

Final Report Project 018

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Within this project, I have visited the Chalmers University for a couple of days, specifically the groups of G. Wendin and P. Delsing, both part of the SQUBIT network. The visit took place in November 2001 and included the time of the SQUBIT meeting. At that meeting, I had the chance to learn about the groundbreaking experimental results of the Saclay group and have presented own research on interplay of time-dependent driving and decoherence. The exchange of ideas was very fruitful. In fact, we developed on our common interest in reading out charge and formulated a common project on the read-out of flux states by a SET, which would correspond to the read-out of σ_x in the flux basis. Such a setup would allow to demonstrate the effects of measurements of noncommuting observables in macroscopic systems. We followed up on this while Andreas Käck, a PhD student from the Wendin group, visited me on a Marie Curie training site fellowship in the beginning of 2003. The project is proceeding well, a couple of quantitative details remain to be detailed, and we are expecting to write a scientific paper in early 2004.

It was highly exciting and stimulating to have exchange with the SQUBIT network and specifically with the Chalmers groups. I wish to thank QUIPROCONE for funding this activity.

Deliverables

Published papers profiting from the project

Decoherence of Flux Qubits Coupled to Electronic Circuits

F.K. Wilhelm, M.J. Storcz, C.H. van der Wal, C.J.P.M. Harmans, and J.E. Mooij
to appear in *Advances in Solid State Physics*, Vol 43 (2003),

Theoretical analysis of continuously driven solid-state qubits,

M.C. Goorden and F.K. Wilhelm
accepted for publication in *Phys. Rev. B*

An asymptotical von-Neumann measurement strategy for solid-state quantum bits

F.K. Wilhelm
accepted for publication in *Phys. Rev. B*

Decoherence and gate performance of coupled solid state qubits

M.J. Storcz und F.K. Wilhelm
Phys. Rev. A **67**, 042319 (2003)

Engineering decoherence in Josephson persistent-current qubits

C.H. van der Wal, F.K. Wilhelm, C.J.P.M. Harmans, and J.E. Mooij
Eur. Phys. J. B **31**, 111 (2003).

Quiet readout of superconducting flux states

J. Clarke, T.L. Robertson, B.L.T. Plourde, A. Garcia-Martinez, D.J. van Harlingen, P. Reichardt, B. Chesca, R. Kleiner, Yu. Makhlin, G. Schön, A. Shnirman, and F.K. Wilhelm
Phys. Scr. T**102**, 173 (2002).

Engineering the quantum measurement process for the persistent current qubit

T.P. Orlando, L. Tian, D.S. Crankshaw, S. Lloyd, C.H. van der Wal, J.E. Mooij, and F.K. Wilhelm
Physica C **368** 294 (2002)

Submitted papers

Large Berry phase in gated persistent-current quantum bits

F.K. Wilhelm and J.E. Mooij
submitted to Europhys. Lett. , 7 pages

Papers in preparation

Reading out the charge states of flux qubits

A. Käck and F.K. Wilhelm, in preparation