

Post-doctoral position Graphene based superconducting quantum circuits

We offer a Postdoc position in Institut Néel in the field of superconducting quantum circuits with hybrid graphene Josephson junctions.

Context : Superconducting quantum circuits are one of the leading platforms for the development of a quantum computer. Traditional approaches, that are used by many research groups and companies (IBM, Google...) around the world, rely on the use of tunnel Josephson junctions made with a thin insulating barrier separating two superconducting electrodes. Using this platform, tunability of the system is obtained using magnetic fields. While successful, this has some major drawbacks for interferences between different parts of the circuit and for scaling. We propose to use a different approach by bringing electrical tunability in such circuit. This can be done using a Josephson junction that contains a semiconducting material. Recent demonstrations have shown that such approaches are very promising [1].

[1] T. W Larsen et al *Phys. Rev. Lett.* 125, 056801(2020), J. I. Wang et al *Nature Nanotech.* 14, 120 (2019)

Objectives and means available: In this project, you will fabricate graphene based Josephson junctions and integrate them into superconducting quantum circuits to realize quantum bits. You will explore the coherence in such system. The goal will be to probe designs that can offer topological protection of the relaxation and coherence. All the necessary equipment is already available and the team has demonstrated superconducting circuits with graphene Josephson junctions.

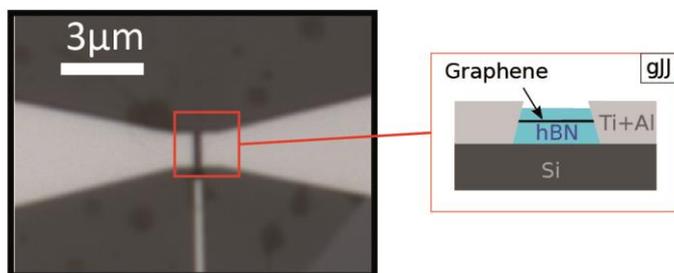


Figure 1: a graphene Josephson junction (gJJ) made in the team. We use hexagonal boron nitride (h-BN) encapsulated graphene and connect it with a superconductor (Ti+Al). The junction shows a voltage-tunable supercurrent thanks to the field effect of graphene.

Possible collaboration and networking : This project is part of the large-scale project in the field of quantum technology in the french community and you will interact with many groups working on similar topics (in Grenoble, Lyon, Paris), including regular meetings.

Required profile : You hold a PhD in experimental physics. You are expected to be strongly motivated to learn the techniques involved in the project (nanofabrication in clean room, radiofrequency electronics, cryogenics...) and engage in an hands-on experimental work.

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

Foreseen start for the position : Fall 2022 (flexible)

Salary : min. 2100€/month

Duration : initially 18 months (with possibility for extension)

Contact : Julien Renard

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More information: <http://perso.neel.cnrs.fr/julien.renard/> and <http://neel.cnrs.fr>