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## Unveiling the Unexplored Decay Mode of a Light Charged Higgs Boson to an Off-Shell Top Quark and a Bottom Quark

Monday 4 November 2024 14:00 (45 minutes)

We investigate the unexplored decay mode of a light charged Higgs boson (H±) into an off-shell top quark and a bottom quark (H±  $\rightarrow$  t\*b) in the type-I two-Higgs-doublet model. Focusing on the 130-170 GeV mass range, we propose pair production of charged Higgs bosons as a model-independent probe. Our comprehensive analysis at the HL-LHC and a 100 TeV pp collider reveals challenges due to soft b-jets. We then explore the potential of multi-TeV muon colliders, demonstrating that a 3 TeV muon collider with 1 ab^-1 luminosity can achieve discovery-level significance. This talk will present our methodology, results, and the comparative performance of different collider scenarios, highlighting the crucial role of muon colliders in exploring physics beyond the Standard Model.

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