

Curriculum Vitae

Lance Simms

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EDUCATION

Graduate:

Stanford University
Masters in Applied Physics, 2006
PhD in Applied Physics, 2009

Undergraduate:

University of California, Santa Barbara
Bachelor of Science in Physics, 2003
Major GPA: 3.69/4.0
Overall GPA: 3.75/4.0
Deans Honors 1999, 2000, 2001
Graduated with High Honors

RELEVANT COURSES

- Quantum Mechanics
- Classical Mechanics
- Electromagnetism
- Computer Interfacing
- Observational Astrophysics
- Thermodynamics
- Differential Equations & Vector Calculus
- Particle Physics
- Advanced Laboratory
- Digital/Analog Electronics Laboratory
- Numerical Methods in the Physical Sciences
- Computational Fluid Dynamics
- The Fourier Transform and Its Applications
- CCD/CMOS Detectors

HONORS AND AWARDS

- Robert Adler Scholarship, Adler Planetarium of Chicago, 1999
- Illinois State Scholar, Congress of the United States, 1999
- All-State Special Mention for Volleyball, Chicago Tribune, 1999
- Scholar Athlete, Central Suburban League of Illinois, 1999
- Varsity Volleyball MVP, Team Captain, New Trier High, 1997, 1999
- UCSB Merit Scholarship, 2002
- Member of Golden Key Honor Society, National Society of Collegiate Scholars, and Alpha Lambda Delta Society
- UCSB Physics Academic Honors, 2002
- Elected President of Stanford Astronomical Society, 2006-08
- Elected President of LLNL Postdoc Association, 2011-2012
- Acting Deployment Coordinator for LLNL CERT Team 2014-Present

TECHNICAL AND SPECIALIZED SKILLS

I have experience machining plastics and metals, soldering and crimping electronics, doing basic electronic schematics and layout, and interfacing computers to external hardware via ADC/DAC equipment and computer programming. I am also proficient with the following equipment and technology:

- CTI 1050 Helium Compressor, LN2 cooling systems
- Lakeshore Temperature Controllers (models 330,331,340)
- Integrating spheres and calibrated photodiodes for QE measurements
- Varian roughing, turbo, and ion pumps
- RS-232, i2C, SPI, Ethernet (TCP/UDP), CAN, USB protocols
- Function generators, Oscilloscopes, Digital multimeters
- Motorola 68HC11 Microcontroller, Marvell PXA270 Microprocessor
- ARM Microprocessors and System On Modules
- CMOS, CCD detectors
- SIDECAR ASIC, ARC Controller Electronics
- Virtex-7, Zynq 7010, and other Xilinx FPGAs

WORK EXPERIENCE (5/12-Present)

Lawrence Livermore National Laboratory Physicist/Computational Engineer

Livermore, CA

My work at LLNL is now spread out among a variety of things. My most important role is lead software engineer for the miniCarb satellite mission. I also write sensor and firmware development for nanosatellite payloads. This involves modifying embedded Linux kernels and cross-compiling them to run on satellite microprocessors, creating drivers for hardware peripherals, and developing socket-based software/firmware for ground-to-satellite communication. Second, I am writing simulation code and a data analysis package for a suite of sensors used in the Discreet Oculus program. This work involves modeling device physics, understanding the effects of the urban environment on gamma ray transport, and maintaining a Git repository for the project. Third, I am programming a Zynq 7010 FPGA to do pulse discrimination, which involves reading in digitized waveforms and running them through algorithms generated using Vivado HLS. Lastly, I am working as a consultant for NASA, where my duties consist of writing firmware for the detector control electronics on the James Webb Space Telescope.

(6/10-5/12)

Lawrence Livermore National Laboratory Postdoctoral Researcher

Livermore, CA

As a postdoc at LLNL, I played a role on several different teams working towards CubeSat development. My primary duty was writing the payload firmware for the Space-Based Actionable Refinement of Ephemeris (STARE) CubeSat optical payload. Part of this involved creating novel algorithms for extracting satellite tracks in the payload optical images. I also spent many long nights with other teammates making night-sky telescope observations of satellites in LEO. My independent research was directed at studies of gamma ray bursts and the x-ray background with Cadmium Zinc Telluride detectors on board another CubeSat called the Cosmic X-Ray Background NanoSat. For CXBN, I collaborated with a team at Morehead State on modeling the particle background that will be seen by the detector. I also wrote the Attitude Determination and Control software that controlled the vehicle.

- (1/10-6/10)** **Associated Universities Inc. (AUI)**
ALMA Commissioning Scientist **Santiago, Chile**
While working on the Atacama Large Millimeter/Sub-millimeter Array project, my duties consisted of instrument calibration and verification, software development, and data analysis. The position required frequent travel from Santiago to the Atacama Desert, where we would have long stays (8 days, typically) at the Operations Site Facility (OSF) at 2900 m. I particularly enjoyed being at the OSF and being integrated into a very large team of engineers, physicists, and technicians.
- (9/08-1/09)** **TELEDYNE IMAGING SENSORS**
Detector & Software Development **Camarillo, CA**
I worked to reduce persistence, dark current, and electrical noise in the HxRG HyViSi sensors. This involved building a test system nearly from scratch. I also wrote and documented runtime configurable firmware for the SIDECAR ASIC controller for use with Teledyne HxRG multiplexers. This firmware is now shipped with the SIDECAR development kit.
- (8/04-1/10)** **STANFORD UNIVERSITY**
Research Assistant **Stanford, CA**
Throughout graduate school I worked on the Large Synoptic Survey Telescope camera, largely on detector development for the guide system. I wrote a large amount of control software and firmware for the detectors and auxiliary equipment, as well as image analysis and feature detection algorithms. My work also consisted of data analysis and GEANT4 computer simulations of telescope optics and detectors. My thesis research was directed at the study of Hybrid Visible Silicon PIN CMOS Detectors and their use in astronomy.
- (8/06-6/09)** **STANFORD RESIDENTIAL COMPUTING**
Computer Consultant **Stanford, CA**
As part of the Stanford Residential Computing team, I administered three sub-networks at a Stanford graduate residence in addition to writing web pages for computer troubleshooting and helping students connect their computers to the Internet. I also served as a teaching assistant during two separate quarters for the Stanford undergraduate course CS196: Microcomputer Consulting. The teaching position included preparing and conducting full classroom lectures.
- (2/07-4/07)** **ROCHESTER IMAGING DETECTOR LABORATORY**
Software Engineer **Rochester, NY**
I designed a graphical user interface, wrote software, and programmed firmware to control a SIDECAR ASIC controller used with Teledyne HxRG Hybrid Silicon PIN detectors. Additional work consisted of data analysis for testing and characterizing the H4RG detector, designing a mechanical mount and cabling for control electronics in Solidworks, and putting together a cryostat for CMOS detectors.
- (6/03-8/04)** **UCSB Physics Department**
Developmental Technician **Santa Barbara, CA**
I worked with a high-energy physics group on the semiconductor technology for the Compact Muon Solenoid. My work included, but was not limited to, computer programming, hardware design and testing, training, and wirebonding.

(9/02-6/03)

**Campus Learning Assistance Services
Undergraduate Tutor**

Santa Barbara, CA

With CLAS I tutored individuals and groups of students in mathematics, physics, statistics, and astronomy. And during my employment, I taught assistance courses in differential calculus and introductory physics.

COMPUTER SKILLS

Software

- Microsoft Visual Studio (Basic, C++, etc.)
- SecureCRT, OpenSSH, ftp applications
- Mathematica, Matlab, IDL
- Autocad, Solidworks, OrCad
- Cygwin, Xming (Unix emulators for Windows)
- Labview 6.1, 7.0, 8.0
- Linux, Unix, Mac and Windows operating systems
- FV, DS9, MAXIM DL, PYRAF, CASA, GEANT4
- VNC, X11
- MySQL, Redmine
- OpenEmbedded, Yocto Project (Embedded Linux)

Programming

- C, C++, Perl, Java, Python, PHP, IRAF, PYRAF
- HTML, CGI, Ruby, Visual Basic, Javascript, Google Maps API
- Applescript, Microsoft VBScript, ActiveX, Mac Automator
- SVN, CVS, Git, Subversion
- Apache, Twiki, Plone, AFS, WebAuth
- MICRIUM OS-II, Cross-Compiling Linux for ARM Microprocessors
- Objective C, iPhone App Development
- Verilog, VHDL, Vivado, Vivado SDK and HLS

PUBLICATIONS

Pulse Discrimination with a Gaussian Mixture Model on an FPGA

L. Simms, B. Blair, J. Ruz, R. Wurtz, A. Kaplan, A. Glenn, Nuclear Inst. and Methods in Physics Research, A, Volume 900, p. 1-7, 21 Aug. 2018

Methodology and performance comparison of statistical learning pulse shape classifiers as demonstrated with organic liquid scintillator

R. Wurtz, B. Blair, C. Chen, A. Glenn, A. Kaplan, P. Rosenfield, J. Ruz, L. Simms, Nuclear Inst. and Methods in Physics Research, A, Volume 901, p. 46-55, 1 Sep. 2018

Government-owned CubeSat Next Generation Bus Reference Architecture

V. Riot, L. Simms, et. al, Proceedings of the AIAA/USU Conference on Small Satellites, Aug. 7, 2014

Orbital Refinement with the STARE Payload

L. Simms et. al, Journal of Small Satellites, Vol. 2, No.2, pp. 235-251, Dec. 2013

The Space-based Telescopes for Actionable Refinement of Ephemeris (STARE) Mission

V. Riot et. al, Proceedings of the AIAA/USU Conference on Small Satellites, SSC13-XI-11, Aug. 16, 2013

CXBN: A Blueprint for an Improved Measurement of the Cosmological X-Ray Background

L. Simms et. al, Proc. SPIE, Vol 8507-44, Aug 15, 2012

The Cosmic X-Ray Background NanoSat (CXBN): Measuring the Cosmic X-Ray Background Using the CubeSat Form Factor

K. Brown et. al., Proceedings of the AIAA/USU Conference on Small Satellites, SSC12-VII-6, Aug 12, 2012

The Space-Based Telescopes for Actionable Refinement of Ephemeris Pathfinder Mission

L. Simms, W. De Vries, V. Riot, S. Olivier, A. Pertica, B. Bauman, D. Phillion, S. Nikolaev, SPIE Optical Engineering, 51, Jan 19, 2012

Analysis of Galaxy 15 Satellite Images from a Small-Aperture Telescope

S. Nikolaev, D. Phillion, L. Simms, A. Pertica, S. Olivier, R. Cognion, Proceedings of the Advance Maui Optical and Space Surveillance Technologies Conference, Sep. 13-15, 2011

Autonomous Sub-Pixel Satellite Track Endpoint Determination for Space-Based Images

L. Simms, Applied Optics, **50**, 22, D1-D6, 2011

Optical Payload for the STARE Pathfinder Mission

L. Simms, V. Riot, W. De Vries, S. Olivier, A. Pertica, B. Bauman, D. Phillion, S. Nikolaev, Proc. SPIE Defense and Security, 8044-05, 2011

Hybrid CMOS SiPIN Detectors as Astronomical Imagers

L. Simms, PhD Thesis, Stanford University, Oct. 2009

Telescope Guiding with a HyViSi H2RG Used in Guide Mode

L. Simms, D. F. Figer, B. J. Hanold, D. K. Gilmore, S. M. Kahn, Proc. SPIE, Vol 7439, Aug. 2009

First use of a HyViSi H4RG for astronomical observations

L. Simms, D. F. Figer, B. J. Hanold, D. J. Kerr, D. K. Gilmore, S. M. Kahn, J. A. Tyson, Proc. SPIE, Vol. 6690, 2007

Stand-alone Cosmic Muon Reconstruction Before Installation of the CMS Silicon Strip Tracker

CMS Tracker Collaboration, Journal of Instrumentation, Volume 06, 4 P05004, May 2009

Performance studies of the CMS Strip Tracker before installation

W Adam et al., Journal of Instrumentation, Volume 06, 4 P06009, June 2009

TECHNICAL DOCUMENTS

Testing and Operation of the SIDECAR ASIC for DUNE and LSST

L. Simms, D. S. M. Kahn, D. K. Gilmore, S. Seshadri, Technical Report for NASA/JPL, July 2008

HxRG Assembly Code Manual for SIDECAR ASIC

L. Simms, Teledyne Scientific and Imaging, Dec. 2008

OUTREACH

I currently do outreach events with the Tri-Valley Stargazers at schools in the Tri-Valley area. I also volunteer with the VOCal organization, building and maintaining trails in the Bay Area.

LANGUAGES

I can speak, read, and write English, Italian, and Spanish.