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NA65 Experiment : study of tau neutrino production with CERN-SPS protons

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Tau neutrino properties are not well known in comparison to those of muon or electron neutrinos. The tau neutrino interaction cross-section is known with large uncertainties. In particular, measured by the DONuT experiment in 2008, it has about 30% statistical error and systematical error of about 50% due to a poor knowledge of the tau neutrino flux in this beam dump experiment. Precise measurement of tau neutrino interaction cross-section will allow to test the Lepton Flavour Universality (LFU) of Standard Model in neutrino interactions. Several results for B-meson decays (LHCb, Babar, BelleII) demonstrated hints of possible LFU violation in modes with tau lepton could be due to Physics Beyond Standard Model effects. Accurate measurement of the tau neutrino interaction cross section is also needed for the future neutrino experiments. The tau neutrinos are produced in the Ds meson decays: Ds $\longrightarrow \tau + \nu\tau$, with further decay $\tau \longrightarrow X + \nu\tau$. DsTau experiment has been proposed to measure the Ds production differential cross-section in proton- tungsten interaction. 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). Large amount of charm decay events (~10^5) are expected to be detected as well, providing interesting by-product studies, in particular a search of intrinsic charm in a proton. In 2016 and 2017, and in 2018, a pilot sample was collected at CERN SPS and processed in 2019. Given the success of pilot test beam and encouraging results of data analysis, CERN approved the DsTau project as a new experiment NA65. Main data sample (x10 more) will be collected in 2021-22. In this talk, the status, prospects of NA65 as well as the results of the pilot run are presented.

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