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Magnetic to valence-bond-solid transition in an S=1/2 XY model with ring-exchange

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Within the Landau-Ginzburg-Wilson framework, phase transitions between two ordered phases with different symmetries are generically of first order, or there is a region of coexistence of the two phases. However, It has recently been argued [1] that there is a generic class of continuous order-order *quantum phase transitions*, where the critical point is characterized by deconfined spinon degrees of freedom. Evidence of such a transition, between a magnetic (or superfluid in a bosonic representation) and a valence-bond-solid (VBS) phase had previously been observed in large-scale quantum Monte Carlo simulations [2] of a 2D XY model which in addition to the standard nearest-neighbor exchange J contains a four-particle exchange of strength K. The VBS phase in this model is not favored by the J and K interactions individually (the K-only model has an Ising-like antigerromagnetic ground state), but emerges out of competition between the two terms. Here I will discuss recent efforts [3] to characterize the magnetic-VBS transition in more detail (extracting the critical exponents) and comparing the behavior with predictions of the deconfined quantum-criticality scenario.

[1] T. Senthil, A. Vishwanath, L. Balents, S. Sachdev, and M. P. A. Fisher, Science **303**, 1490 (2004).
[2] A. W. Sandvik, S. Daul, R. R. P. Singh, and D. J. Scalapino, Phys. Rev. Lett. **89**, 247201 (2002).
[3] A. W. Sandvik, R. G. Melko, and D. J. Scalapino (work in progress).