

New BABAR studies of high-order radiation and the new landscape of data-driven hadronic vacuum polarization predictions of the muon $g - 2$

Saturday 20 July 2024 15:30 (15 minutes)

A measurement of additional radiation in $e^+e^- \rightarrow \mu^+\mu^-\gamma$ and $e^+e^- \rightarrow \pi^+\pi^-\gamma$ initial-state-radiation events is presented using the full *BABAR* data sample. For the first time results are presented at next-to- and next-to-next-to-leading order, with one and two additional photons, respectively, for radiation from the initial and final states. The comparison with the predictions from Phokhara and *AfQEd* generators reveals discrepancies for the former in the one-photon rates and angular distributions. While this disagreement has a negligible effect on the $e^+e^- \rightarrow \pi^+\pi^-(\gamma)$ cross section measured by *BABAR*, the impact on the KLOE and BESIII measurements is estimated and found to be indicative of significant systematic effects. The findings shed a new light on the longstanding deviation between the muon $g - 2$ measurement, the Standard Model prediction using the data-driven dispersive approach and the comparison with lattice QCD calculations.

Alternate track

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