

Study of tau neutrino production in proton nuclear interaction

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Tau neutrino properties are not so well known in comparison to those of muon or electron neutrinos. The tau neutrino interaction cross-section was only measured by the DONUT experiment in 2008 with a large systematical error of 50% due to a poor knowledge of the tau neutrino flux in this beam dump experiment. However, the better measurement of this cross section is needed for the planned future neutrino experiments. It would also allow testing the Lepton Universality (LU) of Standard Model in neutrino interactions. Recently several results for B-meson decays (LHCb, Babar) demonstrated hints of possible LU violation. The tau neutrinos are produced in the Ds meson decays to tau, $D_s \rightarrow \tau + \nu_\tau$, and the cascade decay of the tau, $\tau \rightarrow x + \nu_\tau$. DsTau experiment has been proposed to study the tau neutrino production at CERN SPS. It will measure the Ds production differential cross-section in proton and tungsten interactions. This will allow reducing of the uncertainty due to the tau neutrino flux in the DONUT result from 50% to 10%. The peculiar Ds cascade decay topology ("double kink") in a few mm range will be detected by nuclear emulsion tracker thanks to its excellent spatial resolution (~50nm). In 2016 and 2017, we made test beam exposures of nuclear emulsion modules at CERN SPS 400GeV/c proton beam. A pilot run in August 2018 and physics run in 2021 are scheduled. In this talk, the status and prospects of the DsTau project as well as a review of the modern nuclear emulsion technique and the methods of its data analysis will be presented.

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