NÉEL INSTITUTE Grenoble

Postdoctoral position on superconducting qubits

Context: During the last decade, it has been demonstrated that superconducting Josephson quantum circuits constitute ideal blocks to realize quantum mechanical experiments and to build promising quantum bits for quantum information processing. However, in this field, measurement of qubit suffers from intrinsic drawbacks and are still far from optimal performance. Recently, in our group, we demonstrated an original high-fidelity quantum measurement (Fig.1) which overcomes the usual limitations [1].

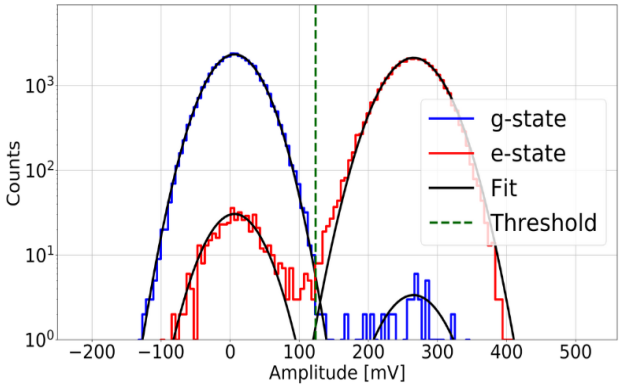

Figure: Histograms of 150ns single shot qubit readout for qubit prepared in its ground state |g> (blue points) and excited state |e> (red points) with heralding. The readout fidelity is 99.3% with a very high 99% quantum-non-demolition.

Research topic and facilities available: In this project, we propose to study fundamental aspects such as quantum-non-demolition measurement, large readout photon number, quantum trajectories but also to build a superconducting multi-qubit platform for quantum technologies based on this new readout and on our recent achievement on quantum limited amplifiers [2]. Within a stimulating environment and in collaboration with a PhD student, you will carry out these quantum experiments at very low temperature in a dedicated equipped fridge. Your work will be realized in the "Quantum Electronics Circuits Alps" team of NEEL Institute (http://neel.cnrs.fr) which has a strong experience in superconducting quantum circuit modelization, nanofabrication, microwave electronics, cryogenic equipment and superconducting qubit experiments.

[1] *"Fast high fidelity quantum non-demolition qubit readout via a non-perturbative cross-Kerr coupling",* R. Dassonneville, et al, Phys. Rev. X 10, 011045 (2020).

[2] *"A photonic crystal Josephson traveling wave parametric amplifier"*, L. Planat, et al, Phys. Rev. X 10, 021021 (2020).

Possible collaboration and networking: This project on superconducting qubits is specifically supported by the National French Funding Agency (ANR), benefits from collaborations with theoretical groups in Paris and Sao Carlos (Brazil) and is part of European projects.

Required skills: You hold a PhD in experimental physics and you are highly motivated to work on original experiments in superconducting qubits. A strong experience in at least one of these areas is required: nanofabrication in clean room, microwave electronics, dilution fridge.

Applications: Please send a CV, including references, together with a publication list and a letter of motivation to olivier.buisson@neel.cnrs.fr. Feel free to contact me for more details.

Starting date: Summer/Automn 2022.
Duration: initially 24 months (with possibility for extension)
Net Salary: min. 2100€/month

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Institut Néel- CNRS : phone: +33 4 56 38 71 77 More informations on : http://neel.cnrs.fr