The Lancaster nanoscience access facility of the European Microkelvin Platform

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- The facility will enable nanoscale samples and nanoelectronic devices to be studied at sub-millikelvin temperatures.
- The project uses the combined expertise of QTC members, including the Ultralow Temperature Physics group.

Users and partners
European Microkelvin Platform members:
- Aalto University (FI)
- Basel University (CH)
- CNRS Grenoble (FR)
- Universität Heidelberg (DE)
- Lancaster University (UK)
- Royal Holloway University of London (UK)
- Slovak Academy of Sciences (SK)
with users from all over Europe, and beyond...

Achieving extremes of temperature and isolation
The facility has been designed to cool samples to the lowest achievable temperatures, deep into the sub-millikelvin regime, using techniques from ultralow temperature physics and superfluid helium research.

To reach the lowest temperatures, a sample must be isolated from ambient radiation and electrical noise as well as effectively cooled. A combination of techniques from the ultralow temperature and nanoelectronics communities are being used to achieve this. These include cold electrical filters and very high conductivity thermal contacts.

New thermometers for a new regime
At these extremes, the temperatures of nuclei, electrons, and phonons in the sample and the substrate are usually decoupled. It is crucial to measure the temperature of the sub-systems of interest. We are developing and testing a range of different types of thermometer to provide this essential metrology.

Quantum dot electron thermometer
Coulomb blockade electron thermometer
Nanomechanical phonon thermometry

A sample holder (left) and miniature RC filters (right). Both are incorporated into the dilution refrigerator along with high thermal conductivity links direct to the refrigerant. This ensures that all electrical connections have excellent thermal contact to the coldest part of the system.

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