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External leg corrections as an origin of large logarithms

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The appearance of large logarithmic corrections is a well-known phenomenon in the presence of widely separated mass scales. In this talk, we point out the existence of large Sudakov-like logarithmic contributions related to external-leg corrections of heavy scalar particles which cannot be resummed straightforwardly using renormalisation group equations. Based on a toy model, we discuss in detail how these corrections appear in theories containing at least one light and one heavy particle that couple to each other with a potentially large trilinear coupling. We show how the occurrence of the large logarithms is related to infrared singularities. In addition to a discussion at the one-loop level, we also explicitly derive the two-loop corrections containing the large logarithms. We point out in this context the importance of choosing an on-shell-like renormalisation scheme. As exemplary applications, we present results for the two-loop external-leg corrections for the decay of a gluino into a scalar top quark and a top quark in the Minimal Supersymmetric extension of the Standard Model as well as for a heavy Higgs boson decay into two tau leptons in the singlet-extended Two-Higgs-Doublet Model.

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