【Research Activity Report 2017】

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■Publications

1) Daniel Burgarth, Paolo Facchi, Giancarlo Garnero, Hiromichi Nakazato, Saverio Pascazio, and Kazuya Yuasa, "Can Decay Be Ascribed to Classical Noise?" Open Systems & Information Dynamics **24**, 1750001 (2017).

2) Christian Arenz, Daniel Burgarth, Vittorio Giovannetti, Hiromichi Nakazato, and Kazuya Yuasa, "Lindbladian Purification," Quantum Science and Technology **2**, 024001 (2017).

3) Jukka Kiukas, Kazuya Yuasa, and Daniel Burgarth, "Remote Parameter Estimation in a Quantum Spin Chain Enhanced by Local Control," Physical Review A **95**, 052132 (2017).

4) Antonella De Pasquale, Kazuya Yuasa, and Vittorio Giovannetti, "Estimating Temperature via Sequential Measurements," Physical Review A **96**, 012316 (2017).

5) Paolo Facchi, Marilena Ligabò, and Kazuya Yuasa, "On the Derivation of the GKLS Equation for Weakly Coupled Systems," Open Systems & Information Dynamics **24**, 1740017 (2017).

6) Paolo Facchi, Saverio Pascazio, Francesco V. Pepe, and Kazuya Yuasa, "Long-Lived Entanglement of Two Multilevel Atoms in a Waveguide," Journal of Physics Communications **2**, 035006 (2018).

■Presentations

1) Shohei Morodome, Takaaki Monnai, and Kazuya Yuasa, "Quantum Fluctuation Relation for Nonequilibrium Steady State: Analysis with an Exactly Solvable Model," YITP Workshop "Quantum Thermodynamics: Thermalization and Fluctuations" (Kyoto , Japan, September 27-30, 2017).

2) Satoshi Ishikawa, Takaaki Monnai, and Kazuya Yuasa, "Eigenstate Thermalization Hypothesis and Degeneracy of Hamiltonian," YITP Workshop "Quantum Thermodynamics: Thermalization and Fluctuations" (Kyoto , Japan, September 27-30, 2017).

■Summary of Research Achievements

1) We are studying "**quantum control**." In particular, we are interested in control strategies which make use of quantum measurement as a tool for quantum control. We had shown before that any unitary control can be regarded as a control realized by switching two commuting unitary controls in an extended Hilbert space ("Hamiltonian purification"). This year, we have shown that the same applies to any nonunitary Markovian controls: any nonunitary Markovian control can be regarded as

a control realized by switching two commuting nonunitary Markovian controls in an extended Hilbert space ("Lindbladian purification").

2) We are studying "**quantum metrology**," which makes use of quantum-mechanical features to achieve a measurement precision beyond the classical limit. We have shown that sequential measurements can enhance the precision of the estimation of the temperature of the system by exploiting the information available from the quantum correlations among the repeated measurements.

3) We have shown that the quantum parameter estimation can be drastically enhanced by the **optimal quantum control** on the target system.