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Perturbative study of the Gluino-Glue operator in SYM

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We investigate the renormalization of the Gluino-Glue operator, using both Lattice Perturbation Theory (LPT) and a Gauge Invariant Renormalization Scheme (GIRS). The latter scheme involves gauge-invariant Green's functions of two operators at different space-time points, which can be also computed via numerical simulations. There is no need to fix a gauge and the mixing with gauge noninvariant operators is inconsequential. We calculate perturbatively the conversion factor relating GIRS with the Modified Minimal Subtraction scheme. On the other hand, Gluino-Glue operator being composite, mixes with several gauge noninvariant operators which have the same quantum numbers. The determination of the mixing matrix on the lattice demands the calculation of 2-pt and 3-pt Green's functions with external gluon, gluino and ghost fields using LPT. We compute at one-loop order the renormalization of the Gluino-Glue operator and all operator mixing coefficients.

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