

# 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 AfsQed 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

### I read the instructions above

Yes

**Authors:** MALAESCU, Bogdan (LPNHE-Paris CNRS/IN2P3 (FR)); ANULLI, Fabio (Sapienza Universita e INFN, Roma I (IT))

**Presenter:** MALAESCU, Bogdan (LPNHE-Paris CNRS/IN2P3 (FR))

**Session Classification:** Strong interactions and Hadron Physics

**Track Classification:** 06. Strong Interactions and Hadron Physics