凝縮系物理学ゼミナール

Condensed Matter Seminar

Location: **Room 413**, School of Science Bldg. 5 (理学 5 号館 413 号室)

Date: **13:30-15:00**, Wednesday, 19 June 2019

“Floquet prethermal phases under a resonant drive: Application to Time crystals and Floquet engineering”

Speaker:

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Abstract:

Periodically driven (Floquet) systems have attracted much interest as non-equilibrium systems, which enable the control of phases of matters (called Floquet engineering), and the realization of topological/ordered phases unique to non-equilibrium.

One of the most significant phenomena in Floquet systems is Floquet prethermalization, in which quasi-steady states realize in intermediate time regime. Since general interacting Floquet systems equilibrate to trivial infinite temperature states in long time regime, this intermediate prethermal regime is important for realizing interesting many-body physics in Floquet systems. When the energy scale of the periodic drive is much smaller than the frequency, Floquet prethermalization is well understood by the high frequency expansions [1].

However, when we consider phases unique to Floquet systems such as time crystals [2] and anomalous Floquet topological insulators [3], resonant drives whose energy scale is comparable to the frequency are inevitably included, and hence the conventional theory for high-frequency regimes is not applicable to them. Therefore, we formulate prethermalization of Floquet systems which includes resonant drives. As a result, we have revealed that, when the resonant drives induce a Z_N symmetry operation, Floquet prethermalization, captured by the van Vleck effective Hamiltonian, takes place and that the system acquires a new emergent symmetry [4]. Furthermore, we have found that this result gives a systematic way to analyze prethermal time crystals and a new scheme of Floquet engineering: controlling phases and adding emergent symmetries as potential applications of our formalism. We would like to discuss these results in the seminar.

References:

[1] T. Kuwahara, T. Mori, and K. Saito, Ann. Phys. **367**, 96 (2016)

[2] D. V. Else, B. Bauer, and C. Nayak, Phys. Rev. X, **7**, 011026 (2017)

[3] M. S. Rudner, N. H. Lindner, E. Berg, and M. Levin, Phys. Rev. X, **3**, 031005 (2013)

[4] K. Mizuta, K. Takasan, and N. Kawakami, arXiv: 1902.01126