NICHOLAS J. LAURITA PH.D.

EMAIL: Laurita.Nicholas@gmail.com
WEBSITE: NicholasLaurita.com
LINKEDIN: linkedin.com/in/NicholasJLaurita
GITHUB: https://github.com/Nlaurita

OVERVIEW

- An established quantum physicist with 8+ of experience performing cutting-edge research devoted to improving the performance of quantum technology, resulting in 20+ publications, 10+ awards (several national), and 10+ invited presentations.
- Proven track record of conceiving and implementing innovative designs to improve experimental and device performance. Designed and automated 4 sub-Kelvin cryogenic microwave systems resulting to 5+ instrumentation publications. Experiments remain in extensive use across three premiere research universities.
- Exceptionally proficient programmer with a history of developing and invoking mathematical models and machine learning algorithms to expedite workflow and optimize device performance. Authored software packages publicly available on GitHub.
- Distinctive ability to synthesize and present complex technical information to both expert and lay audiences alike. Communication skills have garnered international speaking invitations and departmental recognition.

Education

PH.D PHYSICS & ASTRONOMY
Johns Hopkins University
May 2017

M.A. PHYSICS & ASTRONOMY
Johns Hopkins University
May 2012

B.S. APPLIED PHYSICS
University of South Florida
May 2011

Selected Invited Presentations

Shining Light on Quantum Materials
Yale Experimental Quantum Seminar
New Haven, CT 2020

Evidence for a parity broken monoclinic ground state in Herbertsmithite
Ultrafast Spectroscopy of Correlated Quantum Materials Conference
Liyang, Jiangsu China 2019

Anomalous 3D bulk AC conduction within the Kondo gap of SmB_6
Strongly Correlated Electron Symposium
Prague, Czech Republic 2017

Selected Publications

"Evidence for a parity broken monoclinic ground state in the kagome antiferromagnet Herbertsmithite" **N. J. Laurita** *et al.* arXiv:1910:136060, In Review, *Nature Materials* (2020)

Professional Experience

PRINCIPAL PHYSICIST
Northrop Grumman: Quantum Group of Transformational Computing
September 2020 – Current

KEY RESPONSIBILITIES:

- Routinely experimentally benchmarks the performance and fidelity of proprietary qubit based quantum technology at dilution refrigerator temperatures.
- Develops and implements quantum mechanical models of devices to better understand and improve performance.

IQIM POSTDOCTORAL SCHOLAR
Institute for Quantum Information & Matter, California Institute of Technology
August 2017 – July 2020

KEY RESPONSIBILITIES:

- Lead researcher on 2 quantum research projects that investigated signatures of spin entanglement in dynamic quantum systems through non-linear response effects. Research published in *Nature* journals.
- Designed and constructed a novel reflection based time-domain terahertz spectrometer. Incorporated time-resolution allowing for pump-probe style experiments. Experiment remains in extensive use at Caltech.
- Authored a GUI controlled software package that loads, cleans, and processes CCD images as a function of any external parameter, encompassing > 1600 lines of code. Package resulted in > 10x increase in group efficiency and remains in extensive use at Caltech. Code publicly available on GitHub.
- Invited speaker at 8+ conferences, university seminars, and department colloquia. Several international.
- Mentored 10+ graduate students in guided research and lab techniques.

GRADUATE RESEARCH ASSISTANT
Johns Hopkins University
Aug 2011 – May 2017

KEY RESPONSIBILITIES:

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"Evidence for the weakly coupled electron mechanism in an Anderson-Blount polar metal" **N. J. Laurita** *et al. Nature Communications* ***10****, 3217 (2019)*

"Singlet-triplet excitations and long-range entanglement in the spin-orbit liquid candidate $FeSc_2S_4$" **N. J. Laurita** *et al.* Phys. Rev. Letters **114**, 2070201 (2015)

Selected Honors & Awards

Caltech Institute for Quantum Information and Matter Post-Doctoral Fellowship

Achievement Rewards for College Scientists Dillon Fellowship

Roland Prize for Innovation & Excellence in Teaching

Johns Hopkins University Owen Fellowship

NSF Computational Physics Scholarship

Aboly Foundation Endowed Scholarship

- Lead researcher on 5+ quantum research projects that investigated signatures of non-trivial topology and spin-entanglement in two-level quantum systems through excitation with RF and THz pulses.
- Designed and constructed a superconducting microwave cavity resonator experiment that achieved a < 300 mK base temperature and a resolution of 1 part in 200 million. Authored data acquisition and analysis software to automate system.
- Designed and constructed a time-domain terahertz spectrometer that implemented a novel mirror configuration that resulted in a 50% reduction in THz focal spot size. Design published in *The Journal of Infrared, Millimeter, and Terahertz Waves*.
- Authored a GUI controlled software package that loads, analyzes, and plots time-domain data as a function of two external parameters, encompassing > 5500 lines of code. Package resulted in a 10x increase in group efficiency and remains extensively in use at JHU. Code publicly available on GitHub
- Presented research at 5+ conferences, both national and international, some with > 1000 attendees. Led to new collaborations and research opportunities.
- Graduate student President of the Department of Physics and Astronomy 2012-2013.

UNDERGRADUATE RESEARCH ASSISTANT

University of South Florida
May 2008 – May 2011

KEY RESPONSIBILITIES:

- Led a collaborative research project aimed at increasing the sensitivity of magnetic field sensors based on the giant magneto-impedance effect.
- Implemented a novel design which incorporated ferromagnetic capping layers, resulting in a > 100% increase in sensor sensitivity. Led to a collaboration with the University of South Florida School of Medicine.

SKILLS AND TECHNIQUES

Experimental Apparatus and Skills

- Cryogenic systems including dilution refrigerators & He-4 cooled systems
- Microwave equipment including network analyzers, amplifiers, and arbitrary waveform generators
- Microwave engineering including coaxial cables, waveguides, & resonators
- Regeneratively amplified femtosecond laser systems and parametric amplifiers
- Free space optics design and alignment
- Ultra-high vacuum systems

Experimental Techniques

- Qubit characterization including coherence time and fidelity measurements
- Microwave cavity resonator based techniques
- Linear and non-linear optical techniques including high harmonic generation and polarimetry
- Time-domain THz spectroscopy
- 4-probe resistance measurements
- Crystallography techniques including XRD and Laue diffraction

Software, Programming, & Automation

- Python including the NumPy, Pandas, Matplotlib, & Sckit-learn libraries for scientific computing, modeling, and machine learning
- Matlab, Mathematica, Igor Pro, & SQL for further data analysis and presentation
- Labview, Zemax Opticstudio, HFSS, & Solidworks for experimental design and automation
- Inkscape, Blender, and the Microsoft office suite for presenting and disseminating scientific information