welcome to the European Microkelvin Collaboration

CAPACITIES

Application Form for MICROKELVIN Transnational Access Project

1. General Information

Project number:	**AALTO31**	
Project Title:	**Fluctuations and work in driven open quantum systems: From theory to experiment**	
Lead scientist:[1]	**Title:**	Prof. Dr.
	First name:	Joachim
	Last name:	Ankerhold
	Home institution:	Institute for Theoretical Physis, Condensed Matter Theory Group, University of Ulm
Host scientist:[2]	**Title:**	Prof. Dr.
	First name:	Jukka
	Last name:	Pekola
	Home institution:	O.V. Lounasmaa Laboratory (Low Temperature Laboratory), Aalto University School of Science, Helsinki/Espoo
Project scientist:[3]	**Title:**	Dipl.-Phys.
	First name:	Vera
	Last name:	Gramich
	Scientific Field:	Low Temperature Physics, Nanoelectronics, Condensed Matter Physics
	Home institution:	Institute for Theoretical Physics, Condensed Matter Theory Group, University of Ulm
	Is your home institution MICROKELVIN partner?	no
	Business address:	
	Street:	Albert-Einstein-Allee 11
	PO Box:	
	City:	Ulm
	Zip/Postal Code:	89069
	Country:	Germany
	Telephone:	0049-731-5022922
	Fax:	0049-731-5022924
	E-mail:	vera.gramich@uni-ulm.de
	Curriculum vitae (18 lines max): -Date of birth: August 19th, 1985 in 71277 Leonberg (Germany) -1995-2004: secondary school, Gymnasium Renningen, Germany final secondary school examinations qualifying for university admission ('Abitur'), final mark: 1,0 with honors, Valedictorian, awards in physics and German as well as a school prize for the best A-levels -2004-2010: Studies in physics at the University of Ulm, Germany secondary subject: chemistry -April 2007: Intermediate exam (Pre-Diploma), final mark: 1,0 with honors scholarship for exemption of the tuition fees (one of the best 5% of the physicists` age group) -Oct. 09- Oct. 10: Diploma thesis in Condensed Matter Theory, Title: "The influence of noise on the measurement of the Berry phase in	

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.

	superconducting circuits" -Nov. 2010: Masters degree (Diploma), final mark: 1,0; Academic degree: Dipl.-Phys. -2011: Diploma thesis award: Mileva-Einstein-Maric prize of the University of Ulm (prize money: 1000 Euros) -since March 2011: scientific officer, PhD student in the group of J. Ankerhold, Theoretical Physics, Condensed Matter Department -2012: participation at Singapore School of Physics at NTU (Nanyang Technical University) DFG (German research society) scholarship (from Graduate School of the SFB/ TRR 21) for a 2-months visit at the Low Temperature Lab. [all grades on a scale of 1.0 (best) to 4.0 (worst)]		
	Five most recent publications:		
	1- V. Gramich, P. Solinas, M. Möttönen, J. P. Pekola and J. Ankerhold, Phys. Rev. A **84**, 052103 (2011)		
	2-		
	3-		
	4-		
	5-		
Other participating scientists:[4]	**Name:**	**Position:**	**New User:**
	1-		
	2-		
	3-		

4 Please list all participating user group members. Expand the table, if necessary.

2. Project Information

Name of host infrastructure:	O.V. Lounasmaa Laboratory (Low Temperature Laboratory), PICO-group, Aalto University School of Science, Helsinki/Espoo			
Access provider / Infrastructure Director:	**Name: Jukka Pekola, Prof.**		**E-mail address: jukka.pekola@aalto.fi**	
Planned project dates:	**Start date:**	**[15/05/2013]**	**Completion date:**	**[15/08/2013]**

Project description (12 lines max):

The aim of this project is to study fluctuations in superconducting nano-devices and to ask for the definition of work performed in such a driven (open) quantum system. The validity of common fluctuation relations is hard to assess, except in simple limits. As a model system therefore could serve the driven quantum harmonic oscillator which (i) has usually an exact solution and (ii) can be realized in experiments on superconducting quantum circuits/ SQUIDs to be investigated at Aalto University. Going along with that we intend to generalize the Jarzynski equations to a full quantum mechanical fluctuation relation using a full counting statistics approach/ path integrals. This project is both theory but also aims at investigating the experimental feasibility in the lab addressing different measurement schemes (calorimetry, single-charge detection).

Scientific objectives of the project (12 lines max):

-Studying various definitions of work in quantum mechanics in experimental set-ups
-Analyzing the Cooper pair sluice with respect to work relations
-Developing new experimental measurement schemes/ protocols
-Theoretical predictions of work distribution/ fluctuations

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

- **theoretical concepts:**
- rate equations, Master equations (Born-Markov, Lindblad)
- P(E)-theory
- full counting statistics
- path integrals

-**experimental methods:**
- junction fabrication by electron-beam lithography
- transport measurements in dilution refrigerators
- charge counting
- fast thermometry in nano-structures using RF-transmission techniques on NIS junctions (N=normal, I=insulator, S=superconductor)

First the theoretical concepts will be discussed and developed during the visit, but the main emphasis will be on the experimental execution of the plan during the stay at Aalto.

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 (Sari.Laitila@aalto.fi, fax +358-9-47022969)