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Neutrino oscillation physics with a Neutrino Factory

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We illustrate that the baseline Neutrino Factory configuration being developed within the International Design Study for the Neutrino Factory (the IDS-NF) is optimized for standard oscillation-physics measurements and for searches for new physics. For small values of θ13 (sin22θ13 < 10-2) a Neutrino Factory with two storage rings in which 25 GeV muons decay, pointing to two neutrino detectors, one situated at a distance between 2500—5000 km, the second at 7000—8000 km is optimal. If the value of θ13 is found to be large (sin22θ13 > 10-2) a Neutrino Factory in which 10 GeV muons are stored in a single ring provides the best sensitivity for the discovery of CP violation in the neutrino sector, the determination of the neutrino mass hierarchy and the measurement of θ13. Finally, the crucial role played by near detectors in the determination of the standard oscillation parameters and in the search for non-standard physics at the Neutrino Factory will be presented.

Auteur principal: Dr SOLER, Paul (University of Glasgow)

Orateur: Dr SOLER, Paul (University of Glasgow)

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