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Multi-lepton probes of new physics

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Multi-lepton signals provide a relatively clean and rich testing ground for new physics (NP) at the LHC and, in particular, for searching for lepton flavor universality violation (LFUV) effects mediated by new heavy states of an underlying TeV-scale NP. The potential sensitivity of 3rd generation fermions (the top-quark in particular) to TeV-scale NP along with the persistent anomalies in B-decays, the recently confirmed muon g-2 anomaly as well as hints reported recently by ATLAS and CMS of unequal di-muons versus di-electrons production, have led us to explore effects of higher-dimensional $(qq)(\ell\ell)$ 4-Fermi operators involving 3rd generation quarks and muons/electrons, on multi-leptons + jets production at the LHC. I will focused on the "tail –effects" of both flavor-changing $(q_3q_{1,2})(\ell\ell)$ and flavor-diagonal $(q_3q_3)(\ell\ell)$ scalar, vector and tensor contact interactions, that are generated by tree-level exchanges of multi-TeV heavy states, and discuss the sensitivity of the LHC and a future HL-LHC to the scales of these 4-Fermi terms, $\Lambda(q_3q\ell\ell)$, via these $pp \rightarrow$ multi-leptons + jets channels. In particular, I will show that by applying a sufficiently high invariant mass selection on the di-leptons from the $qq\ell\ell$ contact interaction and additional specific jet-selections designed to minimize the SM background, one can obtain a significantly better sensitivity than the current sub-TeV bounds on these type of NP.

In-person participation

Yes

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