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Variance reduction for inclusive semileptonic decays on the lattice

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We discuss the calculation of the inclusive semileptonic decay for the process $B_s \rightarrow X_c l \nu_l$ using lattice QCD. Such a calculation could be decisive in understanding the CKM matrix puzzle: the long-standing tension between inclusive and exclusive determinations of the CKM matrix element, $|V_{cb}|$. A key quantity in these inclusive decays is the four-point correlation function. In this talk we investigate the calculation of such four-point functions and show that by computing the four-point function in a specific way on the lattice the statistical error of the signal can be significantly reduced without a significant increase in computational cost. In addition, we explore the systematic effects of this new four-point function calculation under varying parameters of the four-point function. We show results based on Chebyshev reconstruction techniques, which are part of a larger effort towards a first phenomenologically relevant computation of the inclusive decay rate in the continuum and infinite-volume limits.

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