

Loops from trees in four space-time dimensions

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In order to make predictions that can be compared with the results that the LHC delivers, there are several approaches to compare the experiment with the theory. It is known that to establish this comparison, we cannot rely on leading order (LO) calculations only. Hence, we need to consider next-to-leading order (NLO) contributions, that are often understood as virtual and real. Although we know how to generate these contributions, their evaluation is not always straightforward. In particular, because of the presence of infinities, UV and IR singularities. In this talk, we elaborate on their local cancellation by means of the four-dimensional unsubtraction scheme, which stems from the loop-tree duality theorem. To illustrate this method, we show the decay of $H \rightarrow \gamma\gamma$ at LO and NLO, for which, after properly cancelling the infinities at integrand level, by performing local UV renormalisation and local IR cancellation, we are allowed to integrate in four-dimensions. Finally, we analyse the singular structure of scattering amplitudes directly in the loop momentum space, which is particularly interesting to characterise unitarity and anomalous thresholds for specific kinematical configurations.

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