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Simulating Heavy Neutral Leptons with General Couplings at Forward Collider Experiments

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Heavy neutral leptons (HNLs) are an extension of the Standard Model that are well-motivated by neutrino masses, dark matter, and baryogenesis via leptogenesis. We present a comprehensive analysis of all significant HNL production and decay mechanisms. This work has been incorporated into a new module that generates events for HNLs with arbitrary couplings to the e , μ , and τ neutrinos within the FORESEE simulation package. We apply this new framework to simulate results for the well known benchmarks $U_e^2 : U_\mu^2 : U_\tau^2 = 1:0:0$, $0:1:0$, $0:0:1$, as well as the recently proposed benchmarks $0:1:1$, and $1:1:1$. The simulations are performed for FASER and proposed experiments at the Forward Physics Facility. We find projected sensitivities that extend into currently unexplored regions of parameter space with HNL masses in the 2 to 3.5 GeV range.

Mini Symposia (Invited Talks Only)

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