

凝縮系理論ゼミナール

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, 20 December 2017

“The Sachdev-Ye-Kitaev model, random matrices and out-of-time order correlators”

Speaker: **Masaki Tezuka** (Condensed Matter Theory Group)

Abstract:

The Sachdev-Ye-Kitaev (SYK) model was proposed in 2015 as a quantum mechanical model of (0+1)-dimensional N fermion with random 4-body couplings. In the large N and low energy limit, it is possible to exactly add the Feynman diagrams in correlation function calculations, and a conformal symmetry is known to emerge. Moreover, in this limit the Lyapunov exponent appearing in the time dependence of the out-of-time ordered correlations (OTOC) satisfies the chaos bound, expected in black holes. Due to such features, the model has been extensively studied as a promising candidate of a holographic dual of (1+1)-dimensional AdS black holes as well as a way to study the strange metal phase in strongly correlated materials.

We have so far (1) proposed an experimental scheme to realize the SYK model using cold atoms in an optical lattice [1], (2) clarified the relation between the long-time behavior of correlation functions in the SYK model and the random matrix theory [2], and (3) evaluated the stability of the quantum chaotic dynamics in a generalized SYK model with additional 2-body terms that correspond to fermion hoppings [3].

After introducing the model and commenting on its key features, I will summarily present the main results of (1) and (2) and explain (3) in more detail.

References:

- [1] I. Danshita, M. Hanada and M. Tezuka, PTEP **2017**, 083I01 (2017) [arXiv:1606.02454].
- [2] J. S. Cotler, G. Gur-Ari, M. Hanada, J. Polchinski, P. Saad, S. H. Shenker, D. Stanford, A. Streicher and M. Tezuka, JHEP **1705**, 118 (2017) [arXiv:1611.04650].
- [3] A. M. García-García, B. Loureiro, A. Romero-Bermúdez and M. Tezuka, [arXiv:1707.02197].