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Non-unitary Leptonic Flavor Mixing and CP Violation in Neutrino-antineutrino Oscillations

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If massive neutrinos are Majorana particles, then the lepton number should be violated in nature and neutrino-antineutrino oscillations $\nu_\alpha \leftrightarrow \overline{\nu}_\beta$ (for $\alpha, \beta = e, \mu, \tau$) will definitely take place. In the present paper, we study the properties of CP violation in neutrino-antineutrino oscillations with the non-unitary leptonic flavor mixing matrix, which is actually a natural prediction in the canonical seesaw model due to the mixing between light and heavy Majorana neutrinos. The oscillation probabilities $P(\nu_\alpha \to \overline{\nu}_\beta)$ and $P(\overline{\nu}_\alpha \to \nu_\beta)$ are derived, and the CP asymmetries $cal A_{\alpha\beta} \equiv [P(\nu_\alpha \to \overline{\nu}_\beta) - P(\overline{\nu}_\alpha \to \nu_\beta)]/[P(\nu_\alpha \to \overline{\nu}_\beta) + P(\overline{\nu}_\alpha \to \nu_\beta)]$ are also calculated. Taking into account current experimental bounds on the leptonic unitarity violation, we show that the CP asymmetries induced by the non-unitary mixing parameters can significantly deviate from those in the limit of a unitary leptonic flavor mixing.

In-person participation

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