SCHOOL: Multi-Aspect Young-ORiented Advanced Neutrino Academy (MAYORANA) - International School II edition



Contribution ID: 9

Type: Poster & Mini-talk

The $U(1)_{L_{\mu}-L_{\tau}}$ model meets the new $(g-2)_{\mu}$ data and muon neutrino trident scattering

Monday, 23 June 2025 17:28 (7 minutes)

The Muon g-2 collaboration at Fermilab has announced their final result of the anomalous magnetic moment of the muon. This result is now in agreement with the latest theoretical prediction to the 1σ level. This new result further constrains the allowed parameter space, but does not rule out all possible new physics contributions the muon g-2. We study the implications for one of the relevant models, the gauged $U(1)_{L_{\mu}-L_{\tau}}$. When using this model to resolve the previous 4σ tension, results from muon neutrino trident (MNT) scattering experiments would restrict the mass of the new gauge boson (Z') to be less than 300 MeV. Since the theory and experimental data difference for muon g-2 is lowered down to 1σ , the requirement for $m_{Z'}$ lesssim300 MeV is much relaxed. Within the updated allowed range of Z' boson mass, we study the models implications for electron and tauon g-2 as well as future muon colliders. We find that muon collider can effectively probe the $U(1)_{L_{\mu}-L_{\tau}}$.

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Session Classification: Mini-talk