

# Measuring three-flavor neutrinos with FASERnu at the LHC

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FASER $\nu$  at the LHC is designed to directly detect collider neutrinos for the first time and study their properties at TeV energies, where no such measurements currently exist. The detector will be located 480 m downstream of the ATLAS interaction point. With FASERnu, the three-flavor neutrino cross-sections will be measured in the currently unexplored energy range between 360 GeV and 5 TeV. In particular, tau-neutrino and electron-neutrino cross sections will be measured at the highest energy ever. In 2018 we performed a pilot run with the aims of measuring particle fluxes at the proposed detector location and of possibly detecting neutrino interactions for the first time at the LHC. We installed a 30-kg lead/tungsten emulsion detector and collected data of  $12.2 \text{ fb}^{-1}$ . The analysis of this data has yielded several neutrino interaction candidates, excluding the no-signal hypothesis with a statistical significance of  $2.7\sigma$ . We have also studied the charged particle flux in regard to the characterization of the unprecedented collider neutrino beamline. 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 2,000  $\nu_e$ , 7,000  $\nu_\mu$ , and 30  $\nu_\tau$  interacting in the detector. Here we present the status and plan of FASER $\nu$ , as well as the neutrino detection in the 2018 data.

## What is your topic?

Neutrino Physics

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