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Gauge fixing and the gluon propagator in renormalizable ξ gauges

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Covariant R_ξ gauge fixing is notoriously difficult for large lattice volumes, large ξ and small N_c . We thoroughly test different convergence techniques, which allows the gauge fixing of lattice configurations with a total volume of $(3.25 \text{ fm})^4$, up to $\xi = 0.5$. We are able to study the gluon propagator in the infrared region and its dependence on the gauge fixing parameter ξ . As expected, the longitudinal gluon dressing functions stay constant at their tree-level value ξ . Similar to the Landau gauge, the transverse R_ξ gauge gluon propagators saturate at a non-vanishing value in the deep infrared for all values of ξ studied. We compare with very recent continuum studies and perform a simple analysis of the found saturation with a dynamically generated effective gluon mass.

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