Omar Moreno

Curriculum Vitae

Sunnyvale, CA
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Education

(Expected) 2016 **Ph.D. in Physics**, *University of California at Santa Cruz*, Santa Cruz, CA
Dissertation: Resonance Search for a New Gauge Boson
Advisor: Bruce Schumm

2007-2009 **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
Advisor: Konrad Aniol

2001-2006 **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
Advisor: David Kirkby

Research Experience

2011-present **Graduate Student Researcher, Heavy Photon Search Collaboration**
Santa Cruz Institute for Particle Physics, Santa Cruz, CA

- 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 optimize the selection of signal like events using a Random Forest Algorithm in Scikit-Learn, boosting the signal/background fraction by 40%.
- Co-creator of both a C++ and Java analysis pipeline used to process, clean up, and visualize over 10 TB of noisy data (detector output).
- Developed Java front end used to load and retrieve greater than 100,000 calibration constants from a MySQL database.
- Tested and commissioned the Heavy Photon Search (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, International Linear Collider**
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.
- Mentored several undergraduate students on various projects.

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

- 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, BaBar Collaboration**
Department of Physics and Astronomy, University of California, Irvine, Irvine, CA

- Developed analysis to measure the branching fraction for the extremely rare decay $B \to e^+e^-$ 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, Mathematica. Familiar with with HTML5 and Fortran
Tools: Linux, NumPy, Matplotlib, scikit-learn, scipy, git, SVN, CMake, LaTeX, ROOT, RooFit
Languages: Fluent in English and Spanish

Fellowships and Honors

2012 Margaret Burbidge Award for Best Experimental Research, *American Physical Society*
2011 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 212 - Waves and Thermodynamics
- Physics 213 - Electricity and Magnetism

Publications

[1] 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.

[2] 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.

[3] 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.

[4] 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.

[5] 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.