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Scaling of the Renyi entropy in 1D critical SU(N) spin chains[1]
JONATHAN DEMIDIO, MATTHEW S. BLOCK, RIBHU K. KAUL, University of Kentucky — Using quantum Monte Carlo techniques, we study an SU(N) antiferromagnet with each spin transforming in the fundamental representation. The spin interaction simply permutes "colors" on neighboring sites. This permutation operator is of interest to ultra-cold atomic systems, since at low energies it is the dominant effective interaction of the SU(N) symmetric Hubbard model with one atom per site. We calculate the entanglement entropy across a partition in the spin chain via the so-called "replica trick," whereby the partition function is simulated on the modified topology of an n-sheeted Riemann surface. In the thermodynamic limit, quantum critical spin chains in 1D are described by 2D conformal field theories (CFTs). Thus, the scaling form of the entanglement entropy provides information about the underlying CFT. In particular we extract the central charge of the CFT, which depends only on the symmetries of the spin model and not its microscopic details. We find that the central charge is given by $c = N - 1$, which is in agreement with previous theoretical predictions. We also find agreement in the scaling form of the entanglement entropy, which depends on the number of replicas in the Riemann surface.

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Jonathan Demidio
University of Kentucky

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