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Calculating B-meson Decay Constants, via SU (3)f Symmetry Breaking and Weighted Averaging Methods

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Modern B-factory experiments, such as Belle II, are able to investigate physics anomalies with some of the largest datasets ever produced. High luminosity datasets allow for precision measurements of exclusive B-decays, such as in $B \longrightarrow \ell\nu$, which in turn reduce error in calculations of the correponding CKM matrix element, Vub. This is especially important given the current tension between calculations of Vub via exclusive decays and inclusive ones, the latter of which could hint towards the presence of beyond Standard Model processes. While experimental error in Vub can be constrained with larger datasets, controlling the error contributions from the relevant theory parameters, such as the B(s) meson decay constant fB(s) , requires novel analysis.
This work will present the continuing efforts from the UKQCD/QCDSF/CSSM groups towards improving calculations of fB(s) with lattice QCD techniques. This is performed on 2+1 flavour gauge ensembles, where SU (3)f symmetry is broken in a controlled way. The heavy b-quark is treated with an anisotropic clover-improved action and tuned to the physical properties of B and Bs mesons. Such a tuning requires fitting approximately 1600 correlation functions, where individually optimising the bounds of each fit is no longer feasible, and may lead to systematic fit uncertainties that are difficult to quantify. A weighted-average across multiple fitting regions is implemented so as to improve practicality and reduce the potential for bias in the final derivation of fB(s)

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