Omar Moreno

Curriculum Vitae

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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
Collaborations: Light Dark Matter eXperiment Collaborations, Heavy Photon Search

- Leading the development of a Geant4 based simulation framework for the Light Dark Matter eXperiment (LDMX).
- Using machine learning techniques to develop a veto used to reject rare backgrounds (e.g. photo/electro-nuclear) expected by LDMX.
- Leader of the Heavy Photon Search resonance search analysis group which aims at discovering a prompt decaying heavy photon.

2011-2016 **Graduate Student Researcher**
Santa Cruz Institute for Particle Physics, Santa Cruz, CA
Collaborations: Heavy Photon Search

- Utilized frequentist statistical analysis and maximum likelihood estimation to conduct a resonance search for a new fundamental particle, heavy photon, thought to mediate dark matter interactions.
- Applied machine learning techniques to reject trident and wide angle brem backgrounds.
- Co-creator of both a C++ and Java analysis pipeline used to clean up and process data into physics objects.
- Tested and commissioned the HPS Silicon Vertex Tracker (SVT) data acquisition system used to continuously read out 23,004 channels at a rate of up to 50 kHz.
- Characterized the performance of several components of the HPS SVT including the APV25 readout chips and 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
Collaborations: International Linear Collider

- Characterized the performance of the Long Shaping Time Front End readout chip at various stages of development.
- Mentored several undergraduate students on various projects.

2007-2009 **Graduate Student Researcher**
Department of Physics and Astronomy, California State University, Los Angeles, Los Angeles, CA
Collaborations: GEP-III

- Developed C++ analysis used to optimize detector selection criteria using regression techniques

and frequentist inference resulting in an improved understanding of the interaction of the proton in polyethylene.
- Performed statistical analysis to measure the form factor ratio, G_{E_p}/G_{M_p}, of the proton using blind analysis techniques.

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

2000-2001 **Mechanical Engineering Apprentice**
Nasa Dryden Flight Research Center, Edwards, CA
- Designed and constructed a device used to evaluate the skin-friction reduction of several Micro -Blowing Technique skins at supersonic speeds.

Skills

Prog. Languages: Java, C++, C, Python, MySQL, XML. Familiar with with HTML5 and Fortran
Tools: Linux, ROOT, Geant4, NumPy, matplotlib, scikit-learn, scipy, git, SVN, CMake, LaTeX, RooFit, Mathematica
Languages: Fluent in English and Spanish

Fellowships and Honors

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*

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

[1] O. Moreno, The Heavy Photon Search Experiment, *LHC Physics Center Topic Of The Week*, 2018

[2] O. Moreno, First Results from the Heavy Photon Search, *JLab Physics Seminar*, 2017

[3] O. Moreno, The Heavy Photon Search Experiment, *U.S. Cosmic Visions: New Ideas in Dark Matter*, 2017

Publications

[1] O. Moreno et al. The Heavy Photon Search Silicon Vertex Tracker. *Paper in preparation.*, 2018.

[2] O. Moreno et al. Search for a Dark Photon in Electro-Produced e^+e^- Pairs with the Heavy Photon Search Experiment at JLab. *Paper in preparation.*, 2018.

[3] 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.*, C96(5):055203, 2017.

[4] M. Battaglieri et al. The heavy photon search test detector. *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 777:91 – 101, 2015.

[5] Omar Moreno. The Heavy Photon Search Experiment at Jefferson Lab. *Meeting of the APS Division of Particles and Fields (DPF 2013) Santa Cruz, California, USA*, arxiv:1310.2060, 2013.

[6] W. Luo et al. Polarization components in π^0 photoproduction at photon energies up to 5.6 GeV. *Phys. Rev. Lett.*, 108:222004, May 2012.

[7] M. Meziane et al. Search for effects beyond the born approximation in polarization transfer observables in $\vec{e}\ p$ elastic scattering. *Phys. Rev. Lett.*, 106:132501, Mar 2011.

[8] A. J. R. Puckett et al. Recoil polarization measurements of the proton electromagnetic form factor ratio to $q^2 = 8.5$ GeV. *Phys. Rev. Lett.*, 104:242301, Jun 2010.