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APPOINTMENTS

starting 01/2024 Assistant Professor, Institute of Science and Technology Austria
10/2023 – 12/2023 Visiting Scientist, Max Planck Institute for the Structure and Dynamics of Matter, Germany
09/2020 – 10/2023 Postdoctoral Scholar, Department of Physics, Harvard University, USA
10/2018 - 08/2020 Postdoctoral Scholar, Stanford PULSE Institute, SLAC National Laboratory, USA
10/2013 - 09/2018 Research Assistant, ETH Zürich, Switzerland

EDUCATION

- 04/2018 Dr. Sc. ETH in Natural Sciences, ETH Zürich
- 09/2013 M. Sc. in Chemistry, ETH Zürich
- 04/2013 B. Sc. in Chemistry, ETH Zürich

HONORS AND AWARDS

- 2021 Bronze Talk Prize at the “Low Energy Electrodynamics in Solids”
 - “Low Energy Electrodynamics in Solids” (LEES 2021) conference
- 2021 2nd place Talk Prize
 - 11th “New Generation in Strongly Correlated Electron Systems” (NGSCES 2021) conference
- 2020 PostDoc.Mobility Fellowship from the Swiss National Science Foundation
- 2019 Early PostDoc.Mobility Fellowship from the Swiss National Science Foundation
- 2017 SCS Travel Award for the Participation at the 6th Conference on Attosecond Physics (Xi’an, China)
- 2015 Participation at the 65th Lindau Nobel Laureate Meeting (Interdisciplinary)
- 2014 Medal of the ETH Zürich for an Outstanding Master Thesis
- 2013 Willi Studer Award for the Best Degree in Chemistry 2013
- 2012 Excellence Scholarship & Opportunity Award, ETH Zürich Foundation

RESEARCH INTERESTS

I conduct research at the intersection of physics, physical chemistry, and material science. Currently I am interested in investigating fundamental problems in quantum materials, as well as in controlling their nonequilibrium properties with light. The goal of my research is to discover novel, emergent physical phenomena and solve long-standing problems in the physics of interacting electron systems. To further these goals, I make use of advanced ultrafast optical methods and of ultrafast x-ray scattering probes, both laboratory-based and at large-scale facilities (e.g. free electron lasers).

PUBLICATIONS

Peer-reviewed publications

1. J. Hales, U. Bajpai, T. Liu, **D. R. Baykusheva**, M. Li, M. Mitrano, Y. Wang, “Witnessing Light-Driven Entanglement using Time-Resolved Resonant Inelastic X-Ray Scattering”, [*Nat. Comm.* **14**, 3512 \(2023\)](#)
2. **D. R. Baykusheva**, M. H. Kalthoff, D. Hofmann, M. Claassen, D. M. Kennes, M. A. Sentef, and M. Mitrano, „Witnessing Nonequilibrium Entanglement Dynamics in a Strongly Correlated Fermionic Chain“, [*Phys. Rev. Lett.* **130**, 106902 \(2023\)](#)
3. Ch. Heide, Y. Kobayashi, **D. R. Baykusheva**, D. Jain, J. A. Sobota, M. Hashimoto, P. S. Kirchmann, S. Oh, T. F. Heinz, D. A. Reis, and S. Ghimire, “Probing topological phase transitions using high-harmonic generation”, [*Nat. Phot.* **16**, 620 \(2022\)](#)

4. V. Svoboda, N. Bhargava Ram, **D. Baykusheva**, D. Zindel, M. D. J. Waters, B. Spenger, M. Ochsner, H. Herburger, J. Stohner, H. J. Wörner, “Femtosecond photoelectron circular dichroism of chemical reactions”, [*Sci. Adv.* **8**, eabq2811 \(2022\)](#)
5. X. Gong, I. Jordan, M. Huppert, S. Heck, **D. Baykusheva**, D. Jelovina, A. Schild, and H. J. Wörner, “Attosecond Photoionization Dynamics: from Molecules over Clusters to the Liquid Phase”, [*Chimia* **76**, 520 \(2022\)](#)
6. **D. R. Baykusheva**, H. Jang, A. A. Husain, S. Lee, S. F. R. TenHuisen, P. Zhou, S. Park, H. Kim, J.-K. Kim, H.-D. Kim, M. Kim, S.-Y. Park, P. Abbamonte, B. J. Kim, G. D. Gu, Y. Wang, and M. Mitrano, “Ultrafast Renormalization of the On-Site Coulomb Repulsion in a Cuprate Superconductor”, [*Phys. Rev. X* **12**, 011013 \(2022\)](#)
7. S. Heck, **D. Baykusheva**, M. Han, J.-B. Ji, C. Perry, X. Gong, and H. J. Wörner, “Attosecond interferometry of shape resonances in the recoil frame of CF₄”, [*Sci. Adv.* **7**, eabj8121 \(2021\)](#)
8. **D. Baykusheva**, A. Chacòn, J. Lu, T. P. Bailey, J. A. Sobota, H. Soifer, P. S. Kirchmann, C. Rotundu, C. Uher, T. F. Heinz, D. A. Reis, and S. Ghimire, “All-Optical Probe of Three-Dimensional Topological Insulators Based on High-Harmonic Generation by Circularly Polarized Laser Fields”, [*Nano Lett.* **21**, 21 8970 \(2021\)](#)
9. **D. Baykusheva**, A. Chacòn, D. Kim, D. E. Kim, D. A. Reis, and S. Ghimire, “Strong-field physics in three-dimensional topological insulators”, [*Phys. Rev. A* **103**, 023101 \(2021\)](#)
10. G. Vampa, J. Lu, Y. S. You, **D. R. Baykusheva**, M. Wu, H. Liu, K. J. Schafer, M. B. Gaarde, D. A. Reis, S. Ghimire, “Attosecond synchronization of extreme ultraviolet highharmonics from crystals”, [*J. Phys. B: At. Mol. Opt. Phys.* **53**, 144003 \(2020\)](#)
11. S. Biswas, B. Förg, L. Ortmann, J. Schötz, W. Schweinberger, T. Zimmermann, L. Pi, **D. Baykusheva**, H. A. Masood, I. Lontos, A. M. Kamal, N. G. Kling, A. F. Alharbi, M. Alharbi, A. M. Azzeer, G. Hartmann, H. J. Wörner, A. S. Landsman, and M. F. Kling, “Probing molecular environment through photoemission delays”, [*Nat. Phys.* **16**, 778 \(2020\)](#)
12. **D. Baykusheva**, D. Zindel, V. Svoboda, E. Bommeli, M. Ochsner, A. Tehlar, H. J. Wörner, “Real-time probing of chirality during a chemical reaction”, [*PNAS* **116**, 23923 \(2019\)](#)
13. **D. Baykusheva**, H. J. Wörner, “Chiral discrimination through bi-elliptical high-harmonic spectroscopy”, [*Phys. Rev. X* **8** \(3\), 031060 \(2018\)](#)
14. **D. Baykusheva**, S. Brennecke, M. Lein, H. J. Wörner, “Signatures of electronic structure in bicircular high-harmonic spectroscopy”, [*Phys. Rev. Lett.* **119** \(20\), 203201 \(2017\)](#)
15. S. G. Walt, N. B. Ram, M. Atala, N. I. Shvetsov-Shilovski, A. von Conta, **D. Baykusheva**, M. Lein, and H. J. Wörner, [*Nat. Comm.* **8** \(15651\), 203201 \(2017\)](#)
16. **D. Baykusheva**, H. J. Wörner, “Theory of attosecond delays in molecular photoionization”, [*J. Chem. Phys.* **146**, 124306 \(2017\)](#)
17. Y. Pertot, C. Schmidt, M. Matthews, A. Chauvet, M. Huppert, V. Svoboda, A. von Conta, A. Tehlar, **D. Baykusheva**, J.-P. Wolf, H. J. Wörner, “Time-resolved x-ray absorption spectroscopy with a water window high-harmonic source”, [*Science* **355**, 264 \(2017\)](#)
18. I. Jordan, M. Huppert, S. Pabst, A. S. Kheifets, **D. Baykusheva**, and H. J. Wörner, “Spin-orbit delays in photoemission”, [*Phys. Rev. A* **95**, 013404 \(2017\)](#)
19. R. Rajeev, J. Hellwagner, A. Schumacher, I. Jordan, M. Huppert, A. Tehlar, B. Ram Niraghatam, **D. Baykusheva**, N. Lin, A. von Conta, and H. J. Wörner, “In situ frequency gating and beam splitting of vacuum- and extreme-ultraviolet pulses”, [*Light: Science & Applications* **5**, e16170 \(2016\)](#)

20. M. Huppert, I. Jordan, **D. Baykusheva**, A. von Conta, H. J. Wörner, “Attosecond delays in molecular photoionization”, [*Phys. Rev. Lett.* **117**, 093001 \(2016\)](#)
21. **D. Baykusheva**, Md S. Ahsan, N. Lin, H. J. Wörner, “Bicircular high-harmonic spectroscopy reveals dynamical symmetries of atoms and molecules”, [*Phys. Rev. Lett.* **116**, 123001 \(2016\)](#)
22. P. M. Kraus, B. Mignolet, **D. Baykusheva**, A. Rupenyan, L. Horny, E. F. Penka, G. Grassi, O. I. Tolstikhin, J. Schneider, F. Jensen, L. B. Madsen, A. D. Bandrauk, F. Remacle, H. J. Wörner, “Measurement and laser control of attosecond charge migration in ionized iodoacetylene”, [*Science* **350**, 6262 \(2015\)](#)
23. P. M. Kraus, O. I. Tolstikhin, **D. Baykusheva**, A. Rupenyan, J. Schneider, C. Z. Bisgaard, T. Morishita, F. Jensen, L. B. Madsen, and H. J. Wörner, “Observation of laser-induced electronic structure in oriented polyatomic molecules”, [*Nat. Commun.* **6**, 7039 \(2015\)](#)
24. S. B. Zhang, **D. Baykusheva**, P. M. Kraus, H. J. Wörner, and N. Rohringer, “Theoretical study of molecular electronic and rotational coherences by high-order-harmonic generation”, [*Phys. Rev. A* **91**, 023421 \(2015\)](#)
25. **D. Baykusheva**, P. M. Kraus, S. B. Zhang, N. Rohringer and H. J. Wörner, “The sensitivity of high-harmonic generation and strong-field ionization to coupled electronic and rotational dynamics”, [*Faraday Discuss.* **171**, 113-132 \(2014\)](#)
26. P. M. Kraus, **D. Baykusheva** and H. J. Wörner, “Two-pulse orientation dynamics and high-harmonic spectroscopy of strongly oriented molecules”, [*J. Phys. B: At. Mol. Opt. Phys.*, **47**, 124030 \(2014\)](#)
27. P. M. Kraus, **D. Baykusheva** and H. J. Wörner, “Two-pulse field-free orientation reveals anisotropy of molecular shape resonance”, [*Phys. Rev. Lett.* **113**, 023001 \(2014\)](#)
28. K. Vasilatou, J. M. Michaud, **D. Baykusheva**, G. Grassi and F. Merkt, „The cyclopropene radical cation: Rovibrational level structure at low energies from high-resolution photoelectron spectra“, [*J. Chem. Phys.*, **141** \(6\), 064317 \(2014\)](#)

Preprints

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BOOK CHAPTERS

1. **D. Baykusheva** and H. J. Wörner, “Attosecond Molecular Dynamics and Spectroscopy” [*“Molecular Spectroscopy and Quantum Dynamics”*, R. Marquardt and M. Quack \(eds.\), vol. 1, 113-161, Elsevier, Amsterdam \(2021\)](#)

PROFESSIONAL ACTIVITIES

- Referee for *Nature Physics*, *Nature Communications*, *Physical Review Letters*, *Physical Review A*, *Physical Review B*, *Physical Review X*, *Applied Physics Letters*, *Optics Express*, *Optics Letters*, *Journal of Physics B: Atomic, Molecular and Optical Physics*
- Grant Reviewer for *the Gordon and Betty Moore Foundation (USA)*
- Member of the American Physical Society

EXTERNAL FUNDING

- 2020 – 2022
 - PostDoc.Mobility Fellowship by the Swiss National Science Foundation (Project number P400P2_194343)

- 2019 – 2020
 - Early PostDoc.Mobility Fellowship by the Swiss National Science Foundation (Project number P2EZIP_184255)