

Francisco Salces-Cárcoba

Country of citizenship: Mexico

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EDUCATION

PhD, Physics

University of Maryland College Park, College Park, MD, expected May 2020
Dissertation: Quantum simulation with ultracold bosonic gases

BSc, Physics

Universidad Autónoma de San Luis Potosí, San Luis Potosí, S.L.P., Mexico, 2013

SKILLS AND EXPERTISE

Expertise: Atomic, molecular and optical physics, quantum physics.

Hardware: Optical design in the NIR and visible spectrum, high and ultra-high vacuum manifold design down to 10^{-12} mbar, electronic design in applications up to 10 GHz.

Software: Solidworks, Zeemax, Eagle, Python, L^AT_EX, Labview, Matlab, VHDL.

RESEARCH EXPERIENCE

Graduate research assistant

2017-present

Holographic microscopy of ultracold ^{87}Rb , Joint Quantum Institute, MD

- Implemented off-axis holographic microscope for ^{87}Rb gases.

Graduate research assistant

2016-2018

New apparatus for quantum degenerate Bose gases, Joint Quantum Institute, MD

- Designed and assembled an ultra-high vacuum manifold.
- Designed a magnetic quadrupole based transport assembly.
- Designed supporting structure and layout for new apparatus.

Graduate research assistant

2015-2017

Thermodynamics of one-dimensional Bose gases, Joint Quantum Institute, MD

- Designed, built and characterized high-aspect ratio, crossed optical dipole trap.
- Designed, built and characterized compound microscope objective ($\text{NA} = 0.31$).
- Calibrated optimal signal-to-noise ratio to probe dilute $\sim 1 \mu\text{m}^{-1}$ linear objects.
- Analyzed *in-situ* density distributions with a numerically exact model.

Graduate research assistant

2014-2015

Digital control loop for magnetic field stabilization, Joint Quantum Institute, MD

- Designed and tested a 20-bit, FPGA-based current servo.

Undergraduate research intern

2011-2013

Passive thermal stabilization of optical cavities, UASLP, Mexico

- Designed and assembled composite mirror spacers for confocal cavity.
- Measured thermally driven frequency drift of the cavity transmission.
- Analyzed thermal expansion with numerically implemented finite-element model.

Undergraduate research intern

Summer 2012

Soft X-ray calorimetry from ion electronic recapture, ORNL, TN.

- Operated the keV molecular ion beam accelerator for data acquisition.
- Operated high resolution X-ray cryogenic (0.1K) calorimeter.

- PUBLICATIONS**
- [1] Andika Putra, F. Salces-Cárcoba, Yuchen Yue, Seiji Sugawa, and I. B. Spielman. “Spatial Coherence of Spin-Orbit-Coupled Bose Gases”. In: *Phys. Rev. Lett.* 124 (5 2020), p. 053605. URL: <https://link.aps.org/doi/10.1103/PhysRevLett.124.053605>.
 - [2] S. Sugawa, F. Salces-Carcoba, Y. Yue, A. Putra, and I. B. Spielman. *Observation and characterization of a non-Abelian gauge field’s Wilczek-Zee phase by the Wilson loop*. 2019. arXiv: 1910.13991 [physics.atom-ph].
 - [3] F. Salces-Carcoba, C. J. Billington, A. Putra, Y. Yue, S. Sugawa, and I. B. Spielman. “Equations of state from individual one-dimensional Bose gases”. In: *New Journal of Physics* 20 (2018), p. 113032. URL: <https://doi.org/10.1088%2F1367-2630%2Faaef9b>.
 - [4] S. Sugawa, F. Salces-Carcoba, A. R. Perry, Y. Yue, and I. B. Spielman. “Second Chern number of a quantum-simulated non-Abelian Yang monopole”. In: *Science* 360.6396 (2018), pp. 1429–1434. URL: <https://science.sciencemag.org/content/360/6396/1429>.
 - [5] K. Morgan, V. Andrianarijaona, I. N. Draganic, X. Defay, M. Fogle, A. Galindo-Uribarri, C. I. Guillen, C. C. Havener, M. Hokin, D. McCammon, D. J. Nader, S. L. Romano, F. Salces-Carcoba, P. Sauter, D. Seely, P. C. Stancil, C. R. Vane, A. K. Vasantachart, and D. Wulf. “Charge exchange x-ray emission: Astrophysical observations and potential diagnostics”. In: *AIP Conference Proceedings* 1525.1 (2013), pp. 49–54. URL: <https://aip.scitation.org/doi/abs/10.1063/1.4802288>.