

# Nicholas M. Rapidis

## Curriculum Vitae

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 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* (112<sup>1</sup>), *Relativistic Astrophysics & Cosmology* (C161<sup>1</sup>), *Instrumentation Lab & Advanced Experimentation Lab* (111A - 111B<sup>1</sup>), *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.

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<sup>1</sup>To be taken in Spring 2019

- 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<sup>2</sup>

#### 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 $\mu\text{eV}$ 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 $\mu\text{eV}$

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.

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<sup>2</sup>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*, *L<sup>A</sup>T<sub>E</sub>X*

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**

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### **Dr. Surjeet Rajendran**

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### **Dr. Kent Irwin**

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### **Dr. Ori Ganor**

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