

Loren J. Swenson

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Education

Ph.D., Physics

University of California, Santa Barbara (March 2007)

B.A., Physics

University of Minnesota, Twin Cities (June 2001)

B.S., Chemistry - Summa Cum Laude

University of Minnesota, Twin Cities (June 2001)

Skill Summary

- Broad experience in nanoscale processing including: thin-film deposition (sputter, e-beam, thermal), etching (wet, RIE, and plasma), and lithography (e-beam and optical).
- Familiarity with standard semiconductor metrology tools: SEM, ellipsometry, AFM, and probe stations.
- Comprehensive understanding of cryogenic methods. Expert knowledge of dilution (~30 mK) and He3 (~300 mK) refrigeration systems.
- Experience with low-frequency and RF electronic measurements of physical systems.
- Proficient with digital logic. In particular, experience with Field-Programmable Gate Array (FPGA) technology and VHDL programming.
- Strong background in scientific computing including adeptness with MATLAB, LabVIEW, Mathematica, AutoCAD, SONNET, Fortran, C, Python, Linux and Windows.
- Ability to fabricate and measure a variety of nanoscale devices including high-quality superconducting resonators and single-electron transistors with nanometer-scale tunnel junctions.

Professional Experience

California Institute of Technology - Pasadena, California

Postdoc - January 2011 to present

Participating in the design and realization of scientific instruments utilizing frequency-multiplexed arrays of kinetic inductance detectors. Target applications include terrestrial and airborne astronomy, quantum computing and fundamental physical measurements.

Institut Néel - Centre national de la recherche scientifique - Grenoble, France

Postdoc - July 2008 to December 2010

Responsible for the design, fabrication and measurement of detector arrays based on frequency-multiplexed superconducting resonators. Demonstrated prototype instruments for terrestrial astronomy and high-speed phonon imaging.

Cañada Community College - Redwood City, California

Adjunct Faculty - January 2008 to June 2008

Instructor for introductory physics and astronomy courses.

University of California, Santa Barbara

Graduate Research Scientist - June 2002 to March 2007

Thesis Adviser: Professor Andrew Cleland.

Conducted fundamental research on novel high-speed electronics at cryogenic temperatures. Pioneered new methods for extremely sensitive calorimetry and photon-limited bolometry. Thesis: *High-speed measurement of single-electron circuits at low temperatures with bolometric and calorimetric applications.*

Teaching Assistant - August 2001 to June 2002

Led discussion and laboratory sections in undergraduate physics.

University of Minnesota, Twin Cities

Undergraduate Research Scientist - August 1999 to June 2001

Synthesized and characterized novel inorganic compounds for use in molecular sensing applications. Thesis: *Electronic transitions in vapochromic quasi one-dimensional [Pt(arylisocyanide)₄][Pt(CN)₄] crystals.*

Refereed Publications

A. Monfardini, A. Benoit, A. Bideaud, **L. Swenson**, A. Cruciani, P. Camus, C. Hoffmann, F. X. Désert, S. Doyle, P. Ade, P. Mauskopf, C. Tucker, M. Roesch, S. Leclercq, K. F. Schuster, A. Endo, A. Baryshev, J. J. A. Baselmans, L. Ferrari, S. J. C. Yates, O. Bourrion, J. Macias-Perez, C. Vescovi, M. Calvo and C. Giordano, "A dual-band millimeter-wave kinetic-inductance camera for the IRAM 30 m telescope," *Astrophysical Journal Supplement Series* **194**, 24 (2011).

O. Bourrion, A. Bideaud, A. Benoit, A. Cruciani, J. F. Macias-Perez, A. Monfardini, M. Roesch, **L. Swenson**, and C. Vescovi, "Electronics and data acquisition demonstrator for a kinetic inductance camera," *J. Instr.* **6**, P06012 (2011).

L. J. Swenson, A. Cruciani, A. Benoit, M. Roesch, C. S. Yung, A. Bideaud, A. Monfardini, "High-speed phonon imaging using frequency-multiplexed kinetic inductance detectors," *Appl. Phys. Lett.* **96**, 263511 (2010).

A. Monfardini, **L. J. Swenson**, A. Bideaud, F. X. Désert, S. J. C. Yates, A. Benoit, A. M. Baryshev, J. J. A. Baselmans, S. Doyle, B. Klein, M. Roesch, C. Tucker, P. Ade, M. Calvo, P. Camus, C. Giordano, R. Guesten, C. Hoffmann, S. Leclercq, P. Mauskopf, K. F. Schuster, "NIKA: A Millimeter-Wave Kinetic Inductance Camera," *Astronomy & Astrophysics* **521**, A29 (2010).

G. J. Grabovskij, **L. J. Swenson**, O. Buisson, C. Hoffmann, A. Monfardini, and J.-C. Villégier, "In situ measurement of the permittivity of helium using microwave NbN resonators," *Appl. Phys. Lett.*, **93**, 134102 (2008).

L. J. Swenson, D. K. Wood, and A. N. Cleland, “Diffusion-based electron thermometry using a three-junction single electron transistor,” *Nano Lett.*, **7** (6), 1804 (2007).

D. K. Wood, J.-L. Fraikin, **L. J. Swenson**, and A. N. Cleland, “Electronic microbarcodes: labels for diverse cell populations,” *Lab Chip*, **7**, 469 (2007).

L. J. Swenson, D. R. Schmidt, J. S. Aldridge, D. K. Wood, and A. N. Cleland, “Mixing with the radio-frequency single-electron transistor,” *Appl. Phys. Lett.*, **86**, 173112 (2005).

Conference Proceedings

S. Doyle, P. Mauskopf, A. Monfardini, **L. Swenson**, S. Withington, and D. Goldie, “Superconducting Lumped Element Kinetic Inductance resonators for millimeter, sub-millimeter and far infrared detection,” *35th International Conference on Infrared, Millimeter and Terahertz Waves (IRMMW-THZ 2010)*, IEEE (2010).

S. Doyle, P. Mauskopf, J. Zhang, A. Monfardini, **L. J. Swenson**, J.J.A. Baselmans, S.J.C. Yates, and M. Roesch, “A review of the lumped element kinetic inductance detector,” *Proc. SPIE*, **7741**, 77410M (2010).

M. Roesch, A. Bideaud, A. Benoit, A. Cruciani, F. X. Désert, S. Doyle, S. Leclercq, F. Mattiocco, K. F. Schuster, **L. J. Swenson**, and A. Monfardini, “Characterization of lumped element kinetic inductance detectors for mm-wave detection,” *Proc. SPIE*, **7741**, 77410N (2010).

L. J. Swenson, J. Minet, G. J. Grabovskij, O. Buisson, F. Lecocq, C. Hoffmann, P. Camus, J.-C. Villégier, S. Doyle, P. Mauskopf, M. Roesch, M. Calvo, C. Giordano, S.J.C. Yates, A.M. Baryshev, J.J.A. Baselmans, A. Benoit and A. Monfardini, “A fast, ultra-sensitive and scalable detection platform based on superconducting resonators for fundamental condensed-matter and astronomical measurements,” *Proc. 13th Int. Workshop on Low Temperature Detectors (LTD-13)*, *AIP Conf. Proc.*, **1185**, 84 (2009).

S. J. C. Yates, J. J. A. Baselmans, A. M. Baryshev, Y. J. Y. Lankwarden, **L. Swenson**, A. Monfardini, B. Klein and R. Güsten, “Readout for large arrays of microwave kinetic inductance detectors using a fast fourier transform spectrometer,” *Proc. 13th Int. Workshop on Low Temperature Detectors (LTD-13)*, *AIP Conf. Proc.*, **1185**, 249 (2009).

S. Doyle, P. Mauskopf, J. Zhang, S. Withington, D. Goldie, **L. J. Swenson**, A. Monfardini and D. Glowacka, “Optimisation of lumped-element kinetic-inductance detectors for use in ground based large arrays,” *Proc. 13th Int. Workshop on Low Temperature Detectors (LTD-13)*, *AIP Conf. Proc.* **1185**, 156 (2009).

A. Monfardini, **L. J. Swenson**, A. Benoit, A. Bideau, G. Bres, P. Camus, G. Garde, C. Hoffmann, J. Minet, H. Rodenas and the NIKA collaboration, “Kinetic inductance detectors development for mm-wave astronomy,” *Astrophysics Detector Workshop 2008*, P. Kern (ed), *EAS Publications Series*, **37**, 95-9 (2009).

Presentations

Contribution: “Performance of a far-infrared kinetic inductance detector operating in the non-linear regime,” 14th Int. Workshop on Low Temperature Detectors (LTD-14), Heidelberg, Germany (2011).

Contribution: “Operation of kinetic-inductance detectors in the nonlinear regime,” 4th Workshop on the physics and applications of superconducting microresonators, Grenoble, France (2011).

Contribution: “Progress in fast, sensitive, high-resolution imaging utilizing frequency-multiplexed, superconducting resonators,” CASPER Workshop III, Cape Town, South Africa (2009).

Contribution: “A fast, ultra-sensitive and scalable detection platform based on superconducting resonators for fundamental condensed-matter and astronomical measurements,” 13th Int. Workshop on Low Temperature Detectors (LTD-13), Stanford, CA (2009).

Contribution: “In situ measurement of the permittivity of helium using microwave NbN resonators,” APS March Meeting, Pittsburgh, PA (2009).

Contribution: “A three-junction single electron transistor as a diffusive, high-speed thermometer: Experiment and simulation,” APS March Meeting, Denver, CO (2007).

Contribution: “Nanoscale metal thermometry using a radiofrequency single electron transistor,” APS March Meeting, Baltimore, MD (2006).

Contribution: “Mixing with the radiofrequency single-electron transistor,” APS March Meeting, Los Angeles, CA (2005).

Honors and Awards

National Science Foundation/Lando Fellowship, 2000.

University of Minnesota, Department of Chemistry, Undergraduate Scholarship, 1999, 2000, and 2001.

Marshall H. and Nellie Alworth Memorial Fund, 1997-2002.

Professional Affiliations

American Physical Society member since 2005.