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B9: Infrared physics of the SU(2) Georgi-Glashow phase transition

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We perform a lattice study of the phase transition in the SU(2) Georgi-Glashow model in three dimensions, where the symmetry is broken to U(1) and a photon-like state appears. Motivated by studies of the QCD instanton, we use gradient flow to renormalise the monopole density and study the role of monopoles in the phase transition. We also use modern techniques to measure the mass of the photon-like state in this model. Large volumes are required so that the monopoles are screened from each other. We see evidence for a nonzero photon mass in the broken phase at sufficiently large volumes and confirm its relationship to the monopole density.

The SU(2) Georgi-Glashow model in three dimensions has long been studied as a high-temperature effective field theory for SU(2) QCD-like models. It can also be considered an effective theory of the Standard Model with an additional triplet field where the Higgs field is not dynamical. In both cases, the phase diagram and nature of the phase transition are important for broader questions of phenomenology. Substantial discrepancies exist between perturbative studies and existing lattice results. By studying the role of monopoles in the phase transition, our study seeks to shed light on one likely source of this discrepancy.

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