Comparison of RG and Eliashberg analyses of fermion pairing with competing attractive and repulsive critical bosonic fluctuations.
LUIS MENDOZA, Florida State Univ, N.E. BONESTEEL, Florid State Univ — We study RG equations that describe BCS pairing of non-relativistic fermions coupled to two bosonic fields, both of which are critical at small q. One of these fields has dynamic exponent $z_{b-} = 2 + \epsilon_-$ and mediates an attractive interaction in the Cooper channel, the other has dynamic exponent $z_{b+} = 2 + \epsilon_+$ and mediates a repulsive interaction in the Cooper channel. Our work is motivated by the possibility of interlayer pairing in composite fermion bilayers at filling fraction $\nu = \frac{1}{2} + \frac{1}{2}$, where the attractive (repulsive) bosonic fluctuations correspond to out-of-phase (in-phase) gauge fluctuations in the two layers [1,2,3]. We follow the method of [4] to derive RG equations valid for small ϵ_- and ϵ_+, generalizing calculations in [3] for the (physically relevant for the bilayer) case $\epsilon_- = 1, \epsilon_+ = 0$. We compare the results for the pairing gap obtained from the RG equations to those obtained by solving the Eliashberg equations for the same models. [1] N.E. Bonesteel, I.A. McDonald, and C. Nayak, PRL 77, 3009 (1996). [2] H. Isobe and L. Fu, arXiv:1609.09063. [3] I. Sodemann, I. Kimchi, C. Wang, and T. Senthil, arXiv:1609.08616. [4] M.A. Metlitski, D.F. Mross, S. Sachdev, and T. Senthil, PRB 91, 115111 (2015).

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