

Neutrino quantum decoherence engendered by neutrino decay to photons, familons and gravitons

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The phenomenon of neutrino oscillations emerges due to coherent superposition of neutrino mass states. An external environment can modify a neutrino evolution in a way that the coherence will be violated. Such a violation is called quantum decoherence of neutrino mass states and leads to the suppression of flavor oscillations. In our previous studies (see [1] and reference therein) we presented a new theoretical framework, based on the quantum field theory of open systems and applied it to the problem of neutrino evolution. In the present paper we present the generalized framework that enables one to consider quantum decoherence of neutrino mass states engendered by a neutrino decay to a lighter neutrino and a massless particle. We apply this framework to consider mechanisms of the neutrino quantum decoherence engendered by neutrino decay to photons, familons and gravitons. The obtained results are of interest for experiments with reactor and astrophysical neutrinos.

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[1] K.Stankevich, A.Studenikin, Neutrino quantum decoherence engendered by neutrino radiative decay, Phys. Rev. D 101 (2020) 056004.

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