welcome to the European Microkelvin Collaboration

CAPACITIES

Application Form for MICROKELVIN Transnational Access Project

1. General Information

Project number:	**AALTO30**	
Project Title:	**Nonequilibrium transport through nanodevices**	
Lead scientist:[1]	**Title:**	Professor
	First name:	Iouri
	Last name:	Galperine
	Home institution:	University of Oslo, Norway
Host scientist:[2]	**Title:**	Professor
	First name:	Nikolai
	Last name:	Kopnin
	Home institution:	Low Temperature Laboratory, Aalto University
Project scientist:[3]	**Title:**	Professor
	First name:	Iouri
	Last name:	Galperine
	Scientific Field:	Theory of Condensed Matter
	Home institution:	University of Oslo, Norway
	Is your home institution MICROKELVIN partner?	No
	Business address:	Department of Physics, University of Oslo
	Street:	Sem Saelends vei 24, Nedre Blindern
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	City:	Oslo
	Zip/Postal Code:	0316
	Country:	Norway
	Telephone:	+4722856495
	Fax:	+4722856422
	E-mail:	Iouri.galperine@fys.uio.no
	Curriculum vitae (18 lines max): **Education:** 1968 - Leningrad State University (Theoretical Physics), 1970 - PhD from Institute for Semiconductors; 1980 - DrSci (habilitation) from Physico-Technical Institute (both - Russian Acad, Sci., St. Petersburg). **Employment:** 1968 – Institute for Semiconductors, since 1972 – Physico-Technical Institute (finally Principal Scientist); since 1993 – Professor at University of Oslo. **Professional societies and related activities (main):** 1996 – Member of Royal Norwegian Academy of Sciences and Humanities; 2008 – Fellow of Royal Norwegian Society for Sciences and Letters; 2000-2004 – Member (chairman) of NATO Panel for Physical Sciences and Technology; 2011 – Member of International Union of Pure and Applied Physics (commission of quantum electronics). **Referee:** Served as referee for several national and international granting agencies, as well as for the Nobel Committee. **Publications:** 350+ journal articles cited in 2800+ papers; h-index is 28. **Research interests:** Theoretical nanoscience with an emphasis on mesoscopic physics; physics of disordered media, kinetics in dielectrics, semiconductors, normal metals and superconductors	

[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.

	Five most recent publications:		
	1- A. J. Qviller, V.V. Yurchenko, Y. M. Galperin, J. I. Vestgaarden, P. B. Mozhaev, J. B. Hansen, and T. H. Johansen, Phys. Rev. X 2, 011007 (2012).		
	2- E. Bardalen, J. Bergli and Y. M. Galperin, Phys. Rev. B **85**, 155206 (2012).		
	3- J. I. Vestgaarden, D. V. Shantsev, Y. M. Galperin and T. H. Johansen, Nature Sci. Rep. 2 ,886 (2012)		
	4- Tom H. Johansen, Alexey V. Pan, and Yuri M. Galperin, Prys. Rev. B **87**, 060402(R) (2013).		
	5- P. Mikheenko, A. J. Qviller, J. I. Vestgaarden, S. Chaudhuri, I. J. Maasilta,Y. M. Galperin,and T. H. Johansen, Appl. Phys. Lett. **102**, 022601 (2013).		
Other participating scientists:[4]	**Name:**	**Position:**	**New User:**
	1-		
	2-		
	3-		

2. Project Information

Name of host infrastructure:	**Low Temperature Laboratory**			
Access provider / Infrastructure Director:	**Name:**		**E-mail address:**	
Planned project dates:	**Start date:**	**27/05/2013**	**Completion date:**	**08/06/2013**

Project description (12 lines max):

Nonequilibrium phenomena in nanodevices are of primary importance since the majority of these devices work out of equilibrium. In the present project, we will address specific features of dc and ac electron transport through so-called Coulomb blockaded devices allowing single-electron information processing. Though single-electron devices were extensively studied, the understanding of their non-equilibrium properties is far from being complete. We plan to develop a theoretical framework for a systematic analysis of information flows in nanodevices. In particular, we will study the Maxwell demon device based on a single-electron charge pump. Experiments on such devices are currently conducted at the Aalto University.

Scientific objectives of the project (12 lines max):

The main objective is the development of a theoretical framework for systematic studies of information flow and its relation to energy balance in the device. This task requires understanding of the interplay between reversible and irreversible processes governing the device operation. The latter requires full account of nonequilibrium and non-stationary dynamics in Coulomb-blockaded systems including both normal and superconducting parts needed for optimizing the device parameters. This will, it its turn, require understanding of the specific features of nonequilibrium quantum transport in nanosystems including both energy and information flows. We plan to chart out the theoretical approaches which allow the study of the above-mentioned phenomena.

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

During the two-week visit of Iouri Galperine, we will arrange a meeting between experimentalists and theorists. Based on the results of this meeting, we will formulate the main problems and choose the order in which they will be addressed in order to use our expertise in the best way. We will discuss the leading approximations allowing us to obtain concise results in the general theory of quantum transport. If time allows, we will review and formulate the basic set of equations to be analyzed and solved, either analytically or numerically. Then we will move along the planned way.

3. Joint Proposals / Funding

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

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

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)