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Two-Loop Amplitudes for Top–Quark Pair Production with a Jet

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The production of a top-quark pair with a jet is a key process in the physics programme of the Large Hadron Collider (LHC). Its sensitivity to fundamental Standard Model parameters and the rising precision of LHC data demand that this process is computed to at least next-to-next-to-leading order in QCD. The main obstacle are the relevant two-loop five-particle amplitudes, due to the appearance of elliptic functions coupled with severe algebraic complexity.
In this talk, I will present an analytic computation of these amplitudes in the leading colour approximation. Building on the symbol formalism for transcendental functions and on finite-field arithmetic to handle the algebraic complexity, our new techniques allow us to obtain results that can be directly deployed in phenomenology.

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