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Coexisting fluctuations of charge ordering in quasi-2D organic conductors, θ-$(ET)_2X$ MASAFUMI UDAGAWA, YUKITOSHI MOTOME, Department of Applied Physics, University of Tokyo — Charge ordering is a crystallization of electrons driven by strong electronic correlations, and is one of the central issues in organic conductors. In particular, the charge ordering in 1/4-filled quasi-2D materials, θ-$(ET)_2X$, attracts much attention since the anisotropic triangular lattice structure enables us to study the stability of charge order under the geometrical frustration and quantum fluctuation. A systematic phase diagram was obtained for the anion X which controls the frustration, and surprisingly, an unusual coexistence of charge fluctuations with different wave numbers was observed in the quantum critical regime where the transition temperature goes to zero. Some exotic phenomena such as the strongly non-linear I-V characteristics and large magneto-resistence are observed in this regime, possibly induced by the anomalous properties of the charge degree of freedom. Here we theoretically study how the charge order and its fluctuations develop in the frustrated systems by applying the random-phase approximation to the extended Hubbard model with electron-phonon couplings. We successfully reproduce the coexisting charge fluctuations as well as the phase diagram. The coexistence originates from the competition between the kinetic energy and the Coulomb repulsion in the intermediate correlation regime, and is characteristic of the charge degree of freedom.

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