welcome to the
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 20	
Project Title:	Self trapping of magnon Bose-Einstein condensates	
Lead scientist:[1]	**Title:**	Professor
	First name:	Yuriy
	Last name:	Bunkov
	Home institution:	Institute Neél, CNRS, Grenoble, France
Host scientist:[2]	**Title:**	Professor
	First name:	Matti
	Last name:	Krusius
	Home institution:	Low Temperature Laboratory, Aalto University
Project scientist:[3]	**Title:**	Professor
	First name:	Yuriy
	Last name:	Bunkov
	Birth date:	29.08.1950
	Passport number:	08AA26721
	Research status/Position:	Directeur de Recherches at CNRS
	New User:[4]	No
	Scientific Field:	NMR, vortices, and superfluid dynamics
	Home institution:	Institute Neél, CNRS, Grenoble, France
	Is your home institution MICROKELVIN partner?	Yes
	Business address:	Avenue des Martyrs
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	E-mail:	Yuriy.Bunkov@grenoble.cnrs.fr http://neel.cnrs.fr/spip.php?article260&personne=yuriy.bunkov/mcbt&lang=en

[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)	Long-lived coherent spin precession of 3He-B at the lowest temperatures around 0.2 Tc was discovered by Yuriy Bunkov while he was visiting the ultra-low temperature laboratory in the Lancaster University in the early nineties. Since then this coherent NMR mode has defied accurate description. During the past four years the phenomenon has been redressed in the language of Bose-Einstein condensation, which has created new understanding on how to explore the resonances further [see Yu.M. Bunkov and G.E. Volovik, Phys. Rev. Lett. **98**, 265302 (2007)]. An important new dimension has been found to be rotation, by which one can control and modify the order parameter texture. It forms the radial part of the trapping potential which confines the magnon condensate and ultimately gives the energy spectrum of the different condensate states. Such measurements were performed in the first half of 2010 during the visits of Yuriy Bunkov and his graduate student Pierre Hunger. Subsequently a manuscript was prepared on the results from these measurements and their interpretation [preprint: arXiv-1002.1674v1].
Technical description of work performed: (250 words max)	Since then it has been found that the long spin relaxation times of the magnon condensates in the ground state or on the different excited levels can be readily measured and displayed with the available techniques. The first measurements on the relaxation times have now been performed in the different rotating states, but this work should be continued further. Nevertheless, it is clearly seen that a regular equilibrium vortex array provides large additional spin relaxation, similar to what has been observed to happen at solid surfaces in measurements at the Lancaster University. However, for instance vortices in a dynamic state of tangled motion or the free liquid surface have not yet been probed. Such measurements would provide important missing information which is needed to identify the source of the new relaxation mechanism. The goal of the visit was to discuss the relaxation studies and to rework the current version of the manuscript “Self-localization of magnon Bose-Einstein condensates in the ground state and on excited levels: from harmonic to a box-like trapping potential” which was submitted to a journal for publication recently [preprint: arXiv-1002.1674v3].
Project achievements (and difficulties encountered)[5]: (250 words max)	The main results of this work are (i) a demonstration of self trapping of a Bose-Einstein condensate composed of quasiparticle excitations in an externally controllable trapping potential and (ii) non-ground-state condensate formation. Both phenomena are new properties of boson condensates which have been discussed theoretically in the context of ultra-cold atom condensates but have not been experimentally realized there.

Expected publications and dates:	Report has been submitted for publication.
Submission date of user group questionnaire:	18 Jan, 2012

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