Contribution ID: **321** Type: **not specified**

Displaced Higgs production in Type-III Seesaw at the LHC/FCC, MATHUSLA and Muon collider

Monday 23 August 2021 14:30 (20 minutes)

We explore the possibility of displaced Higgs production from the decays of the heavy fermions in the Type-III seesaw extension of the Standard Model at the LHC/FCC and the muon collider. The displaced heavy fermions and the Higgs boson can be traced back by measuring the displaced charged tracks of the charged leptons along with the b-jets. The prospects of the transverse and longitudinal displaced decay lengths are extensively studied in the context of the boost at the LHC/FCC. Due to the parton distribution function, the longitudinal boosts leads to larger displacement compared to the transverse one, which can reach MATHUSLA and beyond. Such measurements are indeed possible by the fully visible finalstate, which captures the complete information about the longitudinal momenta. The comparative studies are made at the LHC/FCC with the centreof mass energies of 14, 27 and 100 TeV, respectively. . A futuristic study of the muon colliderwhere the collision happen in the centre of mass frame is analysed for centre of mass energiesof 3.5, 14 and 30 TeV. Contrary to LHC/FCC, here the transverse momentum diverges,however, the maximum reach in both the direction are identical due to the constant total momentum in each collision. The reach of the Yukawa couplings and fermion masses areappraised for both the colliders.

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Session Classification: Searches for the BSM Physics at the LHC and Future Hadronic Colliders

Track Classification: Searches for the BSM Physics at the LHC and Future Hadronic Colliders