

# Deciphering the Mysteries of the Long-Lived Particles: Perspectives from LHC, FCC-hh and Muon Collider

*Monday, 11 March 2024 16:30 (1 hour)*

Conventional searches at the LHC operate under the assumption that Beyond the Standard Model particles undergo immediate decay upon production. However, this assumption lacks inherent a priori justification. This talk delves into the exploration of displaced decay signatures across various collider experiments. Combining insights from several studies, we show how small Yukawa couplings, compressed mass spectra, and collider boosts lead to distinctive displaced decays, observable at the CMS, ATLAS and proposed future detectors. These phenomena, manifesting within both Type-I and Type-III seesaw mechanisms, the Vector-like lepton model with non-zero hypercharge, and the Inert Triplet Model, provide a unique insight into the behaviors of neutrinos and dark matter. The seminar highlights the technical challenges and breakthroughs in detecting and interpreting these signatures, emphasizing their significance in probing the depths of the extensions of the Standard Model.

References: 1) JHEP 02 (2023) 103

2) Eur.Phys.J.C 82 (2022) 3, 230

3) arXiv: 2310.08883 [hep-ph]

4) arXiv: 2401.02697 [hep-ph]

**Presenter:** SEN, Chandrima (Indian Institute of Technology Hyderabad)

**Session Classification:** Seminar