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Effects of Magnetic Horn Geometry Uncertainty on Neutrino Flux at DUNE

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The goals of the Deep Underground Neutrino Experiment (DUNE) at Fermi Lab, is to precisely measure neutrino and antineutrino oscillation properties to determine if charge-parity (CP) symmetry is violated in the lepton sector, thus providing a possible explanation for the matter-antimatter asymmetry in the universe, and to measure the neutrino mass ordering. To maximize the neutrino flux in the desired energy range, the secondary charged mesons produced in the interactions of an intense proton beam with a target are focused using the magnetic field created by a set of horns. To ensure an accurate understanding of the beam line and the neutrino flux, it is essential to study uncertainties stemming from the geometry of these horns. In this study, two geometric parameters are considered, (i) the eccentricity and (ii) the ellipticity of the inner conductors. The effects of eccentricity and ellipticity of the inner conductor on the resulting neutrino flux are presented.

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