

A Modern Look at the Oscillation Physics Case for a Neutrino Factory

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The next generation of neutrino oscillation experiments, JUNO, DUNE, and HK, are under construction now and will collect data over the next decade and beyond. As there are no approved plans to follow up this program with more advanced neutrino oscillation experiments, we consider here one option that had gained considerable interest more than a decade ago: a neutrino factory. Such an experiment uses stored muons in a racetrack configuration with extremely well characterized decays reducing systematic uncertainties and providing for more oscillation channels. Such a machine could also be one step towards a high energy muon collider program. We consider a long-baseline configuration to SURF using the DUNE far detectors or modifications thereof, and compare the expected sensitivities to the three-flavor oscillation parameters to the anticipated results from DUNE and HK. We find that a neutrino factory can improve our understanding of CP violation and also aid in disentangling the complicated flavor puzzle.

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