

Curriculum Vitae

Jairo Velasco Jr., Ph.D.

University of California at Berkeley
Department of Physics
366 LeConte Hall #7300
Berkeley, CA 94720-7300, USA

Email: jvelasc5@ucsc.edu
Lab Phone:(510) 643-6391
Office Phone:(510) 642-9396

EMPLOYMENT:

- 2015 University of California, Santa Cruz, Department of Physics, Assistant Professor
- 2015 University of California, Berkeley, Department of Physics Visiting Scholar
- 2012 - 2015 University of California President's Postdoctoral Fellow
University of California, Berkeley, Department of Physics
Host: Professor Michael F. Crommie

EDUCATION:

- 2012 Doctorate of Philosophy – Physics, University of California, Riverside
Advisor: Professor Chun Ning (Jeanie) Lau
- 2005 Bachelor of Science – Physics, Syracuse University

HONORS, FELLOWSHIPS AND AWARDS:

- 2012 University of California President's Postdoctoral Fellowship
The selectivity is 25 out of more than 500 submissions.
- 2012 Robert T. Poe Memorial Scholarship Award for Outstanding Ph.D. Graduate Student (*one awarded per year*)
- 2011 Ford Foundation Dissertation Fellowship, Honorable Mention.
- 2011 Dean's Dissertation Year Fellowship Program award, University of California, Riverside
- 2011 ImagineNano GDR-1 Grant
- 2011 American Physical Society Ovshinsky Student Travel Award
- 2010 Carl Storm Underrepresented Minority Fellowship, Gordon Research Conference
- 2010 Benjamin C. Shen Memorial Graduate Scholarship Award for Outstanding 4th year Graduate Student Researcher (*one awarded per year*)

- 2008 Graduate Research Mentorship Fellowship, University of California, Riverside
- 2006 Dean's Graduate Student Fellowship, University of California, Riverside
- 2006 Mentoring Summer Research Internship Program Fellowship, University of California, Riverside

PATENTS:

- 1) "Suspended Structures", Chun Ning Lau, Gang Liu, **Jairo Velasco Jr.**, patent#7948042
- 2) "Local Doping of Two-Dimensional Materials", Dillon Wong, **Jairo Velasco Jr.**, Long Ju, Salman Kahn, Juwon Lee, Chad E. Germany, Alexander K. Zettl, Feng Wang, Michael F. Crommie, Provisional patent application submitted

PUBLICATIONS:

- 1) A. Yan, **J. Velasco Jr.**, S. Kahn, K. Watanabe, T. Taniguchi, F. Wang, M. F. Crommie, A. Zettl, "Direct growth of single- and few-layer MoS₂ on h-BN with preferred relative rotation angles", accepted at Nano Letters (2015), arXiv:1504.06641
- 2) D. Wong*, **J. Velasco Jr.***, L. Ju*, J. Lee, S. Kahn, H.Z. Tsai, C. Germany, T. Taniguchi, K. Watanabe, A. Zettl, F. Wang, M. F. Crommie, "Characterization and manipulation of individual defects in insulating hexagonal boron nitride using scanning tunneling microscopy", Nature Nanotechnology (2015) Advance Online Publication
*These authors contributed equally to this work
- 3) H.S. Jung, H.Z. Tsai, D. Wong, C. Germany, S. Kahn, Y. Kim, A. S. Aikawa, D. Desai, G. F. Rodgers, A. J. Bradley, **J. Velasco Jr.**, K. Watanabe, T. Taniguchi, F. Wang, A. Zettl, M. F. Crommie, "Fabrication of Gate-tunable Graphene Devices for Scanning Tunneling Microscopy Studies with Coulomb Impurities", Journal of Visual Experiments (101), e52711 (2015)
- 4) L. Ju, Z. Shi, N. Nair, Y. Lv, C. Jin, **J. Velasco Jr.**, C. Ojeda-Aristizabal, H. Bechtel, M. Martin, A. Zettl, J. Analytis, F. Wang, "Topological Valley Transport at Bilayer Graphene Domain Walls", Nature 520, 650-655 (2015)
- 5) Y. Lee, D. Tran, K. Myhro, **J. Velasco Jr.**, N. Gillgren, C. N. Lau, Y. Barlas, J.M. Pomirol, D. Smirnov, F. Guinea, "Competition between spontaneous symmetry breaking and single-particle gaps in trilayer graphene" Nature Communications 5, Article number: 5656 (2014)

6) **J. Velasco Jr.***, Y. Lee*, F. Zhang*, K. Myhro, D. Tran, M. Deo, D. Smirnov, A. H. MacDonald, C. N. Lau, “Competing Ordered Filling Factor Two States in Bilayer Graphene”, Nature Communications 5, Article number :4550 (2014)

*These authors contributed equally to this work

7) L. Ju*, **J. Velasco Jr.***, E. Huang, S. Kahn, C. Nosiola, Hsin-Zon Tsai, W. Yang, T. Taniguchi, K. Watanabe, Y. Zhang, G. Zhang, M. Crommie, A. Zettl, F. Wang, “Photo-induced Doping in Graphene/Boron Nitride Heterostructures”, Nature Nanotechnology 9, 348–352 (2014)

*These authors contributed equally to this work

8) **J. Velasco Jr.**, Y. Lee, Z. Zhao, L. Jing, P. Kratz, M. Bockrath, C. N. Lau, “Transport Measurement of Landau Level Gaps in Bilayer Graphene with Layer Polarization”, Nano Letters Vol. 14, 1324 (2014)

9) H. Zhang†, J.W. Huang†, **J. Velasco Jr.**, K. Myhro, M. Maldonado, D. Tran, Z. Zhao, F. Wang, Y. Lee, G. Liu, W. Bao, C. N. Lau, “Transport in Suspended Monolayer and Bilayer Graphene Under Strain: A New Platform for Material Studies”, Carbon Volume 69, 336–341 (2014)

†These authors contributed equally to this work

10) Y. Lee, **J. Velasco Jr.**, D. Tran, F. Zhang, W. Bao, L. Jing, K. Myhro, D. Smirnov, C.N. Lau, “Broken Symmetry Quantum Hall States in Dual Gated ABA Trilayer Graphene”, Nano Letters Vol. 4, 1627 (2013)

11) **J. Velasco Jr.**, L. Jing, Y. Lee, P. Kratz, W. Bao, D. Smirnov, M. Bockrath and C.N. Lau, “Transport measurements on ultra-clean dual-gated suspended bilayer graphene”, European Physics Journal Web of Conferences 23, 00018 (2012)

12) C.N. Lau, W. Bao, **J. Velasco Jr.**, “Properties of Suspended Graphene Membranes” Materials Today 15, 238-245 (2012)

13) **J. Velasco Jr.**, Y. Lee, L. Jing, G. Liu, W. Bao, and C. N. Lau, “Quantum Transport in Double-gated Graphene Devices”, Solid State Communications 152, 1301 (2012)

14) W.Bao‡, **J. Velasco Jr.** ‡, F. Zhang‡, L. Jing, B. Standley, D. Smirnov, M. Bockrath, A. MacDonald, C.N. Lau, “Evidence for a Spontaneous Gapped State in Ultra-Clean Bilayer Graphene” Proc. Nat. Acad. Sci. 109, 10802 (2012)

‡These authors contributed equally to this work.

15) **J. Velasco Jr.**, L. Jing, W. Bao, Y. Lee, P. Kratz, V. Aji, M. Bockrath, C.N. Lau, C. Varma, R. Stillwell, D. Smirnov, F. Zhang, J. Jung, A.H. MacDonald, “Transport Spectroscopy of Symmetry-Broken Insulating States in Bilayer Graphene” Nature Nanotechnology 7, 156–160 (2012)

Highlighted by International Journal Club for Condensed Matter Physics

Highlighted by American Chemical Society

16) W. Bao, L. Jing, **J. Velasco Jr.**, Y. Lee, D. Tran, B. Standley, M. Aykol, S. B. Cronin, D. Smirnov, M. Koshino, E. McCann, M. Bockrath, C. N. Lau. “Stacking-dependent band gap and transport in trilayer graphene” *Nature Physics* 7, 948–952 (2011)

17) **J. Velasco Jr.**, Z. Zhao, H. Zhang, F. Wang, Z. Wang, P. Kratz, L. Jing, W. Bao, J. Shi and C. N. Lau, “Suspension and Measurement of Graphene and Bi₂Se₃ Thin Crystals” *Nanotechnology* 22, 285305 (2011)- Selected for cover

18) W. Bao, Z. Zhao, H. Zhang, G. Liu, P. Kratz, L. Jing, **J. Velasco Jr.**, D. Smirnov, C. N. Lau, "Magnetoconductance Oscillations in High-Mobility Suspended Bilayer and Trilayer Graphene" *Phys. Rev. Lett.* 105, 246601 (2010)

19) L. Jing, ‡ **J. Velasco Jr.**, ‡ P. Kratz, G. Liu, W. Bao, M. Bockrath, and C. N. Lau, “Quantum Transport and Field-Induced Insulating States in Bilayer Graphene *pnp* Junctions” *Nano Letters* Vol.10, 4000 (2010)

‡These authors contributed equally to this work.

20) **J. Velasco Jr.**, G. Liu, L. Jing, P. Kratz, H. Zhang, W.Z. Bao, M. Bockrath, C.N. Lau, “Probing charging and localization in the quantum Hall regime by graphene *pnp* junctions”, *Phys. Rev. B(R)* 81, 121407 (2010) – Selected for Rapid Communications and Editor’s choice

21) **J. Velasco Jr.** and G. Liu, W. Bao and C. N. Lau, “Electrical Transport in High Quality Graphene *pnp* Junctions” *New J. Phys.* 11, 095008 (2009)

22) M.L. Teague, A.P. Lai, **J.Velasco**, C.R. Hughes, A.D. Beyer, M.W. Bockrath, C.N. Lau, N.-C. Yeh, “Evidence for Strain-Induced Local Conductance Modulations in Single-Layer Graphene on SiO₂” *Nano Letters* Vol. 9, 2542 (2009)

23) G. Liu, **J. Velasco Jr.**, W. Bao and C. N. Lau, “Fabrication of Graphene *pnp* Junctions with Contactless Top Gates” *Appl. Phys. Lett.*, 92, 203103 (2008)

PREPRINTS:

1) Y. Lee, D. Tran, K. Myhro, **J. Velasco Jr.**, N. Gillgren, J.M. Poumirol, Y. Barlas, D. Smirnov, C. N. Lau, “Symmetry-Broken Quantum Hall States and Landau Level Crossing in Rhombohedral Trilayer Graphene” Submitted, arXiv:1406.3132

MENTORSHIP/ TEACHING/ SERVICE:

- At UC Berkeley mentored three graduate students; Long Ju, Dillon Wong and Juwon Lee. This involved teaching electrical measurements of nanoscale devices based on layered two dimensional materials and manuscript preparation.

- At UC Riverside mentored three graduate students; Lei Jing, Zhao Zheng and Yongjin Lee. This involved teaching cleanroom fabrication techniques, low temperature (230mK) ultra-sensitive electrical measurements of graphene-based nanostructures, and manuscript preparation.
- Mentored three undergraduate students: Philip Kratz, now a graduate student in physics at Stanford University, Chad Germany now a graduate student in physics at UI Urbana-Champaign, Salman Kahn a physics undergraduate student at UC Berkeley.
- Taught *Electromagnetics Laboratory* at UC Riverside, 2006-7.
- Assistant to Teaching Assistant, *Electromagnetics Laboratory* at Syracuse University, Fall 2004.
- Refereed manuscripts for Nature Communications, Applied Physics Letters, ACS Nano, Solid State Communications, Nano Letters and Physical Review B.

PRESENTATIONS:

INVITED TALKS:

Strongly interacting electrons and novel electronics in graphene-based transistors
Departmental Colloquium
Department of Physics, University of Tennessee at Knoxville, March 2015

Strongly interacting electrons and novel electronics in graphene-based transistors
Departmental Colloquium
Department of Physics, University of Iowa, March 2015

Strongly interacting electrons and novel electronics in graphene-based transistors
Departmental Colloquium
Department of Physics, University of California at Merced, February 2015

Visualization of photo-induced doping in heterostructures of graphene and boron nitride
Condensed matter seminar
Department of Physics and Astronomy, University of California at Riverside, February 2015

Strongly interacting electrons and novel electronics in graphene-based transistors
Departmental Colloquium
Department of Physics, University of Texas at Dallas, February 2015

Strongly interacting electrons and novel electronics in graphene-based transistors
Departmental Colloquium
Department of Physics, City University of New York, February 2015

Strongly interacting electrons and novel electronics in graphene-based transistors
Departmental Colloquium
Department of Physics, University of New Hampshire, February 2015

Strongly interacting electrons and novel electronics in graphene-based transistors
Departmental Colloquium
Department of Physics, University of California at Santa Cruz, January 2015

Photo-induced doping in heterostructures of graphene and boron nitride
Center for Nanoscale Materials seminar
Argonne National Labs, Argonne IL, October 2014

Photo-induced doping in heterostructures of graphene and boron nitride
Experimental techniques and physics in graphene research
Universidad de los Andes, Bogota Colombia, August 2014

Photo-induced doping in heterostructures of graphene and boron nitride
Condensed matter seminar
Department of Physics and Astronomy, University of Oregon, June 2014

Photo-induced doping in heterostructures of graphene and boron nitride
Condensed matter seminar
Department of Physics and Astronomy, University of California at Davis, June 2014

Photo-induced doping in heterostructures of graphene and boron nitride
Condensed matter seminar
Department of Physics and Astronomy, University of California at Riverside, June 2014

Photo-induced doping in heterostructures of graphene and boron nitride
Academic Retreat for the President's and Chancellors' Postdoctoral Fellows
Lake Arrowhead California, April 2014

Electrical properties of monolayer and bilayer graphene
Joint colloquium for departments of Physics and Electrical Engineering
Universidad Tecnologica, Pereira Colombia, October 2013

Interaction-induced gapped state in charge neutral bilayer graphene
American Physical Society March Meeting
Baltimore Maryland, March 2013

Interaction-induced gapped state in charge neutral bilayer graphene
International Winter School on Electronic Properties of Novel Materials
Kirchberg in Triol Austria, March 2013

Investigation of correlated electron phenomena in ultra-clean bilayer graphene
Academic Retreat for the President's and Chancellors' Postdoctoral Fellows
Lake Arrowhead California, October 2012

Transport Spectroscopy of Symmetry Broken Insulating States in Bilayer Graphene
Condensed matter seminar
National High Magnetic Field Laboratory, Tallahassee Florida, April 2012

2>1: Electrical properties of monolayer and bilayer graphene
Departmental Colloquium
Department of Physics and Astronomy, California State University at Los Angeles,
April 2012

Transport Spectroscopy of Symmetry Broken Insulating States in Bilayer Graphene
Adrian Bachtold group seminar
Institut Català de Nanotecnologia, Barcelona Spain, March 2012

Transport Spectroscopy of Symmetry Broken Insulating States in Bilayer Graphene
Philip Kim group seminar
Department of Physics, Columbia University, New York City New York, March 2012

Transport Spectroscopy of Symmetry Broken Insulating States in Bilayer Graphene
Fundamental Aspects of Graphene and Other Carbon Allotropes
The Kavli Institute for Theoretical Physics, Santa Barbara California, January 2012

CONTRIBUTED TALKS AND POSTERS:

Visualization of photo-induced doping in heterostructures of graphene and boron nitride
American Physical Society March Meeting, talk
San Antonio Texas, March 2015

Photo-induced doping in heterostructures of graphene and boron nitride
American Vacuum Society, talk
Baltimore Maryland, November 2014

Photo-induced doping in heterostructures of graphene and boron nitride
American Physical Society March Meeting, talk
Denver Colorado, March 2014

Bias Spectroscopy Measurements of Quantum Hall States in Bilayer Graphene
Materials Research Society Spring Meeting, talk
San Francisco California, April 2013

Transport Spectroscopy of Symmetry Broken Insulating States in Bilayer Graphene
American Physical Society March Meeting, talk
Boston Massachusetts, March 2012

Transport Spectroscopy of Symmetry Broken Insulating States in Bilayer Graphene
Electronic Properties of Two Dimensional Systems 19, talk
Tallahassee Florida, July 2011

Transport Measurements of Double-Gated Suspended Graphene
IMAGINENANO Graphene 2011, poster presentation
Bilbao Spain, March 2011

Dual Gating of Suspended Graphene Devices via Contactless gates
American Physical Society March Meeting, talk
Dallas Texas, March 2011

Single layer and bilayer graphene pnp junctions
Gordon Research Conference on Correlated Electron Systems, poster presentation
Mount Holyoke College, South Hadley Massachusetts, June 2010

Probing Charging and Localization in the Quantum Hall Regime by Graphene pnp Junctions
Graphene Week, poster presentation
University of Maryland College Park, April 2010

Conductance Fluctuations in the Quantum Hall Regime by Graphene pnp Junctions
American Physical Society March Meeting, talk
Portland Oregon, March 2010

Quantum Transport in Graphene pnp Junctions with Contactless Gates
American Physical Society March Meeting, talk
Pittsburgh Pennsylvania, March 2009

Local Gating of Graphene Devices via Contactless Top gates
Graphene Week, poster presentation
International Center for Theoretical Physics, Trieste Italy, August 2008

Local Gating of Graphene Devices via Contactless Top gates
American Physical Society March Meeting, talk
New Orleans Louisiana, March 2008

Magnetic Decoration an Imaging Technique for Type II Superconductors
Mayfest: Undergraduate Research Symposium, poster presentation
Syracuse University, Syracuse New York, May 2005