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Dimension-6 HQET Sum Rules for Beyond the Standard Model

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Precise determination of hadronic matrix elements is crucial for interpreting possible deviations from the Standard Model observed in flavor physics experiments. While lattice QCD provides first-principles calculations, current results are still limited to a subset of the operators that may appear in theories of new physics. The sum rule approach employed here allows for a complementary determination of matrix elements directly from QCD, with theoretical uncertainties that can be systematically improved order-by-order in perturbation theory. The Standard Model hadronic matrix elements of dimension-six $\Delta F = 0, 2$ operators have previously been determined, and have been shown to be competitive with lattice results. We intend to extend these results to include the full set of four-quark QCD operators which may appear Beyond the Standard Model, and for which no lattice results exist yet. We thus include operators with Dirac structures which have not previously been considered in a sum rules analysis reported in the literature. This will provide for the first time bag parameter results which can increase the precision of a wide variety of new physics theories. The bag parameter results will be determined using HQET sum rules for three-point correlators, which requires a three-loop computation. In addition there is a one-loop computation of the QCD-HQET matching required.

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