

Anna Wang-Holtzen, Ph.D.

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Research Interests

Ultrafast techniques using XUV pulses produced by high harmonic generation (HHG) in atomic gases allow us to study electron motion, which happens on the attosecond timescale. One way to detect such dynamics is by measuring the scattering phase shift of an electron after photoionization out of some atomic or molecular potential. The time delays of ionization in simple atoms have been studied using techniques such as RABBITT and angular streaking, but molecular ionization delays remain largely unexplored. While atoms typically exhibit delays caused by the Coulomb potential of the nucleus, molecules have more complex electronic structure and multiple ionization channels. This provides opportunities to study electron dynamics beyond the Coulomb interaction with the nucleus, such as electron correlations and channel couplings. I hope to use RABBITT, a technique that extracts phase delay by monitoring oscillations in photoelectron yield from pump-probe delay controlled two-photon ionization, to study these dynamics in molecular systems.

Education

2011–2015 B.S. in Physics – University of California, Los Angeles

2017–2022 Ph.D. in Applied Physics – Stanford University
Advisors: Philip Bucksbaum and James Cryan

Employment History and Research Experience

Nov. 2022 Department of Physics, Harvard, MA

– **Present** *Preceptor*

As a Preceptor at Harvard University, my teaching interests center on helping students develop scientific and evidence based thinking. I supervise teaching fellows and course assistants, and work in a team of instructors on the broader physics laboratory education program.

Aug. 2023 Department of Continuing Education, Harvard, MA

– **Present** *Head Instructor*

Head instructor for the Harvard Extension School's introductory physics series.

Sept. 2017 PULSE Institute, Stanford, CA

– **Oct. 2022** *Graduate Research Assistant*

My research interests involve using attosecond metrology to probe dynamic properties of molecular systems. I used a combination of tabletop, XUV and XFEL, X-ray attosecond light sources to access valence and core ionization in molecules.

Jul. 2015 HRL Laboratories, Malibu, CA

– **Feb. 2017** *Development Engineer, Sensors and Electronics*

Conducted cryogenic materials testing of superconducting metals and semiconductors. Performed semiconductor device screening.

Awards & Honors

- **(2023) White Teaching Prize**
Excellence in teaching introductory physics at Harvard University.
- **(2017) Stanford VPGE EDGE Fellowship**
Enhancing Diversity in Graduate Education (EDGE) Doctoral Fellowship Program.
- **(2015) Departmental Honors with College Honors, UCLA Letters and Sciences**
For undergraduate thesis work and honors level coursework.
- **(2012 – 2015) Officer for the Society of Physics Students, UCLA Chapter**
President, Vice President, and Treasurer.

Selected Publications

- A. S. Kheifets, R. Wielan, V. V. Serov, I. A. Ivanov, **A. Li Wang**, A. Marinelli, and J. P. Cryan.
Ionization phase retrieval by angular streaking from random shots of XUV radiation.
Phys. Rev. A 106, 033106, 2022
- **Anna L. Wang**, Vladislav V. Serov, Andrei Kamalov, Philip H. Bucksbaum, Anatoli Kheifets, and James P. Cryan.
Role of nuclear-electronic coupling in attosecond photoionization of H_2 .
Phys. Rev. A 104, 063119., 2021
- Andrei Kamalov, **Anna L. Wang**, Philip H. Bucksbaum, Daniel J. Haxton, and James P. Cryan.
Electron correlation effects in attosecond photoionization of CO_2 .
Phys. Rev. A 102, 023118., 2020
- M. Fan, C. A. Holliman, **A. L. Wang**, A. M. Jayich.
Laser Cooling of Radium Ions.
Phys. Rev. Lett. 122, 223001., 2019

Presentations

- **A. L. Wang**, J. Wang, E. Isele, P. H. Bucksbaum, J. P. Cryan.
Molecular spin-orbit delays from attosecond photoionization.
International Conference on Ultrafast Phenomena contributed poster, 2022
- **A. L. Wang**, A. Kamalov, P. H. Bucksbaum, and J. P. Cryan; V. Serov, A. Bray, A. Kheifets.
Investigation of Coupled Nuclear and Electronic Motion in H_2 Photoionization.
DAMOP contributed poster, 2020
- A. Kamalov, **A. L. Wang**, P. H. Bucksbaum, D. J. Haxton, J. P. Cryan.
Observing Multichannel Effects in Molecular Photoionization Delays.
ATTO poster, 2019

Miscellaneous

- **Programming Skills**
Python and MATLAB