welcome to the European Microkelvin Collaboration

CAPACITIES

Application Form for MICROKELVIN Transnational Access Project

1. General Information

Project number:		
Project Title:	**Development of a New Technique to study superfluid flow.**	
Lead scientist:[1]	**Title:**	**Dr.**
	First name:	**Marcel**
	Last name:	**Clovecko**
	Birth date:	**09/12/1981**
	Passport number:	**SL 507115**
	Research status/Position:	**researcher**
	New User:[2]	**No**
	Scientific Field:	**Quantum fluids, quantum turbulence**
	Home institution:	**Department of Low Temperature Physics, Institute of Experimental Physics, Slovak Academy of Sciences, Kosice, Slovakia**
	Is your home institution MICROKELVIN partner?	☒ YES
	Business address:	
	Street:	**Watsonova 47**
	PO Box:	
	City:	**Kosice**
	Zip/Postal Code:	**040 01**
	Country:	**Slovakia**
	Telephone:	**+421 55 6228158**
	Fax:	**+421 55 6228158**
	E-mail:	**clovecko@saske.sk**
	Curriculum vitae (18 lines max): 2009- present Scientific researcher, Department of Low Temperature Physics, Institute of Experimental Physics, Slovak Academy of Sciences, Kosice, Slovakia. Specialisation: ULT experimental techniques, dilution refrigerator and nuclear adiabatic demagnetization; non-linear dynamics of excitations; Andreev scattering; NMR in superfluid phases of 3He; manufacture of novel experimental cells for ULT experiments. 2005-2009 PhD studies at the Institute of Experimental Physics, Slovak Academy of Sciences, Kosice, Slovakia. PhD thesis: The non-linear phenomena in the superfluid phases of ^{3}He. Research includes: quartz tuning fork – new type of mechanical resonator used for the study of superfluid phases of 4He and 3He, and; a new excited mode of HPD described as non-Goldstone mode of magnon BEC. 2000-2005 Magister degree (Mgr.) in Condensed Matter Physics, P.J.Safarik University,	

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'.

	Kosice, Slovakia.		
	Five most recent publications:		
	1- Probing Andreev reflection in superfluid He-3-B using a quartz tuning fork Author(s): Bradley, DI; Clovecko, M; Gazo, E, et al. Source: JOURNAL OF LOW TEMPERATURE PHYSICS Volume: 152 Issue: 5-6 Pages: 147-155 Published: 2008		
	2- New non-goldstone collective mode of BEC of magnons in superfluid He-3-B Author(s): Clovecko, M; Gazo, E; Kupka, M, et al. Source: PHYSICAL REVIEW LETTERS Volume: 100 Issue: 15 Article Number: 155301 Published: 2008		
	3- Vibrating quartz fork - A tool for cryogenic helium research Author(s): Blazkova, M; Clovecko, M; Eltsov, VB, et al. Conference Information: International Symposium on Quantum Fluids and Solids (QFS-2007), Date: AUG 01-06, 2007 Kazan State Univ Kazan RUSSIA Source: JOURNAL OF LOW TEMPERATURE PHYSICS Volume: 150 Issue: 3-4 Pages: 525-535 Published: 2008		
	4- Quantum turbulence generated and detected by a vibrating quartz fork Author(s): Blazkova, M; Clovecko, M; Gazo, E, et al. Conference Information: International Symposium on Quantum Fluids and Solids (QFS-2006), Date: JUL 31-AUG 06, 2006 Kyoto Univ Kyoto JAPAN Source: JOURNAL OF LOW TEMPERATURE PHYSICS Volume: 148 Issue: 3-4 Pages: 305-310 Published: 2007		
	5- Quartz tuning fork: Thermometer, pressure- and viscometer for helium liquids Author(s): Blaauwgeers, R; Blazkova, M; Clovecko, M, et al. Source: JOURNAL OF LOW TEMPERATURE PHYSICS Volume: 146 Issue: 5-6 Pages: 537-562 Published: MAR 2007		
Other participating scientists:[3]	**Name:**	**Position:**	**New User:**[2]
	1- Dr.Peter Skyba	Senior scientist	**No**
	2- Dr.Martin Kupka	Senior scientist	**No**
	3- Ing. Emil Gazo	Senior scientist	**No**

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

2. Project Information

Name of host infrastructure:	**Ultra low temperature laboratory, University of Lancaster, Lancaster, United Kingdom**			
Access provider / Infrastructure Director:	**Name:** **Shaun Fisher / George Pickett**		**E-mail address:** s.fisher@lancaster.ac.uk g.pickett@lancaster.ac.uk	
Planned project dates:	**Start date:**	**[19/09/2010]**	**Completion date:**	**[28/10/2010]**

Project description (12 lines max):

This project will further develop a new `floppy wire' device and new measurement techniques to study superfluid flow over a very broad temperature range. The project builds on the work initiated in the earlier TNA project "Lancaster01" where prototype devices were made and tested in superfluid 4He. Also, a device was built and installed in a Lancaster style nuclear cooling stage for experiments in superfluid 3He-B at ultralow temperatures, based on the knowledge and experience gained from the preliminary work in superfluid 4He. The superfluid 3He cell is currently being installed on a refrigerator and cooling should commence within the next couple of weeks. The new device offers enormous versatility and should allow us to study mechanical motion through the superfluid over a wide range of temperature, velocity and, in the case of oscillatory motion, frequency. This will be useful for studies of (for example) pair-breaking in 3He-B and vortex / quantum turbulence production in both superfluids 3He-B and 4He. To optimise the technique, we required further development of measurement techniques and instrumentation.

Scientific objectives of the project (12 lines max):

The main objective of the project is develop measurement techniques and instrumentation to optimize the potential applications of the new `floppy' device and to maximize its sensitivity (and hence the information which can be obtained from experiments). A large device, with a grid mesh attached, will be constructed and tested in superfluid 4He to develop techniques to accurately measure the drag force on the moving device, for both transient and oscillatory motion. Superfluid 4He is an ideal medium for developing the technique and will also allow us to make a preliminary study of superfluid turbulence generation by the grid at high velocities. Using the unique cooling facilities at Lancaster, we then hope to apply the techniques to obtain some preliminary results in superfluid 3He-B at the lowest achievable temperatures. The project will also require some development of the measurement instrumentation (in particular, we need to further develop the controllable current source needed to produce stable steady currents with superimposed high frequency probe currents, which was designed by Peter Skyba from the Kosice group).

Technical description of work to be performed (20 lines max):

The large `floppy wire' device holding the grid mesh will be built and installed in a 1K 4He cryostat. The device be cooled to low temperatures (the device can only be operated when the wire is superconducting) to develop techniques to accurately measure the drag force. This will involve ramping the driving current whilst accurately measuring the position of the device from the Faraday voltage induce on near-by coils due to the small oscillating probe current (the drag force is inferred from the lag of the device behind its equilibrium position). Several runs will be required to optimize the technique and the required instrumentation. During this development stage, preliminary measurements of properties of the motion in superfluid 4He will also be obtained. Of particular interest will be the critical velocity for turbulent drag (vortex creation) in the superfluid, including a study of any frequency dependence and hysteretic behavior. In parallel, the 3He experiment will be cooled and tested. If successful, the techniques developed in 4He can then be applied to make some preliminary measurements in superfluid 3He-B at ultra low temperatures.

3. Joint Proposals / Funding

Is this project in collaboration with other (concurrent) projects at the infrastructure? Yes ☐ No ☒
If yes, please specify:

Is this proposal submitted to any funding programmes? Yes ☐ No ☒
If yes, please specify: