

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, 11 July 2018

“Spatial-Translation-Induced Discrete Time Crystals”

Speaker:

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Abstract:

Time crystals, where time translation symmetry is spontaneously broken, are novel phases of matters in that they are proved to exist only in nonequilibrium[1]. In particular, time crystals in Floquet systems, called discrete time crystals (DTCs), have attracted much interest because of theoretical developments[2,3] and recent experimental realization[4,5].

In many of conventional DTCs, symmetry operation and its symmetry breaking are utilized [2,3], but only on-site symmetries are focused on. Therefore, we propose a new kind of DTCs named "spatial-translation-induced DTC"(STI-DTC), which is realized by spatial translation and its symmetry breaking[6]. By focusing on spatial translation symmetry, STI-DTCs have notable properties which do not exist in conventional time crystals —high controllability of time crystal orders and nontrivially oscillating local transport corresponding to fractional Thouless pumping. We have also proposed a new way to realize DTCs in quantum circuits as an experimental platform.

In the seminar, after providing a brief review of conventional DTCs, I would like to discuss our new DTC, especially its realization, properties, and platforms.

References:

- [1] H. Watanabe, and M. Oshikawa, Phys. Rev. Lett. 114, 251603 (2015)
- [2] D. V. Else, B. Bauer, and C. Nayak, Phys. Rev. Lett. 117, 090402 (2016)
- [3] D. V. Else, B. Bauer, and C. Nayak, Phys. Rev. X 7, 011026 (2017)
- [4] J. Zhang, P. W. Hess, A. Kyprianidis, et al., Nature 543, 217 (2017)
- [5] S. Choi, J. Choi, R. Landig, et al., Nature 543, 221 (2017)
- [6] K. Mizuta, K. Takasan, M. Nakagawa, and N. Kawakami, arXiv: 1804.01291