

# Mayra Peralta | CV

Date of birth: August 9th of 1984. Caracas, Venezuela.

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## Current position and address

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### Lecturer/Researcher

Study of graphene based two dimensional systems: Proximity effects in graphene/transition metals systems, transport properties, analytical modeling using tight-binding, design of experiments for studying samples of graphene/transition and alkali metals. Lecturer  
School of Physical Sciences and Nanotechnology,  
Yachay Tech University  
San Miguel de Urucuquí, Ecuador.

## Education

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### Ph.D. in Physics

*September 2007 - July 2014*

**Physics Center, Venezuelan Institute for Scientific Research. Miranda, Venezuela**

**Thesis:** Design and optimization of electromagnetic micro-generators for energy harvesting applications. **Adviser:** Prof. Dr. Ernesto Medina Dagger.

**GPA of 4.00/4.00**

**Licentiate in Physics  
(5-year undergraduate degree)**

*September 2001 - July 2007*

**Central University of Venezuela. Caracas, Venezuela**

**Thesis:** Quantitative analysis of thin films using EPMA-EDX. **Adviser:** Prof. Dr. Carlos Rojas

**Second place on the ranking of the class, out of nine. GPA of 3.28/4.00**

## Research Experience

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### Postdoctoral Researcher

*October 2016 - October 2017*

**Center of Nanoscience and Nanotechnology - National Autonomous University of México (CNyN-UNAM). Ensenada, Mexico**

Study of proximity effects produced by transition metals adsorbed on graphene's magnetic properties and quantum capacitance.

### Research Associate

*September 2013 - December 2016*

**Physics Center, Venezuelan Institute for Scientific Research. Miranda, Venezuela**

Study of proximity effects in graphene based systems. Analysis, development and characterization of micro and nano-systems for energy generation, sensing and actuation.

### Graduate Student

*September 2007 - September 2013*

**Physics Center, Venezuelan Institute for Scientific Research. Miranda, Venezuela**

Analysis, development and characterization of micro-electromagnetic generators for energy harvesting applications.

## Languages

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English: Fluent; Portuguese: Intermediate level; Spanish: Native language.

## Publications

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1. **Mayra Peralta**, Ernesto Medina, and Francisco Mireles. “**A Multiband Tight-Binding Model for Explaining the Rashba+Exchange effect in Graphene/Au/Co and Graphene/Co**”. In writing process.
2. **Alejandro López**, Luis Comenanez, Mayra Peralta, Francisco Mireles, and Ernesto Medina. “**Proximity induced spin-orbit effects in graphene on Au**”. In writing process.
3. **Mayra Peralta**, Arnaud Meyroneinc, and Iván Sanchez. “**Modelling vibrational energy harvesting by induction at MEMS scales for power factor optimization**”. In writing process.
4. **Mayra Peralta**, Luis Comenanez, Alejandro López, Bertrad Berche, and Ernesto Medina. “**Ferromagnetic order induced on graphene by Ni/Co proximity effects**”. *Physical Review B* 94, 235407 (2016).
5. **Mayra Peralta**, Jose Luis Costa Krämer, Ernesto Medina and Arnaldo Donoso. “**Analysis and fabrication steps for a 3D-pyramidal high density coil electromagnetic micro-generator for energy harvesting applications**”. *Sensors and Actuators A: Physical*, v. 205, (2014), 103-110.
6. Olgui Alcalá, Alexander Briceño, Edgar Cañizales, **Mayra Peralta**, Werner Bramer, Pedro Silva. “**Magnetic and Structural Characterization of Nanostructured Hollow Spheres Cobalt, Zinc, Manganese and Nickel Ferrites, Synthesized by the Hydrothermal Method**”. *Acta Microscópica*, v. 22, No. 1 (2013).
7. **Mayra Peralta**, Ernesto Medina, Jose Luis Costa Krämer, Raquel Alvaro and Arnaldo Donoso. “**Thermodynamics of small electromagnetic generators, an experimental perspective**”. *Journal of Physical Studies*, v. 13, No. 4 (2009) 4008 (6 p.).

## Projects

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- **Spin Transport and Topological Effects on Silicene**: October 2017 - to present. Program of Support to Research Projects (PAPIIT - UNAM - México). Participant.
- **Proximity Effects on Graphene with Metallic Adatoms**: January 2016 - to present. Venezuelan Institute of Scientific Research (IVIC - Venezuela), Center of Nanoscience and Nanotechnology - National Autonomous University of Mexico (CNyN-UNAM), Ensenada - Baja California, Mexico. Participant.
- **Study of the Effects of Adatoms on the Quantum Capacitance of Graphene with Applications on Energy Saving**: October 2016 - October 2017. National Council of Science and Technology (CONACYT - México). Participant.
- **Micro-electromechanical Energy Harvesters**: September 2012 - September 2015. National Fund of Science and Technology (FONACYT - Venezuela). Participant.

## Supervision of undergraduate thesis

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- **Lenin Guerrero**: July 2018 - to present. School of Physical Sciences and Nanotechnology, Yachay Tech University. **Porous Carbon Fibers doped with ZnO, Hydroxyapatite or Titania nanostructured systems for biosensor applications**. Co-Advisor.
- **Marlon Jerez**: July 2018 - to present. School of Physical Sciences and Nanotechnology, Yachay Tech University. **Biosensors based on carbon nanotubes functionalized with nanoparticles**. Co-Advisor.
- **Eduardo Martínez Fircgau**: November 2014 - July of 2015. Electronic Engineering, Simón Bolívar University (USB). Thesis developed in a collaboration (IVIC - USB). **Design, development and mechanical and electrical characterization of an electromagnetic generator and design of its rectifier-amplifier circuit**. Co-Advising.

## Teaching experience

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- Lecturer. Oscillations Electricity and Magnetism, Solid State Physics. School of Physical Sciences and Nanotechnology, Yachay Tech University, Urcuquí Ecuador. November 2017 to present.
- Lecturer. Thesis Project. Centro de Investigación Científica y Educación Superior de Ensenada, Baja California (CICESE-UNAM-CNyN). April - August of 2017.
- Teaching Assistant. Statistical Mechanics PhD course. Prof. Dr Ernesto Medina Dagger. Venezuelan Institute for Scientific Research. March - June of 2011.
- Advisor of summer internships for high school students. “*Juventud Científica*” program. Venezuelan Institute for Scientific Research. August - September of 2009 and 2010.
- Undergrad Teaching Assistant. Lab of Physics Demonstrations (mechanics, electricity, waves and optics). For 1st to 5th semester undergrad students of Physics, Chemistry and Biology. Central University of Venezuela. Physics department. September 2005 - July 2007.
- Undergrad Teaching Assistant. Physics Lab I and II (mechanics, electricity and optics). For 3th and 4th semester undergrad students of Physics and Chemistry. Central University of Venezuela. Physics department. September 2003 - July 2005.

## Short term research stays

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Center of Nanoscience and Nanotechnology - National Autonomous University of Mexico (CNyN-UNAM), Ensenada - Baja California, Mexico. Contact: Dr. Francisco Mireles Higuera.

- **May 30th 2018 - June 27th 2018.** Effects of metallic and ferromagnetic interfaces on 2d materials. Electronic properties of graphene on Co and Au. Modeling and analysis of these systems using Tight-Binding.

Madrid Microelectronics Institute, Tres Cantos, Spain. Advisor: Dr. José Luis Costa Krämer.

- **September 18th 2012 - October 29th 2012.** Fabrication and characterization of micro and nano coils, cantilevers, membranes, and magnets for the construction of micro-electromagnetic generators.
- **November 5th 2011 - January 27th 2012.** Fabrication and characterization of micro and nano coils, cantilevers, membranes, and magnets for the construction of micro-electromagnetic generators.
- **October 16th 2010 - January 13th 2011.** Fabrication of micro-coils and micro-cantilevers.
- **September 14th - October 15th 2009.** Micro and nano coil fabrication by 3D e-beam lithography technique.
- **September 07th - October 06th 2008.** Learning and Actualization of micro-fabrication techniques (Dry and wet etching, thin film deposition, and optical and e-beam lithography).

## Skills:

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- **Theoretical modeling:** Tight-Binding modeling and bands structures calculations of 2D systems like graphene and graphene/transition metals.
- **Micro and nano-fabrication techniques under clean room conditions:** optical, colloidal and e-beam lithography (2D and 3D), plasma and wet etching, thin film deposition techniques like thermal and e-beam evaporation, and rf and dc sputtering.
- **Morphology and composition characterization techniques:** optical microscopy, scanning electron microscopy, energy dispersive and wavelength dispersive x-ray spectroscopy, AFM and STM.
- **Computational skills:** system modeling with finite elements method (COMSOL Multiphysics), data and signal analysis with Matlab, Labview and Mathematica.
- **Scientific writing for publications and projects:** writing of all the drafts of my first author publications, and active participation in the writing of scientific projects.

## Research interests:

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- **Quantum Systems:** for the study of proximity effects in graphene and quantum transport phenomena.
- **MEMS and NEMS:** specifically in the study and development of micro and nano systems with applications like sensing, energy generation, and quantum information.
- **New Materials:** in order to study their microscopic properties and their integration to new generations of MEMS and NEMS.

## Awards and fellowships

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- CONACYT-SENER Postdoctoral Fellowship. Awarded by the Mexican Science and Technology Council and the Energy Secretaryship. October 2016 - October 2017, Ensenada B.C., Mexico.
- Paola Carpi Prize. Venezuelan Institute for Scientific Research. For the outstanding academic performance during the PhD studies in physics. March 20th 2015, Miranda-Venezuela.
- Award in the international contest of scientific images "nanoArte" in the category of material science. November 30th 2014, Caracas-Venezuela.
- Level A, Researcher Encouragement Program (PEI). September 2011 until now, Venezuela.
- First place award in the contest of scientific images organized by the Venezuelan Society of Microscopy and Microanalysis, in the category of electronic microscopy. July 27th 2012, Falcón-Venezuela.
- Excellence Fellow. Venezuelan Institute for Scientific Research. Given to PhD students with outstanding academic performance. March 2008 - September 2012, Venezuela.
- High Academic Performance Award. Central University of Venezuela. For the high academic performance during the realization of the Bachelor studies in physics. June 2007, Caracas-Venezuela.
- Gran Mariscal de Ayacucho Fellow. January 2003 - July 2007, Venezuela.

## Workshops and Conferences

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### Conferences

- Ciclo de Conferencias del CNyN. Center of Nanoscience and Nanotechnology - National Autonomous University of Mexico (CNyN - UNAM) Ensenada, Baja California-Mexico. October 11th 2017. "**Conos de Dirac Intactos y Desdoblamiento Rashba Gigante en Sistemas de Grafeno sobre Metales de Transicin**".
- Ciclo de Seminarios del Grupo de Física Teórica. Center of Nanoscience and Nanotechnology - National Autonomous University of Mexico (CNyN - UNAM) Ensenada, Baja California-Mexico. September 21th 2017. "**Conos de Dirac intactos en sistemas de grafeno sobre metales de transicin**".
- Ciclo de Seminarios del Grupo de Física Teórica. Center of Nanoscience and Nanotechnology - National Autonomous University of Mexico (CNyN - UNAM) Ensenada, Baja California-Mexico. November 10th 2016. "**Orden ferromagnético inducido en grafeno por efectos de proximidad con Ni/Co**".

### Oral Contributions

- The Nanoscience Summer School @ Yachay 2018. School of Physical Sciences and Nanotechnology, Yachay Tech University, Hacienda San José, Urcuquí, Imbabura-Ecuador. July 30th - August 3rd 2018. "**A Multiband Tight-Binding Model for Explaining the Rashba+Exchange Effect in Graphene/Au/Co(0001) and Graphene/Co(0001)**".
- IV Nanoscience and Nanomaterials Symposium. CNyN-UNAM Ensenada, Baja California-Mexico. April 23th - 27th 2018. "**A Multiband Tight-Binding Model for Intact Dirac Cones in Graphene on Ni and Co**".

- III Nanoscience and Nanomaterials Symposium. CNyN-UNAM Ensenada, Baja California-Mexico. June 13th - 16th 2017. **“Proximity effects and quantum capacitance on graphene over transition metals”**.
- VIII Congress of the Venezuelan Physical Society. Morrocoy-Tucacas, Falcón, Venezuela. December 1st - 5th 2014. **“Micro-recyclers of energy with electromagnetic principle: Design and characterization of the environmental mechanical noise”**.
- VII Congress of the Venezuelan Physical Society. UCV, Caracas, Venezuela. December 7th - 11th 2009. **“Analysis and Fabrication of Micro-Electromagnetic Actuators”**.

#### Poster Presentations

- Congress Frontiers in Physical Sciences. Buenos Aires, Argentina. November 14th - 18th 2016. **“Ferromagnetic order induced on graphene by Ni/Co proximity effects”**.
- 4th congress CYTVEN, Science and Technology in Venezuela. Caracas, Venezuela. November 4th - 6th 2015. **“Electromagnetic micro transducers for energy harvesting: Mechanical vibrations sources characterization”**.
- Regional Workshop of the Venezuelan Network of Nanotechnology. Caracas, Venezuela. June 6th - 7th 2013. Poster presentation: **“A Three dimensional e-beam lithography technique for the construction of high density micro and nanocoils”**.
- Trends in Nanotechnology (TNT) 2012. Madrid, Spain. September 10th - 14th 2012. **“A Three dimensional e-beam lithography technique for the construction of high density micro and nanocoils”**.
- Franco-Venezuelan School of Nanotechnology. Choroní, Miranda, Venezuela. November 2nd - 6th 2009. **“Development of a Micro-Electromagnetic Generator”**.
- VI Congress of the Venezuelan Physical Society. ULA, Mérida, Venezuela. March 2nd - 9th 2008. **“Quantitative analysis of thin films using EPMA-EDX”**.

#### Attendance to Workshops and Schools

- Introduction to Python and Density Functional Hacking Workshop. School of Physical Sciences and Nanotechnology, Yachay Tech University, Hacienda San José, Urcuquí, Imbabura-Ecuador. August 8th - August 14th 2018.
- Workshop of Introduction to Topological Quantum Theory. Center of Nanoscience and Nanotechnology - National Autonomous University of Mexico (CNyN - UNAM) Ensenada, Baja California-Mexico. April 23th - 27th 2018.
- Workshop: Research Grants and Internationalization. Yachay Tech University, Hacienda San José, Urcuquí, Imbabura-Ecuador. December 19th 2017 - January 12th 2018.
- Group Theory and its Applications to Raman Spectroscopy. UCV, Caracas Venezuela. June 30th-July 2nd 2009.
- Workshop of Nanoscience and Nanotechnology. IVIC, Caracas, Venezuela. May 4th - 21st 2009.
- Workshop/school on Spin Manipulation and Spin-Orbit Coupling: Semiconductors and Superconductors. Choroní, Miranda, Venezuela. November 17th - 20th 2008.
- 2nd Topical School on Open Quantum Systems. Université Nancy 1, Nancy, France. July 1st - 15th 2008.

#### Relevant PhD courses:

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- **Quantum Mechanics:** by Dr. Ernesto Medina, IVIC, Miranda, Venezuela.
  - **Advanced Quantum Mechanics:** by Dr. Ernesto Medina, IVIC, Miranda, Venezuela.
  - **Solid State Physics:** by Dr. Ernesto Medina, IVIC, Miranda, Venezuela.
  - **Information Theory, Entanglement and Decoherence of Charge and Spin in Solids:** by Dr. Ernesto Medina, IVIC, Miranda, Venezuela.

- **Methods of Fabrication of Nano-Materials:** by Dr. Carlos Rojas, UCV, Caracas, Venezuela.
- **Statistical Mechanics:** by Dr. Ernesto Medina, IVIC, Miranda, Venezuela.
- **Critical Phenomena and Phase Transitions:** by Dr. Ernesto Medina, IVIC, Miranda, Venezuela.
- **Mesoscopic Physics of Mechanical Systems:** by Dr. Ernesto Medina, IVIC, Miranda, Venezuela.
- **Electromagnetism:** by Dr. Rodrigo Medina, IVIC, Miranda, Venezuela.
- **Electronic Paramagnetic Resonance:** by Dr. Pedro Silva, IVIC, Miranda, Venezuela.

## References

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- Dr. Francisco Mireles: Researcher at the Theoretical Physics Group of the Center of Nanoscience and Nanotechnology (CNyN-UNAM), Apdo. 14, Ensenada, Baja California 22800, México. Telephone number: +52 646 1750 650 Ext. 356, email: fmireles@cnyn.unam.mx, webpage: <http://www.cnyn.unam.mx> . **Dr. Mireles was my postdoc supervisor, and is my current collaborator in a project about the study of transport properties in 2D materials.**
- Dr. Manuel Herrera: Researcher at the Theoretical Physics Group of the Center of Nanoscience and Nanotechnology (CNyN-UNAM), Apdo. 14, Ensenada, Baja California 22800, México. Telephone number: +52 646 1750 650 Ext. 363, email: zaldivar@cnyn.unam.mx , webpage: <http://www.cnyn.unam.mx> . **I worked with Dr. Herrera during my postdoc, and is my current collaborator in a project about about the study of transport properties in 2D materials.**
- Dr. Ernesto Medina Dagger: Researcher in Physics at Yachay Tech Ecuador and at the Instituto Venezolano de Investigaciones Científicas, Apdo 21827 Caracas 1020A, Venezuela. Telephone number: +58 414 015 2305, +58 212 504 1390, Fax: +58 212 504 1148, email: ernestomed@gmail.com, webpage: <https://sites.google.com/site/ernestomed/>. **Dr. Medina was my Ph.D. advisor and I am working with him in a collaboration project about proximity effects on graphene.**
- Dr. Arnaud Meyroneinc: Associate Researcher at the Instituto Venezolano de Investigaciones Científicas, Apdo 21827 Caracas 1020A, Venezuela. Telephone number: +58 414 917 7281, email: ameyroneinc@gmail.com, ameyrone@ivic.gob.ve, webpage: <http://www.ivic.gob.ve/matematicas/?mod=investigadores.php>. **I worked in collaboration with Dr. Meyroneinc in the subject of analysis and control of micro-transducers powered by mechanical noise.**
- Dr. José Luis Costa Krämer: Senior Researcher at the Instituto de Microelectrónica de Madrid, 28760 Tres Cantos, Madrid, Spain. Telephone number: +34 918 060 700, Fax: +34 918 060 701, email: kramer@imm.cnm.csic.es, webpage: <http://www.imm.cnm.csic.es/eprincip.htm>. **I worked with Dr. Costa Krämer on the development of micro systems for energy harvesting, during my research stays at the Madrid Microelectronics Institute.**