welcome to the

European Microkelvin Collaboration

CAPACITIES

Application Form for MICROKELVIN Transnational Access Project

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
	Scientific Field:	Turbulence in helium superfluids
	Home institution:	Weizmann Institute of Science, Rehovot, Israel
	Is your home institution MICROKELVIN partner?	No
	New User:	Yes
	Business address:	Weizmann Institute of Science
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	E-mail:	Anna.pomyalov@gmail.com http://www.weizmann.ac.il/chemphys/anna/
	Curriculum vitae (18 lines max): Anna Pomyalov is a senior researcher at the Weizmann Institute and a widely known expert of hydrodynamic theory and numerical simulation in both viscous and superfluid liquids. She joined the Weizmann Institute in 1998.	
	Five most recent publications:	
	1- Laurent Boué, Victor L'vov, Anna Pomyalov, and Itamar Procaccia, Enhancement of Intermittency in Superfluid Turbulence, Phys. Rev. Lett. **110**, 014502 (2013)	
	2-Laurent Boué, Victor L'vov, Anna Pomyalov, and Itamar Procaccia, Energy spectra of superfluid turbulence in 3He, Phys. Rev. B **85**, 104502 (2012)	
	3-Uriel Frisch, Anna Pomyalov, Itamar Procaccia, and Samriddhi Sankar Ray, Turbulence in non-integer dimensions by fractal Fourier decimation. Phys. Rev. Lett. **108**, 074501 (2012)	

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-Victor S. L'vov, Anna Pomyalov, Itamar Procaccia, Oleksii Rudenko, Finite-Dimensional Turbulence of Planetary Waves, Phys. Rev E. **80**, 066319 (2009)
	5-Victor L'vov, Anna Pomyalov, Itamar Procaccia, and Rama Govindarajan, Random Vortex-Street Model for a Self-Similar Plane Turbulent Jet, Phys. Rev. Lett,**101**,094503(2008)

Other participating scientists:[4]	**Name:**	**Position:**	**New User:**
	Paul Walmsley	Research fellow Manchester University, UK	No

2. Project Information

Name of host infrastructure:	O.V. Lounasmaa Laboratory, Aalto University			
Access provider / Infrastructure Director:	**Name: Vladimir Eltsov / Pertti Hakonen**		**E-mail address: vladimir.eltsov@aalto.fi**	
Planned project dates:	**Start date:**	**19/07/2013**	**Completion date:**	**02/08/2013**

Project description (12 lines max):

Kelvin waves on vortex lines are believed to be an important component of quantum turbulence in superfluids at low temperatures. In particular, energy transfer over the Kelvin-wave cascade could be responsible for a finite rate of the energy dissipation in the zero-temperature limit. Up to date, however, the Kelvin-wave cascade has not been identified experimentally. We plan to study a type vortex motion, which is closely related to Kelvin waves on individual vortex lines: vortex waves on an array of vortices. Such a vortex array is produced by rotation of a long cylindrical 3He-B sample at temperatures below 0.3 Tc down to 0.15 Tc. Vortices are pinned at one end of the cylinder at a rough surface. The angular velocity of rotation is modulated to create vortex waves. Their build-up, propagation and relaxation is monitored using two nuclear magnetic resonance spectrometers at different heights in the cylinder and by Andreev scattering from vortex lines using quartz tuning forks.

Scientific objectives of the project (12 lines max):

The ultmate goal is to learn about the role of vortex waves in dissipation processes in superfluids in the zero-temperature limit. Earlier measurements indicate that oscillations in 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 vortex waves are created. The restoration of polarization after the modulation of rotation velocity is stopped proceeds in two distinct phases with non-trivial temperature and pressure dependences of relaxation times. The immediate objectives is to understand the nature of the relaxation processes and to establish in what extent they are related to the global turbulence of the reconnecting vortex lines, to Kelvin-wave turbulence on individual vortices or to damping of individual Kelvin waves.

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

A thorough review will be performed of the experimental data collected within the Microkelvin AALTO19 project and afterward in measurements on the rotating cryostat. The model of the relaxation of vortex waves based on the current understanding of the Kelvin-wave cascade will be developed and compared to the experimental results. New measurements in oscillating rotation will be performed as necessary to fill the gaps in the probed ranges of experimental parameters. Feasible problems for numerical simulations of vortex dynamics, important for the understanding of relaxation of vortex waves, will be formulated.

4 Please list all participating user group members. Expand the table, if necessary.

3. Joint Proposals / Funding

Is this project in collaboration with other (concurrent) projects at the infrastructure?	**Yes**
If yes, please specify:	**Numerical calculations of vortex dynamics by Risto Hänninen & AALTO19**

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)