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Theoretical predictions to differential cross sections and decay rates from the loop-tree duality

Understanding the cancellation of ultraviolet and infrared singularities in perturbative quantum field theory is of central importance for the development and automation of various theoretical tools that make accurate predictions for observables at high-energy colliders. The loop-tree duality aims to find an efficient solution by treating loop and tree-level contributions under the same foot to achieve a local cancellation of singularities at integrand level, and thus avoid dimensional regularisation. In this talk, we exploit the causal properties of scattering amplitudes in the loop-tree duality representation to present different applications to physical processes at higher orders.

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