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HVP Contributions to Muon $g-2$: QCD Constraints Using Inequalities and Sum Rules

Sunday, 16 February 2025 11:30 (15 minutes)

Fermilab's 2023 measurement of the muon's anomalous magnetic moment ($a_\mu = (g-2)_\mu/2$) has heightened the discrepancy between experimental results and Standard Model predictions to 5.0σ. By employing the structure of finite-energy QCD sum rules (FESR) and H\"older inequalities, the hadronic vacuum polarization (HVP) contribution to the leading order (LO) muon $g-2$ anomaly ($a_\mu^{\mathrm{HVP,LO}}$) can be constrained. These constraints help bridge the gap between lattice QCD and data-driven values. Upper and lower bounds on $a_\mu^{\mathrm{HVP,LO}}$ are constructed and evaluated up to five-loop order in perturbation theory in chiral limit, LO in light-quark mass corrections, next-to-leading order in dimension-four QCD condensates, and LO in dimension-six QCD condensates.

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