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Abstract for an Invited Paper
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Deconfined quantum criticality in two-dimensional bipartite SU(N) anti-ferromagnets[1]

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I will give an overview of unbiased numerical work on the Néel- valence bond solid (VBS) phase transition in $d = 2$ anti-ferromagnets. This progress has been possible due to the discovery of a new class of Hamiltonians of SU(N) spins that are free of the sign problem of quantum Monte Carlo. I will show through extensive numerical studies of the quantum phase transition on a variety of bipartite systems: square, rectangular, honeycomb and square bilayer, for a number of values of N ($2 \leq N \leq 10$), that a close to complete picture of an unusual "deconfined critical point" has emerged. Significantly, no direct evidence for first order behavior has been found on the largest simulations with 256×256 spins, the crucial role of Berry phases at the critical point has been verified, strong evidence for non-compact CP^{N-1} universality is evident for a range of N values, the inferred "dangerous" (ir)relevance of lattice anisotropy at the critical point is consistent with various limiting analytic calculations on the CP^{N-1} field theory and close to the critical point dramatic signatures of the emergent photon excitation have been detected in VBS correlation functions. I will conclude with some open theoretical issues that remain to be resolved and possible experimental realizations.

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