

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, 5 February 2020

“Laser-induced topological s-wave superconductivity in bilayer transition metal dichalcogenides”

Speaker:

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Abstract:

Application of laser light can be a powerful tool for changing and controlling properties of materials. In recent years, topological phases in periodically driven systems by laser light have garnered attentions and have been actively investigated. For example, photo-induced quantum anomalous Hall states were theoretically proposed in laser-irradiated graphene [1,2] and the observation of this phenomenon was experimentally reported very recently [3]. This method also plays a vital role in realization of topological superconductivity (TSC). For example, it was theoretically proposed that topological d-wave superconductivity can be induced with laser light in cuprate thin films [4].

Motivated by these situations, in this study, we theoretically investigate the laser-induced topological phase transitions in bilayer transition metal dichalcogenides (TMDs). Analyzing the tight-binding model for laser-irradiated bilayer TMDs with use of the Floquet theory, we show a topological phase transition occurred in the band structure and it results in TSC phases.

References:

- [1] T. Oka, and H. Aoki, Phys. Rev. B **79**, 081406 (2009).
- [2] T. Kitagawa, T. Oka, A. Brataas, L. Fu, and E. Demler, Phys. Rev. B **84**, 235108 (2011).
- [3] K. Takasan, A. Daido, N. Kawakami, and Y. Yanase, Phys. Rev. B **95**, 134508 (2017).
- [4] J. W. McIver, B. Schulte, F.-U. Stein, T. Matsuyama, G. Jotzu, G. Meier, and A. Cavalleri, Nat. Phys. **1** (2019).