

# JITCP Seminar

THE UNIVERSITY OF HONG KONG  
HKU-UCAS JOINT INSTITUTE OF THEORETICAL AND COMPUTATIONAL PHYSICS  
[Thursday afternoon, 4 pm, Zoom (online)]

## Discrete time crystals enforced by Floquet-Bloch scars

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The discrete time crystal (DTC) relying on many-body localization or prethermal conditions has been explored theoretically early on, and its features have been further clarified in a set of new experiments over the past 2 years. However, the experimental and numerical observation of corresponding phenomena in translation-invariant (clean) systems with initial states defying prethermal conditions have remained a puzzle so far. Little is known about their underlying mechanism. In this talk, I will show an analytical solution to such a problem based on the strong-drive and strong-interaction Floquet perturbation theory. It is demonstrated that spatiotemporal translation symmetry can protect a special class of "Floquet-Bloch scar" (FBS) states, which are rare type of Floquet eigenstates violating ergodicity. Crucially, under rather generic perturbations, it is the quasienergy level spacing between pairs of FBS that are protected. This is vitally different from (quasi-)static many-body scars relying on microscopic details to protect each scar level. We also demonstrate experimental proposal and numerical studies based on the trimerized kagome and dimerized honeycomb platforms related to the latest development in the Berkeley laboratory. Our work paves the way to the long-sought analytical understanding of generic DTCs in clean systems.

References:

Biao Huang, Tsz-Him Leung, Dan M. Stamper-Kurn, W. Vincent Liu, "Discrete time crystals enforced by Floquet-Bloch scars", Phys. Rev. Lett. 129, 133001 (2022), arXiv:2205.07919

**Online Zoom Seminar**

**Thursday, October 13, 2022, 4:00 pm**

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