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 T

A 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:	CNRS11-2	
Project Title:	**Rapid thermometers for specific heat measurement in thermodynamic equilibrium**	
Lead scientist:[1]	**Title:**	Privatdozent, Dr.
	First name:	Sven
	Last name:	Sahling
	Birth date:	04.12.1951
	Passport number:	CCJ2CK520
	Research status/Position:	Scientific assistant
	New User:[2]	
	Scientific Field:	Thermodynamical properties of solids
	Home institution:	IFP, TU Dresden
	Is your home institution MICROKELVIN partner?	No
	Business address:	Technische Universitaet Dresden
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[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)	1D spin chains and spin ladders exist in $Sr_{12}Cu_{24}O_{41}$. At very low temperatures the heat capacity will be determined by the 1D chains with dimerized antiferromagnetic spins. The chains are cut into sequences of different length due to holes. At the ends of the sequences appear free spins. No magnetic ordering was observed of these free spins above 1K. The nature of the ground state of this system is unclear up to now (magnetic ordering or spin glass). In addition there exist in this material 1D spin and charge density waves, which also can give a time and magnetic field dependent contribution to the heat capacity. The corresponding spectrum of relaxation times can be determined by the investigation of thermal relaxation. The holes shift from the chains to the ladders after doping the sample with Ca. This gives the possibility to check the influence of the holes in the chains on the thermodynamic properties.
Technical description of work performed: (250 words max)	- Calibration of AuGe thermometers at very low temperatures. - Calibration of heat capacity measurement at low temperatures. - Development of experimental methods (hardware and software elaborated in Institut Néel) for long and short time thermal relaxation and heat capacity measurement. - Measurement of the magnetization, heat capacity and thermal relaxation in dependence of the temperature, magnetic field and time.
Project achievements (and difficulties encountered)[5]: (250 words max)	**Part 1 (March-February 2012)** The heat capacity of a $Sr_{14}Cu_{24}O_{41}$ single crystal was investigated at very low temperatures and magnetic fields up to 10 T and as a function of time between 1ms and 10^4 s. The contributions to the heat capacity at low temperatures are complex. In addition to the phonon contribution we found a magnetic field independent quasi linear term, 2 Schottky - terms, which are strongly time dependent and 4 Schottky-terms, which are time independent, but field dependent. For the two time and field dependent contributions the relaxation time spectrum was determined as a function of temperature and magnetic field. At least one of them is caused by the 1D CDWs. The other Schottky - contributions are probably caused by free Cu-spins on the 1D Cu-chains **Part 2 (September 2012)** The heat capacity of a $Sr_2Ca_{12}Cu_{24}O_{41}$ single crystal was measured at very low temperatures and magnetic fields up to 10 T and as a function of time between 1ms and 10^4 s. A strongly time and magnetic field dependent Schottky term was found caused probably by the 1D charge density waves. All parameters are in a good agreement with the corresponding term for

	$Sr_{14}Cu_{24}O_{41}$. As expected, all other Schottky contributions disappear in the Ca doped sample. In addition the magnetization of the $Sr_2Ca_{12}Cu_{24}O_{41}$ crystal was measured. Magnetization steps were observed, as typical for frustrated magnetic systems. The analysis of all data is going on.
Expected publications and dates:	The results will be published in two papers (Phys. Rev. B 2013).
Submission date of user group questionnaire:	

Completed Project Reports should be returned to MICROKELVIN Management Office (Leena.Meilahti@tkk.fi, Fax: +358 9 4512969).