Langevin dynamics of lattice Yang--Mills--Higgs and applications

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We investigate the Langevin dynamics of various lattice formulations of the Yang--Mills--Higgs model, where the Higgs component takes values in $\mR^N$, $\mS^{N-1}$ or a Lie group. We prove the exponential ergodicity of the dynamics on the whole lattice via functional inequalities. As an application, we establish that correlations for a broad range of observables decay exponentially. Specifically, the infinite volume measure exhibits a strictly positive mass gap under strong coupling conditions. Moreover, appropriately rescaled observables exhibit factorized correlations in the large N limit when the state space is compact. Our approach involves disintegration and a nuanced analysis of correlations to effectively control the unbounded Higgs component.

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