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Muon neutrino interaction studies with 2024 data with SND@LHC detector

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The Scattering and Neutrino Detector at LHC (SND@LHC) is a compact, standalone experiment located in the TI18 tunnel, 480 meters downstream of the ATLAS interaction point, designed to observe neutrinos produced in LHC proton-proton collisions. The SND@LHC detector allows for the identification of all three flavors of neutrino interactions in the pseudorapidity region $7.2 < \eta < 8.4$ within an unexplored energy range of 100 GeV < E < 1 TeV. The SND@LHC detector comprises three main sections: an instrumented target, a hadron calorimeter, and a muon system. All high-energy νN interactions in the target produce hadronic showers, while muon neutrino interactions are distinguished by the presence of a muon in the final state.
This talk will present the status of the ongoing analysis of 2024 data. Compared to the 2022 dataset—which enabled the first observation of accelerator neutrinos—this analysis benefits from several significant improvements. The recorded luminosity in 2024 is more than three times larger than in 2022, leading to an expected number of neutrino interactions in the detector of the order of thousands. Additionally, the installation of a veto plane during the 2023–2024 Year-End Technical Stop enhanced target coverage and significantly improves background rejection. Another key advancement is the calorimeter calibration, made possible by a dedicated test beam campaign. This calibration not only enables precise energy estimation for recorded events, but also provides an additional tool for background suppression, allowing full exploitation of the instrumented volume. As a result, this analysis benefits from substantially larger statistics compared to previous studies.

Secondary track

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