

Curriculum Vitae:

Hakonen, Pertti Juhani (born May 17, 1957, Helsinki, Finland)
 Prof., Director of Low Temperature Laboratory
 O.V. Lounasmaa Laboratory, Aalto University, School of Science
 Phone (mobile): +358 50 344 2316

ResearcherID: E-7688-2012

Education:

D.Sc. in Technology at Helsinki University of Technology, 1985. Thesis “*NMR, Textures, and Vortex Structures in Rotating ³He Superfluids*”. Thesis advisor Prof. Matti Krusius.

Most Important Academic Positions:

2012 – Full professor at Aalto University
 2010 – Director of Low Temperature Laboratory/O.V. Lounasmaa Laboratory
 2009 Visiting professor at ENS Paris: 1 month
 2000 – Professor at Helsinki University of Technology (name changed to Aalto University in 2010)
 1996 – 97 Visiting scientist at CEA Saclay, Paris, France
 1987 – 88 Postdoctoral associate at Cornell University, Ithaca, USA (with Nobel Laureate Prof. Robert Richardson and Prof. J Parpia)

Research interests (starting 1997):

Nanophysics, especially mesoscopic superconductivity, nanoelectromechanical systems, and graphene
 Nanotechnology using nanomaterials and novel amplifiers
 Quantum fluids and solids

Research interests in 1979-1997:

Superfluid gyrometers
 Quantum dynamics of surfaces in ⁴He crystals
 Nuclear magnetism in silver and rhodium metals at positive and negative temperature
 Vortex structures in superfluid ³He

Summary of publications: Over 200 international publications (2 in Science, 4 in Nature, 1 in Nature Materials, 2 in Nature Communications, 2 in Scientific Reports, 1 in PNAS, 5 in Nano Letters, 32 in Phys. Rev. Lett.); H-index is 32. Seven articles in outreach activity.

Honours:

2002 Member of Academia Europaea (by election)
 2001 Member of the Finnish Academy of Sciences and Letters (by election)
 1995 Fellow of American Physical Society (by election) **Citation:** “For his experimental investigations on vortex structures in superfluid ³He and studies of nuclear ordering of metals at positive and negative nanokelvin temperatures”
 1987 Prize for excellent PhD thesis by Finnish Academy of Sciences and Letters
 1985 The PhD thesis was accepted with honors by the Helsinki University of Technology.
 1982 The M.Sc. degree was awarded with honors by the Helsinki University of Technology.

Major Professional Activities:

Chairman

2015 Chairman (chief organizer) of GSS15: 6th Graphene and 2D Materials Satellite Symposium of NT15: The Sixteenth International Conference on the Science and Application of Nanotubes, Nagoya, Japan, June 28, 2015.
 2014 Co-chairman of GSS14: 5th Graphene and 2D Materials Satellite Symposium of NT14: The Fifteenth International Conference on the Science and Application of Nanotubes, Los Angeles, USA, June 7, 2014.
 2013 Co-chairman of GSS13: the 4th Graphene Satellite Symposium of NT13: The Fourteenth International Conference on the Science and Application of Nanotubes, Tallinn, Estonia, June 29, 2013.
 2013 – 16 Deputy director of WP7 “Sensors” of the “Graphene Flagship” project
 2013 Co-chairman of NT13: The Fourteenth International Conference on the Science and Application of Nanotubes, Helsinki, Espoo, Finland, June 24-28, 2013.
 2012 Chairman of the Olli V. Lounasmaa Prize Committee
 2011 Co-chairman of the Techniques Programme Committee for the 26th Int. Conf. on Low Temperature Physics LT26, Beijing, China.

- 2009 Programme Committee for the 43rd Annual Meeting of the Finnish Physical Society.
 2009 CARDEQ (EU-STREP) yearly meeting in Dresden, March 24-26, 2009.
 2008 CARDEQ (EU-STREP) yearly meeting in Paris, April 24 – 26, 2008.
 2007 CARDEQ (EU-STREP) yearly meeting in Barcelona, April 26 – 28, 2007.
 2006 CARDEQ (EU-STREP) yearly meeting in Regensburg, 2 – 4 March, 2006.
 2005 Kilpisjärvi Spring School on Mesoscopic Physics for Graduate Students of Nordic Countries
 April 30 - May 5, 2005.
 2001 Kevo Spring School on Mesoscopic Physics for Graduate Students of Nordic Countries,
 Kevo Subarctic Research Institute, Kevo, Finland, April 22 – 28, 2001.
 1996 ESF workshop “Liquid/Solid Interfaces in Helium”, Otaniemi, Finland, Jan. 5-7, 1996.
 1992 Organizing Committee for the 26th Annual Meeting of the Finnish Physical Society.

Coordinator

- 2009 – 13 ESF EuroGRAPHENE network “Entangled Spin Pairs in Graphene”
 2010 – 11 National Center of Excellence Funded by the Academy of Finland
 2006 – 09 Carbon nanotube devices at the quantum limit, “CARDEQ” (FP6-IST programme of European
 Union). A 3.5 year STREP project with 7 nodes and 1.95 M€ budget.

Member of International Evaluation Panel

- 2005 Laboratoire Pierre Aigrain (LPA), Ecolé Normal Supérieure

Member

- 2015 London Prize committee
 2013 Advisory committee of IXth Rencontres du Vietnam, Quy-Nhon, Vietnam, Aug. 4 – 10, 2013.
 2010 Organizing committee for Graphene School 2010, Cargese, France, Oct. 11 – 23, 2010.
 2005 Organizing committee for the 39th Annual Meeting of the Finnish Physical Society, Otaniemi,
 Finland, March 17 – 21, 2005.
 2004 Organizing committee for the conference “Quantum phenomena at low temperatures”, Jan. 7 –
 11, 2004, Lammi, Finland.
 1999 Organizing Committee for the 22nd Int. Conf. on Low Temp. Phys. LT22, Otaniemi, Finland
 1994 – National Center of Excellence Funded by Academy of Finland (present term 2012-2017)
 1993 Organizing Committee for the 27th Annual Meeting of the Finnish Physical Society
 1992 – 94 Board of the Finnish Physical Society

Editor/Board member

- 2015 Member of the advisory board of J. Low Temp. Phys.
 1999 Proceedings of 22nd International Conference on Low Temperature Physics LT22
 1998 Proceedings of the symposium on quantum phenomena at low temperatures - "Disorder,
 Defects, and Decoherence in Quantum Systems"
 1992 Proceedings of the 26th Annual Meeting of the Finnish Physical Society

Referee

Nature, Nature Phys., Phys. Rev. Lett., Phys. Rev. B, EPL, Appl. Phys. Lett., J. Appl. Phys., J. Low Temp.
 Phys., and Physica B.

Evaluation of EU-projects

- Panel member: SOLID (Solid-state hybrid systems that are capable of performing elementary processing and
 communication of quantum information, IP-project 2010 - 2013, 16 partners, coordinator G. Wendin)
 Panel member: SE2ND (Source of Electron Entanglement in Nano Devices, STREP-project 2011 - 2014,
 coordinator C. Schönenberger)

Evaluator of Research Proposal

NSF, USA; ESF, Europe; Israeli Science Foundation; European Research Council Young investigator
 grants & advanced investigator grants; Swedish National Funding Agency

Evaluation panels of Research Proposal

- Panel member: Swedish Research Council, NT-15, 2015
 Panel member: Swedish Research Council, NT-15, 2014
 Panel member: German Research Foundation, German Excellence Initiative, Panel P 13 Physics, 2012

Referee in Promotion of Professor in Physics

Cornell (1991), Gothenburg (2008), Delft (2015)

Referee in Professorship in Physics

Gothenburg (2012)

Present/recent funding and collaborations:

QuDeT – Quantum Devices in Topological media: carbon nanotubes, graphene, and novel superfluids, ERC Advanced Grant (2016 – 2020) 2 400 000 €

Graphene Flagship (partner in 1 billion, 10 year project coordinated by Chalmers) first 3years 335 302 €
1.1.2016 – 31.12. 2017 300 000 €

iQUOEMS - Interfacing Quantum Optical, Electrical, and Mechanical Systems, FP7 STREP 386 120 €
(2013 – 2016), PIs: T. Kippenberg (EPFL, Lausanne), M. Aspelmeyer (Vienna), E. Polzik (Copenhagen), K. Hammerer (Hannover), coordinator David Vitali (Camerino University, Italy)

Entangled spin pairs in graphene, “ENTS” (ESF EUROgraphene call) 360 000 €
Seven partners with individual national grants, *coordinator P. Hakonen*, (2009-2013)
Other PIs: Jaan Aarik (Tartu), C. Beenakker (Leiden), L. Molenkamp (Wurzburg),
A. Morpurgo (Geneva), C. Schönberger (Basel), B. Trauzettel (Wurzburg)

RODIN, FP7 STREP (2010 – 2013, Six academic and two industry partners) 594 440 €
PIs: H. Alles (Tartu), A. Bachtold (Barcelona), A. Ferrari (Cambridge), A. Isacsson (Chalmers),
H. van der Zant (Delft), J. Kolehmainen (Diarc Ltd.) and Risto Kaunisto (Nokia NRC Ltd.)

CRYOHALL upgrades

Shared Academy of Finland infrastructure grant 1 M€ “Upgrade of Cryohall” (2011-2012)

Investment money to upgrade a home-made dilution refrigerator to a commercial one 325 000 €

Quantum Electro-Mechanical Properties of Graphene (in bilateral programme of Academy of Finland and NSF). The project addresses suspended graphene and NEMS resonators made out of graphene. Duration three years, 1.7.2009 – 30.6.2012.

PIs: *Harold Craighead & Jeevak Parpia, Cornell University*

Pertti Hakonen, Aalto University, Low Temperature Laboratory 493 160 €

Major invited conference presentations during 2006 - 2015:

Dynamical Casimir photons with multifrequency interference effects, Quantum metamaterials 2015, Spetses, Greece, June 1 – 5, 2015.

Dynamical Casimir photons with interference effects: Microwave cavities with multi-frequency correlations, Charge Transfer meets Circuit Quantum Electrodynamics, Dresden, Germany, June 29 – July 3, 2015.

Electrical and mechanical resonance modes in suspended graphene systems, Two Dimensional Nanostructures, 1st Erwin Schrödinger Symposium 2014, Vienna, Austria, Nov. 26 – 28, 2014.

Current-current correlations in graphene and in nanowires with superconducting contacts, Superconducting Nanocircuits 2014, SNC-2014, Maratea, Italy, Sept. 7 – 12, 2014.

Suspended carbon nanotube resonators at ultra low temperatures, International Conference on Ultra Low Temperature Physics, ULT2014, Bariloche, Argentina, Aug.15- 19, 2014.

Comparison of graphene and carbon nanotube sensors, Graphene Connect: Sensors, Gothenburg, Sweden, June 23 – 24, 2014.

Hybrid circuit cavity quantum electrodynamics with a micromechanical resonator, Workshop on Frontier between atomic and solid state physics, Paris, France, July 17 – 19, 2013.

Electrical cavities with micromechanical resonators: optomechanics at microwaves, Nanomaterials and their application in biology and medicine, Poznan, Poland, June 16 – 19, 2013.

Microwave Amplification with Nanomechanical Resonators, International Solid-State Circuits Conference, San Francisco, USA, Feb. 17 – 21, 2013.

Hybrid circuit cavity quantum electrodynamics with a micromechanical resonator, Superconducting nanohybrids SNh-2012, San Sebastian, Donostia International Physics Center, Spain, Sept. 3 – 7, 2012.

Electromechanical parametric effects, Workshop on Noise and Nonlinearities in Mechanical Resonators, Barcelona, Spain, May 28 – June 1, 2012.

Towards optomechanics with graphene mechanical resonators, Materials Research Society Spring Meeting 2012, San Francisco, USA, April 9 – 13, 2012.

Dynamical Casimir effect in a Josephson metamaterial, Workshop on quantum spintronics, Ottiolu, Italy, Oct. 2 – 6, 2011.

Dynamical Casimir effect in a Josephson metamaterial, 26th International Conference on Low Temperature Physics (LT26), Beijing, China, Aug. 10 – 17, 2011.

Proximity-induced superconductivity in nanocarbons, Advanced many-body and statistical methods in mesoscopic systems, Constanta, Romania, June 27 – July 2, 2011.

Transport in nanoscale CNT and graphene junctions, Linneaus Summer School, Hindås, Sweden, July 1 – 7, 2010.

Graphene Josephson junctions: supercurrent, noise, and thermal properties, Materials Research Society Spring Meeting 2010, San Francisco, USA, April 5 – 9, 2010.

Shot noise in graphene, MESO09, Chernogalovka, Russia, June 11 – 16, 2009.

Gate-controlled supercurrents in carbon nanotubes, International symposium on carbon nanotube nanoelectronics, Matsushima, Miyagi, Japan, June 09 – 12, 2009.

Shot noise in Nanocarbons, Spin and Qubit 2008, Copenhagen, Denmark, July 3 – 4, 2008.

Shot noise in graphene, RTN Nano - Fundamentals of Nanoelectronics, Bremen, Germany, April 7 – 11, 2008.

Shot noise in nanotubes and graphene, Quantum Transport and Nanophysics, La Thuile, Italy, March 8 – 15, 2008.

Properties of Josephson junctions made out of single and multiwalled carbon nanotubes, Physics of Nanoscale Superconducting Heterostructures, Leiden, the Netherlands, July 2 – 6, 2007.

Gate-controlled superconductivity in MWNTs, March meeting of APS, Denver, USA, March 5 – 9, 2007.

Towards quantum measurements with Josephson junctions, Nanoscience Days, Jyväskylä, Finland, Oct. 26-27, 2006.

Landau-Zener interferometry in a Cooper pair box, Recontres du Vietnam, Hanoi, Vietnam, Aug. 6 – 12, 2006.

Single Electron Transistors: progress towards the quantum limit, International Conference on Superlattices, Nanostructures, and Nano-devices, Istanbul, Turkey, July 30 – Aug. 4, 2006.

Mach-Zehnder interferometry in a superconducting charge qubit, 8th International Conference on Materials and Mechanisms of high T_c superconductivity, Dresden, Germany, July 9 – 14, 2006.

Landau-Zener Interferometry in a Cooper pair box, Spin and Qubit 2006, Copenhagen, Denmark, June 20-22, 2006.

Coulomb blockaded Josephson junction as a noise detector, MESO06, Chernogalovka, Russia, June 13 – 19, 2006.

Landau-Zener interferometry in a Cooper pair box, Quantum Coherence, Noise and Decoherence in Nanostructures, Dresden, Germany, May 15 – 26, 2006.

Summary of supervision:

- Supervised 13 PhD students, 6 active graduate students presently
- Supervised 18 MSc students
- Two of my PhDs have become professors in Finland
- One of my students, Mika Sillanpää, has received an ERC Young Investigator grant (2008 ERC call)
- Supervised 10 Postdocs: one has obtained an academic position in Finland and 3 abroad (F,DE,J)

Opponent:

Committee member (Foreign) for **Ben Schneider's Ph.D.** thesis "Suspended Carbon Nanotubes Coupled to Superconducting Circuits", Delft University of Technology, Delft, the Netherlands, Jul. 3, 2014.

Committee member (Rapporteur) in the examination of **Francois Parmentier's Ph.D.** thesis "Single electron source", Ecolé Normal Supérieure (ENS), Paris, France, Nov. 26, 2010.

Opponent in the examination of **Fredrik Persson's Ph.D.** thesis "Fast dynamics and measurements of single-charge devices", Chalmers Tekniska Högskola, Gothenburg, Sweden, June 9, 2010.

Committee member (Rapporteur) for **Aurelien Fay's Ph.D.** thesis "Detection of mesoscopic quantum noise at high frequency", Joseph Fourier University, Grenoble, France, June 9, 2008.

Committee member (Rapporteur) in the examination of **Pierre-Marie Billangeon's Ph.D.** thesis "Detection of mesoscopic quantum noise at high frequency", University of Paris Sud, Orsay, France, Feb. 1, 2008.

Opponent (together with Prof. C. Marcus from Harvard) in the examination of **Kasper Grove-Rasmussen's Ph.D.** thesis "Electronic Transport in Single Wall Carbon Nanotubes", Copenhagen University, The Niels Bohr Institute, Copenhagen, Denmark, June 20, 2006.

Committee member in the examination of **Jaekuk Kim's Ph.D.** thesis "Non-equilibrium Transport in quantum wires", Chalmers Tekniska Högskola, Gothenburg, Sweden, April 26, 2005.

Opponent in the examination of **Surita Devi's Lic.** Thesis "Advances in Coulomb blockade thermometry", Chalmers Tekniska Högskola, Gothenburg, Sweden, Nov. 3, 2003.

Committee member in the examination of **Peter Ågren's Ph.D.** thesis "Charging effects in small capacitance Josephson junction circuits", Kungliga Tekniska Högskolan, Stockholm, Oct. 18, 2002.

Opponent in the examination of **Karin Anderson's Lic.** thesis "A Cooper pair turnstile made from a one dimensional array of Josephson junctions", KTH, Stockholm, Sweden, Jan. 13, 2000.

Examiner:

Pre-examiner of **Marcus Rinkiö's Ph.D.** thesis on "Carbon nanotube memory devices with high-k gate dielectrics", Jyväskylä University, Finland, Dec. 11, 2009.

Pre-examiner of **Jani Kotakoski's Ph.D.** thesis "Irradiation-mediated tailoring of carbon nanotubes", University of Helsinki, Finland, March 31, 2007.

Examiner, **Yuriy Mukharskiy's Habilitation Thesis**, CEA Saclay, France, Dec. 5, 2006.

Pre-examiner of **Mikko Leivo's Ph.D.** thesis "On-chip Cooling by Quasiparticle Tunnelling below 1 Kelvin", Jyväskylä University, Finland, July 4, 1999.

Institution building:

New laboratory: In 2005 – 2007, I was involved in the construction of new premises for Low Temperature Laboratory. By year 2008, the whole laboratory was moved, together with the nanofabrication facilities.

Semiclean room: In 2001-02, I took part in construction of a semiclean room for nanofabrication at the Low Temperature Laboratory. Together with a staff scientist (**J. Penttilä**) and three graduate students, we set up a full production line for e-beam lithography. This production line was in use till the end of 2007.

Collaboration with industry and contributions to SMEs:

FINCRYO project (2011–2013) together with Aivon, BlueFors, PicoWatt, and VTT Technical Research Centre of Finland to develop new (dry) cryogenic solutions and sensors for low temperature experiments.

In collaboration with **R. Blaauwgeers** and **P. Vorselman**, we constructed in 2006 - 2007 a prototype dry dilution refrigerator. Presently, the design is marketed by BlueFors Cryogenics Ltd.

Patents/ applications:

FI117032, US7550759, "Kapasitiivinen yhden elektronin transistori", P. Hakonen, M. Sillanpää, and L. Roschier, English translation: "Capacitive single-electron transistor". Sold for 10000 € to American company MagiQ Ltd.

WO2012123642 *Low noise amplifier [based on undamped Josephson junction]* H. Seppä, J. Hassel, and P. Hakonen

DE112010002623, US2010272917, WO2010125231, CN102396084, *Method and apparatus [Ultrafast Graphene Electronics Using Novel Oxidization and Contacting Technique]* (with Nokia NRC) R. Lehtiniemi, A. Kärkkäinen, L. Lechner, P. Hakonen, and S. Haque