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Superfluid–Solid Quantum Phase Transitions and Landau-Ginzburg-Wilson Paradigm A.B. KUKLOV, CSI, CUNY, N.V. PROKOF'EV, B.V. SVISTUNOV, UMASS, Amherst, and Kurchatov Institute, Moscow — We study superfluid (SF)–solid zero-temperature transitions in 2d lattice boson/spin models by Worm-Algorithm Monte Carlo simulations. The SF – Valence Bond Solid (VBS) transition was recently argued to be generically of II order in violation of the Ginzburg-Landau- Wilson (GLW) paradigm [1]. We simulate the J-current model on lattices up to 64x64x64, and observe that SF- columnar VBS and SF-checkerboard solid transitions are typically weak I-order ones and in small systems they may be confused with the continuous or high-symmetry points [2]. Thus, in the simulated model, the SF-VBS transition proceeds in agreement with the GLW paradigm. We explain this by dominance of standard particle and hole excitations, as opposed to fractionalized (spinon) excitations [1]. We developed a technique based on tunneling events (instantons) in the insulating phase which reveals charges of the revelant long-wave modes. While in 1d systems spinons are clearly seen in tunneling events, in two spatial dimensions tunneling is solely controlled by particles and holes in our system. This work is supported by NSF grant ITR-405460001 and PSC-CUNY- 665560035. [1] T. Senthil, A. Vishwanath, L. Balents, S. Sachdev, and M.P.A. Fisher, Science **303**, 1490 (2004); [2] A.B. Kuklov, N.V. Prokof'ev, B.V. Svistunov, condmat/0406061; PRL, to be published.

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