Asymptotically Exact Scenario of Strong-Disorder Criticality in One-Dimensional Superfluids

LODE POLLET, LMU Munich, NIKOLAY PROKOF’EV, BORIS SVISTUNOV, University of Massachusetts, Amherst — We present a controlled rare-weak-link theory of the superfluid-to-Bose/Mott glass transition in one-dimensional disordered systems. The transition has Kosterlitz-Thouless critical properties but may occur at an arbitrary large value of the Luttinger parameter $K$. In contrast to the scenario by Altman et al. [Phys. Rev. B 81, 174528 (2010)], the hydrodynamic description is valid under the correlation radius and defines criticality via the renormalization of microscopically weak links, along the lines of Kane and Fisher [Phys. Rev. Lett. 68, 1220 (1992)]. The hallmark of the theory is the relation $K(c) = 1/\zeta$ between the critical value of the Luttinger parameter at macroscopic scales and the microscopic (irrenormalizable) exponent $\zeta$ describing the scaling $\propto 1/N^{1-\zeta}$ for the strength of the weakest link among the $N/L \gg 1$ disorder realizations in a system of fixed mesoscopic size $L$. 

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Date submitted: 14 Nov 2013

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