

Foundation of Quantum Technology

Project Leader

CHEON Taksu, PhD.
Professor, Information Systems Engineering Course

Faculty Members involved in this Project

Azhar Iqbal, PhD.
Visiting Associate Professor, Research Institute

Objective

Our ultimate goal is to reconcile the mysteries of quantum mechanics with our intuition. Past three decades have shown that the seemingly philosophical pursuit of fuller understanding of quantum mechanics can yield scientific discoveries, some of which even have immediate technological impacts, such as quantum computation, quantum cryptography, and quantum teleportation. Our current research projects include the completion of the physics of quantum singularity and quantum graph, the theory of quantum transport and quantum chaos, and the quantum information.

Project Outline

- (1) We seek to extend the theory of quantum singularity on one-dimensional line, and establish the general theory of quantum graph, which is expected to supply the foundation of the single electron quantum device.
- (2) We intend to establish a consistent, general theory of quantum games. This should have impacts to both game theory itself, and to quantum information theory. As an extension of conventional game theory, quantum game theory is expected to supply a unified description of game strategy that includes player correlations. At the same time, quantum game theory can become a general framework to formulate quantum information processing that involves more than two participants.
- (3) In the process of establishing a general theory of quantum games, the problem of intuitive understanding of quantum entanglement is to be considered. We shall look into such fundamental problems as nonlocality, conditionality and elements of reality in quantum mechanics.

References

- 1) T. Cheon and T. Shigehara, *Fermion-boson duality of one-dimensional quantum particles with generalized contact interactions*, Physical Review Letters **82** (1999) 2536-2539.
- 2) T. Cheon and I. Tsutsui, *Classical and quantum contents of solvable game theory on Hilbert space*, Physics Letters A **348** (2006) 147-162.

Contact

E-mail: taksu.cheon@kochi-tech.ac.jp
URL: <http://www.lab.kochi-tech.ac.jp/quantum/>