welcome to the European Microkelvin Collaboration

CAPACITIES

# Application Form for MICROKELVIN Transnational Access Project

## 1. General Information

| | | |
|---|---|---|
| **Project number:** | CNRS11 | |
| **Project Title:** | **Rapid Thermometers for specific heat measurement in thermodynamic equilibrium** | |
| **Lead scientist:**[1] | **Title:** | Privatdozent, Dr. |
| | **First name:** | Sven |
| | **Last name:** | Sahling |
| | **Home institution:** | Institut für Festkörperphysik TU Dresden |
| **Host scientist:**[2] | **Title:** | Dr. |
| | **First name:** | Gyorgy |
| | **Last name:** | REMENYI |
| | **Home institution:** | Institut Néel, CNRS |
| **Project scientist:**[3] | **Title:** | Privatdozent Dr. rer. nat. habil. |
| | **First name:** | Sven |
| | **Last name:** | Sahling |
| | **Scientific Field:** | Condensed matter Physics |
| | **Home institution:** | Institut für Festkörperphysik, TU Dresden |
| | **Is your home institution MICROKELVIN partner?** | No |
| | **Business address:** | |
| | Street: | |
| | PO Box: | |
| | City: | Dresden |
| | Zip/Postal Code: | D-01062 |
| | Country: | Germany |
| | Telephone: | 004935146334881 |
| | Fax: | 0049463-37734351 |
| | E-mail: | sahling@physik.tu-dresden.de |
| | **Curriculum vitae (18 lines max):**<br>- 1970 – 1976 Moscow State University, (Russia)<br>study of physics, Master "In Low Temperature Physics<br>- 1976-1982 Institute of Low Temperature Physics in Technical University Dresden,<br>- 1982 Dr rer.nat. with "Summa cum laude" TU Dresden, (Germany)<br>- 1983-1990 Scientific researcher in the Joint Institute for Nuclear Research, Dubna (Russia)<br>1986 Habilitation (Dr. rer.nat. habil.); "The long Time Thermal Relaxation of Amorphous and Defects Crystalline materials at Low Temperatures", TU Dresden<br>- 1990-1993 Scientific assistant of Institute for Low Temperature Physics TU Dresden<br>- 1993-1994 Scientific co-worker of CRTBT CNRS Grenoble<br>- 1994-1997 Scientific assistant of Institute for Low Temperature Physics TU Dresden<br>- since 1997 Scientific assistant of Institute of Solid State Physics TU Dresden | |
| | | |

[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.

| | | | |
|---|---|---|---|
| | **Five most recent publications:** | | |
| | 1 - Anomalous isotopic effect of tunneling states in NiTi-H/D,<br>S. Sahling, S. Abend, V.L. Katkov, V.A. Osipov, Phys.Rev. B **82**, 174204 (2010). | | |
| | 2 - Equilibrium low temperature heat capacity of the spin density wave compound (TMTTF)2 Br: effect of a magnetic field,<br>Sahling, S., Lasjaunias, J. C., Mélin, R., Monceau, P., Reményi, G. Eur. Phys. J. B **59**, 9 (2007). | | |
| | 3 - Exploring low-energy landscape of quasi-1 dimensional conductor by heat relaxation and magnetic field,<br>K. Biljakovic, J.C. Lasjaunias, R. Melin, P. Monceau, G. Remenyi, S. Sahling, D. Staresinic Synhetic Metals **159**,2402 (2009). | | |
| | 4 - R. Mélin, J.C. Lasjaunias, S. Sahling, G. Remenyi, K. Biljakovic,<br>PRL **97**, 227203 (2006) | | |
| | 5 - Low-temperature internal friction and thermal conductivity in plastically deformed metals due to dislocation dipoles and random stresses,<br>Churochkin, D. V., Sahling, S., Osipov, V. A. Phys. Rev. B **72**, 014116 (2005). | | |
| **Other participating scientists:**[4] | **Name:** | **Position:** | **New User:** |

[4] Please list all participating user group members. Expand the table, if necessary.

## 2. Project Information

| | | | | |
|---|---|---|---|---|
| **Name of host infrastructure:** | **Institut Néell MCBT Ultra Low Temperature Facility Grenoble** | | | |
| **Access provider / Infrastructure Director:** | **Name: Henri Godfrin** | | **E-mail address: henri.godfrin@grenoble.cnrs.fr** | |
| **Planned project dates1:** | **Start date 1:** | 26/02/2012 | **Completion date 1:** | 31/03/2012 |
| **Planned project dates2:** | **Start date 2:** | 26/09/2012 | **Completion date 2:** | 06/10/2012 |

**Project description (12 lines max):**

Investigation of the thermodynamic properties (heat capacity, thermal relaxation, magnetization) of the spin chain – ladder system $Sr_{12-x}Ca_xCu_{24}O_{41}$ at very low temperatures and high magnetic field for x = 0 and x = 10.

**Scientific objectives of the project (12 lines 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 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 the 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 at low temperatures.

**Technical description of work to be performed (20 lines 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 Institute Néel) for long and short time thermal relaxation and fully automated heat capacity measurement.

Structural and spin glasses, 1D and 2D systems with charge and spin density waves and other disordered systems show at very low temperature non-typical thermal relaxation behaviour, with a time dependent heat capacity. The investigation of this thermal relaxation behaviour allows us to get important information about the energy and relaxation time spectrum of different contributions.

The heat capacity, thermal relaxation and magnetization of $Sr_{12-x}Ca_xCu_{24}O_{41}$ will be investigated at very low temperatures and magnetic fields up to 10 T. Special thermometers and measuring techniques allow us to measure the time dependence of the sample temperature after a short heat pulse (between 1 ms and 10000 s) even at very low temperatures and high magnetic fields. This gives the possibility to determine the relaxation time spectrum of low energy excitations in this range. For faster contributions we get the equilibrium heat capacity.

## 3. Joint Proposals / Funding

| | |
|---|---|
| **Is this project in collaboration with other (concurrent) projects at the infrastructure?** | **No** |
| **If yes, please specify:** | |

| | |
|---|---|
| **Is this proposal submitted to any funding programmes?** | **No** |
| **If yes, please specify:** | |

The completed Application Form should be submitted to MICROKELVIN Management Office (sari.laitila@aalto.fi, fax +358947022969)