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Alien operators and the four-loop DGLAP evolution

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The scale evolution of the parton distribution functions is controlled by the anomalous dimensions of twisttwo operators, which correspond to the Mellin moments of the DGLAP splitting functions. The four-loop anomalous dimensions are important for precision physics at the LHC and at the future EIC. Computing the anomalous dimensions of the flavour singlet operators is highly challenging, due to their mixing with unphysical operators, known as aliens. Indeed, the set of all contributing alien operators was unknown beyond two-loop order.

In this talk I discuss the construction of all the required aliens to compute anomalous dimensions of gluonic operators through four loops. With this approach, I calculate a set of anomalous dimensions up to four loops, finding agreement with the literature and opening the way to the calculation of the full DGLAP evolution through four loops.

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