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Deep underground neutrino experiment DUNE – calculation of sensitivity to the measurement of oscillation parameters

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Neutrinos have a special place in the physics of elementary particles. Neutrinos are the lightest particles, leptons that can change their flavors, i. e. oscillate, propagating through the vacuum or matter. Neutrino oscillations are a phenomenon that has been activity studied during the past decades and have a lot of undecided problems at the moment. Working now accelerator experiments, such as NOvA and T2K, make a significant contribution to the development of the neutrino oscillation physics. However, they have some restrictions. For example, neutrino possesses a tiny interaction cross section with the matter, so enormous detectors volumes are needed for their observation. Therefore at the present, a huge accelerator experiment DUNE is been creating for investigations at opened questions in the field of neutrino physics, including the neutrino oscillation physics.
In this work calculation of sensitivity DUNE to precise measurement of oscillation parameters describing neutrino oscillation in the three-flavor paradigm of the extended Standard Model of elementary particles was determined. DUNE modeling was built in a specialized simulator of neutrino experiments GloBES, as well as with software of neutrino analysis GNA. From simulation numbers of rates that were supposed to a true were calculated, then analysis with methods of statistical hypotheses was realized. Thus sensitivities to CP violation in the lepton sector (δCP), to mass hierarchy defining (Δm32) and to an octant in which one of mixing angles locates (θ23) were plotted. Finally, comparative characteristics for two independent software (GloBES and GNA) was considered due to each of them has particular qualities.

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