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Gluonic evanescent operators: two-loop anomalous dimensions

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Evanescent operators are a special class of operators that vanish in fourdimensional spacetime but are nonzero in d dimensions. In this paper, we continue our systematic study of the evanescent operators in the pure Yang-Mills theory and focus on their two-loop renormalization. We compute the form factors of evanescent operators using the d-dimensional unitarity method. We apply both the MS scheme and the finite renormalization scheme and obtain the two-loop anomalous dimensions for the dimension-10 basis. As a consistency check, we show that the results of the two schemes coincide with each other at the Wilson-Fisher conformal fixed point. Our results show explicitly that starting from the two-loop order, evanescent operators can give rise to non-negligible physical effects in dimensional regularization.

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