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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:	**CNRS 18**	
Project Title:	**Investigation of 2D and 3D frustrated magnets in the mK regime**	
Lead scientist:[1]	**Title:**	Dr
	First name:	Romain
	Last name:	SIBILLE
	Home institution:	Paul Scherrer Institut
Host scientist:[2]	**Title:**	Dr
	First name:	Elsa
	Last name:	Lhotel
	Home institution:	CNRS, Institut Néel, Grenoble
Project scientist:[3]	**Title:**	Dr.
	First name:	Romain
	Last name:	SIBILLE
	Birth date:	18/06/1986
	Passport number:	National French ID number: 070654301707
	Research status/Position:	PSI fellow / COFUND (EC-FP7)
	New User:[4]	YES
	Scientific Field:	Condensed Matter Physics
	Home institution:	Paul Scherrer Institut
	Is your home institution MICROKELVIN partner?	No
	Business address:	Laboratory for Developments and Methods
	Street:	WLGA/027
	PO Box:	
	City:	VILLIGEN
	Zip/Postal Code:	5232
	Country:	SWITZERLAND
	Telephone:	+41 56 310 35
	Fax:	
	E-mail:	romain.sibille@psi.ch

[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)	This project is concerned with experimental investigations of highly frustrated magnetic systems by means of macroscopic magnetization and AC susceptibility measurements in the mK range. These materials are, first, pyrochlore insulators of general formula $A^{III}_2B_2O_7$ with A = Ce or Tb and B = Sn or Hf. In these compounds, the magnetic moments lie on a 3D lattice of corner-sharing tetrahedra leading to geometrical frustration. In such systems, the tendency of the magnetic moments to form long-range ordered ground states is inhibited due to magnetic frustration, thus resulting in novel short-range ordered alternatives such as spin glasses or spin liquids of which spin ice is an example. Second, $Co^{II}_5(OH)_2(C_4H_4O_4)_4$ is a metal-organic framework in which a 2D geometrically frustrated lattice of magnetic ions has a different topology compared with the most largely studied Kagome, triangular and star lattices. Despite its Weiss temperature of -50 K, no magnetic transition was observed down to 1.8 K. Its behaviour below this temperature is addressed.
Technical description of work performed: (250 words max)	Thanks to the exceptional capabilities of the SQUID magnetometers developed by C. Paulsen at Institut Neel – CNRS, and now jointly operated with E. Lhotel, we performed fine and detailed magnetic characterizations at very-low temperatures on three compounds. Data have been recorded for magnetization (up to 8 T, down to 75 mK) and AC susceptibility (same temperature range, with rare and fruitful access to very low frequencies for this technique). The data taking was primarily performed by Romain Sibille, but additional help was administered by Michel Kenzelmann. These important results will be completed in the next weeks/months by neutron scattering experiments at Paul Scherrer Institut - CH.
Project achievements (and difficulties encountered)[5]: (250 words max)	We have successfully investigated the magnetic behaviour of $Co^{II}_5(OH)_2(C_4H_4O_4)_4$ at very-low temperatures (transition temperature is 380 mK). A single-crystal specimen was used and allowed measuring the transition with the field applied along each of the crystallographic directions in this monoclinic material. These data will be of prime importance for the validation of the magnetic structure (neutron powder diffraction experiments planned in July 2013). The dynamics of the magnetism has been studied by recording AC susceptibility data for various frequencies and time-dependence of the magnetization. The low-temperature magnetic properties of the pyrochlore material $Tb_2Hf_2O_7$ were studied for the first time, to the best of our knowledge. We have observed an exotic behavior which is mainly characterized by a signal around 800 mK, with both magnetization and ac susceptibility techniques. The exact nature of this transition remains to be clarified by complementary

	techniques.
Expected publications and dates:	- '*Magnetism in $M^{II}_5(OH)_2(C_4H_4O_4)_4$ compounds with 2D bowtie lattice*', submission in fall 2013 - *'Frustrated magnetism in $Tb_2Hf_2O_7$'*, submission beginning of 2014
Submission date of user group questionnaire:	28 June, 2013

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

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Please complete and sign the form and send it by email or fax to the MICROKELVIN Management Office (leena.meilahti@tkk.fi, Fax No.: +358 9 4512969)

CERTIFICATION OF VISIT

at MICROKELVIN Transnational Access Site

I herewith confirm that the following project was carried out at our Transnational Access Site

Microkelvin TA2 - CNRS – Institut Néel - Grenoble

in the context of MICROKELVIN Transnational Access:

Structure factor of two-dimensional 3He

The amount of access delivered to the project group (project users) is as follows:

	Participant name	Duration of stay (start – end date)	Amount of access[2]
Project leader:	Dr. Romain Sibille	26/05 to 15 /06/2013	21
Project user 1:	Dr. Michel Kenzelmann	2/06 to 5/06/2013	4
Project user 2:			
Project user …:[3]			
Total amount of access delivered to project group:			**25**

Grenoble, July 15th. 2013

Location and date

Signature of access provider

Villigen, Switzerland, July 15th. 2013

Location and date

Signature of project leader

Completed Certification of Visit should be returned to MICROKELVIN Management Office
(sari.laitila@aalto.fi, fax: +358 9 47022969)

[1] TKK Helsinki, CNRS Crenoble, or Lancaster University

[2] The amount of access is defined as the time, in days, spent by the user at the infrastructure for this project, including weekends and public holidays (e.g., a scientist who spent 5 days at the infrastructure must indicate '5'). The total amount of access of the project group is the sum of access days of each project user.

[3] Please, expand if necessary