welcome to the
European Microkelvin Collaboration

CAPACITIES

Report on the Transnational Access Activity carried out within MICROKELVIN

The eligibility of transnational access to a MICROKELVIN TA site implies the submission of the following:

1) **The Certification of visit**

The form "Certification of visit" must be completed and signed by the access provider in charge of the infrastructure and the leader of the project.

2) **A TA project report**

The form for the TA project report is contained within this document. It should be completed after project end by the group leader of the project. You must respect the limited number of words specified, longer descriptions will be rejected. Figures/tables may be attached at the end of the document. The document must be submitted in an editable format (doc, rtf).

3) **A User group questionnaire**

To enable the Commission to evaluate the Research Infrastructures Action, to monitor the individual contracts, and to improve the services provided to the scientific community, each project leader of a user-project supported under an EC Research Infrastructure contract is requested to complete a "user group questionnaire". The questionnaire must be submitted once by each user group to the Commission as soon as the experiments on the infrastructure come to end.

The user group questionnaire is not part of this document and must be completed on-line. It is accessible at:

http://cordis.europa.eu/fp7/capacities/questionnaire_en.html.

► **Please note that any publications resulting from work carried out under the MICROKELVIN TA activity must acknowledge the support of the European Community:**

> **"The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 228464 (MICROKELVIN)."**

welcome to the European Microkelvin Collaboration

CAPACITIES

MICROKELVIN Transnational Access Project Report

1. General information

Project number:	**Lancs21**	
Project Title:	**Ultralow temperature properties and thermometry in mesoscopic structures**	
Lead scientist:[1]	**Title:**	Prof.
	First name:	Stefan
	Last name:	Ludwig
	Home institution:	Luwig-Maximilians Universität, München
Host scientist:[2]	**Title:**	Dr.
	First name:	Richard
	Last name:	Haley
	Home institution:	University of Lancaster, Lancaster, United Kingdom
Project scientist:[3]	**Title:**	Dipl. Phys.
	First name:	Florian
	Last name:	Forster
	Birth date:	16.10.1986
	Passport number:	LF08ZFKMG
	Research status/Position:	PhD-student
	New User:[4]	No
	Scientific Field:	Nanophysics, Solid State Physics
	Home institution:	LMU Munich
	Is your home institution MICROKELVIN partner?	No
	Business address:	Fakultät für Physik, Ludwig-Maximilians-Universität
	Street:	Geschwister-Scholl-Platz 1
	PO Box:	
	City:	München
	Zip/Postal Code:	80539
	Country:	Germany
	Telephone:	0049-89-2180-3586
	Fax:	0049-89-2180-3182
	E-mail:	f.forster@physik.uni-muenchen.de

2. Project information

[1] The lead scientist indicated here is expected to participate in the campaign as a user of the infrastructure.

[2] The host scientist is supervising the work of the visiting project scientist at the infrastructure.

[3] The project scientist is the person who will be visiting the infrastructure.

[4] Indicate 'Yes' only if the user has never visited the infrastructure before this specific project, otherwise write 'No'.

Please, give a brief description of project objectives: (250 words max)	A major goal of the Microkelvin project is to develop technology to better enable the cooling of electronic devices and nanocircuits to temperatures below 1mK. For this purpose a new EU Access Facility machine was recently built at Lancaster. A major obstacle to cooling electronic devices is heat generated by noise transmitted through electrical leads. To address this, sophisticated wiring/filter protocols and designs developed by Stefan Ludwig's group in Munich are being implemented in the new machine at Lancaster. The Ludwig group has also developed high quality low temperature measurement techniques for nanostructures which they produce in-house. This project aims to perform the first ultralow temperature measurements on nanostructures built in Munich. To achieve this, Stefan Ludwig and Florian Forster have made several visits to the Lancaster Access Facility to develop the necessary measurement techniques and thermometry and to perform the preliminary measurements. The primary scientific and technological objective of this collaborative project is to investigate nanoelectronic circuits in a hitherto unrivalled range of ultralow temperatures. This will allow us to reach lower energy scales and go beyond the present state-of-the-art to investigate collective and phase sensitive quantum phenomena such as: mesoscopic interferometry effects; quantum Hall phases; the Kondo effect in coupled quantum dots; the 0.7 anomaly in quantum point contacts; and the hyperfine interaction between confined electrons and many nuclear spins. One of our main efforts will be to study coherent dynamics and entanglement in semiconductor-based quantum information circuits at ultralow temperatures. The combination of expertise in ultralow temperature physics in Lancaster and low temperature nanoelectronic measurements in Munich provides the framework for a successful collaboration. Nanostructures are being produced and initially characterised in Munich, while the ultralow temperature measurements will be performed in Lancaster.
Technical description of work performed: (250 words max)	This third visit of Florian Forster at Lancaster University was an extension of his second visit (the two visits were interrupted by one week of vacation). The technical description of the performed work is the same as for his second visit.
Project achievements (and difficulties encountered)**:**[5] (250 words max)	During this third visit he completed the low temperature filters and thermal couplings for the refrigerator. The Hall bar and quantum dot samples are now ready to be bonded to the low temperature chip holder. Our initial goal to pursue first experiments on ultra-cold nanostructures during this visit was not achieved owing to technical delays in getting the dilution refrigerator to work. These difficulties are now being fixed so we are about to mount and cool the first mesoscopic sample. We expect to be able to present the first experimental results on semiconductor nanostructures at ultra-low temperatures by the end of this year.
Expected publications and dates:	We expect to be able to present the first publications in 2014.
Submission date of user group questionnaire:	30 Sep, 2013

Completed Project Reports should be returned to MICROKELVIN Management Office (Sari.Laitila@aalto.fi, Fax: +358 9 47022969).

SEVENTH FRAMEWORK PROGRAMME

Please complete and sign the form and send it by email or fax to the MICROKELVIN Management Office (leena.meilahti@tkk.fi, Fax No.: +358 9 4512969)

CERTIFICATION OF VISIT

at MICROKELVIN Transnational Access Site

I herewith confirm that the following project was carried out at our Transnational Access Site

University of Lancaster

in the context of MICROKELVIN Transnational Access:

Ultralow temperature properties and thermometry in mesoscopic structures

The amount of access[1] delivered to the project group (project users) is as follows:

	Participant name	Duration of stay (start – end date)	Amount of access[2]
Project leader:	Dr Stefan Ludwig		
Project user 1:	Florian Forster	16/9/13 – 30/9/13	15
Project user 2:			
Project user …:[3]			
Total amount of access delivered to project group:			15

LANCASTER 30/9/13
Location and date

S. Fisher
Signature of access provider
Prof Shaun Fisher

LANCASTER 21/9/13
Location and date

Signature of project leader
Dr Stefan Ludwig

Completed Certification of Visit should be returned to MICROKELVIN Management Office
(sari.laitila@aalto.fi, fax: +358 9 47022969)

[1] TKK Helsinki, CNRS Crenoble, or Lancaster University

[2] The amount of access is defined as the time, in days, spent by the user at the infrastructure for this project, including weekends and public holidays (e.g., a scientist who spent 5 days at the infrastructure must indicate '5'). The total amount of access of the project group is the sum of access days of each project user.

[3] Please, expand if necessary