welcome to the European Microkelvin Collaboration

CAPACITIES

Application Form for MICROKELVIN Transnational Access Project

1. General Information

Project number:	**CNRS15**	
Project Title:	**Structure factor of two-dimensional 3He**	
Lead scientist:[1]	**Title:**	Prof.
	First name:	Jordi
	Last name:	Boronat
	Home institution:	Universitat Politècnica de Catalunya
Host scientist:[2]	**Title:**	Dr.
	First name:	Henri
	Last name:	Godfrin
	Home institution:	CNRS – Institut Néel
Project scientist:[3]	**Title:**	Prof.
	First name:	Jordi
	Last name:	Boronat
	Scientific Field:	Quantum fluids and solids
	Home institution:	Universitat Politècnica de Catalunya
	Is your home institution MICROKELVIN partner?	No
	Business address:	
	Street:	Jordi Girona, 31
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	E-mail:	jordi.boronat@upc.edu
	Curriculum vitae (18 lines max): -Born in 1961 in Marçà (Spain), obtained the degree (*licenciatura*) in Physics in 1984 in the University of Barcelona, Doctor in Physics by the University of Barcelona in 1991 under the supervision of Prof. Artur Polls. Associate professor in the Department of Physics and Nuclear Engineering of the Technical University of Catalonia in Barcelona. Full professor of Physics in the same Department and University from 2011. Author of 130 articles in international journals and more than 1300 citations. Advisor and coadvisor of seven PhD students. Leader of the Quantum Monte Carlo research group of the Department of Physics and Nuclear Engineering. Member of the American Physical Society and Institute of Physics. Research interest in: a) quantum fluids and solids such as helium and hydrogen using microscopic theory, b) devise and implementation of quantum Monte Carlo programs both at zero and finite temperature, and c) study of ultracold dilute Bose and Fermi gases in Bose-Einstein condensed states. - - -	

[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.

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	Five most recent publications:		
	1- C. Cazorla, Y. Lutsyshyn, J. Boronat, Elastic constants of solid ^{4}He under pressure: diffusion Monte Carlo study, Physical Review B **85**, 024101 (2012)		
	2- R. Rota, J. Boronat, Onset temperature of Bose-Einstein condensation in incommensurate solid ^{4}He, Physical Review Letters **108**, 045308 (2012)		
	3- S. O. Diallo, R. T. Azuah, D. L. Abernathy, R. Rota, J. Boronat, H. R. Glyde, "Bose-Einstein condensation in liquid ^{4}He near the liquid-solid transition line", Physical Review B **85**, 140505(R) (2012)		
	4- M. C. Gordillo, J. Boronat, Zero-temperature phase diagram of the second layer of ^{4}He adsorbed on graphene, Physical Review B **85**, 195457 (2012)		
	5- O. N. Osychenko, R. Rota, J. Boronat, Superfluidity of metastable glassy bulk para-hydrogen at low temperature, Physical Review B **85**, 224513 (2012)		
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:	**TA2 Microkelvin -CNRS - Institut Néel**			
Access provider / Infrastructure Director:	**Name: H. Godfrin**		**E-mail address: henri.godfrin@grenoble.cnrs.fr**	
Planned project dates:	**Start date:**	**15/01/2012**	**Completion date:**	**22/01/2012**

Project description (12 lines max):

We plan to get insight on the properties of 3He adsorbed on a carbon surface by a combined effort of theory and experiment. Recent activity in the experimental group of Prof. Godfrin in the Institut Néel-CNRS of Grenoble has allowed for the first time to measure elusive and long-time pursued magnitudes in low temperature physics: the static and dynamic structure factors of 3He in a nearly two-dimensional environment. The precision achieved makes possible to compare these results with accurate theoretical calculations derived from microscopic theory. Our goal with this collaboration is to merge the new experimental data and many-body theory, to better understand the properties of quasi-two-dimensional 3He, which is the best example of a strongly interacting Fermi fluid.

Scientific objectives of the project (12 lines max):

This Project would make it possible to approach the problem of quasi-two-dimensional 3He using up-to-date technology in both theory and experiment. The Barcelona team, led by Prof. Boronat, has long-term experience in the study of quantum fluids using Quantum Monte Carlo methods. The access to experiments at Microkelvin-Grenoble with the group of Dr. Godfrin will yield deeper insight of the physics involved in these systems. In particular, the comparison between the theoretical predictions for the static structure factor derived from quantum Monte Carlo simulations can help to understand the experimental data. And, on the other hand, the experimental results can provide useful bounds for the theory, to establish the accuracy of the analysis carried out.

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

At the Grenoble Microkelvin facility, we will perform a detailed analysis of the experimental data for the static structure factor S(k) of liquid 3He adsorbed on graphite. We will run specific quantum Monte Carlo simulations of two-dimensional 3He with quantum Monte Carlo methods and accurate potentials to calculate S(k) at conditions as close as possible to the experimental work in Grenoble. As the initial calculations will be made in a strictly two-dimensional geometry, we can also get insight on the effect of the third dimension, which is reduced but still present in the experiments. Further refinements of the calculations to a real quasi-two-dimensional setup, or even, including the effect of a real substrate in the simulation, can be prepared to approach the experimental conditions as closely as possible.

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)