the Majorana mass term. To investigate this effect, we studied the time variation of the lepton number density distribution. As an initial state, a neutrino wave packet is prepared near the spacetime origin. We studied how the lepton number density distribution corresponding to the state changes with time by drawing contour plots of the lepton number density distribution. This allows us to investigate the effects of neutrino propagation and the production and annihilation of (anti-)neutrino pairs from the vacuum.

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