

High Energy Physics - Phenomenology

Topological phase in two flavor neutrino oscillations

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We show that the phase appearing in neutrino flavor oscillation formulae has a geometric and topological contribution. We identify a topological phase appearing in the two flavor neutrino oscillation formula using Pancharatnam's prescription of quantum collapses between non-orthogonal states. Such quantum collapses appear naturally in the expression for appearance and survival probabilities of neutrinos. Our analysis applies to neutrinos propagating in vacuum or through matter. For the minimal case of two flavors with CP conservation, our study shows for the first time that there is a geometric interpretation of the neutrino oscillation formulae for the detection probability of neutrino species.

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