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The isospin-violating part of the hadronic vacuum polarisation

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The experimental precision for the muon ($g-2$) currently exceeds that of the Standard-Model based prediction. In the latter, the biggest contribution to the uncertainty results from the calculation of the Hadronic Vacuum Polarisation (HVP). To achieve a higher precision, one needs in particular to determine the small, QED induced corrections to the HVP. These corrections can be calculated at leading order in the fine-structure constant using lattice QCD.

Here we present a calculation of the isospin-violating part of the HVP. We use a covariant coordinate-space approach, where the photon propagator is treated in the continuum. In order to handle the divergence originating from large photon virtualities, we use a (doubly) Pauli-Villars regulated photon propagator and calculate the required isovector mass-counterterm, which is determined from the Kaon mass splitting. These calculations are performed on four SU(3) flavour-symmetric CLS ensembles with different lattice spacings and with varying Pauli-Villars masses.

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