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The ’t Hooft-Veneziano limit of the Polyakov loop models

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The broad class of U(N) and SU(N) Polyakov loop models on the lattice are solved exactly in the combined large N, Nf limit, where N is a number of colors and Nf is a number of quark flavors, and in any dimension. In this ‘t Hooft-Veneziano limit the ratio N/Nf is kept fixed. We calculate both the free energy and various correlation functions. The critical behavior of the models is described in details at finite temperatures and non-zero baryon chemical potential. Furthermore, we prove that the calculation of the N-point (baryon) correlation function reduces to the geometric median problem in the confinement phase. In the deconfinement phase we establish an existence of the complex masses and an oscillating decay of correlations in a certain region of parameters.

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