

The colour matrix at next-to-leading-colour accuracy

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In the colour decomposition approach to treating the $SU(3)$ colour gauge group in automated event generators, the size of the colour matrix grows factorially with the number of external particles in the process. As such, the treatment of the colour degrees of freedom becomes the bottleneck for high-multiplicity QCD processes. We propose to utilize the large- N_C expansion to obtain a sparse colour matrix at next-to-leading-colour accuracy which reduces the computation complexity from a factorial to a polynomial scaling at the parton-level. We examine this efficiency for both the fundamental and the colour-flow decompositions for processes with up to two quark pairs. This work is the first step towards an efficient and accurate event generator for processes with 8-9 QCD partons or more.

Authors: FREDERIX, Rikkert (Lund University); VITOS, Timea (Lund University)

Presenter: VITOS, Timea (Lund University)

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