welcome to the European Microkelvin Collaboration

CAPACITIES

Application Form for MICROKELVIN Transnational Access Project

1. General Information

Project number:	**AALTO 05**	
Project title:	**Hybrid turnstile for single electrons**	
Project acronym:	**HTSE**	
Lead scientist:[1]	**Title:**	**Mr.**
	First name:	**Martin**
	Last name:	**Gustafsson**
	Birth date:	**1979-02-25**
	Passport number:	
	Research status/Position:	**PhD student**
	New User:[2]	**Yes**
	Scientific Field:	**Quantum Device Physics**
	Home institution:	**Chalmers University of Technology**
	Is your home institution MICROKELVIN partner?	☐
	Business address:	**QDP group, MC2, Chalmers University of Technology**
	Street:	**Kemivägen 9**
	PO Box:	
	City:	**Göteborg**
	Zip/Postal Code:	**41296**
	Country:	**Sweden**
	Telephone:	**+46 707 459955**
	Fax:	
	E-mail:	**martin.gustafsson@chalmers.se**
	Curriculum vitae (18 lines max): 2006 - current: PhD student at Chalmers University of Technology. Main research project: Single photon detection using single electron transistors and surface acoustic wave transport. 2003 - 2005: International Masters Program in Nanoscale Science and Technology, Chalmers University of Technology. Average course grade: 4.9. Thesis project: Photon Assisted Tunneling in Resistive Electron Pumps, at the National Physical Laboratory, UK, with full scholarship. 1999 - 2002: Physics education corresponding to BSc degree, Göteborg University. 2001 - 2005: Ran a consultant business in parallel with my studies, developing computerized measurement systems for small and medium-sized technology companies.	
	Five most recent publications:	
	1- Acousto-electric single-photon detector; SPIE proceedings; 2006; v6583; p658304;P.D. Batista, M. Gustafsson; M.M. de Lima Jr., M. Beck, V.I. Talyanskii, R. Hey, P.V. Santos, M. P. Delsing, J. Rarity.	
	2- Photon-Assisted Tunneling in a Resistive Electron Pump; LT24 proceedings; 2006; S. Giblin, M. Gustafsson, S. Lotkhov, A. Zorin.	

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

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

	3-		
	4-		
	5-		
Other participating scientists:[3]	**Name:**	**Position:**	**New User:**[2]
	1- Per Delsing	**Professor**	**Yes**
	2-		
	3-		

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

2. Project Information

Name of host infrastructure:	**AALTO**			
Access provider / Infrastructure Director:	**Name: Jukka Pekola/Mikko Paalanen**		**E-mail address:**	
Planned project dates:	**Start date:**	**08/02/2010**	**Completion date:**	**07/03/2010]**

Project description (12 lines max):

We plan to do combined measurements of SINIS electron turnstiles and RF-single electron transistors (RF-SETs). The turnstiles are extremely accurate current sources, transporting one electron for every control pulse given to them. The accuracy of the turnstiles is better than that of the best traditional current measurement setups, so their ultimate performance has not yet been established.

The RF-SET is the fastest and most sensitive device that exists for measuring charge. By using the RF-SET, we can directly measure the transport errors in the turnstiles, thereby determining just how accurate the turnstiles are under various conditions.

The SINIS turnstile was invented at TKK, and the RF-SET originates from Chalmers. The visitor from Chalmers has experience with RF-SET measurements, adding to the knowledge present in the TKK group.

Scientific objectives of the project (12 lines max):
We intend to determine the error rate of the SINIS turnstiles by counting the transport errors with an RF-SET. The results of such an investigation are interesting and publishable in themselves, but should also provide information about how the pumps can be improved to the desired accuracy. We also have the option to investigate the influence of factors such as the impedance surrounding the turnstile.

Technical description of work to be performed (20 lines max):
The major part of the sample fabrication will be done at Chalmers, which has advanced nanoscale fabrication facilities. This way, we make sure to have samples of high quality and in sufficient number.

The primary type of device will consist of two SINIS turnstiles connected in series, with an RF-SET coupled so as to probe the region between the two. When the turnstiles are driven at a slow rate, the RF-SET will be able to directly detect each electron transferred. At higher transport rates, the RF-SET can instead selectively detect the transport errors.

The experiments will take place in a dilution refrigerator at TKK, which is equipped with RF components that make it suitable for these types of measurements.

3. Joint Proposals / Funding

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

Is this proposal submitted to any funding programmes? Yes X No ☐
If yes, please specify: There is a project on SINIS turnstile: EU STREP "SCOPE" where both TKK and CTH participate.

The completed Application Form should be submitted to MICROKELVIN Management Office (**leena.meilahti@tkk.fi**, fax +358-9-4512969)