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Neutrino and feebly interacting particle searches at the LHC

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The first direct neutrino measurements at the Large Hadron Collider, CERN, have recently been published following a year of data taking of two new small forward detectors, FASER(ν) and SND@LHC. These experiments use both electronic and emulsion based detector components for the measurement of neutrino interactions and long lived particles produced in the very forward region of the proton-proton interacting points. They exploit the unique energies of the LHC's proton-proton collisions at center-of-mass energies of 13.6 TeV and the high beam intensities to measure physics from a new angle. This talk is an overview of these measurements in the context of the FASER experiment: Its design, technology, and analysis strategy for detection of Standard Model neutrinos and new feebly interacting particles, whilst controlling for the high muon flux background. FASER's first neutrino-based measurements mark the first observation of muon neutrinos at a collider and the detection of the highest energy electron neutrinos from a human made source.
Once these measurements grow more precise in future analyses, the results will offer useful constraints on neutrino interaction cross-sections and simulation of particle production processes in the forward region. I will remark on the connection between these results and astroparticle physics experiments, such as neutrino telescopes, cosmic ray shower arrays, and dark matter experiments.

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