

Javier Tiffenberg

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RESEARCH APPOINTMENTS

- Fermilab Particle Physics Division, Associate Scientist, Nov 2017-present.
- Fermilab Particle Physics Division, Postdoctoral Research Associate, July 2012-2017.
- Kavli Institute for Cosmological Physics at the University of Chicago, Associate Fellow, July 2013-present.

VISITING POSITIONS

- Visiting Professor at the University of Buenos Aires. In charge of the graduate course “Experimental Searches of Dark Matter” during the second semester of 2015.

SELECTED RESEARCH GRANTS

- “Development of 10 kilogram Skipper Charge Coupled Device”, Co-PI, \$530k, Laboratory Directed Research and Development program (**LDRD**), Fermilab-DOE, Batavia, US. 2018 to 2020.
- “Towards table-top neutrino detectors: kg-scale Skipper-CCD experiments”, PI, \$2.5M, **Early Career Award** funded by DOE, US. 2018 to 2023.
- “SENSEI: A Novel Search for Hidden-Sector and Ultralight Dark Matter”, PI, \$985k, **Heising-Simons Foundation**, US. 2017 to 2021.
- “Development of an ultra low energy threshold particle detector”, PI, \$170k, **LDRD**, Fermilab-DOE, Batavia, US. 2015 to 2017.
- “Deployment and operation of prototype CCD array at Reactor Site for detection of Coherent Neutrino-Nucleus Interaction to do the installation at a nuclear power plant in Brazil.” Co-PI, \$170k, **LDRD**, Fermilab-DOE, Batavia, US. 2014 to 2016

EDUCATION

- **PhD Physics:** “Search for ultra high energy neutrinos using the Surface Detector of the Pierre Auger Observatory”. Directed by Prof. R. Piegai, University of Buenos Aires (2011).
- **M.Sc Physics:** “General method to include silent stations in the reconstruction of the events acquired by the Surface Detector of the Pierre Auger Observatory”. Directed by Prof. R. Piegai, University of Buenos Aires (2006).

AWARDS & HONORS

- “DPF Instrumentation Early Career Award”, for the development of the Skipper CCD and its applications. American Physical Society (2018). <http://bit.do/dpftiff>
- “Early Career Research Award”, for the development of the Skipper CCD. US Department of Energy (2018). <http://bit.do/ecatiff>
- First Special Mention, JJ Giambiagi Price “Best Thesis in Experimental Physics in the 2010-2011 biennium”. Awarded by the Argentine Physical Society (2012).

RESENT RESEARCH HISTORY

Early Career Award: 2018 - present

In Jun-2018 I was awarded a \$2.5M DOE **Early Career Award** to explore the potential of the Skipper-CCD technology to scale up to particle detectors with thousands of sensors and tens of kilograms of active mass. This technological leap will open a new path for the next generation of short baseline neutrino oscillation experiments and dark matter searches. Furthermore, it will provide a novel nuclear reactor monitoring option for Non-Proliferation Treaty Verification. Skipper-CCD sensors also have natural and immediate applications to imaging and spectroscopic instruments for astronomical, quantum physics and biomedical research. This project will develop the tools to enable the adoption of the Skipper-CCD technology for a wide range of future high-sensitivity instruments

SENSEI: 2015 - present

In 2015 I was awarded a Fermilab LDRD to develop and build a CCD-based detector with an energy threshold close to the silicon band gap (1.1 eV) and a readout noise of 0.1 electrons using a new generation Skipper-CCD developed by the LBNL MicroSystems Lab group. The project produced outstanding results with immediate applications for a wide range of scientific disciplines, from biological imaging to fundamental physics.

In Aug 2017 I was awarded, together with Rouven Essig from Stony Brook University, a \$985k grant by the **Heising-Simons Foundation** to build a Dark Matter detector based on this technology. I'm currently Spokesperson of the SENSEI Collaboration that includes groups from Stony Brook University, Tel Aviv University and University of Oregon.

DAMIC: 2012 - 2017

From 2012 to 2017 I've dedicated most of my efforts to the DAMIC experiment, a direct Dark Matter search using CCD sensors. The detector is taking data at Snolab since December 2012. I was in charge of the operations since the commissioning of the detector at SNOLAB at the end of November 2012 until 2017. I'm co-coordinator of the Analysis and Software tasks and developed a full set of software tools that are used widely in the Collaboration and provide a complete data processing framework from raw data to a catalog of reconstructed events. I designed and implemented the slow control and on-line data quality and monitoring system. This is a key element as the detector operates in a harsh environment with difficult access. We are currently able to achieve an uptime higher than 95% and respond to power and network outages in the mine. I've also been taken as a priority to invest on technology transfer and coordinated the commissioning of a CCD testing facilities at the University of Chicago, University of Michigan and University of Mexico.

CONNIE: 2012 - present

Since its conception on 2012 I've been an active collaborator of the CONNIE experiment currently taking data in a nuclear power plant in Brazil to measure low energy neutrino interactions. I played a key role in the installation and commissioning of the detector at the Nuclear Power Plant. The analysis tools I developed are the official tools within the CONNIE collaboration. The CONNIE detector also uses the slow control system and the CCD configuration I developed for DAMIC.

SELECTED PUBLICATIONS

Only listing publications to which I made a significant contribution. For a full list please refer to <https://www.scopus.com/authid/detail.uri?authorId=35277348200>

Publications authored by Collaborations use alphabetical order. Author list is provided provided otherwise.

As the Principal Investigator of the SENSEI project

1. SENSEI Collaboration. “SENSEI: Direct-Detection Constraints on Sub-GeV Dark Matter from a Shallow Underground Run Using a Prototype Skipper-CCD”, submitted for publication Phys. Rev. Lett., arXiv:1901.10478 (2019)
2. SENSEI Collaboration. “SENSEI: First Direct-Detection Constraints on sub-GeV Dark Matter from a Surface Run”, Phys. Rev. Lett. 121, 061803, arXiv:1804.00088 (2018)
3. **Javier Tiffenberg**, et al. “Single-electron and single-photon sensitivity with a silicon Skipper CCD”, Phys. Rev. Lett. 119, 131802, arXiv:1706.00028 (2017)

As a member of the DAMIC Collaboration

4. DAMIC Collaboration. “First direct detection constraints on eV-scale hidden-photon dark matter with DAMIC at SNOLAB”, Phys. Rev. Lett. 118, 141803, arXiv:1611.03066 (2017)
5. DAMIC Collaboration. “Measurement of low energy ionization signals from Compton scattering in a CCD dark matter detector”, Phys. Rev. D 96, 042002, arXiv:1706.06053 (2017)
6. DAMIC Collaboration. “Search for low-mass WIMPs in a 0.6 kg day exposure of the DAMIC experiment at SNOLAB”, Phys. Rev. D, 94, 082006, arXiv:1607.07410 (2016)
7. DAMIC Collaboration. “Measurement of the ionization produced by sub-keV silicon nuclear recoils in a CCD dark matter detector”, Phys. Rev. D, 94, 082007, arXiv:1608.00957 (2016)
8. DAMIC Collaboration. “Measurement of radioactive contamination in the high-resistivity silicon CCDs of the DAMIC experiment”, Journal of Instrumentation, 10, 08, P08014 (2015)
9. DAMIC Collaboration. “DAMIC at Snolab”, TAUP 2013. Elsevier B. V. Virtual Special Issue.
10. DAMIC Collaboration. “DAMIC: a novel dark matter experiment”, ICRC 2013. Special issue of the Brazilian Journal of Physics.

As a member of the CONNIE Collaboration

11. CONNIE Collaboration. “Results of the engineering run of the Coherent Neutrino Nucleus Interaction Experiment (CONNIE)”, Journal of Instrumentation, 11, 07, P07024 (2016)
12. G. Fernandez Moroni, J. Estrada, G. Canelo, E. Paolini, **J. Tiffenberg**, J. Molina. “Charge Coupled Devices for detection of coherent neutrino-nucleus scattering”, Phys. Rev. D, 91, 072001. (2015)
13. CONNIE Collaboration. “New Instrument for Neutrino Detection: Coherent Neutrino-Nucleus Interaction Experiment(CONNIE)”, ICRC 2013. Published in an special issue of the Brazilian Journal of Physics.

As a member of the Pierre Auger Collaboration

Only listing papers in which I was the submitting author or played a major role

14. Pierre Auger Collaboration. “An improved limit to the diffuse flux of ultra-high energy neutrinos from the Pierre Auger Observatory”, Phys. Rev. D 91, 092008. (2015) - **Updated result based on the work I did for [17]**.
15. Pierre Auger Collaboration. “Ultra-High Energy Neutrinos at the Pierre Auger Observatory”, Advances in High Energy Physics, 2013 708680. (2013) - **Updated result based on the work I did for [17]**.
16. Pierre Auger Collaboration. “Search for point-like sources of ultra-high energy neutrinos at the Pierre Auger Observatory and improved limit on the diffuse flux of tau neutrinos”, Astrophysical Journal Letters, 755. (2012) - **In charge of the point-like sources analysis**.
17. Pierre Auger Collaboration. “A search for ultra-high energy neutrinos in highly inclined events at the Pierre Auger Observatory”, Phys. Rev. D 84, 122005. (2011) - **Submitting author and paper coordinator**.

Applied Physics publications

18. F. M. Grings, **J. Tiffenberg**, H. Karszenbaum, P. Perna, J. Jacobo-Berlles. “Determination of SAR System Parameters Constraints from a Soil Moisture Retrieval Scheme”, Geoscience and Remote Sensing Symposium. IGARSS 2006. IEEE International Conference on July 2006, 3051–3054. (2006)
19. F. M. Grings, P. Ferrazzoli, J. Jacobo-Berlles, H. Karszenbaum, **J. Tiffenberg**, P. Prato-longo, P. Kandus. “Monitoring flood condition in marshes using EM models and Envisat ASAR observations”. IEEE Transactions on Geoscience and Remote Sensing, 44, no. 4, 936-942. (2006)
20. F. M. Grings, P. Ferrazzoli, H. Karszenbaum, **J. Tiffenberg**, P. Kandus, L. Guerriero, J. C. Jacobo-Berlles. “Modeling temporal evolution of junco marshes radar signatures”, IEEE TGRS 43, 10, 2238-2245. (2005)
21. O. A. Capurro, J.E. Testoni, G.V. Martí, A. Arazi, J.O. Fernández Niello, A.J. Pacheco, M.E. Ortega, **J. Tiffenberg**, M. Fleitas. “Integral system for detecting evaporation residues in fusion reactions”, Brazilian Journal of Physics 35, 3B. (2005)

CONFERENCES AND INVITED TALKS

Review talks at conferences

- “Future DM detectors”, **Keynote Speaker** at ALPS2017 – an Alpine LHC Physics Summit. Obergurgl, Austria (2017)
- “Semiconductor based detectors for DM detection”, Dark Matter 2016: From the smallest to the largest scales. Santander, Spain (2016)

As the Principal Investigator of the SENSEI project

Invited talks at conferences

- “The SENSEI experiment”, Illuminating Dark Matter - Simons Symposium. Munich, Germany (2018)
- “The SENSEI Experiment, Status and Plans”, New Probes for Physics Beyond the Standard Model. KITP, Santa Barbara (2018)
- “The SENSEI project: a zero noise detector for DM searches”, PACIFIC-2018. Akaigawa, Japan (2018)
- “The SENSEI project: how to look for DM-electron scattering events”, U.S. Cosmic Visions: New Ideas in Dark Matter. University of Maryland, College Park (2017)
- “Future of CCDs for Dark Matter Searches: The SENSEI project”, 3rd Berkeley Workshop on the Direct Detection of Dark Matter. LBNL, Berkeley (2016)

Seminars

- “SENSEI: First results, status, and plans”, Purdue University, HEP Seminar (2018)
- “SENSEI: First results, status, and plans”, SLAC Experimental Seminar. (2018)
- “Skipper CCDs and the SENSEI experiment”, KITP Program: High Energy Physics at the Sensitivity Frontier. (2018)
- “Fermilab LDRD-Fest”, Joint Experimental-Theoretical Physics Seminar (Wine and Cheese Seminar) (2017)
- “The SENSEI Project and things you can do with less than one electron”, Fermilab Research Techniques Seminar (2017)

As a member of the DAMIC Collaboration

Invited talks at conferences

- “Results from DAMIC at Snolab”, UCLA Dark Matter 2016. UCLA, Los Angeles (2016)
- “Light DM at DAMIC”, Beyond WIMPs: From Theory to Detection. Ha Goshrim, Israel (2015)
- “DAMIC: A Search for Dark Matter with CCDs”, PIXEL 2014. Niagara Falls, Canada (2014)
- “DAMIC at Snolab: status and plans”, UCLA Dark Matter 2014. UCLA, Los Angeles (2014).
- “The DAMIC experiment and scientific CCDs for DM detection”, SnowDARK 2013. Salt Lake City (2013)

Seminars

- “A Search for Low Mass Dark Matter with CCD Detectors”, HEP/Astro/Nuclear Seminar. University of Michigan (2014)
- “DAMIC: looking for Dark Matter 2 km underground”, Department of Physics Colloquium. University of Buenos Aires (2013)
- “DAMIC: a novel dark matter experiment”, ICRC 2013. Rio de Janeiro, Brazil (2013)

ACADEMIC SUPERVISION ACTIVITY

- Director: Postdoc, Guillermo Fernandez-Moroni, Fermilab, 2017-present.
- Director: PhD, Mariano Cababié, University Of Buenos Aires (UBA), April 2018-present.
- Director: M.Sc thesis , André Donadon, UBA, Jan 2018-present.
- Co-director with Ricardo Piegaia: M.Sc thesis, Pablo Pieroni. “Identification of cosmic neutrinos in upgoing showers with the Auger Observatory”, UBA, March 2011.
- Co-director with Ricardo Piegaia: M.Sc thesis, Yann Guardincerri. “Limit on the Cosmic Diffuse Ultra-high Energy Neutrino Flux”, UBA, August 2008.

SCHOLARSHIPS, FELLOWSHIPS & GRANTS

- Postdoctoral grant, CONICET. 2011 to 2013.
- EPLANET grant, European Union - Marie Curie Actions, University of Santiago de Compostela, Spain. June 2011 to July 2011.
- CONICET PhD grant type I. 2006 to 2008.
- CONICET PhD grant type II. 2009 to 2010.
- HELEN grant, European Union - ALFA program, University of Santiago de Compostela, Spain. July 2007 to December 2007.
- HELEN grant, European Union - ALFA program, University of Santiago de Compostela, Spain. July 2006 to January 2007.

INTERNATIONAL SCHOOLS

As a Professor in charge of the CCD lab:

- “XII ICFA School on Instrumentation in Elementary Particle Physics”, Bogota, Colombia, 25 November-06 December 2013.

As a student:

- “Sixth CERN-Fermilab Hadron Collider Physics Summer School”, CERN, Geneva, Switzerland, 8-17 June 2011.
- “XI ICFA School on Instrumentation in Elementary Particle Physics”, San Carlos de Bariloche, Argentina, 11-22 January 2010.
- “5th CERN Latin American School of High-Energy Physics”, Recinto Quirama, Antioquia Region, Colombia, 15-28 March 2009.