

USA Patents authored / co-authored by Robert V. Duncan, Ph.D.

PAT. NO.	Title
15/131,200	Published patent application—expected to award soon
9,408,656	Cryotherapy probe (2016)
8,740,891	Flexible multi-tubular cryoprobe (2014)
8,591,503	Cryotherapy probe (2013)
8,387,402	Methods and systems for cryogenic cooling (2013)
8,087,256	Cooling methods and systems using supercritical fluids (2012)
7,921,657	Methods and systems for cryogenic cooling (2011)
7,507,233	Cryotherapy system (2009)
7,499,745	Multidimensional bioelectrical tissue analyzer (2008)
7,410,484	Cryotherapy probe (2008)
7,273,479	Methods and systems for cryogenic cooling (2007)
7,083,612	Cryotherapy system (2006)
5,193,909	Quantitative method for measuring heat flux emitted from a cryogenic object (1993)

Refereed Publications in Journals, Books, and Book Chapters

1. "Singularity in the Kapitza Resistance between Gold and Superfluid ^4He " with Guenter Ahlers and Victor Steinberg, *Phys. Rev. Lett.* 58, 377 (1987).
2. "Nonlinearity in the Kapitza Resistance Between Gold and Superfluid ^4He Near T", with G. Ahlers, *Jpn. J. Appl. Phys.* 26-3, 363 (1987).
3. "Depression of the Superfluid Transition in ^4He by a Heat Current" with Guenter Ahlers and Victor Steinberg, *Phys. Rev. Lett.* 60, 1522 (1988).
4. "Finite-Size Effects on the Thermal Conductivity of ^4He Near the Superfluid Transition" with Guenter Ahlers, *Phys. Rev. Lett.* 61, 846 (1988).
5. "Recent Experiments near the Superfluid Transition in ^4He " with Guenter Ahlers, in Frontiers of Physics, Proceedings of the Landau Memorial Conference, E. Gotsman, Y. Ne'eman, and A. Voronel (eds.), p.219 (Oxford : Pergamon Press 1990).
6. "Thermal effects on the Josephson series-array voltage standard", *Physica B* 165-166, 101 (1990).
7. "Singularity and Nonlinearity in the Kapitza Resistance Between Gold and Superfluid ^4He ", with G. Ahlers, *Phys. Rev. B* 43, 7707 (1991).
8. "Using a New Generation of Multimeters to Measure the Quantized Resistance" with M.E. Cage, D.Y. Yu, B.M. Jeckelmann, and R.L. Steiner, *IEEE Transactions on Instruments and Measurements* 40, 262 (1991).

9. "A Refrigerated Dewar for the Josephson Array Voltage Calibration System" *IEEE Transactions on Instrumentation and Measurement* 40, 326 (1991).
10. "Measurement accuracy of macroscopic quantum circuits with rf-biased Josephson junction arrays" with D. H. Dunlap, *Superconductor Science and Technology* 4, 413 (1991).
11. "Proposed differential frequency readout system by hysteretic Josephson junctions" with L. Z. Wang, *Phys. Rev. A* 46, 3617 (1992).
12. "Superconducting Instrumentation for Precision Measurement and Control", in Superconducting Devices and Their Applications, page 446, H. Koch and H. Lubbig, editors (Springer-Verlag, Berlin, 1992).
13. "Fundamental Measurement Accuracy of RF-Biased Josephson Device Comparisons" with D. H. Dunlap, *J. Appl. Phys.* 71, 6177 (1992).
14. "A Superfluid-Transition Fixed-Point Temperature-Reference" with G. Ahlers, in Temperature: Its Control and Measurement in Science and Industry, Volume 6, page 243, J. F. Schooley, editor (American Institute of Physics Press, New York, 1992).
15. "A frequency to voltage converter based on Bloch oscillations in a capacitively-coupled GaAs-GaAlAs quantum well" with D. Dunlap, V. Kovanis, and J. Simmons, *Phys. Rev. B* 48, 7975 (1993).
16. "Dynamic measurements near the lambda-point in a low-gravity simulator on the ground" with U.E. Israelsson, D.M. Strayer, T.C.P. Chui, and M. Larson, *Physica B* 194-196, 593 (1994).
17. "Sidewall thermometry perturbations to nonlinear heat transport near the superfluid transition" with R. Akau, S. Gianoulakis, U.E. Israelsson, and T.C.P. Chui, *Physica B* 194-196, 603 (1994).
18. "Effect of Gravity on the Thermal-Conductivity Measurement of ^4He near T_λ ", with F-C. Liu, U. E. Israelsson, T.C.P. Chui, D. Hensinger, A. Nash, M.J. Adriaans, W.A. Moeur, *Czechoslovak Journal Of Physics* 46(S1), 87 (1996).
19. "Cryogenic Design Of The Liquid-Helium Experiment Critical-Dynamics In Microgravity" with M.J. Adriaans, W. A. Moeur, S.T.P. Boyd, and D. M. Strayer, *Cryogenics* 36, 787 (1996).
20. "Critical-Dynamics In Microgravity" with S.T.P. Boyd, W.A. Moeur, S. Robinson, R. Akau, and S. Gianoulakis, *International Journal Of Thermophysics* 17, 631 (1996).
21. "Observation of Self-Organized Criticality Near the Superfluid Transition in ^4He ", with W.A. Moeur, P.K. Day, F-C. Liu, S.T.P. Boyd, and M.J. Adriaans, *Phys. Rev. Lett.* 78, 2421 (1997).
22. "Large Enhancement of Boron Carbide's Seebeck Coefficients through Vibrational Softening", with

- T. L. Aselage, D. Emin, and S. S. McCready, *Phys. Rev. Lett.* 81, 2316 (1998).
23. "Breakdown of Fourier's Law near the Superfluid Transition in ^4He ", with P. K. Day, W. A. Moeur, S. McCready, D. Sergatskov, and F-C. Liu, *Phys. Rev. Lett.* 81, 2474 (1998).
24. "Gravitational Effects on Nonlinear Heat Transport near the Superfluid Transition in ^4He ", with P. K. Day, S. McCready W. A. Moeur, F-C. Liu, and D. Sergatskov, *J. Low Temp. Phys.* 113, 861 (1998).
25. "PdMn and PdFe: New Materials for Temperature Measurement Near 2K", with B. Klemme, M.J. Adriaans, P.K. Day, D.A. Sergatskov, and T.L. Aselage, *J. Low Temp. Phys.* 116, 133 (1999).
26. "Onset of superfluidity far from equilibrium: dynamical effects on the correlation length", with D. Sergatskov, S. Boyd, T. McCarson, A. Babkin, P. Day, and D. Elliott, *Physica B* 280, 45 (2000).
27. "Dynamic and Gravitational Effects on the Correlation Volume: Experimental Methods" with D.A. Sergatskov, S.T.P. Boyd, S.S. McCready, T.D. McCarson, A.V. Babkin, P.K. Day, F- C.Liu, and D. Elliott, *J. Low Temp. Phys.* 119, 265 (2000).
28. Science Requirements Document for Critical Dynamics in Microgravity, JPL Document Number D-18698, May 31, 2000.
29. "Gravitational alignment in ground-based measurements to support Critical Dynamics in Microgravity" with Sven Mueller, T. D. McCarson, and D. A. Sergatskov, AIP Conference Proceedings 504, 701 (2000).
30. "The CQ Experiment", with T.C.P. Chui, A.H Harter, R.A.M. Lee, A. Chatto, P.K. Day, and D.L. Goodstein, American Institute of Aeronautics and Astronautics, AIAA 2001-4964 (2001).
31. "Critical Dynamics in Microgravity - Flight prototype and planned orbital measurements", with D. Sergatskov, S. Boyd, A. Babkin, T. McCarson and P. Day, American Institute of Aeronautics and Astronautics AIAA-2001-4936 (2001).
32. "Sampled DC technique for high precision resistance measurements" with P. R. Williamson, J. A. Lipa, and D. A. Sergatskov, American Institute of Aeronautics and Astronautics AIAA- 2001-4937 (2001).
33. "Numerical Analysis of a Cryogenic Bolometer for Space Radiation Measurement" with S.T.P. Boyd, W.A. Holmes, and P.R. Williamson, American Institute of Aeronautics and Astronautics AIAA-2001-4969 (2001).

34. "New Measurement Technology for DYNAMX, and for Future Fundamental Physics Missions in Space" with D. A. Sergatskov, A. V. Babkin, S.T.P. Boyd , R. C. Nelson, P. K. Day, J. Dooley, and D. Elliott, FP-1067, *Proc. 2nd Pan Pacific Basin Workshop on Microgravity Science* (2001).
35. "The CQ Experiment: Enhanced Heat Capacity of Superfluid Helium in a Heat Flux", with D. L. Goodstein, A. W. Harter, R. A. M. Lee, A. Chatto, T. C. P. Chui, and P. Day, FP-1025, *Proc. 2nd Pan Pacific Basin Workshop on Microgravity Science* (2001).
36. "New Paramagnetic Susceptibility Thermometers for Fundamental Physics Measurements" with D. A. Sergatskov, P. K. Day, A. V. Babkin, R. C. Nelson, T. D. McC Carson, and S.T.P. Boyd, in Temperature : Its Control and Measurement in Science and Industry, 7, 1009, Dean C. Ripple, editor (American Institute of Physics Press, New York, 2002).
37. "Self-Organized Heat Transport near the Superfluid Transition in ⁴He" with D.L. Goodstein, A.V. Babkin, and D.A. Sergatskov, *J. Low Temp. Phys.* 126, 1529 (2002).
38. Proceedings of the 2002 Conference on Unified Science and Technology for Reducing Biological Threats and Countering Terrorism (BTR 2002), R. V. Duncan, Chair, University of New Mexico
39. "The Magnetic Properties of Sputtered Pd_{1-x}Mn_x Films for Thermometry and Bolometry", with R.C. Nelson and D.A. Sergatskov, *J. Low Temp. Phys.* 127, 173 (2002).
40. "The CQ Experiment: Enhanced Heat Capacity of Superfluid Helium in a Heat Flux", with R. A. M. Lee, A. W. Harter, A. Chatto, T. C. P. Chui, P. K. Day and D. L. Goodstein, Paper- 2.0103, 2002 IEEE Aerospace Conference, 1-31 (2002).
41. "Ultrasound Imaging of Breast Tissue" with N. Duric, P. Littrup, E. Holsapple, A. Babkin, A. Kalinin, A. Pevzner, and A. Tokarev, *Proceedings of the SPIE: Medical Imaging 2003*; San Diego, California; Feb. 21-26, 2003. Ultrasonic Imaging and Signal Processing – Paper 5035-4.
42. "New Propagating Mode Near the Superfluid Transition in ⁴He", with D.A. Sergatskov, A.V. Babkin, R.A.M. Lee, and S.T.P. Boyd, *Physica B* 329 – 333, 208 (2003).
43. "New Paramagnetic Susceptibility Thermometers for Fundamental Physics Measurements" with D.A. Sergatskov, P.K. Day, A.V. Babkin, R.C. Nelson, T.D. McC Carson, and S.T.P. Boyd, AIP Conference Proceedings 684, 1009 (2003).
44. Proceedings of the 2003 Conference on Unified Science and Technology for Reducing Biological Threats and Countering Terrorism (BTR 2003), R. V. Duncan, Chair, University of New Mexico

45. “‘Heat from Above’ heat capacity measurements in liquid ^4He ”, with R.A.M. Lee, A. Chatto, D.A. Sergatskov, A.V. Babkin, S.T.P. Boyd, A.M. Churilov, T.D. McCarson, T.C.P. Chui, P.K. Day, and D.L. Goodstein, *J. Low Temp. Phys.* 134, 495 (2004).
46. “Preface to the Proceedings of QFS 2003” with S.T.P. Boyd and D. L. Goodstein, *J. Low Temp. Phys.* 134, 1 (2004); “Welcome Address to QFS 2003, delivered by Louis Caldera, President of UNM”, *J. Low Temp. Phys.* 134, 17 (2004).
47. “Experiments in ^4He Heated From Above, Very Near the Lambda Point”, with D.A. Sergatskov, A.V. Babkin, S.T.P. Boyd, and R.A.M. Lee, *J. Low Temp. Phys.* 134, 517 (2004).
48. “Experiments in Fundamental Physics Scheduled and in Development for the ISS” with C. Lammerzahn, G. Ahlers, N. Ashby, M. Barmatz, P. Beirmann, H. Dittus, V. Dohm, K. Gibble, J. Lipa, N. Lockerbie, N. Mulders, and C. Salomon, *General Relativity and Gravitation* 36, 615 (2004).
49. “Fundamental Physics: Long-range quantum order, interactions, and phase transitions” (Preface), *Advances in Space Research*, Elsevier, (2004). Proceedings of the 2004 Conference on Unified Science and Technology for Reducing Biological Threats and Countering Terrorism (BTR 2004), R. V. Duncan, Chair, University of New Mexico.
50. “Demonstration of an Ultra-Stable Temperature Platform” with C. J. Green and D. A. Sergatskov, *J. Low Temp. Phys.* 138, 871 (2005).
51. “Adaptive Optimal PI Controller for Use in Precision Low-Temperature Experiments” with Jinyang Liu and D. A. Sergatskov, *J. Low Temp. Phys.* 138, 905 (2005).
52. “Dynamic Simulation of the Superfluid / Normal Fluid Interface Motion in ^4He ” with Z. Xie, N. C. Menicucci, S.T.P. Boyd, and D. A. Sergatskov, *J. Low Temp. Phys.* 138, 79 (2005).
53. Proceedings of the 2005 Conference on Unified Science and Technology for Reducing Biological Threats and Countering Terrorism (BTR 2005), R. V. Duncan, Chair, University of New Mexico.
54. “CW Measurements of the Upward-Going Temperature Wave in the ^4He Self-Organized Critical State” with S.T.P. Boyd and D.A. Sergatskov, AIP Conference Proceedings 850, 135 (ISBN 0-7354-0347-3; 2006).
55. “Effect of Inhomogeneous Heat Flow on the Enhancement of the Heat Capacity in He-II by Counterflow near T_λ ”, with S.T.P. Boyd, A. Chatto, R.A.M. Lee, and D. Goodstein, AIP Conference Proceedings 850, 133 (ISBN 0-7354-0347-3; 2006).
56. “Measurement of the SOC State Specific Heat in ^4He ” with A.R. Chatto, R.A.M. Lee, P.K. Day and

- D.L. Goodstein, AIP Conference Proceedings 850, 137 (ISBN 0-7354-0347-3; 2006).
57. “Magnetic Properties of Pd(96%)Mn(4%) Films for High Resolution Thermometry” with R. C. Nelson, C. Green, and D.A. Sergatskov, AIP Conference Proceedings 850, 1123 (ISBN 0- 7354-0347-3; 2006).
58. “Experiments on the Self-Organized Critical State of ^4He ” with A. Chatto, R.A.M. Lee, and D. Goodstein, *J. Low Temp. Phys.* 148, 519 (2007).
59. “Noise Immunity of High-Precision Low-Temperature Experiments” with J. Liu and D.A. Sergatskov, *J. Low Temp. Phys.* 148, 921 (2007).
60. “Critical phenomena in microgravity: Past, present, and future”, with Martin Barmatz, Inseob Hahn, and John Lipa, *Reviews of Modern Physics*, 79, pp. 1-52 (January – March, 2007).
61. “Immediate Communications in the CBRN Environment”, International Seminar on Nuclear War and Planetary Emergencies, 42nd Session (World Scientific Press, 2010) ISBN-13 978-981-4327-19-0 and ISBN-10 981-4327-19-0.
62. “Cell phones, texting, position reporting, and self-assembly in emergency response management”, International Seminar on Nuclear War and Planetary Emergencies, 43rd Session (World Scientific Press, 2011) ISBN-13 978-981-4365-92-5 and ISBN-10 981-4365-92-0.
63. “Planning for desperate Climate Intervention: Can it make sense?”, International Seminar on Nuclear War and Planetary Emergencies, 46rd Session (World Scientific Press, 2013) ISBN-13 978-981-4623-43-8.
64. “Texas programs and technologies for UAS”, International Seminar on Nuclear War and Planetary Emergencies, 48th Session (World Scientific Press, 2015) ISBN-13 978-981-3148-64- 2.