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Gluon nonlocal operator mixing in lattice QCD

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In this study, we explore the renormalization of a comprehensive set of gauge-invariant gluon nonlocal operators on the lattice. We calculate the renormalization factors for these operators in the modified Minimal Subtraction ($\overline{\text{MS}}$) scheme up to one-loop, utilizing both dimensional and lattice regularizations in the Wilson gluon action. To facilitate a non-perturbative renormalization approach, we examine an appropriate version of the modified regularization-invariant (RI') scheme and determine the conversion factors from this scheme to $\overline{\text{MS}}$. Additionally, by employing symmetry arguments on the lattice, we identify the mixing pattern of these operators under renormalization.

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