Large volume behaviour of Yang-Mills propagators

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We investigate finite volume effects in the propagators of Landau gauge Yang-Mills theory using Dyson-Schwinger equations on a 4-dimensional torus. In particular, we demonstrate explicitly how the solutions for the gluon and the ghost propagator tend towards their respective infinite volume forms in the corresponding limit. This solves an important open problem of previous studies where the infinite volume limit led to an apparent mismatch, especially of the infrared behaviour, between torus extrapolations and the existing infinite volume solutions obtained in 4-dimensional Euclidean space-time. However, the correct infinite volume limit is approached rather slowly. The typical scales necessary to see the onset of the leading infrared behaviour emerging already imply volumes of at least 10 to 15 fm in lengths. To reliably extract the infrared exponents of the infinite volume solutions requires even much larger ones. While the volumes in the Monte-Carlo simulations available at present are far too small to facilitate that, we obtain a good qualitative agreement of our torus solutions with recent lattice data in comparable volumes.