

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:	CNRS8	
Project Title:	Local magnetization measurements using miniature Hall probes array	
Lead scientist: ¹	Title:	Dr.
	First name:	Zuzana
	Last name:	Pribulova
	Birth date:	25.05.1978
	Passport number:	SL503806
	Research status/Position:	Researcher
	New User: ²	No
	Scientific Field:	superconductivity
	Home institution:	Department of Low Temperature Physics, Institute of Experimental Physics, Slovak Academy of Sciences, Kosice, Slovakia
	Is your home institution MICROKELVIN partner?	Yes
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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

<p><u>Please, give a brief description of project objectives:</u> (250 words max)</p>	<p>The proposed project has two important scopes: a technical and a scientific one. The technical part is the transfer of knowledge and expertise in local magnetisation measurements using miniature Hall probes arrays for future use in an apparatus in Kosice as well as testing of Hall probes in collaboration with an expert (Thierry Klein). The scientific goal of the project is the experimental study of iron based superconductors down to 0.3K. The aim was to study the phase diagram Temperature vs Magnetic field and magnetic relaxation in iron based superconductors with a focus to study the first penetration field (related to the lower critical field H_{c1}) into the sample down to very low temperatures.</p>
<p><u>Technical description of work performed:</u> (250 words max)</p>	<p>The first experiments described below were made in a 3He cryostat at the Microkelvin facility, with the support of Dr. Klein. We completed the wiring and installation of a sample holder – for both magnetization and specific heat measurements. Then we prepared all required connectors and shielded boxes for easy connection with measurement devices. After we cooled the cryostat down we needed to find a proper regime for a helium circulation through several stages (cooling of the charcoal, 1K pot). When we reached the lowest temperature we tested the Hall probes and subsequently started the measurements of the penetration field H_p. Using the Hall probe arrays from Bratislava we measured the magnetic field induced in the sample after we applied a well-defined field in the superconducting coil. From the response of the sample we could determine the penetration field. We performed the measurements in the temperature range starting from 750 mK up to 3.2 K and magnetic fields up to 5000 Oe.</p>
<p><u>Project achievements (and difficulties encountered):</u>⁵ (250 words max)</p>	<p>Even with the best settings, we could not reach temperatures lower than 750 mK in 3He pot. Moreover the time to maintain the lowest temperature was short compared to the test run without a load. We suspect a large heat link between 1K pot and 3He pot to be the reason. In the near future the sample holder will be adapted to reduce heat input to the 3He bath.</p> <p>In spite of technical difficulties we succeeded to measure the temperature dependence of the first penetration field of SrPd_2Ge_2 – material which is isostructural to iron-based pnictides but lacking any magnetic ordering. From the measured dependence we will derive values of lower critical field and penetration depth of the material.</p> <p>Since the operation time of 3He cryostat at its lowest temperature was short and we needed to regenerate the 3He liquid often, the measurement was very time-demanding. For this reason we performed measurements using only one Hall probe. In the future we would like to continue in the research of this material at lower temperature and on several different Hall probes.</p>

	<p>Since we had very little measurement time we could not test the Hall probes in details. However, first test showed that they are very sensitive even at such low temperatures. On the other hand they seem to be sensitive to any shock so they have to be treated very carefully. Forthcoming tests are necessary to prove their reproducibility and overall quality.</p>
<p><u>Expected publications and dates:</u></p>	<ul style="list-style-type: none"> ▪ SrPd₂Ge₂..... Phys. Rev. B, october-november 2011 ▪ SrPd₂Ge₂..... Physica C 2011-2012, proceeding of Vortex VII Conference
<p><u>Submission date of user group questionnaire:</u></p>	<p>11.7.2011</p>

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