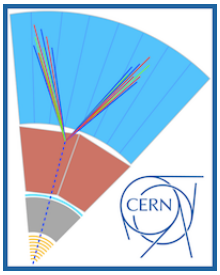

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Probing HNL properties through their lifetime distribution

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Extensions of the standard model of particle physics with Heavy Neutral Leptons (HNLs) can simultaneously generate the light neutrino masses as well as the baryon asymmetry of the Universe. In the minimal seesaw model, with only two HNLs, these particles form a pseudo-Dirac pair, degenerate in mass with nearly identical couplings to the SM leptons. The HNLs therefore follow a simple exponential decay law, with the only parameter that can be extracted at leading order being the relationship between their coupling and lifetime.

If the seesaw scenario is extended by a third HNL, this decay law can be significantly modified, deviating from the simple pseudo-Dirac picture, and leading to a much richer phenomenology. This can in turn be used to recover more of the the HNL parameters, including their mass differences, even in scenarios where these are too small to be distinguished kinematically.

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