

凝縮系物理学ゼミナール

Condensed Matter Seminar

Location: **Online (Zoom Seminar)**

Date: **13:30-15:00**, Wednesday, 16 December 2020

“Correlation effects in fragile topological insulators”

Speaker:

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Abstract:

The recently discovered ‘fragile’ topological insulators (FTIs) offer an obstruction to the formation of exponentially localized Wannier functions but show no stable topology since they can be trivialized by the addition of certain trivial degrees of freedom [1, 2]. Fragile topology is of importance since it is predicted to be present in hundreds of materials (including the twisted bilayer graphene) [3]. Even though FTIs do not feature any symmetry protected edge states which connect the bulk gap, another bulk-boundary correspondence exists for these phases. When the system is taken through a slow deformation of some twisted boundary conditions (TBC) (which depends on the point group), the gap between the fragile bands and other bands closes [4].

In this work, we explicitly study the effects of correlations on FTIs. We find that the fragile topology and twisted boundary states are stable until a critical interaction strength, after which a phase transition to the Mott insulating phase occurs. We also find that the twisted boundary states are stable with doping. Interestingly, we find a spin density wave below a critical interaction strength, above which our model has a ferromagnetic phase in which the twisted boundary states disappear (along with the many localized in-gap edge states).

References:

- [1] H. C. Po, H. Watanabe, and A. Vishwanath, *Phys. Rev. Lett.* 121, 126402 (2018).
- [2] D. V. Else, H. C. Po, and H. Watanabe, *Phys. Rev. B* 99, 125122 (2019).
- [3] Z. Song, L. Elcoro, N. Regnault, and B. A. Bernevig, *Phys. Rev. X* 10, 031001 (2020).
- [4] Z. Song, L. Elcoro, and B. A. Bernevig, *Science* 367, 794–797 (2020).