

# Nicholas M. Rapidis

## Curriculum Vitae

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 Nationalities: USA & Greek

## Education

- 2019– **Stanford University**  
 Ph.D. in Physics — Anticipated concentration in Particle Physics Phenomenology
- 2015-2019 **University of California, Berkeley**  
 B.A. in Physics. Graduated with High Distinction and Departmental Honors  
 Thesis Title: *Resonant Axion-Photon Scattering and Galactic Searches for Axions* – Adviser: Prof. Karl van Bibber  
 Relevant courses: *Quantum Field Theory I & II, Standard Model and Beyond I & II, General Relativity, Quantum Mechanics I & II, Cosmology, Analytic Mechanics, Electromagnetism & Optics, Statistical & Thermal Mechanics, Instrumentation Lab & Advanced Experimentation Lab, Abstract Algebra*
- 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 from galactic and astrophysical sources.
- 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

- 2019 *Member of ΦBK* – Inducted in Spring 2019.
- 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>1</sup>

**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, *Review of Scientific Instruments* **90**, 024706 (2019). doi.org/10.1063/1.5055246

**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. Urdinarian, 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. Urdinarian, 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. Urdinarian, 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.

### 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

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<sup>1</sup>All publications are also available on [INSPIRE](#).

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

**Characterization of the HAYSTAC dark matter detector cavity: microwave measurement and simulation**

*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*, *Matlab*

Basic: *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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University of California, Berkeley  
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Phone: +1 (510) 642-3477

### **Dr. Surjeet Rajendran**

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### **Dr. Kent Irwin**

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Stanford University  
Varian Hall 130, Stanford, CA, 94305  
Email: irwin@stanford.edu

### **Dr. Ori Ganor**

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