Renormalisation of singlet operators to four loops

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In QCD the anomalous dimensions of gauge invariant operators of twist 2 play a key role, because they control the scale dependence of the parton distribution functions. Notably, flavour singlet operators, such as those associated to the gluon distribution, mix under renormalisation with a set of unphysical operators, also known as aliens. Missing this effect leads to wrong results already for the two-loop anomalous dimensions.
The correct renormalisation of gluonic operators has not been developed systematically beyond two loops yet. This is an important step towards the computation of the scale evolution of flavour singlet parton distributions, which is now required to 4 loops.
Leveraging both the background field method and an enhanced BRST symmetry, we construct the required ghost and alien operator basis up to 4 loops for arbitrary mass dimensions. Furthermore, we extract four-loop anomalous dimensions of the physical operators of lowest dimension.

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