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Institute of Physics
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Mateusz Borkowski

Employment

Apr 2024 onwards – University of Amsterdam, Amsterdam, The Netherlands
Research assistant at the Quantum Gases and Quantum Information Group

Mar 2022 – Mar 2024, Columbia University of New York, New York City, USA
Postdoctoral researcher (experiment, prof. T. Zelevinsky's molecular clock)

Mar 2021 – Feb 2022, University of Amsterdam, Amsterdam, The Netherlands
Postdoctoral researcher (experiment, prof. Florian Schreck's RbSr project)

Mar 2018 – Feb 2021, Nicolaus Copernicus University, Toruń, Poland
Postdoctoral researcher (theory, group of prof. Piotr Żuchowski)

Oct 2015 – Feb 2018, Nicolaus Copernicus University, Toruń, Poland
PI, National Science Centre grant (theory)

Education

2010 – 2015, Nicolaus Copernicus University, Toruń, Poland
PhD in Physics
thesis: Optical Feshbach resonances in ultracold atomic gases
thesis advisor: prof. Roman Ciuryło

2005 – 2010, Nicolaus Copernicus University, Toruń, Poland
Master of engineering in technical physics + computer science;
thesis: Optical control of atomic interactions in ultracold ytterbium
thesis advisor: prof. Roman Ciuryło

International experience

2022–2024, Columbia University of New York, USA
Travel grant + postdoc; molecular clock experiment of prof. Tanya Zelevinsky

2019–2022, University of Amsterdam, The Netherlands
Travel grant + postdoc; RbSr experiment of prof. Florian Schreck

2012, Kyoto University, Japan
MEXT stipend; Yb photoassociation group of prof. Yoshiro Takahashi

2007–2008, University of Strathclyde, Glasgow, UK
EU funded student exchange;
Laser cooling of calcium with prof. Erling Riis
and theoretical BEC dynamics with prof. Gian-Luca Oppo

Selected awards

2019, Stefan Pieńkowski Award, Polish Academy of Sciences
Awarded for the proposal of a novel molecular lattice clock

2011, Arkadiusz Piekara Award, Polish Physical Society
Awarded for an outstanding Masters thesis

2010, Best graduate, Nicolaus Copernicus University
Awarded to the university's top student in their final year of a Masters degree

Selected invited talks

Testing fundamental physics with molecular lattice clocks
SPIE Quantum West, San Francisco, 2023

Molecular Lattice Clocks in the Optical Domain
51st Annual Meeting of the APS DAMOP, Portland, 2020

Optical Clock Transitions in Weakly Bound Molecules
International Conference on Spectral Line Shapes, Dublin, 2018

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Selected papers

1. B. Iritani, E. Tiberi, W. Skomorowski, R. Moszynski, M. Borkowski, T. Zelevinsky, Accurate Determination of Blackbody Radiation Shifts in a Strontium Molecular Lattice Clock, Phys. Rev. Lett. **131**, 263201 (2023)
2. K. H. Leung, B. Iritani, E. Tiberi, I. Majewska, M. Borkowski, R. Moszynski, T. Zelevinsky, Terahertz vibrational molecular clock with systematic uncertainty at the 10^{-14} level, Phys. Rev. X **13**, 011047 (2023)
3. M. Borkowski, L. Reichsöllner, P. Thekkeppatt, V. Barbé, T. van Roon, N.J. van Druten, F. Schreck, Active stabilization of kilogauss magnetic fields to the ppm level for magnetoassociation on ultranarrow Feshbach resonances, Rev. Sci. Instrum. **94**, 073202 (2023)
4. M. Borkowski, A. A. Buchachenko, R. Ciuryło, P. S. Julienne, H. Yamada, Y. Kikuchi, Y. Takasu, Y. Takahashi, Weakly bound molecules as sensors of new gravitylike forces, Sci. Rep. **9**, 14807 (2019)
5. M. Borkowski, Optical Lattice Clocks with Weakly Bound Molecules, Phys. Rev. Lett. **120**, 083202 (2018)
6. M. Borkowski, A. A. Buchachenko, R. Ciuryło, P. S. Julienne, H. Yamada, Y. Kikuchi, K. Takahashi, Y. Takasu, Y. Takahashi, Beyond-Born-Oppenheimer effects in sub-kHz-precision photoassociation spectroscopy of ytterbium atoms, Phys. Rev. A **96**, 063405 (2017); Editor's Suggestion
7. M. Borkowski, P. Morzyński, R. Ciuryło, P. S. Julienne, M. Yan, B. J. DeSalvo, T.C. Killian, Mass scaling and nonadiabatic effects in photoassociation spectroscopy of ultracold strontium atoms, Phys. Rev. A **90**, 032713 (2014)
8. M. Borkowski, P. S. Żuchowski, R. Ciuryło, P. S. Julienne, D. Kędziera, Ł. Mentel, P. Tecmer, F. Münchow, C. Bruni, A. Görlitz, Scattering lengths in isotopologues of the RbYb system, Phys. Rev. A **88**, 052708 (2013)
9. M. Borkowski, R. Ciuryło, P. S. Julienne, S. Tojo, K. Enomoto, Y. Takahashi, Line shapes of optical Feshbach resonances near the intercombination transition of bosonic ytterbium, Phys. Rev. A **80**, 012715 (2009)
10. U. Dammalapati, I. Norris, L. Maguire, M. Borkowski and E. Riis, A compact magneto-optical trap apparatus for calcium, Meas. Sci. Technol. **20**, 095303 (2009)

Selected grants

Search for new physics via high-resolution spectroscopy of ultracold strontium molecules in optical lattices (2022 – 2024)
Polish National Agency for Academic Exchange fellowship; principal investigator

Atomic Quantum Simulators 2.0 – Taming Long-range Interactions (2019 – present)
NWO programme; postdoc 2021-2022

Optical molecular clocks (2019 – 2020)
National Science Centre UWERTURA fellowship; principal investigator

Controlled ultracold collisions and chemical reactions of atoms and molecules with complex structure (2018 – 2021)
National Science Centre OPUS program; postdoc

Optical clocks with 1×10^{-18} uncertainty (2016 – 2019)
EMPIR programme co-financed by the Participating States and from the European Union's Horizon 2020 research and innovation programme; associate researcher

Control of atomic interactions using Feshbach resonances near ultra-narrow optical transitions (2015 – 2018)
National Science Centre PRELUDIUM program; principal investigator

Precise optical control and metrology of quantum systems (2011 – 2015)
Foundation for Polish Science TEAM Program; PhD stipend