

Hybrid Renormalization for Quasi Distribution Amplitudes of A Light Baryon

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We develop a hybrid scheme to renormalize quasi distribution amplitudes of a light baryon on the lattice, which combines the self-renormalization and ratio scheme. By employing self-renormalization, the UV divergences and linear divergence at large spatial separations in quasi distribution amplitudes are removed without introducing extra nonperturbative effects, while making a ratio with respect to the zero-momentum matrix element can properly remove the UV divergences in small spatial separations. As a specific application, distribution amplitudes of the Λ baryon made of uds are investigated, and the requisite equal-time correlators, which define quasi distribution amplitudes in coordinate space, are perturbatively calculated up to the next-to-leading order in strong coupling constant α_s . These perturbative equal-time correlators are used to convert lattice QCD matrix elements to the continuum space during the renormalization process. Subsequently, quasi distribution amplitudes are matched onto lightcone distribution amplitudes by integrating out hard modes and the corresponding hard kernels are derived up to next-to-leading order in α_s including the hybrid counterterms. These results are valuable in the lattice-based investigation of the lightcone distribution amplitudes of a light baryon from the first principles of QCD.

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