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The DUNE experiment

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The Deep Underground Neutrino Experiment (DUNE) is a next generation, long-baseline neutrino oscillation experiment which will utilize high-intensity ν_μ and $\bar{\nu}_\mu$ with peak neutrino energies of ~2.5 GeV produced at Fermilab, over a 1285 km baseline, to carry out a detailed study of neutrino mixing. The neutrino beam has an initial design intensity of 1.2 MW, but has a planned upgrade to 2.4 MW. The unoscillated neutrino flux will be sampled with a near detector complex at Fermilab, and oscillated at the DUNE far detector at the Sanford Underground Research Facility, which will ultimately consist of four modules each containing a total liquid argon mass of 17 kt.

In this talk, the key features of the DUNE experiment will be described. DUNE's long-baseline neutrino oscillation sensitivity will be discussed, including a full simulation, reconstruction, and event selection of the far detector and a full simulation and parameterized analysis of the near detector. Detailed uncertainties due to the flux prediction, neutrino interaction model, and detector effects are included. DUNE is able to resolve the neutrino mass ordering to a 5σ precision, for all values of the CP-phase, after a 66 kiloton-megawattyear exposure (ktMWyr). It has the potential to observe charge-parity violation in the neutrino sector to a precision of 3σ (5σ) after an exposure of 197 (646) ktMWyrs, for 50% of all values of the CP-violating phase. DUNE's sensitivity to other oscillation parameters of interest have been explored.

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