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**Nontrivial Vacuum Effect in Flavor Mixing Problem** NICK LUHRING, CHUENG-RYONG JI, North Carolina State University — One of the most popular inquiries in particle physics today is the flavor mixing problem as we see in the neutrino oscillation phenomena. Although the flavor mixing problem has been explored with the Pontecorvo formalism in quantum mechanics, more advances have been made in our understanding through the quantum field theory. By taking the effects of the coherent vacuum, the quantum field theory offers more accuracy to the flavor mixing problem than quantum mechanics. In this presentation, we discuss the unitary inequivalence between the flavor vacuum and the mass vacuum in quantum field theory and describe its consequence to the flavor mixing problem in neutrino oscillations. We show the nontrivial vacuum effect as it relates to the neutrino oscillation problem and compare it with the difference in the time evolution of the two mixing pseudoscalar meson fields (e.g.$\eta-\eta'$ system) between the quantum field theory and the quantum mechanics. We also explore an analogy between coupled harmonic oscillators and flavor mixing problem and discuss more heuristically the difference between the trivial vacuum and the coherent vacuum.

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