Guillermo Fernández Moroni

CURRENT POSITION

I am currently a Research Associate in Fermilab National Accelerator Laboratory. I dedicate most of my effort to the SENSEI experiment, a direct Light Dark Matter search using Skipper CCD sensors. I'm also have major role in the CONNIE experiment to measure low energy neutrino interaction in a nuclear reactor using CCDs. Moreover, I'm involved in the DAMIC experiment, a direct search for GeV-mass Dark Matter using standard CCDs.

EDUCATION

My undergraduate and graduate education took place at the National University of the South of Bahia Blanca (UNS), Argentina. My undergraduate studies were in electrical engineering, while my graduate studies were in physics.

- Ph. D. in Engineering: "Detection of the Coherent Neutrino-Nucleus Interaction using CCDs". Directed by Prof. Eduardo E. Paolini (UNS) and Dr. Juan C. Estrada Vigil (Fermilab). Universidad Nacional del Sur.
- B. S. in Electrical Engineering: "Low noise CCD readout" Directed by Prof. Eduardo E. Paolini. Universidad Nacional del Sur.

GRANTS

- Co-PI Fermilab LDRD project: "Skipper CCDs for Cosmic Surveys". Granted by Fermilab in 2019.
- PI PICT-2016-4628 grant: "Development of a high sensitivity controller controller for CCD" Granted by Agencia Nacional de Promoción Científica y Tecnológica (ANPCyT) in Argentina, in 2017.
- PI PICT-2014-1225 grant: "Neutrino Detection using CCDs". Granted by Agencia Nacional de Promoción Científica y Tecnológica (ANPCyT) in Argentina, in 2014.
- Co-PI PGI-UNS 24/K055 grant: "Noise and distortion reduction of electronic systems". Granted by Universidad Nacional del Sur, in 2012.

INVITED TALKS

- "Low-Mass DM Direct Detection", plenary presentation in 29th International Meeting on Lepton Photon Interactions, to be presented in August 2019.
- "Results from the SENSEI Dark Matter Search", Wine and Cheese Seminar, Fermi National Accelerator Laboratory, IL, United States of America., 2019.
- "Dark matter and neutrino direct detection using CCDs", seminar in University of Minnesota, MN, U. S., 2018.

- "The SENSEI experiment", seminar in University of Oregon, Eugene, May 2018.
- "Charge coupled devices for detection of coherent neutrino-nucleus scattering", seminar in Universidade Federal de Rio de Janeiro, Rio de Janeiro, Brazil, 2015.
- "New frontiers for scientific CCDs", seminar in Centro Atómico Bariloche, San Carlos de Bariloche, Argentina, 2011.

SELECTED PUBLICATIONS IN REFEREED JOURNALS

- Abramoff, O; Barak, L;. Bloch, I; Chaplinsky, L.; Crisler, M.; Dawa; Drlica-Wagner, A.; Essig, R.; Estrada, J.; Etzion, E.; Fernandez Moroni, G.; Gift, D.; Taenzer, J.; Tiffenberg, J.; Sofo Haro, M.; Volansky, T.; Yu, T.:"SENSEI: Direct-Detection Constraints on Sub-GeV Dark Matter from a Shallow Underground Run Using a Prototype", Accepted for publication (arXiv:1901.10478) in *Phys. Rev. Lett.*, 2019.
- Crisler, M.;Essig, R.; Estrada, J. ;Fernandez Moroni, G.; Tiffenberg, J.; Sofo Haro, M.; Volansky, T.; Tien-Tien, Y.; "SENSEI: First Direct-Detection Constraints on Sub-GeV Dark Matter from a Surface Run", *Phys. Rev. Lett*. Vol 121, Issue 6, Page 061803, 2018.
- Aguilar-Arevalo, A.; Amidei, D.; Bertou, X.; Butner, M.; Cancelo, G.; Castañeda Vazquez, A.; Chavarria, A.E.; Chavez, C. R.; Mello Neto, J.; D'Olivo, J. C.;Estrada, J.; Fernández Moroni, G.; Gaïor, R.; Guardincerri, Y.; Hernández Torres, K.P.;Izraelevitch, F.; Kavner, A.; Kilminster, B.; Lawson, I.; Liao, J.; Matalon, A.; Mello, V.B.B.; Molina, J.; Privitera, P.;Ramanathan, K.; Sarkis, Y.; Schwarz, T.; Settimo, M.; Sofo Haro, M.; Thomas, R.;Tiffenberg, J.; Tiouchichine, E.; Torres Machado, D.; Trillaud, F.; You, X. and Zhou, J.: "First Direct-Detection Constraints on eV-Scale Hidden-Photon Dark Matter with DAMIC at SNOLAB", *Phys. Rev. Lett.*, Volume 118, Issue 14, Page 141803, 2017.
- Izraelevitch, F.; Amidei, D.; Aprahamian, A.; Arcos-Olalla, R.; Cancelo, G.; Casarella, C.; Chavarria, A. E.; Collon, P.; Estrada, J.; Fernandez Moroni, G.; Guardincerri, Y.; Gutierrez, G.; Gyurjinyan, A.; Kavner, A.; Kilminster, B.; Liao, J.; Liu, Q.; Lopez, M.; Molina, J.; Privitera, P.; Reyes, M. A.; Scarpine, V.; Siegl, K.; Smith, M.; Strauss, S.; Tan, W.; Tiffenberg, J.; Villanueva, L.: "A measurement of the ionization efficiency of nuclear recoils in silicon", *Journal of Instrumentation*, Volume 12, Page P06014--P06014 , June 2017.
- Aguilar-Arevalo, A.; Amidei, D.; Bertou, X.; Butner, M.; Cancelo, G.; Castañeda Vazquez, A.; Chavarria, A.E.; Chavez, C. R.; Mello Neto, J.; D'Olivo, J. C.;Estrada, J.; Fernández Moroni, G.; Gaïor, R.; Guardincerri, Y.; Hernández Torres, K.P.;Izraelevitch, F.; Kavner, A.; Kilminster, B.; Lawson, I.; Liao, J.; Matalon, A.;Mello, V.B.B.; Molina, J.; Privitera, P.;Ramanathan, K.; Sarkis, Y.; Schwarz, T.; Settimo, M.; Sofo Haro, M.; Thomas, R.;Tiffenberg, J.; Tiouchichine, E.; Torres Machado, D.; Trillaud, F.; You, X. and Zhou, J.: "Search for low-mass WIMPs in a 0.6 kg day exposure of the DAMIC experiment at SNOLAB", *Physical Review D*, Volume D94, Issue 8, Page 082006, 2016.
- Aguilar-Arevalo, A. ; Bertou, X.; Bonifazi, C.; Butner, M.; Cancelo, G.; Castañeda **Vázquez,** A.; Cervantes Vergara, B.; Chavez, C.R.; Da Motta, H.; D'Olivo, J.C.; Dos Anjos, J.; Estrada, J.; Fernández Moroni, G.; Ford, R.; Foguel, A.; Hernández Torres, K.P.; Izraelevitch, F.; Kavner, A.; Kilminster, B.; Kuk, K.; Lima Jr., H.P. ; Makler, M.; Molina, J.; Moreno-Granados, G.; Moro, J.M.; Paolini, E.E.; Sofo Haro, M.; Tiffenberg, J.; Trillaud, F.; Wagner, S.: "Results of the engineering run of the Coherent Neutrino Nucleus Interaction Experiment (CONNIE)", *Journal of Instrumentation*, Volume 11, Issue 7, Pages P07024.

- Fernández Moroni, G.; Estrada, J.; Paolini, E. E.; Cancelo, G.; Tiffenberg, J.; Molina, J.: "Charge Coupled Devices for detection of coherent neutrino-nucleus scattering," *Physical Review D*, American Physical Society, Volume 91, Page 072001, 3 April 2015.
- Aguilar-Arevalo, A.; Amidei, D.; Bertou, X.; Bole, D.; Butner, M.; Cancelo, G.; Castañeda Vazquez, A.; Chavarria, A.E.; De Mello Neto, J.R.T.; Dixon, S.; D'Olivo, J.C.; Estrada, J.; Fernández Moroni, G.; Hernández Torres, K.P.; Izraelevitch, F.; Kavner, A.; Kilminster, B.; Lawson, I.; Liao, J.; López, M.; Molina, J.; Moreno-Granados, G.; Pena, J.; Privitera, P.; Sarkis, Y.; Scarpine, V.; Schwarz, T.; Sofo Haro, M.; Tiffenberg, J.; Torres Machado, D.; Trillaud, F.; You, X. and Zhou, J.: "Measurement of radioactive contamination\l in the high-resistivity silicon CCDs of the DAMIC experiment," *Journal of Instrumentation*, SISSA, Volume 10, Page 08014, August 2015.
- Blostein, J.J.; Estrada, J.; Tartaglione, A.; Sofo Haro, M., Fernandez Moroni, G.; Cancelo G.: "Development of a novel neutron detection technique by using a boron layer coating a Charge Coupled Device," *Journal of Instrumentation*, SISSA, Volume 10, Page 01006, January 2015.
- Fernández Moroni, G.; Estrada, J.; Cancelo, G.; Holland, S. E.; Paolini, E. E.; Diehl, H. T.: "Sub-electron readout noise in a Skipper CCD fabricated on high resistivity silicon," *Experimental Astronomy*, Springer Netherlands, Volume 34, Issue 1, Pages 43-64, 1 July 2012.
- Cancelo, G.; Estrada, J.; Fernandez Moroni, G.; Treptow, K.; Zmuda, T.; Diehl, H. T.: "Achieving sub electron noise in CCD systems by means of digital filtering techniques that lower 1/f pixel correlated noise," *Experimental Astronomy*, Springer Netherlands, Volume 34, Issue 1, Pages 13-29, 1 July 2012.
- Estrada, J.; Molina, J.; Blostein, J. J.; Fernández Moroni, G.: "Plasma effect in silicon charge coupled devices (CCDs)," *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, Volume 665, Pages 90-93, 11 February 2011.

ADVISOR OF STUDENTS

- Matias Repctto: "Electron recoil efficiency calibration in silicon", Undergraduate student thesis in progress. Universidad Nacional del Sur, Argentina.
- Susana Duran Hernandez: "Studies on Dark Current events in CCDs", Undergraduate student thesis in progress. Universidad de Guanajuato, Mexico.
- Pedro Querejeta Simbeni:"Optimal filter to reduce the readout error in CCDs, Undergraduate student thesis. 2018. Universidad Nacional del Sur, Argentina.

PROCEEDINGS AND CONFERENCES

- Fernandez Moroni, G.; Chierchie, F.; Soto, A.; Sofo Haro, M.; Stefanazzi, L.; Estrada, J; Cancelo, G.; Tiffenberg, J.; Treptow, K.; Wilcer, N.; Zmuda, T.; Paolini, E.: "Low Threshold Acquisition Controller for Skipper Charge Coupled Devices", **oral presentation and proceedings**, IEEE Argentine Conference on Electronics 2019, March 14-15, 2019, Mar del Plata, Argentina.

- Querejeta Simbeni, P.; Fernandez Moroni, G.; Chierchie, F.; Sofo Haro, M.; Soto, A.; Stefanazzi, L.; Estrada, J; Paolini, E.; Oliva, A.; Cancelo, G.: "Optimal Filter Taking into Account the Charge Transfer Characteristic in CCD Readout", **oral presentation and proceedings**, IEEE Argentine Conference on Electronics 2019, March 14-15, 2019, Mar del Plata, Argentina.
- Fernandez Moroni, G.: "Sub-electron readout noise with fully depleted Skipper CCD", **oral presentation,** High Energy, Optical, and Infrared Detectors for Astronomy VIII , June 10-13, 2018 , Austin (TX), United States.
- Fernandez Moroni, G. for the SENSEI collaboration:" The SENSEI Experiment, **oral presentation,** Conference on the Intersections of Particle and Nuclear Physics , May 29-June 3, 2018, Palm Spring (CA), United States.
- Fernandez Moroni, G. for the CONNIE collaboration:"Coherent Neutrino Nucleus Scattering Interaction Experiment", **oral presentation ,** American Physical Society April Meeting 2018, April 14-17, 2018, Columbus (OH), United States.
- Sofo Haro, M.; Soto, A.; Fernandez Moroni, G.; Chierchie, F.; Soto, A.; Stefanazzi, L.; Chavez, R.; Castaneda, A.; Hernandez, K.; Estrada, J; Cancelo, G.; Tiffenberg, J.; Treptow, K.; Wilcer, N.; Zmuda, T.; Paolini, E.:"A low noise digital readout system for scientific charge coupled devices" , **oral presentation and proceedings**, XVII Workshop on Information Processing and Control RPIC 2017, September 20-22, 2017, Mar del Plata, Argentina.
- Querejeta Simbeni, P.; Fernandez Moroni, G.; Chierchie, F.; Sofo Haro, M.; Soto, A.; Stefanazzi, L.; Cancelo, G.; Estrada, J.:"Optimal filter for noise reduction in CCD readout", **oral presentation and proceedings,** XVII Workshop on Information Processing and Control RPIC 2017, September 20-22, 2017, Mar del Plata, Argentina.
- Fernández Moroni, G.; Sofo Haro, M.; Tiffenberg, J.; Cancelo, G.; Paolini, E. E.; Estrada, J.; Bertou, X.: "Mathematical model of point events in CCD images," **oral presentation and proceedings,** *XVI Workshop on Information Processing and Control (RPIC 2015)*, 6-9 October 2015, Córdoba, Argentina.
- Fernández Moroni, G.; Estrada, J.; Cancelo, G.; Paolini, E. E.; Bonifazi, C.; Dos Anjos, J.; Tiffemberg, J.; Da Motta, H.; Lima, H.: "New Instrument for Neutrino Detection: Coherent Neutrino-Nucleus Interaction Experiment (CONNIE)," **oral presentation and proceedings**, *33rd International Cosmic Ray Conference (ICRC 2013)*, 2-9 July 2013, Rio de Janeiro, Brazil.
- Fernández Moroni, G.; Paolini, E. E.; Estrada, J.; Cancelo, G.: "Improvements of the detection efficiency of point like events on CCD images by means of the diffusion information of the device," **oral presentation and proceedings**, *XV Workshop on Information Processing and Control (RPIC 2013)*, 16-20 September 2013, San Carlos de Bariloche, Argentina.
- Fernández Moroni, G.; Estrada, J.; Cancelo, G.; Paolini, E. E.: "Neutrino Detection using CCDs," **oral presentation and proceedings,** *NuInt12: Eighth International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region*, 22-27 October 2012, Rio de Janeiro, Brazil.
- Fernández Moroni, G.; Estrada, J.; Cancelo, G.; Holland, S. E.; Paolini, E. E.; Diehl, H. T.: "Extremely Low Noise Developments for Charge Coupled Devices," **oral presentation**, *2011 Nuclear Science Symposium and Medical Imaging Conference and 18th International*

Workshop on Room-temperature semiconductor detectors, 23-29 October 2011, Valencia, Spain.

- Fernández Moroni, G.; Estrada, J.; Paolini, E. E.; Cancelo, G.; Diehl, T.: "Achieving sub-electron readout noise in Skipper CCDs," **poster and proceeding**, *Argentine Conference on Micro-Nanoelectronics Technology and Applications* 2011 *(EAMTA-CAMTA 2011)*, 11-12 August 2011, Buenos Aires, Argentina.
- Fernández Moroni, G.; Paolini, E. E.; Estrada, J.; Cancelo, G.; Diehl, H. T.: "Noise Performance Analysis of CCD Readout Systems," o**ral presentation and proceeding**, *XIV Workshop on Information Processing and Control (RPIC 2011)*, 16-18 November 2011, Oro Verde, Entre Ríos, Argentina.
- Fernández Moroni, G.; Diehl, T.; Paolini, E. E.; Estrada, J.; Cancelo, G.: "Noise Reduction in CCD Readout," **poster presentation,** *XI ICFA School on Instrumentation in Elementary Particle Physics*, 11-22 January 2010, San Carlos de Bariloche, Argentina.
- Fernández Moroni, G.; Paolini, E. E.: "New results of the off-line implementation of a click modulator," **poster and proceeding**, *XIII Workshop on Information Processing and Control (RPIC 2009)*, 16-20 September 2009, Rosario, Argentina.

TEACHING EXPERIENCE

- Teaching assistant at the Mathematical Department of Universidad Nacional del Sur, from August 2014 to 2017. Courses taught: Statistics, Probability and Random Variables.
- Teaching assistant at the Electrical Department of Universidad Nacional del Sur, from March 2015 to 2017. Courses taught: Electromagnetism and Circuits.

PATENTS

- DOE Patent Assignment Form, FAA-821, S-130642. High Resolution Neutron Imaging by Means of a Boron-Coated CCD.

SCHOLARSHIPS

- Comisión Nacional de Investigaciones Científicas y Técnicas (CONICET) fellowship type II, from 2014 to 2016.
- Fermilab International Fellowship in 2011.
- Comisión Nacional de Investigaciones Científicas y Técnicas (CONICET) fellowship type I, from 2011 to 2014.
- Universidad Nacional del Sur (UNS) fellowship for Introduction to research, 2010.
- Comisión de Investigaciones Científicas de la Prov. De Buenos Aires (CIC) scholarship for Research Training, 2009.
- PNNBTICS-Education Ministry stimulus scholarship, 2009.
- Fundación Banco Provincia (BAPRO Foundation) scholarship for studies and research, 2009.

- Universidad Nacional del Sur (UNS) scholarship for student's excellence, 2009.
- Universidad Nacional del Sur (UNS) scholarship for student's excellence, 2008.
- Universidad Nacional del Sur (UNS) scholarship for student's excellence, 2007.

AWARDS, HONORS AND DISTINCTIONS

- Member of the executive board of the IIIE Institute financed by CONICET and Universidad Nacional del Sur, 2015-2017.
- Best grade in Electrical Engineering granted by the Government of the City of Bahía Blanca in 2010.
- Second Prize: Best student paper in the XII Workshop on Information Processing and Control (RPIC 20009).
- Gold medal in Argentinean National Olympics of Biology in 2001.
- Bronze medal in Argentinean National Olympics of Biology in 2000.