welcome to the European Microkelvin Collaboration

CAPACITIES

MICROKELVIN Transnational Access Project Report

1. General information

Project number:	**TKK 04**	
Project title:	**Magnetic Q ball**	
Project acronym:	**Q ball**	
Lead scientist:[1]	**Title:**	Professor
	First name:	Yuriy
	Last name:	Bunkov
	Birth date:	29.08.1950
	Passport number:	08 AA 267212
	Research status/Position:	Directeur de Recherches at CNRS
	New User:[2]	Yes
	Scientific Field:	NMR, vortices, and superfluid dynamics
	Home institution:	Institute Neél, CNRS, Grenoble, France
	Is your home institution MICROKELVIN partner?	Yes
	Business address:	Avenue des Martyrs
	Street:	25 avenue des Martyrs, batiment M
	PO Box:	BP 166
	City:	Grenoble
	Zip/Postal Code:	38042 Grenoble cedex 9
	Country:	France
	Telephone:	+33 (0)4 76 88 12 52, +33624480425
	Fax:	+33 (0)4 56 38 70 87
	E-mail:	Yuriy.Bunkov@grenoble.cnrs.fr http://neel.cnrs.fr/spip.php?article260&personne=yuriy.bunkov/mcbt&lang=en

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

Please, give a brief description of project objectives: (250 words max)	***PERSISTENT INDUCTION MODE IN SUPERFLUID ^{3}He-B*** The Persistent Induction Mode develops from the collective spin wave resonances which can be excited in a potential well formed by a slowly changing distribution of order parameter orientations in the centre of the axially symmetric flare-out texture of a cylindrical sample. These spin wave excitations are a standard part of the continuous wave NMR spectrum at the lowest temperatures, *eg.* in the vicinity of one of the flat end plates of the cylinder. At carefully adjusted low excitation level in a precision magnetic field sweep the spin wave mode can be enhanced and expanded to dominate the NMR absorption. The phenomenon can be studied as a quantum oscillator where both the axial and the transverse strengths of the potential well can be externally tuned [3]. For instance, the distribution of vortices and vortex-free counterflow changes the flare-out order parameter texture and thereby the potential well of spin waves. This appears to be a competitive method for the detection of vortices in certain applications. For better comparison with the standard measuring methods based on an analysis of the NMR absorption line shape a more detailed evaluation has to be carried out below 0.2 T_c.
Technical description of work performed: (250 words max)	**We have found that the Q ball is very sensitive to the level of RF pumping. Owing the very small dissipation, the excitation level should be also very small. The spin system became chaotic at the level of RF pumping, used usually for CW NMR. We have also found the optimal parameters for magnetic and orbital components of the trap. At our experiments we was able to measure the anisotropy of superfluid density and the interaction of counter flow with vortices**
Project achievements (and difficulties encountered)**:**[5] (250 words max)	**We have succeed to found the trap parameters at which the frequencies of longitudinal and transverse excited lines does not overlaps. Owing to this, we was able to performer the exact measurements of excited levels and comparer its with the theoretical estimations. Finally we have made the pioneering experiments for to use the Q ball for measurements of anisotropy of superfluid density and the interaction of counter flow with vortices**
Expected publications and dates:	▪ **Phys Rev Letter September 2010** ▪ **JETP Letters October 2010** ▪ **Review article 2011**
Submission date of user group questionnaire:	

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