

Glueball spectrum from $N_f = 2$ lattice QCD study on anisotropic lattices

Summary

The spectrum of the lowest-lying glueballs are investigated on the lattice with two flavors of degenerate quarks. We generate large ensembles of gauge configurations on anisotropic lattices at two pion masses, $m_\pi \sim 650 \text{ MeV}$ and $m_\pi \sim 938 \text{ MeV}$. We focus on the ground states of the scalar, pseudoscalar and tensor glueballs, which are measured by gluonic operators constructed from different prototypes of Wilson loops. We also investigate the pseudoscalar channel using the topological charge density as the interpolation field operator, which are defined through Wilson loops and smeared by the Wilson flow technique. The masses of the lowest state derived in this way are much lighter (around 1GeV) and compatible with the expected masses of the flavor singlet $q\bar{q}$ meson. This provides a strong hint that the operator $\epsilon_{ijk} \text{Tr} B_i D_j B_k$ and the topological charge density (proportional to $\text{Tr} \mathbf{E} \cdot \mathbf{B}$) couple very differently to the glueball states and $q\bar{q}$ mesons.

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