

The study on ordering and fluctuation of electronic degrees of freedom by coherent x-rays and high-flux neutrons

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【 Outline of survey 】

The ordering and fluctuation of electronic degrees of freedom (charge, spin, and orbital) play very important roles in electric and magnetic properties of strongly correlated electron systems. In high-temperature superconductors and colossal magnetoresistance compounds, the carrier doping to Mott insulators makes a kind of disorder in the ordering of electronic degrees of freedom. We consider a characteristic correlation in space and time exists even in the disordered state. Our aim of this project is to detect the correlation and to elucidate the mechanism of the properties in strongly correlated electron systems using coherent x-rays and high-flux neutrons.

【 Expected results 】

We employ the resonant x-ray speckle scattering using coherent x-rays with the absorption edge energy of the magnetic ion. By this new technique we can directly know the long-range correlation in space and time: This correlation is closely related to the electric and magnetic properties. We also expect to detect new excitations by the improvement of the monochromater and the analyzer systems in neutron scattering experiments.

【 References by the principal researcher 】

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- B. Direct Observation of Charge and Orbital Ordering in $\text{La}_{0.5}\text{Sr}_{1.5}\text{MnO}_4$,
Y. Murakami, H. Kawada, H. Kawata, M. Tanaka, T. Arima, Y. Moritomo, and Y. Tokura, Phys. Rev. Lett. 80 (1998) 1932-1935.

【 Term of project 】 F Y 2004 - 2008

【 Budget allocation 】 80,300,000 yen

【 Homepage address 】 <http://calaf.phys.tohoku.ac.jp/index-j.html>