Contribution ID: **26** Type: **not specified**

Hadronic light-by-light contribution to $(g-2)_\mu$ near the SU(3)-flavor-symmetric point

Wednesday, 5 August 2020 14:20 (20 minutes)

Understanding the tension between the Standard Model prediction and the experimental results on the anomalous magnetic moment of the muon (a_\mu) has been an active research field over the past two decades. The theoretical uncertainty mainly comes from the hadronic contributions, among which the hadronic light-by-light scattering (a_μ^{hlbl}) process plays an important role. We investigate this contribution on the lattice with a position-space approach. In our setup, we treat separately the QED part in the continuum and infinite volume and the QCD part on the lattice, which helps to avoid finite-size effects due to the photon in finite-volume. However, noticeable finite-size effects due to long-distance physics still persist in our approach. In our recent work [arXiv:2006.16224], we have performed computations of a_μ^{hlbl} on the lattice with $N_f = 3$ ensembles having degenerate light and strange quark masses. Our results have satisfactory statistical errors and allow us to concentrate on our strategy to control the finite-size effects using the pion-exchange contribution. The extension of our setup to include non flavor-symmetric ensembles does not require much effort, thanks to the pre-computed single-propagator trace in position space shared among other Mainz projects. Our work in progress toward the physical point will be briefly reported, with focus on the Wick-contraction topologies that vanish at the flavor-symmetric point.

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Session Classification: Hadron Structure

Track Classification: Hadron Structure