



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).”



MICROKELVIN Transnational Access Project Report

1. General information

Project number:	AALTO35	
Project Title:	Cosmological analogue experiments on SQUID arrays	
Lead scientist: ¹	Title:	Prof. Dr.
	First name:	Ralf
	Last name:	Schutzhold
	Home institution:	Univ. Duisburg-Essen
Host scientist: ²	Title:	Dr.
	First name:	Sorin
	Last name:	Paroanu
	Home institution:	Aalto Univ.
Project scientist: ³	Title:	Prof. Dr.
	First name:	Ralf
	Last name:	Schutzhold
	Birth date:	1974-03-28
	Passport number:	
	Research status/Position:	Prof. Dr.
	New User: ⁴	
	Scientific Field:	low temperature physics, condensed matter
	Home institution:	Univ. Duisburg-Essen
	Is your home institution MICROKELVIN partner?	No
	Business address:	
	Street:	Lotharstr. 1
	PO Box:	
	City:	Duisburg
	Zip/Postal Code:	47057
	Country:	Germany
	Telephone:	0049-203-379-4721
	Fax:	0049-203-379-4722
	E-mail:	kay.eibl@uni-due.de; ralf.schutzhold@uni-due.de

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)	<p>The connection between gravitation and condensed matter physics has long been established through the seminal work of Unruh and others, and an intense experimental effort has been put since into realizing experimentally various quantum-field effects in curved space-times in condensed matter systems. The field is sometimes called “analog gravity”. In particular, at the Microkelvin infrastructure of the O.V. Lounasmaa Laboratory there is a strong tradition in this field, often through the use of superfluid He. This expertise is both theoretical (represented by scientists such as G. Volovik) and experimental, in the ROTA group. For example, the Kibble-Zurek effect (the creation of vortices by an ultrafast quench) has been first observed in the ROTA group.</p> <p>In this project we aim at studying another condensed-matter system in which such effects can be realized, namely arrays of SQUID used as the signal line in a coplanar waveguide. These samples have been designed and fabricated recently at the host institution, and the aim of the project is to develop theoretical models for these devices.</p>
Technical description of work performed: (250 words max)	<p>We have analyzed the problem of creating analogue cosmological effects such as the creation of particles by expansion or the Hawking radiation. We have focused on how realistic these proposals are for being implemented in our setup.</p>
Project achievements (and difficulties encountered): ⁵ (250 words max)	<p>It turns out that the Hawking radiation would be very difficult to realize. In the samples currently under design, we think, after discussing possible experimental problems, that the cosmological creation of particles is feasible.</p>
Expected publications and dates:	<ul style="list-style-type: none">▪▪
Submission date of user group questionnaire:	April 12, 2013

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