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European Microkelvin Collaboration

CAPACITIES

Report on the Transnational Access Activity carried out within MICROKELVIN

The eligibility of transnational access to a MICROKELVIN TA site implies the submission of the following:

1) **The Certification of visit**

The form "Certification of visit" must be completed and signed by the access provider in charge of the infrastructure and the leader of the project.

2) **A TA project report**

The form for the TA project report is contained within this document. It should be completed after project end by the group leader of the project. You must respect the limited number of words specified, longer descriptions will be rejected. Figures/tables may be attached at the end of the document. The document must be submitted in an editable format (doc, rtf).

3) **A User group questionnaire**

To enable the Commission to evaluate the Research Infrastructures Action, to monitor the individual contracts, and to improve the services provided to the scientific community, each project leader of a user-project supported under an EC Research Infrastructure contract is requested to complete a "user group questionnaire". The questionnaire must be submitted once by each user group to the Commission as soon as the experiments on the infrastructure come to end.

The user group questionnaire is not part of this document and must be completed on-line. It is accessible at:

http://cordis.europa.eu/fp7/capacities/questionnaire_en.html.

► **Please note that any publications resulting from work carried out under the MICROKELVIN TA activity must acknowledge the support of the European Community:**

> **"The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 228464 (MICROKELVIN)."**

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MICROKELVIN Transnational Access Project Report

1. General information

Project number:	**AALTO 39**	
Project Title:	**Vortex waves in rotating superfluid 3He-B**	
Lead scientist:[1]	**Title:**	Dr
	First name:	Anna
	Last name:	Pomyalov
	Home institution:	Weizmann Institute of Science, Rehovot, Israel
Host scientist:[2]	**Title:**	Dr.
	First name:	Vladimir
	Last name:	Eltsov
	Home institution:	Aalto University, Finland
Project scientist:[3]	**Title:**	Dr.
	First name:	Anna
	Last name:	Pomyalov
	Birth date:	Dec. 18, 1964
	Passport number:	10187585
	Research status/Position:	Researcher
	New User:[4]	Yes
	Scientific Field:	Turbulence in helium superfluids
	Home institution:	Weizmann Institute of Science
	Is your home institution MICROKELVIN partner?	No
	Business address:	Weizmann Institute of Science, Rehovot 76100,Israel
	Street:	Herzel str. 234
	PO Box:	
	City:	Rehovot
	Zip/Postal Code:	76100
	Country:	Israel
	Telephone:	+972(8)9342308
	Fax:	+972(8)9344123
	E-mail:	Anna.pomyalov@weizmann.ac.il

[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.

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

2. Project information

Please, give a brief description of project objectives: (250 words max)	The ultimate goal is to study the role of vortex waves in the dissipation processes of superfluids in the zero-temperature limit. Earlier measurements have indicated that oscillations of the vortex cluster result in a frequency shift of the magnon condensate NMR mode, owing to a reduction in the polarization of vortices in the cluster when the vortex waves are created. After the modulation of the rotation velocity is stopped, the restoration of the polarization proceeds in two distinct phases with non-trivial temperature and pressure dependences of their relaxation times. The immediate objective is to understand the nature of these relaxation processes and to establish to what extent they are related to the global turbulence of the reconnecting vortex lines, to Kelvin-wave turbulence on individual vortices or to the damping of individual Kelvin waves.
Technical description of work performed: (250 words max)	During the visit to the Low Temperature Laboratory we performed a systematic analysis of the experimental data collected within the Microkelvin AALTO19 project and participated in new measurements on the rotating cryostat with the goal to clarify the role of inertial waves and of Kelvin waves in a two-step energy dissipation process. We managed to formulate a consistent explanation of the basic experimental results. In particular, from the rotation-velocity dependence of the parameters of the relaxation we concluded that the only reasonable way to rationalize the observations is to assume that the rate of energy dissipation in one vortex line is independent of the stored energy. This significantly limits possible candidates for the relaxation mechanisms. In addition we analysed experimental results on the interaction of gravity waves on the free surface of the superfluid with a trapped Bose-Einstein condensate bordering to the free surface. We suggest a simple Hamiltonian model of this interaction that presumable can rationalize the available experimental data.
Project achievements (and difficulties encountered)[5]: (250 words max)	Our analysis of the experimental data allows us to formulate the crucial questions in future experiments, in particular, concerning the temperature and pressure dependences of the relaxation parameters. The new data will allow us to make a choice between the possible mechanisms of energy dissipation, to clarify the role of the Kelvin wave cascade and to formulate an adequate model of the relaxation of vortex waves based on the current understanding of Kelvin-waves. Some feasible routes for the numerical simulation of vortex dynamics were also formulated. These will become important to create the proper understanding about the relaxation of vortex waves. Based on the Hamiltonian model of the interactions of the surface waves with trapped magnons, as developed during the visit, we suggest some new measurements that will clarify the basic physics of this phenomenon. The relevant experiments are now in preparation.
Expected publications and dates:	We plan to submit this work to Phys. Rev. Lett. in 2014.
Submission date of user	Sept 6, 2013

group questionnaire:	

Completed Project Reports should be returned to MICROKELVIN Management Office (Mari.Kaarni@aalto.fi, Fax: +358 9 47022969).

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CAPACITIES

CERTIFICATION OF VISIT
at MICROKELVIN Transnational Access Site

I herewith confirm that the following project was carried out at our Transnational Access Site

(Name of the Site) Low Temperature Laboratory, Aalto University

in the context of MICROKELVIN Transnational Access:

(Name of the Project). Vortex waves in rotating superfluid 3He-B

The amount of access[1] delivered to the project group (project users) is as follows:

	Participant name	Duration of stay (start – end date)	Amount of access[2]
Project leader:	Anna Pomyalov	19/07/2013-02/08/2013	15
Project user 1:			
Project user 2:			
Project user ...:[3]			
Total amount of access delivered to project group:			**15**

Espoo, 15/08/2013

Location and date

Signature of access provider

Rehovot, Israel 05/09/2013

Location and date

Signature of project leader

Completed Certification of Visit should be returned to MICROKELVIN Management Office
(sari.laitila@aalto.fi, fax: +358 9 47022969)

[1] TKK Helsinki, CNRS Crenoble, or Lancaster University

[2] The amount of access is defined as the time, in days, spent by the user at the infrastructure for this project, including weekends and public holidays (e.g., a scientist who spent 5 days at the infrastructure must indicate '5'). The total amount of access of the project group is the sum of access days of each project user.

[3] Please, expand if necessary.