

Detecting and studying high-energy neutrinos with FASER ν at the LHC

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FASER ν at the CERN LHC is designed to directly detect collider neutrinos for the first time and study their cross sections at TeV energies. The detector will be located 480 m downstream of the ATLAS interaction point. With FASER ν , the three-flavor neutrino cross-sections will be measured in the currently unexplored energy range between 350 GeV and 5 TeV. In particular, tau-neutrino and electron-neutrino cross sections will be measured at the highest energy ever. From the other perspective, FASER ν can measure forward neutrino production, and provide novel constraints on forward particle production.

In 2018 we performed a pilot run with the aims of measuring particle fluxes at the detector location and of detecting neutrino interactions for the first time at the LHC. We installed a 30-kg lead/tungsten emulsion detector and collected data of 12.2 fb $^{-1}$. The analysis of this data has yielded several neutrino interaction candidates, excluding the no-signal hypothesis at the 2σ level.

During Run-3 of the LHC starting from 2022, we will deploy an emulsion detector with a target mass of 1.1 tons, coupled with the FASER magnetic spectrometer. This would yield roughly 1,300 ν_e , 9,000 ν_μ , and 30 ν_τ interacting in the detector. We present the status and plan of FASER ν , as well as the neutrino detection in the 2018 data.

Working group

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