

Project Title:

Quantum mechanics in superconducting electrical circuits

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I plan to use my RICC account for studies of dynamical quantum properties of superconducting electrical circuits, such as qubit circuits as candidates for possible building blocks in future quantum computing devices, and as artificial atoms and quantum field waveguides for fundamental studies on quantum-optics-like problems in the microwave regime.

In these studies I plan using the software package QuTiP, which I am co-developing. This is a framework for numerical simulations of quantum dynamics of open systems, which use ODE solvers and sparse matrices for solving quantum master equations and the wave-function Monte-Carlo equations. More information about this open-source tools are available at:

<http://www.qutip.org>

I have used this software for a number of theoretical studies in open quantum systems, most recently in

<http://arxiv.org/abs/1402.4900>

However, I have not yet been able to port the QuTiP software to be compatible with the RICC system, and have therefore not been able to use the RICC system as I had hoped. I am still working on porting this software to the RICC system when I have time, and hope to be able to complete this during the next fiscal year and continue to use the system in my scientific investigations on open quantum systems. This fiscal year I have not been able to use it and have for this reason not used any CPU time.

RICC Usage Report for Fiscal Year 2013

Fiscal Year 2011 List of Publications Resulting from the Use of RICC

[Publication]

J.R. Johansson, P.D. Nation, F. Nori, *QuTiP 2: A Python framework for the dynamics of open quantum systems*, Comp. Phys. Comm. **184**, 1234 (2013).

<http://arxiv.org/abs/1211.6518>

This software is not yet compatible with RICC, and I have therefore used other computer resources in papers using this software. When the porting of this software to RICC is completely I expect to actively use the cluster.

[Proceedings, etc.]

[Oral presentation at an international symposium]

[Others]