Dispersive approach to the muon's anomalous magnetic moment

VLADYSLAV PAUK, MARC VANDERHAEGHEN, University Mainz — In view of the new muon (g-2) experiments at Fermilab and at J-PARC, we present a new dispersive formalism for evaluating the hadronic light-by-light (HLbL) scattering contribution to the muon's anomalous magnetic moment a_μ. It is suggested to represent this contribution as a dispersive integral of the vertex function discontinuity in the virtuality of the external photon. By unitarity this discontinuity is related to the amplitudes of decay and production of hadrons. As a test of the dispersive formalism, we firstly apply it to the case of a scalar two-loop vertex diagram of similar topology as entering the HLbL contribution to a_μ [1]. We provide a first realistic application of the proposed formalism to the case of pseudoscalar meson pole exchanges. A crucial distinctive feature of the dispersion approach is that it allows extension to implement the form factors beyond the simplest monopole or dipole approximations and to include multi-meson channels. Moreover, it allows for a more straightforward implementation of the experimental data. The ongoing measurements by the BES-III Collaboration will be a crucial input into the presented dispersive formalism.

[1] V. Pauk and M. Vanderhaeghen, arXiv:1403.7503 [hep-ph].

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Date submitted: 14 Jul 2014   Electronic form version 1.4