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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CAPACITIES

MICROKELVIN Transnational Access Project Report

1. General information

Project number:	AALTO13	
Project Title:	**Fabrication of nanoresonators for energy dissipation in superfluid 3He**	
Lead scientist:[1]	**Title:**	Dr.
	First name:	Vladimir
	Last name:	Komanicky
	Birth date:	22.07.1974
	Passport number:	BG8692823
	Research status/Position:	Research scientist
	New User:[2]	
	Scientific Field:	
	Home institution:	Safarik University
	Is your home institution MICROKELVIN partner?	no
	Business address:	
	Street:	Park Angelinum 9
	PO Box:	
	City:	Kosice
	Zip/Postal Code:	04001
	Country:	Slovakia
	Telephone:	00421552342300
	Fax:	
	E-mail:	Vladimir.komanicky@upjs.sk

[1] The lead scientist indicated here is expected to participate in the campaign as a user of the infrastructure.

[2] 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 proposed project aims at promoting scientific collaboration and knowledge exchange between two European research institutions. The nanofabrication facilities at Aalto University were used to fabricate nanoresonators, which are to be tested at Safarik University. The scientific goal of the project is to study mechanical properties of nanoresonators and dissipation of energy at low and ultra low temperatures in cryogenic liquids. Skyba et. al recently showed that the force – velocity dependencies measured at corresponding resonance frequencies for the mesoscopic tuning forks in superfluid 3He-B display interesting phenomena. While the dependence for the small fork clearly shows the "Andreev character" of the dependence, i.e. a reduction of the damping force with increasing velocity, there is no such evidence of this dependence for the large and medium forks. Therefore we expect to see some new phenomena arising when the size of the resonators falls to the nanoscale regime.
Technical description of work performed: (250 words max)	**Fabrication of metallic bridges by electron beam lithography** Free standing nanobridges from aluminum and gold were fabricated in the clean-room facility at Aalto University. 1. A positive resist layer consisting of MMA/PMMA bylayer resist was spincoated on the silicon substrate 2. The structures were drawn in GDSII format and a dose test was performed. 3. After development and metallization the correct dose was determined. 4. Structures with different lengths of the metallic beam were prepared by EBL, metallized and after lift-off step etched in RIE plasma etcher. 5. Correct etching mixture and etching time was determined for free-standing metallic beams. **Testing of the physical properties of fabricated metallic bridges** The resistance of the bridges at room temperature and at 4K was determined by four probe measurements. The bridges exhibit expected resistance values at room temperature and at 4K.
Project achievements (and difficulties encountered)[5]: (250 words max)	We were able to optimize the process for the fabrication of metallic resonators based on the suspended metallic beam. We have fabricated bridges of various lengths from Aluminum and Gold. Basic transport properties of the nanostructures were tested at room temperature and at 4K. The structures exhibit expected properties and are pretty robust.
Expected publications and dates:	▪ ▪

Submission date of user group questionnaire:	7 Oct, 2011

Completed Project Reports should be returned to MICROKELVIN Management Office (laitila@neuro.hut.fi, Fax: +358 9 47022969).