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**Properties of Resonating-Valence-Bond Spin Liquids and Critical Dimer Models**[1] YING TANG, ANDERS W. SANDVIK, Boston University, CHRISTOPHER L. HENLEY, Cornell University — We use Monte Carlo simulations to study properties of resonating-valence-bond (RVB) spin liquid states for $s = 1/2$ spins on 2D square lattices. It is well known that the spin-spin correlations decay exponentially in these states, but we find that the four-spin (valence-bond-solid, VBS, type) correlations are critical [1]. We compare various properties of the RVB with those of the classical dimer model (CDM), i.e., the exact ground state wavefunction of the critical Rokhsar-Kivelson quantum dimer model. It is well known that the CDM maps to a height model with a gradient-squared elasticity governed by a stiffness constant $K$. We show that also the RVB has such an effective classical field theory description, namely its (i) four-spin (dimer) correlations (ii) probabilities of different winding number sectors, and (iii) separation of monomer defect pairs, are all consistent with the same value of $K$ (which is higher than in the CDM, i.e., the RVB is closer to an ordered VBS state). In addition to the short-bond RVB we also consider systems with longer bonds, and again find consistency with the height-model description. We discuss implications of the critical fluctuations of the RVB states.

[1] Y. Tang, A. W. Sandvik, and C. L. Henley, arXiv:1010.6146.

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