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Widening the $U(1)_{L_{\mu}-L_{\tau}} Z'$ mass range for resolving the muon g-2 anomaly

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Exchanging a Z' gauge boson is a favored mechanism to solve the muon $(g-2)_\mu$ anomaly. Among such models the Z'

from $U(1)_{L_{\mu}-L_{\tau}}$ gauge group has been extensively studied. In this model the same interaction addressing $(g-2)_{\mu}$, leads to an enhanced muon neutrino trident (MNT) process $\nu_{\mu}N \rightarrow \nu_{\mu}\mu\bar{\mu}N$ constraining the Z' mass to be less than a few hundred MeV. Many other Z' models face the same problem. It has long been realized that the coupling of Z' in the model can admit $(\bar{\mu}\gamma^{\mu}\tau + \bar{\nu}_{\mu}\gamma^{\mu}L\nu_{\tau})Z'_{\mu}$ interaction which does not contribute to the MNT process. It can solve $(g-2)_{\mu}$ anomaly for a much wider Z' mass range. However this new interaction induces $\tau \rightarrow \mu \bar{\nu}_{\mu} \nu_{\tau}$ which rules out it as a solution to $(g-2)_{\mu}$ anomaly. Here we propose a mechanism by introducing type-II seesaw $SU(2)_{L}$ triplet scalars to evade constraints from all known data to allow a wide Z' mass range to solve the $(g-2)_{\mu}$ anomaly. This mechanism opens a new window for Z' physics.

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