

# Christian Bunker

Gainesville, FL

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## EDUCATION

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- **University of Florida** Gainesville, FL  
*Ph.D. in Physics* August 2020 - Present
- **University of Notre Dame** Notre Dame, IN  
*B.S. in Physics, magna cum laude* August 2016 - December 2019
  - **Concentration:** Advanced Physics.
  - **Honors:** Outstanding Undergraduate Research Award.

## PUBLICATIONS

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- L. Riney, **C. Bunker**, S.-K. Bac, J. Wang, D. Battaglia, Yun Chang Park, M. Dobrowolska, J.K. Furdyna, X. Liu, B.A. Assaf. "Introduction of Sr into Bi<sub>2</sub>Se<sub>3</sub> thin films by molecular beam epitaxy." Journal of Applied Physics 129, 085107 (2021).
- J. Wang, X. Liu, **C. Bunker**, L. Riney, B. Qing, S.K. Bac, M. Zhukovskiy, T. Orlova, S. Rouvimov, M. Dobrowolska, J.K. Furdyna, B.A. Assaf. "Weak antilocalization beyond the fully diffusive regime in Pb<sub>1-x</sub>Sn<sub>x</sub>Se topological quantum wells." Phys. Rev. B 102, 155307 (2020).

## PRESENTATIONS

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- Spatial formulation of anisotropy exchange resonance. Center for Molecular Magnetic Quantum Materials All Hands Meeting (July 2021).
- Analysis of the Statistical Uncertainty on Monte Carlo W Decay Events. Notre Dame College of Science Fall Undergraduate Research Fair. (October 2019).
- Factors Influencing the Optical Features of Quartz Glass Capillaries. Notre Dame College of Science Joint Annual Meeting (May 2018).

## RESEARCH

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- **Research Assistant, University of Florida** Gainesville, FL  
*Dr. Hai-Ping Cheng, Center for Molecular Magnetic Quantum Materials* April 2021 - Present
  - Used PySCF quantum chemistry code to investigate transport properties of magnetic impurities in a metal
  - Examined the physical limits under which magnetic molecules to behave like spin-1 qubits using model hamiltonians.
- **Research Assistant, University of Notre Dame** Notre Dame, IN  
*Dr. Badi H. Assaf, Topological Quantum Matter Group* January 2020-May 2020
  - Used numerical methods to investigate the energies and dispersion relations of bound states in band gap inverted IV-VI quantum wells.
  - Investigated SrBiSe and CuBiSe using x-ray diffraction, Raman spectroscopy, and Fourier-transform infrared spectroscopy.
  - Performed low temperature magnetotransport experiments on  $\alpha$ -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  
*Dr. Josh Bendavid, CMS W Mass Group* *January 2019 - June 2019*
  - Investigated the effects of applying angular smoothing theory derived from QCD to leptonic W decays.
  - Analyzed lepton and W boson data from millions of Monte Carlo simulated W decay events with independently written Python and ROOT code.
  - Created code to calculate the angular smoothing coefficients from the W decay angular parameters for separate bins of W transverse momentum and pseudorapidity and then use these coefficients to smooth the W decay cross section.
  - Created code to bootstrap the smoothed and unsmoothed W decay cross section data sets in order to rigorously compare the effects of smoothing on the uncertainty of the lepton parameters.
- **Research Assistant, University of North Florida** Jacksonville, FL  
*Dr. Daniel Santavicca, Nanoscale Electronics and Optoelectronics Lab* *May 2018 - August 2018*
  - Researched improvements to superconducting nanowire single photon detectors (SNSPDs) using AWR Design Environment circuit design software.
  - Designed and simulated exotic circuit elements using AWR Design Environment in order to determine how nanowire geometry affects the dispersion, resonance, and detection capabilities of SNSPDs.
- **Research Assistant, University of Notre Dame** Notre Dame, IN  
*Dr. Randall Ruchti, QuarkNet* *August 2017 - May 2018*
  - Examined the effects of quartz capillary design features such as waveshifting dye concentration, ruby quartz end capping, and titanium mirroring on their ability to transmit ultraviolet light with minimal attenuation.
  - Investigated the extent to which the attenuation properties of these capillary designs remained consistent under radiation exposure.

## EXPERIENCE

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- **Physics Tutor, University of Notre Dame** Notre Dame, IN  
*Academic Services for Student Athletes* *August 2019 - December 2019*
  - Provide support to student athletes in Engineering Physics I and II classes.
- **Physicist Assistant, Ackerman Cancer Center** Jacksonville, FL  
*Department of Physics and Dosimetry* *May 2018 - August 2018*
  - Performed quality assurance checks on the proton therapy machine using myQA software to ensure proper strength and calibration of the beam.
  - Implemented quality assurance checks on beam apertures and range compensators using .decimal software to ensure that each is properly tailored to the dosimetry plan of the specific patient.

## SKILLS

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- **Programming:** Intermediate Python, Basic ROOT, Basic C++
- **Software:** AWR Design Environment, Mathematica,  $\text{\LaTeX}$ , Igor