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Decay constants of heavy pseudoscalar mesons: reconciling QCD sum rules and lattice QCD

We revisit the sum-rule extraction of the decay constants of the D, Ds, B, and Bs mesons from the two-point correlator of heavy-light pseudoscalar currents. We use the operator product expansion for this correlator expressed in terms of the $\overline{\text{MS}}$ heavy-quark mass, for which the perturbative expansion exhibits a reasonable convergence. Our main emphasis is laid on the control over the uncertainties in the decay constants, related both to the input QCD parameters and to the limited accuracy of the method of sum-rules. This becomes possible due to the application of our procedure of extracting hadron observables that involves as novel feature dual thresholds depending on the Borel parameter. For charmed mesons, we find the decay constants $f_D = 206.2 \pm 7.3$ (OPE) ± 5.1 (syst) MeV and $f_{D_s} = 245.3 \pm 15.7$ (OPE) ± 4.5 (syst) MeV. For beauty mesons, the decay constants turn out to be extremely sensitive to the precise value of $m_b(m_b)$. By requiring our sum-rule estimate to match the average of the lattice results for f_B , a very accurate value $m_b(m_b) = 4.245 \pm 0.025$ GeV is extracted, leading to $f_B = 193.4 \pm 12.3$ (OPE) ± 4.3 (syst) MeV and $f_{B_s} = 232.5 \pm 18.6$ (OPE) ± 2.4 (syst) MeV.

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