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## Probing long-lived HNLs via top-philic interactions at the LHC

*Monday, 2 June 2025 17:30 (17 minutes)*

Heavy Neutral Leptons (HNLs) provide a well-motivated extension of the Standard Model, offering a window into neutrino mass generation and potential new physics at the TeV scale. In this talk, we explore the phenomenology of HNLs at the LHC in the framework of  $N_R$ SMEFT, focusing on top-philic dimension-six operators. We identify two key HNL production channels: direct production in association with single top quarks and production via exotic top decays. For long-lived HNLs, we estimate the sensitivity reach of both main LHC detectors (such as ATLAS) and far-detector experiments (including MATHUSLA and ANUBIS) in the high-luminosity era. Our results show that ATLAS can probe new physics scales up to 12 TeV for certain operators, while far detectors are sensitive up to 4.5 TeV, covering complementary regions of HNL parameter space. These findings highlight the role of top quark interactions in unveiling long-lived particles and expanding the discovery potential for HNLs at the LHC.

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