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# Dynamical charge susceptibility in layered cuprates: Beyond the conventional random-phase-approximation scheme

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## Abstract

The analytical expression for a dynamical charge susceptibility in layered cuprates has been derived in the framework of a singlet-correlated band model beyond the random-phas--approximation (RPA) scheme. Our calculations performed near optimal doping regime show that there is a peak in the real part of the charge susceptibility χch(q, ω) at Q=(π,π) at strong enough intersite Coulomb repulsion. Together with strong maximum in the Im χch(Q, ω) at low frequencies, it confirms the formation of low-energy collective excitations or charge fluctuations. This justifies that these excitations are important and together with spin fluctuations can contribute to the Cooper pairing in layered cuprates. Analyzing the charge susceptibility with respect to the instability we obtain a new plasmon branch, ωq, along the Brillouin zone (BZ). In particular, we have found that it goes to zero around Q≈(π,π).