Condensed Matter Seminar

Date: May. 29 (Thu.) 14:00 ～

Speakers:

(1) Prof. J. Bonca (Univ. of Ljubljana, Slovenia)

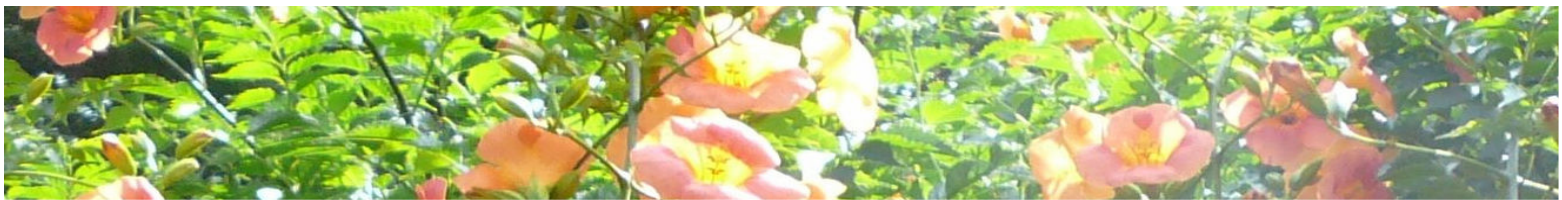
(2) Dr. W. Ren (Hong Kong Univ.)

Title:

(1) Spectral and optical properties of the *t*-*J*-Holstein model in the low-doping limit

(2) Spin Hall conductance in quantum electron transport

Room: Seminar Room1, COE Bldg.



Abstract (1):

We develop an efficient numerical method for the description of a single-hole motion in the antiferromagnetic background. The method is free of finite-size effects and allows calculation of physical properties at an arbitrary wavevector. Methodical increase of the functional space leads to results that are valid in the thermodynamic limit. In the case of the *t-J* model we found good agreement with cumulant expansion, exact-diagonalization approaches on finite lattices as well as self-consistent Born approximations. The method allows a straightforward addition of other inelastic degrees of freedom, such as lattice effects. Our results for spectral functions as well as quasiparticle weight of the *t-J*-Holstein model are in agreement with diagrammatic Monte Carlo method. Calculated spectral functions in the strong coupling limit reproduce well ARPES spectra on $Ca_{2-x}Na_xCuO_2Cl_2$. We also extend the existing method to computation of the bipolaron. We discuss the effect of electron-phonon EP coupling on various bipolaron correlation functions. We also compute the charge stiffness and optical conductivity of the *t-J* Holstein model. Increasing EP coupling leads to a decrease of the charge stiffness - a measure of a free-electron propagation, and a shift of the spectral weight towards higher frequencies.

Abstract (2):

The electrons charge current can be controled in the classic or quantum Hall effect by using a magnetic field. Spin Hall effect gives us ability to maneuver electrons spin current in the spin-based electronics. In this talk we will discuss the new theoretical and experimental developments. Statistical distribution and universal spin Hall conductance fluctuation in the mesoscopic systems will be presented.

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