Nicholas M. Rapidis

Curriculum Vitae

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Nationalities: USA & Greek

Education

2019–   **Stanford University**
Ph.D. in Physics

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

2018   **Institute for Quantum Computing – University of Waterloo**
Attended *Undergraduate School on Experimental Quantum Information Processing (USEQIP)*.

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

Research Experience

2020-   **Graduate Research Assistant**, Stanford University
Advisor: *Kent Irwin*

Member of DM Radio collaboration. Designing and understanding limitations of DM Radio m^3, the third generation of the experiment.

2019-2020   **Graduate Research Assistant**, Stanford Institute for Theoretical Physics
Advisor: *Savas Dimopoulos*

Studying the physics and phenomenology of dense dark matter axion clumps (oscillons) in the context of oscillon-neutron star collision. Using current sensitivity of radio telescopes, we set limits on the abundance of oscillons in galactic dark matter halos in terms of the axion mass and symmetry breaking scale.

2016-2019   **Undergraduate Research Assistant**, UC Berkeley
Advisor: *Karl van Bibber*

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.

Teaching Experience

Spring 2020 **Teaching Assistant** Stanford University

Taught two discussion sections for Electricity and Magnetism (Physics 43) with a total of 58 students.

Summer 2017 **Reader** UC Berkeley

Graded weekly problem sets for 65 students in Quantum Mechanics (Physics 137A).

Honors & Awards

2019 *Member of* ΦBK

2018-2019 *Haas Scholar*

2017-2018 *Berkeley Physics Undergraduate Research Scholar*

2016-2019 UC Berkeley *Dean's List*

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

Publications, Talks, & Conferences

Peer-Reviewed Journal Articles[1]

A quantum-enhanced search for dark matter axions

K. M. Backes, D. A. Palken, S. Al Kenany, B. M. Brubaker, S. B. Cahn, A. Droster, G. C. Hilton, S. Ghosh, H. Jackson, S. K. Lamoreaux,1 A. Leder, K. W. Lehnert, S. M. Lewis, M. Malnou, R. H. Maruyama, N.M. Rapidis, M. Simanovskaia, S. Singh, D. H. Speller, I. Urdinaran, L. R. Vale, E. C. van Assendelft, K. van Bibber, and H. Wang. arXiv:2008.01853.

Resonant Conversion of Dark Matter Oscillons in Pulsar Magnetospheres

A. Prabhu and N.M. Rapidis. Submitted to JCAP. arXiv:2005.03700.

An improved analysis framework for axion dark matter searches

D.A. Palken, B.M. Brubaker, M. Malnou, S. Al Kenany, K.M. Backes, S.B. Cahn, Y.V. Gurevich, S.K. Lamoreaux, S.M. Lewis, R.H. Maruyama, N.M. Rapidis, J.R. Root, M. Simanovskaia, T.M. Shokair, S. Singh, D.H. Speller, I. Urdinaran, K. van Bibber, L. Zhong, K.W. Lehnert. Phys. Rev. D **101**, 123011, (2020). doi.org/10.1103/PhysRevD.101.123011.

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.

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[1]Publications list is also available on INSPIRE.

Palken, <u>N.M. Rapidis</u>, 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, <u>N.M. Rapidis</u>, 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, <u>N.M. Rapidis</u>, 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
<u>N.M. Rapidis</u>, 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
<u>N.M. Rapidis</u> (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 & Software

Advanced: *Mathematica, CST Microwave Studio, L^AT_EX*
Intermediate: *Python, 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.