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The polarized three-loop anomalous dimensions from on-shell massive operator matrix elements. (English) [Zbl 07209994](#)
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Summary: We calculate all contributions $\propto T_F$ to the polarized three-loop anomalous dimensions in the M-scheme using massive operator matrix elements and compare to results in the literature. This includes the complete anomalous dimensions $\gamma_{qq}^{(2),PS}$ and $\gamma_{qg}^{(2)}$. We also obtain the complete two-loop polarized anomalous dimensions in an independent calculation. While for most of the anomalous dimensions the usual direct computation methods in Mellin N -space can be applied since all recurrences factorize at first order, this is not the case for $\gamma_{qg}^{(2)}$. Due to the necessity of deeper expansions of the master integrals in the dimensional parameter $\varepsilon = D - 4$, we had to use the method of arbitrary high moments to eliminate elliptic contributions in intermediate steps. 4000 moments were generated to determine this anomalous dimension and 2640 moments turned out to be sufficient. As an aside, we also recalculate the contributions $\propto T_F$ to the three-loop QCD β -function.

MSC:

- 81V05 Strong interaction, including quantum chromodynamics
- 81T50 Anomalies in quantum field theory
- 81T15 Perturbative methods of renormalization applied to problems in quantum field theory
- 81T18 Feynman diagrams

Software:

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