Abstract Submitted
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**Study of the $U(1) - Z_4$ cross-over in 2D valance-bond-solids**[1] JIE LOU, ANDERS SANDVIK, Associate Professor — We consider the 2D Heisenberg model in the overcomplete basis of valence bonds. By tuning matrix elements corresponding closely to the diagonal and off-diagonal terms in Rokhsar-Kivelson quantum dimer model, we show, using a projector quantum Monte Carlo technique, that there is a quantum phase transition into a valence-bond-solid (VBS) state. This system allows us to study the cross-over length-scale [1] associated with emergent U(1) symmetry of the VBS order parameter [2], which has up until now not been possible in other systems [3], where the VBS order is weaker and prohibitively large system sizes are needed to observe the stabilization of a manifestly $Z_4$-symmetric VBS.
[1] J. Lou, A. W. Sandvik, and L. Balents, Arxiv:0704.1472. [2] T. Senthil, A. Vishwanath, L. Balents, S. Sachdev, and M. P. A. Fisher, Science **303**, 1490 (2004). [3] A. W. Sandvik, Phys. Rev. Lett **98**, 227202 (2007).

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