【Research Activity Report 2019】

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■Publications

1) Daniel Burgarth, Paolo Facchi, Hiromichi Nakazato, Saverio Pascazio, and <u>Kazuya Yuasa</u>, "Generalized Adiabatic Theorem and Strong-Coupling Limits," Quantum **3**, 152 (2019) [Featured by Martin Fraas, Quantum Views **3**, 18 (2019)].

2) Takaaki Monnai, Shohei Morodome, and <u>Kazuya Yuasa</u>, "Relaxation to Gaussian Generalized Gibbs Ensembles in Quadratic Bosonic Systems in the Thermodynamic Limit," Physical Review E **100**, 022105 (2019).

3) Paolo Facchi, Giorgio Parisi, Saverio Pascazio, Antonello Scardicchio, and <u>Kazuya Yuasa</u>, "Phase Diagram of Bipartite Entanglement," Journal of Physics A **52**, 414002 (2019).

■Presentations

1) <u>Kazuya Yuasa</u>, Teruo Matsubara, Paolo Facchi, and Vittorio Giovannetti, "Optimal Gaussian Metrology for Generic Multimode Interferometric Circuit," 12th Italian Quantum Information Science Conference (IQIS 2019) (University of Milan, Milano, Italy, September 9-12, 2019).

2) <u>Kazuya Yuasa</u>, "Quantum Zeno Dynamics and Adiabatic Theorem" (invited), Quantum Information Processing in Non-Markovian Quantum Complex Systems (QIPQC 2019) (Nagoya University, Nagoya, Japan, December 9-12, 2019).

■Summary of Research Achievements

1) We have studied the entanglement of a large quantum system through the general Rényi entropy, and have analyzed two phase transitions as the degree of the entanglement is changed for a general value of the parameter q of the Rényi entropy.

2) We have analyzed the equilibration of the general quadratic bosonic system in the thermodynamic limit and have shown that it relaxes into a Gaussian generalized Gibbs ensemble.

3) We have proved a generalized adiabatic theorem that can be applied to the dynamics of open quantum systems. This has allowed us to unify and to generalize all the previously known continuous quantum Zeno dynamics in the strong-coupling limit.