

Study of large hadron collider neutrino fluxes
for The KM3NeT experiment

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Abstract

The main sources of neutrino fluxes at the Large Hadron Collider (LHC) are the weak decays of particles produced in proton-proton interactions. These neutrinos could enable a wide range of scientific program, significantly enhancing the LHC's physics reach, particularly for the High-Luminosity LHC, which is scheduled to start operation by 2030. Recently, dedicated neutrino experiments at the LHC—FASER and SND@LHC—located along the beam collision axis, have detected collider neutrinos for the first time and measured their cross sections in a new kinematic area. Neutrino physics is also being studied in the KM3NeT/ORCA experiment, which is currently under construction at the bottom of the Mediterranean Sea and also expected to be completed by 2030. This 10-megaton detector has the potential to detect neutrinos from the LHC, despite being located approximately 400 kilometers away. In this study, we investigate neutrino fluxes in the perpendicular direction to the proton-proton interaction axis ($|\eta| < 1.5$) and evaluate the prospects of their detection in the KM3NeT/ORCA detector.