MICROKELVIN WORKSHOP – USER MEETING – REVIEW
2013

Time: September 9 - 13, 2013
Venue: Sannäs Manor House and Convention Centre, Porvoo, Finland
Sponsorship: EU research infrastructure project MICROKELVIN COLLABORATION
European Community’s 7th Framework Programme (FP7/2007-2013)
grant 228464 (MICROKELVIN)
Mission: To develop μK technologies and their introduction in nanophysics
Documentation: http://www.microkelvin.eu/
http://ltl.tkk.fi/wiki/Events/Microkelvin_2013

PROGRAMME

Sunday, 8 September, 2013
15:00 starting Transportation from Helsinki-Vantaa airport to Sannäs (40 min drive, 55 km)
(Transportation Officer: Juho Rysti, phone +358503442727)
(Housing Officer: Petri Heikkinen, phone +358503442318 or +358407276892)

Monday, 9 September, 2013
09:00 – 10:00 Transportation from Nanobuilding (Otaniemi) to Sannäs (60 min drive, 70 km)
10:00 – 11:00 Hotel registration
(Fix posters (of poster session I) to white boards in the main lecture hall
Coffee in the registration lobby

JRA1 Session I: Refrigeration, thermalization, and thermometry
Chairman Matti Krusius
11:00 – 11:15 Welcome & workshop essentials
11:15 – 11:45 George Pickett (Lancaster University), Large-scale refrigeration to μK temperatures
11:45 – 12:15 Dominik Zumbühl (Universität Basel), Towards microkelvin quantum transport experiments in nanosamples
12:15 – 12:45 Jost Engert (PTB, Berlin), Thermometry and temperature scales below 1 K

JRA1 Session II: New μK technology developments
Chairman George Pickett
14:30 – 15:00 Aya Shibahara (Royal Holloway, University of London), Pulse-tube precooled and hyperfine-field-enhanced nuclear refrigeration with noise thermometry
15:00 – 15:30 Dario Maradan (Universität Basel), Pulse-tube precooling and Coulomb blockade thermometry in nuclear refrigeration
15:30 – 16:00 Igor Todoshchenko (Aalto University)
Pulse-tube precooled nuclear demagnetization cooling of liquid 3He and thermometry

16:00 – 16:30  Coffee

16:30 – 18:00  Poster session I
Chairman Juha Tuoriniemi

- Andrew Casey (Royal Holloway): Demonstration of NMR signals from microcoils coupled to low inductance SQUIDs
- Daniel Cox (Aalto University): Electron-Phonon Coupling in Suspended Graphene
- Martial Defoort (Institut Néel, CNRS, Grenoble): Modal decomposition in goalpost micro/nano electro-mechanical devices
- Simone Gasparinetti (Aalto University): Cooper-pair pumping: experimental progress and perspective
- Jarno Järvinen (Turku University): Dynamic nuclear polarization and relaxation in Si:P at very low temperatures
- Russell Lake (Aalto University): Thermometry and power sensing with superconductor weak links
- Mika Oksanen (Aalto University): Single and multimode Fabry-Pérot interference in suspended graphene
- Antti Puska (Aalto University): Shot noise and correlations in multiterminal diffusive conductors
- Aya Shibahara (Royal Holloway): A microkelvin cryogen-free platform
- Matti Tomi (Aalto University): Mechanical nonlinearities in graphene resonators
- Maciej Zgirski (Institute of Physics, Polish Academy of Sciences, Warsaw): How to measure magnetic field by flipping a coin? Switching measurements of DC-SQUIDs

18:00 – 20:00  Dinner

20:30 – 21:30  Guided tour along 3 km jogging trail (Risto Hänninen)
21:00 – 23:00  Sauna & swimbath (Petri Heikkinen)
20:00 – 24:00  Discussions in the pub (basement of manor house)

Tuesday, 10 September, 2013

JRA2 Session I: Nanodevices
Chairman Jukka Pekola
9:00 – 9:30  Pepita Martinez (SNS Pisa)
Heat interference in Josephson nanocircuits: toward coherent caloritronics
9:30 – 10:00  Hervé Courtois (Université Joseph Fourier & CNRS)
Existence of an independent phonon bath in a quantum device
10:00 – 10:30  Coffee

JRA2 Session II: Thermometry and refrigeration with nanodevices
Chairman Hervé Courtois
11:00 – 11:30  Yuri Pashkin (Lancaster University), Low-temperature thermometry with nanomechanics
11:30 – 12:00  Matthias Meschke (Aalto University)
Thermometry for solid state NIS refrigerators operating at low temperatures
12:00 – 12:30  Hung Nguyen (Aalto University)
High power electronic coolers based on superconducting tunnel junctions
12:30 – 14:00  Lunch
14:00 – 14:30  Photographing session: Group photo of participants  (Alexander Savin)

JRA2 Session III: New developments
Chairman Yuri Pashkin
14:30 – 15:00  Sergey Kubatkin (Chalmers University), Electronic properties and metrological applications of epitaxial graphene on silicon carbide
15:00 – 15:30  Tero Heikkilä (Aalto University), Enhancing the optomechanical coupling via the Josephson coupling
15:30 – 16:00  Mika Sillanpää (Aalto University), Optomechanics with a Josephson junction cavity

16:00 – 16:30  Coffee

JRA2 Session IV: Nanoelectronics
Chairman Sergey Kubatkin
16:30 – 17:00  Jukka Pekola (Aalto University), Szilard’s engine for electrons
17:00 – 17:30  Nikolai Kopnin (Aalto University), Information flow and optimal protocol for Maxwell’s demon single electron pump
17:30 – 18:00  Sorin Paraoanu (Aalto University), Analogue experiments in nanoelectronics

18:00 – 20:00  Dinner

JRA2 Session V: Nonlinear response
Chairman Stefan Ludwig
20:00 – 20:30  Nathan Vercruyssen (Technische Universiteit Delft), Evanescent states and non-equilibrium in driven superconducting nano wires
20:30 – 21:00  Konstantin Arutyunov (University of Jyväskylä), Quantum fluctuations in 1D superconductors: physics and applications

21:00 – 23:00  Sauna & swim bath  (Petri Heikkinen)

Wednesday, 11 September, 2013

JRA3 Session I: Fermi liquids at low temperatures
Chairman Shaun Fisher
9:00 – 9:30  Henri Godfrin (Institut Néel, CNRS, Grenoble), The dynamics of correlated fermion and boson many-body systems unveiled by neutron scattering studies in quantum fluids
9:30 – 10:00  John Saunders (Royal Holloway, University of London), Topological superfluids confined in nanoscale slab geometries
10:00 – 10:30  Kimitoshi Kono (RIKEN), Electron bubble transport under the free surface of superfluid 3He: chirality in 3He-A

10:30 – 11:00  Coffee

JRA3 Session II: Condensed matter analogues of quantum fields
Chairman Henri Godfrin
11:00 – 11:30  Grigory Volovik (Aalto University), Superfluid 3He: from quantum chromodynamics to Higgs bosons
11:30 – 12:00  Peter Skyba (Institute of Physics, SAS, Kosice)
Spin wave analogue of event horizon in superfluid 3He-B
12:00 – 12:30 Rich Haley (Lancaster University)
Probing the AB phase interface in superfluid 3He using quartz tuning forks

12:30 – 14:30 Lunch

JRA3 Session III: Magnon condensation
Chairman Peter Skyba
14:30 – 15:00 Yuriy Bunkov (Institut Néel, CNRS, Grenoble), Magnon condensation
15:00 – 15:30 Vladimir Eltsov (Aalto University)
Trapped Bose-Einstein condensates of magnons in superfluid 3He-B
15:30 – 16:00 Sergey Vasiliev (University of Turku)
Electron spin waves in quantum gas of atomic hydrogen

16:00 – 16:30 Coffee

16:30 – 18:00 Poster session II
Chairman Juha Tuoriniemi
- Samuli Autti (Aalto University): Spontaneous formation of the magnon Q-ball in superfluid 3He-B
- Henri Godfrin (CNRS - Grenoble): An above-ground pulse-tube-based facility for the test of large mass bolometers
- Petri Heikkinen (Aalto University): Gravity waves on the surface of topological superfluid 3He-B
- Niklas Hietala (Aalto University): Challenges in identifying Kelvin waves in numerical simulations
- Matti Manninen (Aalto University): Surface Waves in normal and superfluid 3He
- Jere Mäkinen (Aalto University): Energy dissipation and librating motion of superfluid 3He-B in the T → 0 limit
- Tetiana Romanova (Institute for Low Temperature and Structure Research, Polish Academy of Sciences, Wroclaw): Heat transfer in CO-N2 solid solution
- Juho Rysti (Aalto University): Melting pressure of saturated helium mixture
- John Saunders (Royal Holloway): Superfluidity of 3He confined in slab geometry
- Sergey Vasiliev and Jarno Järvinen (Turku University): Magnetic resonance of atomic hydrogen and deuterium in solid H2 and D2 matrices below 1 K
- Aya Shibahara (Royal Holloway): Fast current sensing noise thermometry for dilution refrigerator temperatures

18:00 – 20:00 Dinner

JRA3 Session IV: Superfluids and vortices
Chairman Rich Haley
20:00 – 20:30 Shaun Fisher (Lancaster University)
Quantum turbulence in superfluid 3He-B at low temperatures
20:30 – 21:00 Paul Walmsley (Manchester University), Emission of small vortex loops due to reconnections in superfluid 4He in the zero temperature limit
21:00 – 21:30 Viktor Tsepelin (Lancaster University)
Studies of superfluid 4He using vibrating resonators

21:30 – 24:00 Discussions in the pub (basement of manor house)
Thursday, 12 September, 2013

JRA4 Session I: Ultra-sensitive measurement
Chairman Joern Beyer
9:00 – 9:30  Christian Enss (Universität Heidelberg), Decoherence and relaxation of atomic two-level systems in non-equilibrium quantum systems at ultralow temperatures
9:30 – 10:00  Andrew Casey (Royal Holloway, University of London), NMR with SQUID detection
10:00 – 10:30  Tjerk Oosterkamp (Leiden Universiteit), MRI-AFM at mK temperatures and the prospects of scanning probe experiments at sub-mK temperatures

10:30 – 11:00  Coffee

JRA4 Session II: New techniques
Chairman Tjerk Oosterkamp
11:30 – 12:00  Andreas Reiser (Universität Heidelberg), A microkelvin magnetic flux noise thermometer
12:00 – 12:30  Pertti Hakonen (Aalto University), Josephson junction amplifiers near the quantum limit
12:30 – 13:00  Eddy Collin (Institut Néel, CNRS, Grenoble), Energy dissipation in nano-electro-mechanical devices at mK temperatures

12:30 – 14:30  Lunch

JRA4 Session III: SQUID measurement & applications
Chairman Christian Enss
14:30 – 15:00  Jörn Beyer (PTB, Berlin)
SQUID sensors for precision measurements at low temperatures
15:00 – 15:30  Sebastian Kempf (Universität Heidelberg), Microcalorimeters with inductively read out paramagnetic and superconducting temperature sensors
15:30 – 16:00  Klaus Hasselbach (Institut Néel, CNRS), Magnetic imaging with NanoSQUID microscopy

16:00 – 16:30  Coffee

JRA4 Session IV: Novel condensed-matter systems
Chairman Carley Paulsen
16:30 – 17:00  Rüdiger Klingeler (Universität Heidelberg), Probing low-energy excitations in unconventional superconductors and quantum magnets by specific heat
17:00 – 17:30  Aviad Frydman (Bar Ilan University), The electron glass in semiconductors
17:30 – 18:00  Sean Giblin (Rutherford Appleton Laboratory), Frustrating ways to emergent behavior

18:00 – 20:00  Dinner

JRA3 Session V: Vortices
Chairman Vladimir Eltsov
20:00 – 20:30  Mihail Silaev (Physics of Microstructures, RAS, Nizhny Novgorod), Localized fermionic states on vortices and interfaces in superfluid 3He-B
20:30 – 21:00  Vladislav Zavyalov (Aalto University), Probing vortex cores with trapped magnon condensates in 3He-B
21:00 – 21:30  Edouard Sonin (Hebrew University), Transverse force on a vortex in superfluids without Galilean invariance
21:30  Meeting of the Microkelvin General Assembly: *Microkelvin future, election of working group*

21:30 – 23:00  **Sauna & swim bath** (Petri Heikkinen)

**Friday, 13 September, 2013**

**Review session I:** Summary on community services: milestones and deliverables  
Chairman Matti Krusius  
8:00 – 8:20  Project Officer Maria Douka, *Views from the EU Project Office*  
8:20 – 8:40  Coordinator Matti Krusius, *Report on management (NA1) & transnational access (NA2)*  
8:40 – 9:00  Activity Leader Peter Skyba, *Report on knowledge & technology transfer (NA3)*  
9:00 – 9:20  Activity Leader Henri Godfrin, *Report on Strengthening European research (NA4)*  
9:20 – 9:40  Observations & discussion, *Advisory Board Members, External Reviewers, Comments from the audience*  
9:40 – 10:00  **Coffee**

**Review session II:** Summary on joint research: milestones and deliverables  
Chairman Matti Krusius  
10:00 – 10:20  Activity Leader George Pickett, *Report on refrigeration & opening the µK regime to nanophysics (JRA1)*  
10:40 – 11:00  Activity Leader Henri Godfrin, *Report on fundamental physics questions probed with µK measurements (JRA3)*  
11:00 – 11:20  Activity Leader Christian Enss, *Report on methods & devices for µK measurements (JRA4)*  
11:20 – 11:40  Observations & discussion, *Advisory Board Members, External Reviewers, Comments from the audience*  
11:40 – 12:00  **Coffee**

**Review session III:** Future of Microkelvin  
Chairman Matti Krusius  
12:00 – 12:20  Project Officer Maria Douka, *Future possibilities within EU Horizon 2020*  
12:20 – 13:00  *Discussion about principles: new Microkelvin application*

13:00 – 14:30  **Lunch**  
14:30  **Departure**