December 2018

Nicholas M. Rapidis

Curriculum Vitae

Address: 2516 Ridge Rd. Apt. 6, Berkeley CA, 94709
Phone: +1 (510) 847-1414
Email: rapidis@berkeley.edu
Nationalities: American & Greek

Education

2015-Present **University of California, Berkeley**
B.A. in Physics with Honors (Expected Graduation Date: Spring 2019)
Thesis Title: *A Search for Cosmological Signatures of the Axion* – Adviser: Prof. Karl van Bibber
GPA-to-date: 3.88/4.0
Upper Division & Graduate Level Physics GPA: 3.97
Relevant courses: *Quantum Field Theory I & II* (Graduate Level – 232A & 232B), *Standard Model and Beyond I & II* (Graduate Level – 233A & 233B), *General Relativity* (Graduate Level – 231), *Quantum Mechanics I & II* (137A-B), *Analytic Mechanics* (105), *Electromagnetism & Optics* (110A), *Statistical & Thermal Mechanics* $\left(112^1\right)$, *Relativistic Astrophysics & Cosmology* $\left(\text{C}161^1\right)$, *Instrumentation Lab & Advanced Experimentation Lab* $\left(111\text{A}-111\text{B}^1\right)$, *Abstract Algebra* (Math 113)

2018 **Institute for Quantum Computing – University of Waterloo**
Attended *Undergraduate School on Experimental Quantum Information Processing (USEQIP)*. Selective two week fully funded summer program introducing the fundamentals of Quantum Information.

2011-2015 **Psychiko College High School, Athens, Greece**
Completed International Baccalaureate Diploma Program in May 2015

Research and Teaching Experience

2018-present **Undergraduate Researcher**
Computational-phenomenological physics work in collaboration with Professors Karl van Bibber, Peter Graham (Stanford University), and Kent Irwin (Stanford University).
Searching for signals of the axion in the cosmic microwave background through resonant downconversion of the axion. Honors Thesis in progress.

2016-present **Undergraduate Researcher**
Member of Berkeley HAYSTAC group led by Prof. Karl van Bibber in search of the QCD Axion.
· Use of the bead perturbation technique to study characteristics of annular cavities.
· Determination of frequency scan range for future runs based on cavity measurements.
· Initial measurements on photonic band gap cavities.
· Finite element electromagnetic simulations using *CST Microwave Studio* for different types of

cavities.

· Machining of parts to be used on test cavities.

Summer 2017 **Reader** Department of Physics

Graded weekly problem sets for 65 students in Quantum Mechanics (Physics 137A) taught by Dr. Charles Wohl at UC Berkeley.

Honors & awards

2018-2019 *Haas Scholar* – $13,800 grant awarded to twenty UC Berkeley undergraduates across all disciplines to conduct research in their senior year.

2017-2018 2×*Berkeley Physics Undergraduate Research Scholar* – Fall 2017 paper on *Study of Effects of Rod Misalignments in a 3-6 GHz Annular Cavity for HAYSTAC* – 2×$500 award.

2016-2018 4×UC Berkeley *Dean's List* – *Dean's List* awarded to top 4% of students in *College of Letters and Science. Honors to Date* as of Fall 2016.

2014 Member of the Greek National Linguistics Team: Attended 12th International Linguistics Olympiad in Beijing, China.

Publications, Talks, & Conferences

Peer-Reviewed Journal Articles[2]

Resonant Axion Photon Scattering

S. Chaudhuri, N.M. Rapidis, P.W. Graham, K.D. Irwin, K.A. van Bibber. *In preparation.*

Characterization of the HAYSTAC axion dark matter search cavity using microwave measurement and simulation techniques

N.M. Rapidis, S.M. Lewis, K.A. van Bibber, Accepted to *Review of Scientific Instruments.* arXiv:1809.02246 [physics.ins-det]

Results from Phase 1 of the HAYSTAC microwave cavity axion Experiment

L. Zhong, S. Al Kenany, K.M. Backes, B.M. Brubaker, S.B. Cahn, G. Carosi, Y.V. Gurevich, W.F. Kindel, S.K. Lamoreaux, K.W. Lehnert, S.M. Lewis, M. Malnou, R.H. Maruyama, D.A. Palken, N.M. Rapidis, J.R. Root, M. Simanovskaia, T.M. Shokair, D.H. Speller, I. Urdinaran, K.A. van Bibber. Phys. Rev. D **97**, 092001, (2018). doi.org/10.1103/PhysRevD.97.092001.

Design and Operational Experience of a Microwave Cavity Axion Detector for the 20-100 μeV Range

S. Al Kenany, M.A. Anil, K.M. Backes, B.M. Brubaker, S.B. Cahn, G. Carosi, Y.V. Gurevich, W.F. Kindel, S.K. Lamoreaux, K.W. Lehnert, S.M. Lewis, M. Malnou, D.A. Palken, N.M. Rapidis, J.R. Root, M. Simanovskaia, T.M. Shokair, I. Urdinaran, K.A. van Bibber, L. Zhong. Nuclear Instruments and Methods in Physics Research A **854** (2017) 11–24. doi.org/10.1016/j.nima.2017.02.012.

First Results from a Microwave Cavity Axion Search at 24 μeV

B.M. Brubaker, L. Zhong, Y.V. Gurevich, S.B. Cahn, S.K. Lamoreaux, M. Simanovskaia, J.R. Root, S.M. Lewis, S. Al Kenany, K.M. Backes, I. Urdinaran, N.M. Rapidis, T.M. Shokair, K.A. van Bibber, D.A. Palken, M. Malnou, W.F. Kindel, M.A. Anil, K.W. Lehnert, G. Carosi. Phys. Rev. Lett. **118**, 061302 (2017). doi.org/10.1103/PhysRevLett.118.061302.

[2] All publications are also available on INSPIRE.

Conference Proceedings

Completion of Phase I and Preparation for Phase II of the HAYSTAC Experiment
N.M. Rapidis, Contributed to the 14th Patras Workshop on Axions, WIMPs and WISPs, DESY in Hamburg, June 18 to 22, 2018. arXiv: 1809.05913 [physics.ins-det]

Application of the Bead Perturbation Technique to a Study of a Tuneable 5 GHz Annular Cavity
N.M. Rapidis (2018), In: Carosi G., Rybka G., van Bibber K. (eds) Microwave Cavities and Detectors for Axion Research. Springer Proceedings in Physics, vol 211. Springer, Cham doi.org/10.1007/978-3-319-92726-8_5.

Talks

Studies of the HAYSTAC dark matter detector cavity through microwave measurements and simulation techniques
Abstract for talk submitted to *APS April Meeting 2019*, April 13-16, 2019, Denver, CO

Completion of Phase I and Preparation for Phase II of the HAYSTAC Experiment
14th Patras Workshop on Axions, WIMPs, and WISPs, June 18-22, 2018, DESY, Hamburg, Germany

Application of the Bead Perturbation Technique to a Study of a Tunable 5 GHz Annular Cavity
2nd Workshop on Microwave Cavities and Detectors for Axion Research, January 10-13, 2017, LLNL, Livermore, CA

Skills

Programming

Advanced: *CST Microwave Studio, LaTeX*
Intermediate: *Mathematica, LabVIEW*
Basic: *Matlab, HTML*

Languages

English (native), Greek (native), German (advanced proficiency)

Experimental Tools

Basic Machine Shop Skills (operating mills, lathes, and drill presses for work on metallic parts), Operating and calibrating network analyzers for studies of electromagnetic devices.

References

Dr. Karl van Bibber

Professor, Department of Nuclear Engineering
University of California, Berkeley
4151 Etcheverry Hall, Berkeley, CA, 94720
Email: karl.van.bibber@nuc.berkeley.edu
Phone: +1 (510) 642-3477

Dr. Surjeet Rajendran

Assistant Professor, Department of Physics
University of California, Berkeley
419 Leconte Hall, Berkeley, CA, 94720
Email: surjeet@berkeley.edu
Phone: +1 (510) 666-3371

Dr. Kent Irwin

Professor, Department of Physics
Stanford University
Varian Hall 130, Stanford, CA, 94305
Email: irwin@stanford.edu

Dr. Ori Ganor

Associate Professor, Department of Physics
University of California, Berkeley
403 Leconte Hall, Berkeley, CA, 94720
Email: ganor@berkeley.edu
Phone: +1 (510) 642-4065