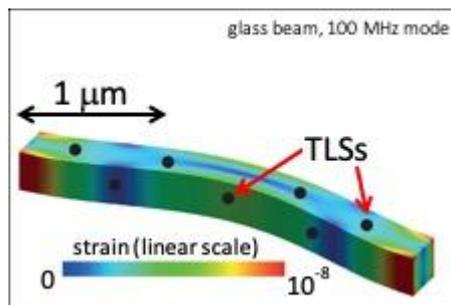
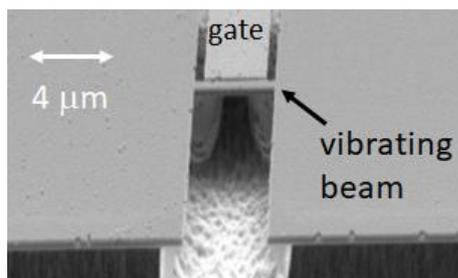


Post-doctoral position: Mechanical resonators passively cooled to the quantum ground state

Context: We have recently cooled a nanomechanical resonator to sub-mK temperatures purely by good thermal coupling to the refrigerator, i.e., by passive cooling[1]. In contrast to the optomechanical cooling techniques used by many other groups, our technique cools the phonon bath of the vibrating structure as well as the low energy excitations arising from atomic-scale disorder in the structure. As a result, the 15 MHz mechanical mode reaches its quantum ground state.

[1] D. Cattiaux *et al.*, "A macroscopic object passively cooled into its quantum ground state of motion beyond single-mode cooling", *Nature Communications* **12**, 6182 (2021).



Objectives and means available: We will now apply this technology to study fundamental physics, including wave function collapse models, quantum thermodynamics, and the nature of the low energy excitations that dominate the behavior of amorphous solids at low temperatures. In addition to fundamental concerns, the latter topic has practical applications considering the importance of tunneling two level systems to the damping of nanomechanical resonators and the decoherence of superconducting qubits.

These experiments are carried out on our nuclear demagnetization cryostat reaching sub-mK temperatures and two dry dilution refrigerators. Our group is also developing a continuous nuclear demagnetization refrigerator, which will allow us to maintain sub-mK temperatures indefinitely in a cryogen-free system. Our combination of microwave optomechanical measurements with sub-mK temperatures is a unique capability.

We are seeking a postdoc and a more senior visiting researcher to work on this ERC-funded project at the Institut Néel/CNRS in Grenoble, France. Activities include nanofabrication and measurement of the devices at ultra-low temperatures.

Required profile: Experience with at least one of the following: measurements at low temperatures; microwave electronics; nanofabrication; or theory of optomechanics or quantum circuits.

Foreseen start for the position: Winter/Spring 2022

Gross Salary: 2664 €/month to 4213 €/month depending on the number of years of experience

Duration: 24 to 48 months

To Apply: Please send a CV and a publication list to andrew.fefferman@neel.cnrs.fr.

More Information: <https://neel.cnrs.fr/equipes-poles-et-services/ultra-basses-temperatures-ubt>.

