Usage Report for Fiscal Year 2022

Project Title: Ultrastrong coupling regime of three-body interaction

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1. Background and purpose of the project, relationship of the project with other projects

The purpose of this project was to use advanced numerical methods to study nontrivial properties of many-body quantum physics in the presence of the environment. In particular, we are investigating the use of dissipative systems for quantum metrological purposes.

2. Specific usage status of the system and calculation method

We used advanced machine learning techniques and a homodyne quantum trajectory approach (i.e. stochastic differential equations) to investigate a qubit in dispersive coupling with a Kerr nonlinear resonator.

3. Result

We are analyzing the results, which demonstrate the possibility to engineer a rapid and responsive measurement instrument. Our preliminary results have been presented at the NEURIPS conference, and are available as a preprint on the arXiv (https://arxiv.org/abs/2112.05332).

4. Conclusion

This is a promising method with potential application in quantum computing. We plan to continue pursuing this investigation.

5. Schedule and prospect for the future

In the next months, we will finalize our results, and plush an article in a high-profile journal.

6. If no job was executed, specify the reason.

N.A.

Fiscal Year 2022 List of Publications Resulting from the Use of the supercomputer

[Conference Proceedings]

https://arxiv.org/abs/2112.05332. Presented at ML4PS, the 4th workshop on Machine Learning and the Physical Sciences (NeurIPS2021). Submitted: 27 September. Accepted: 21 October