welcome to the European Microkelvin Collaboration

CAPACITIES

Application Form for MICROKELVIN Transnational Access Project

1. General Information

Project number:	**CNRS13**	
Project Title:	**Magnetization and susceptibility measurements of two spin ½ Heisenberg systems**	
Lead scientist:	Title:	Dr
	First name:	Sean
	Last name:	Giblin
	Home institution:	Rutherford Appleton Lab
Host scientist:	Title:	Dr
	First name:	Carley
	Last name:	Paulsen
	Home institution:	CNRS, Grenoble
Project scientist:	Title:	Dr
	First name:	Sean
	Last name:	Giblin
	Scientific Field:	Condensed Matter Physics
	Home institution:	ISIS, STFC.
	Is your home institution MICROKELVIN partner?	No
	Business address:	Rutherford Appleton Lab
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	Curriculum vitae (18 lines max): 1997-2001, University of Durham, UK. Master in Physics - 2001-2005, University of Durham, UK. PhD in Physics, this involved the fabrication of a SQUID magnetometer that functioned down to 300mK. - 2005 - present, Instrument Scientist at the ISIS pulsed neutron and muon source in the UK. I currently am responsible for the EMU muon spectrometer.	
	Five most recent publications:	
	1 - Ferrimagnetism in Fe-Rich NbFe2, PRB, **85**, 115137 (2012)	
	2 - Competing Interactions and magnetic frustration in Yb4LiGe4, PRB, **84**, 174429 (2011)	
	3 - muSR study of the spin dynamics of LiY1-xHoxF4, PRB, **83**, 17440 (2011)	

	4 - Creation of long-lived magnetic monopole currents in spin ice, Nature Physics, **7**, 252 (2011)		
	5-Magnetic and non-magnetic phases of a quantum spin liquid, Nature, **471**, 612, (2011)		
Other participating scientists:	Name:	Position:	New User:
	1-Dr Francis Pratt	Instrument Scientist, ISIS	YES
	2-		
	3-		

2. Project Information

Name of host infrastructure:	Microkelvin TA2 Facility – CNRS Grenoble			
Access provider / Infrastructure Director:	Carley Paulsen/ Henri Godfrin		E-mail address: carley.paulsen@grenoble.cnrs.fr	
Planned project dates:	Start date:	[02/10/2012]	Completion date:	[02/11/2012

Project description (12 lines max):

The search for quantum spin liquids in spin 1/2 systems has recently accelerated. The systems of largest interest contain spins on a triangular lattice of antiferromagnetic Heisenberg coupled moments. In an ideal system an estimate of the nearest neighbour coupling gives a J value much greater than 10 K. However, no experimental evidence of ordering is seen down to the lowest available temperatures (typically of the order of 20 mK), and the specific heat is still linear at such low temperatures indicating the possibility of a quantum spin liquid with a virtually gapless excitation spectrum. Recent muon experiments (performed by members of this investigating team) on Ba3CuSb2O9 and (ET)2Cu2(CN)3 have suggested the existence of such a phase. Moreover, in both samples with the application of a weak magnetic field weak static moments are observed in muon measurements. Sine the muon is a local probe, the critical ordering parameters can be extracted and can be compared to theoretical predictions. We would like to investigate the bulk properties of these samples using bulk magnetization and susceptibility measurements, as available at CNRS-Grenoble.

Scientific objectives of the project (12 lines max):

The properties of quantum spin liquids in applied fields are a source of intense theoretical predictions. The interpretation of muon (a local implanted probe) experiments on Ba3CuSb2O9 and (ET)2Cu2(CN)3 suggests the existence of a quantum critical point. The system is driven into a bulk non-collinear antiferromagnetic state on the application of a small magnetic field. However, an alternative prediction suggests a staggered magnetisation of the quantum spin liquid state. It is possible that the muons are perturbing the sample and the interpretation of the muon data does not easily allow the separation of these two scenarios. However, the observation of an induced moment in the bulk of the sample would confirm the existence of a quantum critical point. Moreover if observed, ac susceptibility can be used to probe the dynamics around the transition. The understanding of triangular lattices which are the simplest prototype of the frustrated lattice spin liquid should offer a base for interpreting the behaviour of the more complex kagome and hyperkagome spin liquids.

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

- Sean Giblin will come to Grenoble to perform the experiments.
- The temperature region of interest is between 100mK and 400mK for both samples.
- The applied magnetic field is between 0 and 0.2 T, it is anticipated that field cooled and zero field cooled measurements will be required.
- It is expected that each sample will be investigated on the magnetometer and ac susceptometer over the time of the visit.
- The samples used for the visit to Grenoble are already well characterised and have been used in our previous experiments.

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 +358-9-47022969)