

Probing dark particles in scattering experiments

Saturday, 29 November 2025 15:40 (10 minutes)

We present a model-independent search for a dark particle χ produced via four-fermion effective interactions at the DUNE Near Detector, COHERENT, and CONUS+ experiments. Analyzing scalar, pseudoscalar, vector, axial-vector, and tensor operators, we find a clear sensitivity hierarchy. DUNE-ND dominates for most interactions due to its high-intensity beam, while COHERENT and CONUS+ provide complementary constraints at lower masses. The results, strongly dependent on the Lorentz structure, give stringent universal bounds applicable to scenarios like Left-Right Symmetric Models and sterile neutrinos, offering a powerful tool for interpreting future neutrino data.

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Session Classification: 茶歇 + 展报 / Tea Break+Poster