

RobustSuperQ – Job offer

2 to 3-year Post-doc position
Starting date: September 2024

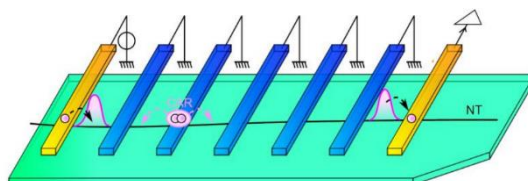
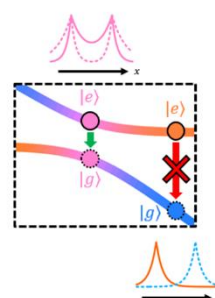
QCMX Lab

Laboratoire de Physique de la Matière Condensée, Ecole Polytechnique
<https://pmc.polytechnique.fr/spip.php?article1274>

Experimental realization of an Andreev molecule qubit

A Fermionic Qubit with intrinsic protection mechanisms against decoherence

The goal of this project is to demonstrate the existence of internal protection mechanisms against decoherence in fermionic qubit architectures composed of a chain of superconducting quantum dots. This chain is created by depositing a carbon nanotube (CNT) on a set of superconducting electrodes to form a chain of Josephson junction. This approach can yield different types of qubits, but for this project we will focus on the Andreev molecule [1,2]. It possesses intrinsic selection rules relying on its nonlocal properties that we want to exploit to fight decoherence. We have already fabricated devices hosting this exotic electronic state, and we have proven its nonlocal character with DC transport measurements by demonstrating nonlocal Josephson effect. The goal of the project is to place this elementary quantum object inside a microwave cavity to perform its coherent manipulation, and subsequently demonstrate that it does have internal protection mechanisms.



[1] J.-D. Pillet, V. Benzoni, J. Griesmar, J.-L. Smirr, and C. Ö. Girit, *Nonlocal Josephson Effect in Andreev Molecules*, *Nano Letters* **19**, 7138 (2019).
[2] J.-D. Pillet, V. Benzoni, J. Griesmar, J.-L. Smirr, and C. Girit, *Scattering Description of Andreev Molecules*, *SciPost Physics Core* **2**, 009 (2020).

The candidate must have a PhD in Physics, and preferably experience with low temperature physics, superconductivity, low noise and high frequency measurements

Contact Jean-Damien Pillet, jean-damien.pillet@polytechnique.edu

Landry Bretheau, landry.bretheau@polytechnique.edu

Joël Griesmar, joel.griesmar@polytechnique.edu



<https://www.robustsuperq.fr>