welcome to the European Microkelvin Collaboration

CAPACITIES

Application Form for MICROKELVIN Transnational Access Project

1. General Information

Project number:	**Lancaster16**	
Project Title:	**Ultralow temperature properties and thermometry in mesoscopic structures**	
Lead scientist:[1]	**Title:**	Prof.
	First name:	Stefan
	Last name:	Ludwig
	Home institution:	LMU University Munich
Host scientist:[2]	**Title:**	Professor
	First name:	George
	Last name:	Pickett
	Home institution:	Lancaster University
Project scientist:[3]	**Title:**	Prof.
	First name:	Stefan
	Last name:	Ludwig
	Birth date:	17.01.1970
	Passport number:	CH1H71PW1
	Research status/Position:	group leader
	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
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	City:	München
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	Telephone:	0049-89-2180-1457
	Fax:	0049-89-2180-3182
	E-mail:	Ludwig@LMU.de
	Curriculum vitae (18 lines max): - Jan. 1997 **Diploma in Physics** University of Heidelberg - July 2000 **Ph. D. in Physics** University of Heidelberg - 2000 - 2001 **Postdoctoral researcher** University of Heidelberg - 2001 - 2003 **Postdoctoral researcher** Stanford University (with Doug Osheroff) - since 2003 **Senior researcher** LMU Munich - spring 2008 **Visiting professor (W3)** University of Regensburg - 2008 **Habilitation** - 2008 – 2009 **Visiting professor (W3)** LMU Munich - since 10/12 **Heisenberg Fellowship** of the German Research Foundation (DFG) (host inst.: LMU and Walther-Meißner-Institute)	

[1] The lead scientist indicated here is expected to supervise the planned project at the infrastructure.

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

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

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

	Five most recent publications:		
	1- G. Granger, D. Taubert, C. E. Young, L. Gaudreau, A. Kam, S. A. Studenikin, P. Zawadzki, D. Harbusch, D. Schuh, W. Wegscheider, Z. R. Wasilewski, A. A. Clerk, S. Ludwig,and A. S. Sachrajda *"Quantum interference and phonon-mediated back-action in lateral quantum-dot circuits "* Nature Phys. 8, 522–527 (2012)		
	2- A. Wild, J. Kierig, J. Sailer, J. W. Ager, E. E. Haller, G. Abstreiter, S. Ludwig, and D. Bougeard *"Few electron double quantum dot in an isotopically purified 28Si quantum well "* Appl. Phys. Lett. 100, 143110 (2012)		
	3- D. Taubert, D. Schuh, W. Wegscheider, and S. Ludwig *"Determination of energy scales in few-electron double quantum dots"* Rev. Sci. Instrum. 82, 123905 (2011)		
	4- D. Taubert, G. J. Schinner, C. Tomaras, H. P. Tranitz, W. Wegscheider, and S. Ludwig *"An electron jet pump: The Venturi effect of a Fermi liquid "* J. Appl. Phys. 109, 102412 (2011)		
	5-D. Taubert, C. Tomaras, G. J. Schinner, H. P. Tranitz, W. Wegscheider, S. Kehrein, and S. Ludwig *"Relaxation of hot electrons in a degenerate two-dimensional electron system: transition to one-dimensional scattering "* Phys. Rev. B 83, 235404 (2011)		
Other participating scientists:[5]	**Name:**	**Position:**	**New User:**[2]
	1- Florian Forster	PhD student	yes

[5] Please list all participating user group members. Expand the table, if necessary.

2. Project Information

Name of host infrastructure:	Ultra Low Temperature laboratory, University of Lancaster, Lancaster, United Kingdom			
Access provider / Infrastructure Director:	**Name:** Prof. S.N. Fisher Prof. G.R. Pickett		**E-mail address:** s.fisher@lancaster.ac.uk g.pickett@lancaster.ac.uk	
Planned project dates:	**Start date:**	**24/4/13**	**Completion date:**	**26/4/13**

Project description (12 lines 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 have 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 require several visits to the Lancaster Access Facility to further develop the necessary measurement techniques and thermometry and to perform the preliminary measurements.

Scientific objectives of the project (12 lines max):

The primary scientific and technologic 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 well 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 will be produced and initially characterised in Munich, while the final ultralow temperature measurements will be performed in Lancaster.

Technical description of work to be performed (20 lines max):

Presently we are installing cables and filters in the newly built dilution unit at the Universtity of Lancaster, and we are exchanging skills and technology between Munich and Lancaster, with visits in both directions. This transfer will now be intensified during several visits of Stefan Ludwig and a PhD-student from Munich, Florian Forster. They will bring the first mesoscopic samples from Munich, including quantum Hall and double quantum dot devices, and initiate experiments on these structures in Lancaster. Stefan Ludwig will bring the expertise on thermalization and cooling of the 2DEG samples plus on their low noise cryogenic measurement techniques. The first experiments will aim at optimising the cooling of the electronic quantum circuits to ultralow temperatures and to reliably detect the temperature of the electron system. These initial steps are crucial for the success of the future development of the new Lancaster facility for studying nanoelectronic circuits at ultralow temperatures.

3. Joint Proposals / Funding

Is this project in collaboration with other (concurrent) projects at the infrastructure?	**No**
If yes, please specify:	

Is this proposal submitted to any funding programmes?	**No**
If yes, please specify:	

The completed Application Form should be submitted to MICROKELVIN Management Office
(**Katariina@neuro.hut.fi**, fax +358-9-47022969)