

# 凝縮系物理学ゼミナール

## Condensed Matter Seminar

(※ seminar is held online via zoom )

Date: **13:30-15:00**, Wednesday, 4th November 2020

“Nonlinear response in strongly-correlated electron systems”

Speaker:

Yoshihiro Michishita (Condensed Matter Theory Group)

Abstract:

Nonlinear responses in condensed matter are intensively studied because they provide rich information about materials and hold the possibility of being applied to the diode or high-frequency optical devices. While the nonlinear responses in noninteracting models have been explored widely, the effect of strong correlations on the nonlinear response is still poorly understood, even though it has been suggested that correlations can enhance the nonlinear response [1-3].

In this work, we first give an analytical derivation of nonlinear responses using the Green's function methods at finite temperature, expand the Parker's diagram methods [4] to the finite temperature, and compare the results to the semi-classical Boltzmann equation and the formulation by the reduced-density matrices. We reveal that the relaxation time approximation, often used in the above two formalisms, leads to some limitations when considering optical responses. Finally, we analyze that correlation effects, such as the renormalization effect and lifetime differences in different orbitals, can yield large nonlinear responses [5].

References:

- [1] H. Kishida et al, Nature **405**, 929-932 (2000).
- [2] S. Dzsaber et al, arXiv:1811.02819 (2019).
- [3] T. Morimoto and N. Nagaosa, Scientific report **8**, 2973 (2018).
- [4] D. E. Parker et al, Physical Review B **99**, 045121 (2019).
- [5] YM and R. Peters, in preparation.