welcome to the European Microkelvin Collaboration

CAPACITIES

Application Form for MICROKELVIN Transnational Access Project

1. General Information

Project number:	CNRS09	
Project Title:	**Electronic cooling in hybrid tunnel junctions**	
Lead scientist:[1]	**Title:**	Dr
	First name:	Francesco
	Last name:	Giazotto
	Home institution:	NEST Pisa
Host scientist:[2]	**Title:**	Pr
	First name:	Hervé
	Last name:	Courtois
	Home institution:	CNRS Grenoble
Project scientist:[3]	**Title:**	
	First name:	Maria
	Last name:	Camarasa Gomez
	Scientific Field:	Quantum nano-electronics
	Home institution:	NEST Pisa
	Is your home institution MICROKELVIN partner?	Yes
	Business address:	NEST, Istituto Nanoscienze-CNR & Scuola Normale Superiore
	Street:	Piazza San Silvestro 12
	PO Box:	
	City:	Pisa
	Zip/Postal Code:	56127
	Country:	Italy
	Telephone:	0039-050-509453
	Fax:	0039-050-509417
	E-mail:	maria.camarasa@sns.it
	Curriculum vitae (18 lines max): *Academic Degree:* Licenciatura en Física (5 years) Universidad de Salamanca**.** September, 2011 *Other Academic Degrees:* Ingeniería Técnica en Informática de Sistemas (3 years) Universidad de Salamanca. September, 2012 (expected date of ending and presentation of PFC) *Grants and Contracts:* Low Temperature Laboratory. Ph.D. Enrique Díez.Collaboration Student. Amorphous Sillicon Tandem Cells Characterization. Topographic Study of monolayer, bilayer and trilayer graphene. Academic year: 2009/2010. Universidad de Salamanca. *Workshops, Congresses, Courses and Scientific Events:* 25th European Photovoltaic Solar Energy Conference and Exhibition / 5th World Conference on Photovoltaic Energy Conversion, September 6th-10th, 2010, Valencia, Spain as communicator. III Jornadas de Energías Renovables: Tendencias actuales en el diseño de	

[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.

	paneles fotovoltaicos. Béjar (Salamanca), June, 2010, as student.		
	Five most recent publications:		
	1-Authors: E. Díez, E. García, C. Sánchez-Fabrés, **M. Camarasa**, J.E. Velázquez-Pérez, Y.M. Meziani, V. Bellani, I. Colino, F. Rossella, J. Izard Title: Magneto-Transport and Optical Characterization of Amorphous Silicon Tandem Cells. Ref. review: Book of Proceedings of 25th European Photovoltaic Solar Energy Conference and Exhibition / 5th World Conference on Photovoltaic Energy Conversion, 6-10 September 2010, Valencia, Spain ISBN 3-936338-26-4 Key: A; Volume: Pages: 3240-3242 Date: 2010 Place of publication: Valencia		
	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:	**CNRS Grenoble**			
Access provider / Infrastructure Director:	**Name: H. Godfrin**		**E-mail address: henri.godfrin@grenoble.cnrs.fr**	
Planned project dates:	**Start date:**	**01/06/12**	**Completion date:**	**31/06/12**

Project description (12 lines max):

In this project, we will investigate out-of-equilibrium effects in hybrid superconducting junctions, either in the Josephson coupling regime or in the weak-coupling (i.e. tunneling) regime. Our approach will be to compare local probe experiments with theoretical calculations. This will give us unprecedented insight into the thermal couplings between the different baths at quasi-equilibrium (electrons, phonons, substrate) in the different parts of a device.

Scientific objectives of the project (12 lines max):

Electronic refrigeration appears in a Normal metal - Insulator - Superconductor (S-I-N) tunnel junction voltage-biased just below the superconductor energy gap. In a S-I-N-I-S geometry, the cooling power is doubled and the normal metal is more efficiently decoupled from the thermal bath. In this topic, open questions remain about the coupling of the cooled electron bath to the thermal bath. Phonon cooling in this metal has been inferred from a detailed analysis of the electron temperature behaviour, but not accessed directly. This question is important in view of the realization of a double-stage cooler that could in principle enable cooling to below 100 mK, starting from a bath temperature above 1 K. This device would enable one to access dilution-refrigrator-type temperatures while using only a pumped helium bath, or today even a cryocooler. Our project aims at contributing to the question outlined above, namely the feasibility of a two-stage cooler.

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

The visitor will contribute to measurements with a local probe method on the electronic energy distribution in a mesoscopic device, either a S-N-S junction or a S-I-N-I-S micro-cooler. This will be performed with the cryogenic equipment available at CNRS, a combined AFM-STM device in a dilution refrigerator which can be used down to 80 mK. With this instrument, we will first locate the single nano-device in the AFM mode, using coarse positioning motors and special markers patterned on the sample substrate. In the STM mode, we will then perform local tunneling experiments with both a normal metal tip for probing the local density of states, and a superconducting tip for probing the energy distribution function.

The measured data will be analyzed in the framework of a theoretical model developed in collaboration between NEST Pisa and CNRS Grenoble.

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)