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Neutrino masses from a pseudo-Dirac bino and its detection prospects

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We examine the detection prospects for a long-lived bivo, a pseudo-Dirac bino which is responsible for neutrino masses, at the LHC and at dedicated long-lived particle detectors. The bivo arises in U(1)_R-symmetric supersymmetric models where the neutrino masses are generated through higher dimensional operators in an inverse seesaw mechanism. At the LHC the bivo is produced through squark decays and it subsequently decays to quarks, charged leptons and missing energy via its mixing with the Standard Model neutrinos. We consider long-lived bivos which escape the ATLAS or CMS detectors as missing energy and decay to charged leptons inside the proposed long-lived particle detectors FASER, CODEX-b, and MATHUSLA. We find the currently allowed region in the squark-bivo mass parameter space by recasting most recent LHC searches for jets+MET.We also determine the reach of MATHUSLA, CODEX-b and FASER. We find that a large region of parameter space involving squark masses, bivo mass and the messenger scale can be probed with MATHUSLA, ranging from bivo masses of 10 GeV-2 TeV and messenger scales 10ˆ2–10ˆ11TeV for a range of squark masses.

Summary

Author: GEHRLEIN, Julia

Co-author: IPEK, Seyda

Presenter: GEHRLEIN, Julia

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