



量子物理学・ナノサイエンス第 86 回特別セミナー

Transitions in dynamical modes of open quantum many-body systems: Symmetry breaking, incoherentons, and many-body localization

講師 : 芳賀 大樹 氏

大阪公立大学 大学院工学研究科

日程 : 3月1日(水) 11:00-12:00

場所 : Zoom*

概要

The dynamics of Markovian open quantum systems is governed by the Gorini–Kossakowski–Sudarshan–Lindblad (GKSL) equation. Recently, the phase transition in the steady state of the many-body GKSL equation has attracted a great deal of attention. We focus here on the transition exhibited by dynamical (non-steady) modes of the GKSL equation when the control parameters are varied. The transition of dynamical modes can significantly change the relaxation dynamics of the system. We discuss three types of transitions that occur in dynamical modes.

(1) Spontaneous symmetry breaking [1]: A transition from a disordered phase to a symmetry-broken ordered phase occurs in dynamical modes far from the steady state. This transition leads to a qualitative change in the early time evolution of highly entangled states.

(2) Deconfinement of incoherentons [2]: We introduce quasiparticles defined on dynamical modes, “incoherentons”, which are bound states between the degrees of freedom in the ket and bra spaces. When the dissipation strength falls below a critical value, the localization length of an incoherenton diverges and its deconfinement occurs.

(3) Many-body localization [3]: It is known that the eigenstates of isolated quantum many-body systems become localized in the presence of strong disorder, called “many-body localization”. We show that the dynamical modes of a dissipative spin model with random fields also exhibit many-body localization for sufficiently strong disorder and dissipation.

[1] T. Haga, arXiv:2212.09327

[2] T. Haga, M. Nakagawa, R. Hamazaki, and M. Ueda, arXiv:2211.14991

[3] R. Hamazaki, M. Nakagawa, T. Haga, and M. Ueda, arXiv:2206.02984

* 本 ZOOM セミナーに参加されます場合には、事前に下記より登録を済ませてください。

<https://zoom.us/meeting/register/tJYudeypqzMrHtCqEq2cJ00VHgB9sqGy04H2>



ご来聴を歓迎いたします。

連絡教員 笹本 智弘 (内線 2736)