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XY-sliding phases – mirage of the Renormalization Group[1]
STEVEN VAYL, ANATOLY KUKLOV, VADIM OGANESYAN, CSI and the Graduate Center, CUNY — The so called sliding XY phases in layered systems are predicted to occur if the one loop renormalization group (RG) flow renders the interlayer Josephson coupling irrelevant, while each layer still features broken U(1) symmetry [2]. In other words, such a layered system remains essentially two-dimensional despite the presence of inter-layer Josephson coupling. We have analyzed numerically a layered system consisting of groups of asymmetric layers where the RG analysis predicts sliding phases to occur. Monte Carlo simulations of such a system have been conducted in the dual representation by Worm Algorithm [3] in terms of the closed loops of J-currents [4] for layer sizes varying from 4×4 to 640×640 and the number of layers – from 2 to 40. The resulting flow of the inter-layer XY-stiffness has been found to be inconsistent with the RG prediction and fully consistent with the behavior of the 3D standard XY model where the bare inter-layer Josephson coupling is much smaller than the intra-layer stiffness. This result emphasizes the importance of the compactness of the U(1) variable for 2D to 3D transformation.

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