Christian Bunker

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Education

Ph.D. in Physics, University of Florida, Gainesville, FL 08/2020−Present

- **Honors**: Graduate Student Fellowship.

B.S. in Physics, University of Notre Dame, Notre Dame, IN 08/2016−01/2020

- **Honors**: magna cum laude, Outstanding Undergraduate Research Award.

Publications & Presentations

C. Bunker, S. Hoffman, J.-X. Yu, X.-G. Zhang, and H.-P. Cheng. "Scattering solution of interacting Hamiltonian for electron mediated entanglement." Paper in preparation.

C. Bunker, S. Hoffman, J.-X. Yu, X.-G. Zhang, and H.-P. Cheng. "Tight-binding scattering solution for electron mediated entanglement." Oral presentation, North America-Greece-Cyprus Conference on Paramagnetic Materials (2022).

C. Bunker, S. Hoffman, J.-X. Yu, X.-G. Zhang, and H.-P. Cheng. "Scattering for entangled state switching in molecular dimers." Poster presentation, Sanibel Symposium (2022).

L. Riney, **C. Bunker**, S.-K. Bac, J. Wang, D. Battaglia, Y. C. Park, M. Dobrowolska, J.K. Furdyna, X. Liu, B.A. Assaf. "Introduction of Sr into Bi_2Se_3 thin films by molecular beam epitaxy." J. Appl. Phys. 129, 085107 (2021).

J. Wang, X. Liu, **C. Bunker**, L. Riney, B. Qing, S.K. Bac, M. Zhukovskyi, T. Orlova, S. Rouvimov, M. Dobrowolska, J.K. Furdyna, B.A. Assaf. "Weak antilocalization beyond the fully diffusive regime in $Pb_{1-x}Sn_xSe$ topological quantum wells." Phys. Rev. B 102, 155307 (2020).

Research

Research Assistant, University of Florida, Gainesville, FL 08/2020−Present

- Developed Python code to simulate an electron scattering from magnetic molecules using Green's function techniques.
- Implemented scattering code to demonstrate control of the entanglement state of molecular dimers for quantum information science applications, and prepared a paper on the results.
- Developed Python code that builds on the PySCF "full configuration interaction" solver to generate and visualize data for the time dependent behavior of small interacting electron systems.
- Developed Python code that builds on the PySCF "dynamical mean-field theory" solver to calculate the linear response current density through an interacting region.

Research Assistant, University of Notre Dame, Notre Dame, IN 01/2020−05/2020

- Developed Python code to calculate the bound states of quantum well heterostructures using a $\mathbf{k} \cdot \mathbf{p}$ perturbative method, contributing to a paper on the design of topological insulators.
- Developed Python code to interface with and record data from Oxford Instruments high magnetic field system.
- Investigated SrBiSe and CuBiSe using x-ray diffraction, Raman spectroscopy, and Fourier-transform infrared spectroscopy.
- Conducted low temperature magnetotransport experiments on α-Sn thin films to investigate evidence for superconductivity.

- Developed a simple numerical model for accounting for the exchange effects of introducing paramagnetic ions into lead salts and calculating subsequent band levels.

Research Assistant, CERN, Geneva, Switzerland 01/2019−05/2019

- Developed Python and ROOT code to analyze lepton data from simulated W boson decay events.
- Bootstrapped the simulated decay data to evaluate the efficacy of uncertainty reduction techniques.

Research Assistant, University of North Florida, Jacksonville, FL 05/2018−08/2018

- Simulated exotic circuit elements using AWR Design Environment circuit design software to investigate improvements to superconducting nanowire single photon detectors.