## Renormalization and scale evolution of the soft-quark soft function

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Soft functions enter in factorization theorems in soft collinear effective field theory (SCET) and they capture the large distance effects of a process. They are defined as matrix elements of soft fields dressed by Wilson lines. While at leading order in power counting they are described by emissions of soft gauge bosons at subleading order one needs to consider emissions of soft fermions too. In this work we consider the soft quark soft function, that enters in the factorization theorem of  $H \rightarrow \gamma \gamma$ . We present here the renormalization of the soft-quark soft function at one loop, derive its two loop anomalous dimension and discuss solutions of its renormalization group equation in momentum space, in Laplace space and in the so called diagonal space, where we show that the soft function evolves multiplicatively.

## **Summary**

In this work the main summary points are:

- 1. Derivation of the renormalisation factor for the soft quark soft function based on the argument of the RG invariance of one of the terms in the amplitude, the T3 term.
- 2. Present an exact solution to the RGE of the soft quark soft function in momentum space.
- 3. Build a diagonal space where the soft function evolves locally.
- 4. Show that the known rapidity regulators in momentum space are inconsistent with the RG invariance of the T3.

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