研究課題別事後評価結果

１．研究課題名：　励起子 - ポラリトンにおける強相関トポロジカルハルデーンモデルの実現

２．個人研究者名

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３．事後評価結果

The goal of this project is to develop an optical platform for strongly correlated topologically non-trivial states that leads to realization of robust, manipulable non-Abelian (Fibonacci) anyonic states. Basic ingredients are the topologically non-trivial band (strongly correlated Haldane model) combined with strong interaction. In the case of the exciton-polariton bosonic system, the density of state is constant but the size of the system changes. Therefore, short magnetic length that can be achieved by the exicton-polariton system is quite advantageous towards realization of braiding-based quantum computing that requires a quite large number of gates even for a simple single gate operation.

Experimentally, fabrication process for GaAs/GaAlAs micro-cavity pillars has been developed. These pillars are distributed into topologically needed patterns and confine exciton-polaritons for realization of the strongly correlated Haldane model. However, the final structure is yet to be completed. Meanwhile, Dr. Fraser succeeded in experimental rotation of polariton condensates for reaching the quantum Hall regime using a planer GaAs/GaAlAs systems. Such quantum control protocol will serve as a basic element in the future topological experiments using the pattered pillars.

This project takes a very unique approach in the field of non-Abelian quantum information processing. When experimental platforms are fully prepared, we expect to witness a series of very important experimental developments in boson based quantum information processing.