Omar **Moreno**

Curriculum Vitae

Los Altos, CA
+1 (562) 396-1622
omoreno@slac.stanford.edu
omarmoreno2
omar-moreno

Education

2016 **Ph.D. in Physics**, *University of California at Santa Cruz*, Santa Cruz, CA
Dissertation: Search for a Heavy Photon in the 2015 Engineering Run Data of the Heavy Photon Search Experiment

2009 **M.Sc. in Physics**, *California State University, Los Angeles*, Los Angeles, CA
Thesis: Measurement of the Analyzing Power for the Reactions $p + CH_2 \rightarrow X$ at a Proton Momentum of 2.2032 GeV/c

2006 **B.Sc. in Applied Physics**, *University of California at Irvine*, Irvine, CA
Thesis: Search for the $B \rightarrow e^+e^-$ as a Hint to Supersymmetry

Research Experience

2016-present **Research Associate**
SLAC National Accelerator Laboratory, Menlo Park, CA

- Leading the development of a Geant4, C++ based simulation and reconstruction framework for the Light Dark Matter eXperiment (LDMX).
- Applied machine learning techniques to identify and veto rare photon-induced reactions (e.g. photo-nuclear) expected to be the dominant background for LDMX.
- Managed the production and reconstruction of large signal and background samples (∼10 billion total) that were used to study the sensitivity of LDMX to several physics scenarios.
- Played a key role in the installation and commissioning of the upgraded Heavy Photon Search (HPS) silicon vertex tracker (SVT) and the integration of the data acquisition system with Jefferson Lab's Hall-B central data acquisition system for the 2019 run.
- Conducted a resonance search for a new gauge boson (dark photon) in the mass range 19 MeV/c^2 to 81 MeV/c^2 leading to the first physics publication by the Heavy Photon Search experiment.
- Mentored HPS graduate students and post-docs on machine learning, analysis and data acquisition projects.
- Mentored LDMX undergraduates, graduate students and post-docs on machine learning, simulation and reconstruction projects.

2011-2016 **Graduate Student Researcher**
Santa Cruz Institute for Particle Physics, Santa Cruz, CA

- Lead developer of both the analysis pipeline and statistical package used to conduct a resonance search for a new fundamental particle.
- Co-creator of both a C++ and Java data processing pipeline used to clean up, reconstruct, and visualize over 50 TB of noisy detector data.
- Tested and commissioned the HPS SVT data acquisition system used for the 2015 and 2016 engineering runs.
- Characterized the performance of several components of the HPS SVT including the front end readout boards and the silicon microstrip modules at various stages of production.
- Key member of team that assembled, installed and commissioned the HPS SVT.

2009-2011 **Graduate Student Researcher**
Santa Cruz Institute for Particle Physics, Santa Cruz, CA

- Characterized the performance of the Long Shaping Time Front End readout chip at various stages of development.

2007-2009 **Graduate Student Researcher**
Department of Physics and Astronomy, California State University, Los Angeles, Los Angeles, CA
- Used likelihood techniques to measure the form factor ratio, G_{E_p}/G_{M_p}, of the proton.

2005-2006 **Undergraduate Researcher**
Department of Physics and Astronomy, University of California, Irvine, Irvine, CA
- Developed analysis to measure the branching fraction for the extremely rare decay $B \to e^+e^-$.
- Used a neural network to boost the identification of the particle decay $\Lambda \to p\pi^-$ by 10%.

Skills

Prog. Lang. bash, C, C++, Java, MySQL, Python. Familiar with with HTML5 and Fortran
Tools Geant4, git, LaTeX, Linux, matplotlib, numpy, ROOT, RooFit, tensorflow, scipy, CMake
Languages Fluent in English and Spanish

Appointments, Fellowships and Honors

2019 Luis Alvarez Award for Best Experimental Research, *American Physical Society*
2018 Visiting Professor, *Università degli Studi di Sassari, Sassari, Italy*
2012 Margaret Burbidge Award for Best Experimental Research, *American Physical Society*
2011 Regent's Fellowship, *University of California, Santa Cruz*
2010 GAANN Fellowship, *University of California, Santa Cruz*
2009 Special Recognition in Graduate Studies, *California State University, Los Angeles*
2009 Margaziotis Award for Best Experimental Research, *California State University, Los Angeles*
2007-2009 LSAMP Bridge to the Doctorate Fellowship, *National Science Foundation*
2006 California Alliance for Minority Participation Mentor of the Year, *University of California, Irvine*
2006 Special Merit in Research, *University of California, Irvine*
2001-2002 Chancellor's Leadership Scholar, *University of California, Irvine*

Leadership

2019-present Member of the Heavy Photon Search Excecutive Committee
2017-present Coordinator of the LDMX Software and Computing Working Group
2016-2017 Leader of the HPS Tracking Working Group
2015-2018 Leader of the Resonance Search Working Group

Teaching Experience

2013-2015 **GRE Physics Bootcamp Instructor**
Department of Physics, University of California, Santa Cruz
- Taught undergraduate level quantum mechanics.

2009-2011 **Graduate Teaching Assistant**
Department of Physics, University of California, Santa Cruz
- Physics 6A - Mechanics
- Physics 6B - Waves and Thermodynamics
- Physics 6C - Electricity and Magnetism

2007 **Graduate Teaching Assistant**
Department of Physics and Astronomy, California State University, Los Angeles
- Physics 211 - Classical Mechanics
- Physics 213 - Electricity and Magnetism

Invited Talks

- Moreno, O. *Visible Dark Sector Probes*. Light Dark Matter at Accelerators 2019. (2019). Venice, Italy.
- Moreno, O. *Accelerating Dark Matter*. Seminar given at the Dipartimento di Fisica, Università di Roma Tor Vergata. (2018). Rome, Italy.
- Moreno, O. *Accelerating Dark Matter*. Seminar given at the Dipartimento di Fisica, Università degli Studi di Torino. (2018). Turin, Italy.
- Moreno, O. *Accelerating Dark Matter*. Seminar given at the Istituto Nazionale di Fisica Nucleare Genova. (2018). Genoa, Italy.
- Moreno, O. *Probing the Dark World with Accelerators*. Seminar given at the Dipartamento di Chimica, Università degli Studi di Sassari. (2018). Sassari, Italy.
- Moreno, O. *The Heavy Photon Search Experiment*. Fermi National Accelerator Laborary LHC Physics Center Topic of the Week. (2018). Batavia, IL.
- Moreno, O. *First Results from the Heavy Photon Search.* Jefferson Lab Physics Seminar. (2017). Newport News, VA.
- Moreno, O. *The Heavy Photon Search Experiment.* U.S. Cosmic Visions: New Ideas in Dark Matter. (2017). College Park, MD.

Publications

[1] A. M. Ankowski, A. Friedland, S. W. Li, O. Moreno, P. Schuster, N. Toro and N. Tran, *Lepton-Nucleus Cross Section Measurements for DUNE with the LDMX Detector*, arXiv:1912.06140 [hep-ph].

[2] T. Åkesson *et al.* [LDMX Collaboration], *A High Efficiency Photon Veto for the Light Dark Matter eXperiment*, arXiv:1912.05535 [hep-ex].

[3] P. H. Adrian *et al.* [HPS Collaboration], *Search for a dark photon in electroproduced e^+e^- pairs with the Heavy Photon Search experiment at JLab*, Phys. Rev. D **98**, no. 9, 091101 (2018) arXiv:1807.11530 [hep-ex].

[4] T. Åkesson *et al.* [LDMX Collaboration], *Light Dark Matter eXperiment (LDMX)*, arXiv:1808.05219 [hep-ex].

[5] A. J. R. Puckett *et al.*, *Polarization Transfer Observables in Elastic Electron Proton Scattering at Q^2 =2.5, 5.2, 6.8, and 8.5 GeV^2*, Phys. Rev. C **96**, no. 5, 055203 (2017) Erratum: [Phys. Rev. C **98**, no. 1, 019907 (2018)] arXiv:1707.08587 [nucl-ex].

[6] A. J. R. Puckett *et al.*, *Technical Supplement to "Polarization Transfer Observables in Elastic Electron-Proton Scattering at Q^2 = 2.5, 5.2, 6.8, and 8.5 GeV^2"*, Nucl. Instrum. Meth. A **910**, 54 (2018) [arXiv:1707.07750 [nucl-ex]].

[7] M. Battaglieri *et al.*, "The Heavy Photon Search Test Detector," Nucl. Instrum. Meth. A **777**, 91 (2015) doi:10.1016/j.nima.2014.12.017 [arXiv:1406.6115 [physics.ins-det]].

[8] W. Luo *et al.* [GEp-III and GEp2gamma Collaborations], "Polarization components in π^0 photoproduction at photon energies up to 5.6 GeV," Phys. Rev. Lett. **108**, 222004 (2012) doi:10.1103/PhysRevLett.108.222004 [arXiv:1109.4650 [nucl-ex]].

[9] M. Meziane *et al.* [GEp2gamma Collaboration], "Search for effects beyond the Born approximation in polarization transfer observables in $\vec{e}p$ elastic scattering," Phys. Rev. Lett. **106**, 132501 (2011) doi:10.1103/PhysRevLett.106.132501 [arXiv:1012.0339 [nucl-ex]].

[10] A. J. R. Puckett *et al.*, "Recoil Polarization Measurements of the Proton Electromagnetic Form Factor Ratio to Q^2 = 8.5 GeV^2," Phys. Rev. Lett. **104**, 242301 (2010) doi:10.1103/PhysRevLett.104.242301 [arXiv:1005.3419 [nucl-ex]].