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## Predictions for dimuon production in high-energy neutrino–proton collisions using the color dipole model

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Interactions of high-energy neutrinos with matter can be studied through the angular separation observed in dimuon production, an observable particularly sensitive to the transverse momentum dynamics of partons. In this work, we develop a Monte Carlo event generator based on the color dipole model, interfaced with Pythia8 for parton showering and hadronization simulations, to predict dimuon production cross sections in neutrino–proton collisions at energies relevant to IceCube and future detectors. The color dipole formalism generates larger transverse momentum compared to standard Pythia predictions, enhancing the yield of angularly separated high-energy muons.

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