



## Application Form for MICROKELVIN Transnational Access Project

### 1. General Information

<b>Project number:</b>	AALTO21	
<b>Project Title:</b>	Nonequilibrium transport through nanodevices	
<b>Lead scientist:</b> <sup>1</sup>	<b>Title:</b>	Professor
	<b>First name:</b>	louri
	<b>Last name:</b>	Galperine
	<b>Home institution:</b>	University of Oslo, Norway
<b>Host scientist:</b> <sup>2</sup>	<b>Title:</b>	Professor
	<b>First name:</b>	Nikolai
	<b>Last name:</b>	Kopnin
	<b>Home institution:</b>	Low Temperature Laboratory, Aalto University
<b>Project scientist:</b> <sup>3</sup>	<b>Title:</b>	Professor
	<b>First name:</b>	louri
	<b>Last name:</b>	Galperine
	<b>Scientific Field:</b>	Theory of Condensed Matter
	<b>Home institution:</b>	University of Oslo, Norway
	<b>Is your home institution MICROKELVIN partner?</b>	No
	<b>Business address:</b>	Department of Physics, University of Oslo
	Street:	Sem Saelends vei 24, Nedre Blindern
	PO Box:	1048
	City:	Oslo
	Zip/Postal Code:	0316
	Country:	Norway
	Telephone:	+4722856495
	Fax:	+4722856422
	E-mail:	louri.galperine@fys.uio.no
	<p><b>Curriculum vitae (18 lines max):</b>  <b>Education:</b> 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).  <b>Employment:</b> 1968 – Institute for Semiconductors, since 1972 – Physico-Technical Institute (finally Principal Scientist); since 1993 – Professor at University of Oslo.  <b>Professional societies and related activities (main):</b> 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).  <b>Referee:</b> Served as referee for several national and international granting agencies, as well as for the Nobel Committee.  <b>Publications:</b> 350+ journal articles cited in 2800+ papers; h-index is 27.  <b>Research interests:</b> Theoretical nanoscience with an emphasis on mesoscopic physics; physics of disordered media, kinetics in dielectrics, semiconductors, normal metals and superconductors</p>	

<sup>1</sup> The lead scientist indicated here is expected to participate in the campaign as a user of the infrastructure.

<sup>2</sup> The host scientist is supervising the work of the visiting project scientist at the infrastructure.

<sup>3</sup> The project scientist is the person who will be visiting the infrastructure.

	<b>Five most recent publications:</b>		
	1- N.V Agrinskaya, V.I. Kozub, D.V. Shamshur, A.V. Shumilin, and Y.M. Galperin, J. Phys. C <b>22</b> , 405301 (2010).		
	2- N.B. Kopnin, Y.M. Galperin, and V.M. Vinokur, Phys. Rev. B <b>82</b> , 012503 (2010).		
	3- N.B. Kopnin, Y.M. Galperin, J. Bergli, and V.M. Vinokur. Phys. Rev. B <b>80</b> , 134502 (2009).		
	4- N. B. Kopnin, Y. M. Galperin and V. M. Vinokur. Phys Rev. B <b>79</b> , 035219 (2009).		
	5- J. Bergli, Y. M. Galperin and B. L. Altshuler. New Journal of Physics <b>2</b> , 025002 (2009).		
<b><u>Other participating scientists:</u></b> <sup>4</sup>	<b>Name:</b>	<b>Position:</b>	<b>New User:</b>
	1-		
	2-		
	3-		

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<sup>4</sup> Please list all participating user group members. Expand the table, if necessary.

## 2. Project Information

<b>Name of host infrastructure:</b>	Low Temperature Laboratory		
<b>Access provider / Infrastructure Director:</b>	<b>Name:</b>	<b>E-mail address:</b>	
<b>Planned project dates:</b>	<b>Start date:</b>	27/11/2011	<b>Completion date:</b> 03/12/2011
<b>Project description (12 lines max):</b>			
<p>Nonequilibrium phenomena in nanodevices are of primary importance since the majority of devices work out of equilibrium. Within 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. In the present project, we will develop a theoretical framework for a systematic analysis of nonlinear responses of such devices to stationary and time-dependent perturbations. We will focus mainly on hybrid systems, containing normal and superconducting parts. Such devices are very interesting from the fundamental point of view and promising for numerous applications.</p>			
<b>Scientific objectives of the project (12 lines max):</b>			
<p>The main objective is the development of a theoretical framework for systematic studies of nonlinear stationary and time-dependent transport through hybrid devices consisting of normal and superconducting parts. This task requires understanding the interplay between Coulomb interaction (Coulomb blockade effects) and coherent phenomena related to the dynamics of the superconducting condensate. The latter requires full account of quantum dynamics in confined superconductors involving several specific features. Among the unusual non-equilibrium properties of hybrid systems is the so-called branch of imbalance - asymmetry in populations of electron- and hole-like branches of the excitation spectrum, specific electro-neutral interface modes, non-conventional heat release and transport, etc. We plan to explore the theoretical approaches which allow the study of the above-mentioned phenomena.</p>			
<b>Technical description of work to be performed (20 lines max):</b>			
<p>During the 7-day 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 leading approximations allowing the obtaining of concise results from 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.</p>			

## 3. Joint Proposals / Funding

<b>Is this project in collaboration with other (concurrent) projects at the infrastructure?</b>	<b>No</b>
<b>If yes, please specify:</b>	
<b>Is this proposal submitted to any funding programmes?</b>	<b>No</b>
<b>If yes, please specify:</b>	

The completed Application Form should be submitted to MICROKELVIN Management Office ([Sari.Laitila@aalto.fi](mailto:Sari.Laitila@aalto.fi), fax +358-9-47022969)