

Contribution ID: 49

Type: Parallel

Renormalisation group evolution of the shape function g_{17} in $\overline{B} \to X_s \gamma$ and $\overline{B} \to X_s \ell^+ \ell^-$ at subleading power

We derive and solve the renormalization-group (RG) equation for the shape function $g_{17}(\omega, \omega_1; \mu)$, which appears at subleading power in the factorization of the inclusive decays $\bar{B} \to X_s \gamma$ and $\bar{B} \to X_s \ell^+ \ell^-$.

Our results provide the first key ingredient for a next-to-leading order analysis of the resolved-photon $Q_1^c - Q_{7\gamma}$ interference contribution, whose current uncertainties rank among the largest in both inclusive penguin modes.

We examine the renormalization of this function and demonstrate that, for amplitude-level soft functions, the analytic properties of the anomalous dimension enable a much simpler "reduced" evolution equation. This simplification will play a crucial role in various inclusive and exclusive B decays beyond leading power in the heavy-quark and large-energy expansions.

Secondary track

T05 - QCD and Hadronic Physics

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Session Classification: T07

Track Classification: T07 - Flavour Physics and CP Violation