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First Result for a Full Two-Loop Five-Gluon Amplitude

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The physics exploitation of the precision data to be collected in future runs of the LHC requires highly accurate theory predictions, which are obtained through the calculation of higher orders in perturbation theory. For many processes of interest, Next-to-Next-to-Leading-Order results are required. At present, only observables involving up to four particles are available at this order. The main bottleneck towards higher multiplicity observables is the analytic calculation of the required two-loop scattering amplitudes. We present the first fully analytic result for a full-color two-loop five-particle amplitude: the five-gluon amplitude in the all-plus helicity configuration. We express it in a remarkably compact form containing only logarithms, dilogarithms, and rational functions, which exhibit surprising signs of conformal symmetry.

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