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Long-lived Neutral Fermions at the DUNE near Detector (17'+3')

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At the Deep Underground Neutrino Experiment (DUNE), a proton beam hits a fixed target leading to large production rates of mesons. These mesons can decay and potentially provide a source of long-lived neutral fermions. Examples of such long-lived fermions are heavy neutral leptons which can mix with the standard-model active neutrinos, and the bino-like lightest neutralino in R-parity-violating supersymmetry. We show that the Standard Model Effective Field Theory extended with right-handed singlet neutrinos can simultaneously describe heavy neutral leptons and bino-like neutralinos in a unified manner. We use the effective-field-theory framework to determine the sensitivity reach of the DUNE near detector in probing various scenarios of long-lived neutral fermions.

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