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Calculation of hadronic matrix elements contributing to the $B_s - \bar{B}_s$ width difference

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The width difference $\Delta\Gamma_s$ is one of three observables, along with the mass splitting ΔM_s and the semileptonic CP asymmetry a_{SL}^s , whose measurements completely constrain the physics of $B_s - \bar{B}_s$ oscillations. One of the dominant uncertainties in theoretical calculations of the width difference is due to not knowing matrix elements of dimension-7 operators beyond the vacuum saturation approximation. In particular, progress requires a first-principles calculation of the matrix element of R_2 , a $\Delta B = 2$ operator with a derivative acting on the strange quark field. We discuss our methodology and present preliminary results of a calculation of $\langle B_s | R_2 | \bar{B}_s \rangle$ using nonrelativistic b quarks and highly-improved staggered s quarks on the MILC Collaboration's $n_f = 2 + 1 + 1$ configurations.

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