Quantum Critical Fluctuations of Loop Currents and D-wave Superconductivity through their Exchange

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Abstract

A continuum version of the Action for fluctuations of loop currents can bewritten near criticality exactly in terms of two kinds of orthogonal topological excitations. The model is soluble and yields the w/T scaling and spatial locality which was suggested to obtain the Marginal Fermi-Liquid properties in the normal state.There has been an enduring paradox that d-wave superconductivity requires scattering of fermions peaked near Pi/2 characteristic of anisotropic fluctuations but the normal state scattering in Cuprates is angle independent characteristic of the isotropic fluctuations described above. This paradox is resolved by showing that the vertex of the fermions to the loop current fluctuations has the symmetry of the form Psi+(k',s) (ik 'x k) Psi(k,s). This leads to nearly angle independent single-particle self energy but attractive scattering in the d-wave Cooper channel. Analysis of results of high resolution ARPES are presented consistent with the above results.

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