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Meson Mass in a Magnetic Field at Zero Temperature from Lattice QCD

We present preliminary lattice QCD results for the masses and decay constants of the pion and kaon in a background magnetic field at zero temperature, using three different lattice sizes. Our computations are performed on (2+1)-flavor ensembles using the highly improved staggered quark (HISQ) action with physical quark masses. We utilized seven different values of the magnetic field strength, reaching up to ~ 1.22 GeV^2 (~66 M_π^2) in the vacuum, and three values of the lattice spacing, a ≈ 0.056, 0.084, 0.112 fm, to facilitate continuum extrapolation. The meson masses and decay constants were extracted from two-point correlation functions, as these quantities can be derived from the exponential decay behavior and amplitude of the correlation functions. Finally, we discuss the dependence of the masses and decay constants on the magnetic field to enhance our understanding of mesonic properties in strong magnetic fields.

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