Dominika Ďurovčíková

dominika@mit.edu — dominikadu.github.io

EDUCATION

Doctor of Philosophy in Physics | Massachusetts Institute of Technology, USA 09/2020 - present
Research advisor: Anna-Christina Eilers, Robert Simcoe
Research area: High-redshift astrophysics and cosmology (Cosmic Dawn Group)
Other research areas: Precision quantum metrology for quantum gravity (past member at Quantum and Precision Measurements Group)

Master of Physics (4-year MPhys) | University of Oxford, United Kingdom 10/2016 - 07/2020
Degree classification: First class
Graduate concentration: Laser Physics and Quantum Information Processing, Theoretical Physics
Graduate thesis: Cross-Telescopic Super-Resolution Galaxy Images from Generative Adversarial Networks

International Baccalaureate Diploma | Gymnazium Jur Hronec, Bratislava, Slovak Republic 09/2014 - 06/2016
Score: 42/45
Subjects: Physics HL, Mathematics HL, English B HL, German B SL, Psychology SL, Slovak A SL.

RESEARCH EXPERIENCE

Astrophysics:

PhD candidate | Cosmic Dawn Group, MIT Kavli Institute, Cambridge, MA 09/2022 - present
Advisor: Anna-Christina Eilers, Robert Simcoe
Interests: quasar damping wings and proximity zones, Epoch of Reionization, quasar lifetimes, supermassive black hole growth

Student Researcher | Beecroft Institute of Particle Astrophysics and Cosmology, Oxford, UK 10/2017 - 08/2020
Advisor: Adrianne Slyz, Julien Devriendt
Interests: Epoch of Reionization, machine learning, quasar damping wings, galaxy super-resolution imaging, simulations of galaxy formation

Co-Researcher | M.R. Štefánik Observatory, Hlohovec, Slovakia 02/2015 - 10/2016
Advisor: Karol Petrík
Interests: transiting exoplanets, multiband photometry
Co-initiated exoplanetary research at the observatory

Precision and quantum metrology:

Research Assistant | Quantum and Precision Measurements Group, MIT, Cambridge, MA 09/2020 - 08/2022
Advisor: Vivishek Sudhir
Interests: quantum sensing, cavity optomechanics, trapping, interface of quantum physics and general relativity

Laidlaw Scholar | LIGO Laboratory, MIT, Cambridge, MA 07/2018 - 09/2018
Advisor: Nergis Mavalvala
Interests: gravitational wave detectors, opto-electronic control systems, squeezed states of light

Other:

Student Intern | Tearney Laboratory, Massachusetts General Hospital, Boston, MA 07/2019 - 09/2019
Advisor: Guillermo J. Tearney
Interests: micro-optical coherence tomography

Student Intern | Research Center for Quantum Information, Bratislava, Slovakia 06/2017 - 08/2017
Advisor: Daniel Nagaj
Interests: Quantum Approximate Optimization Algorithm (QAOA)

PUBLICATIONS

9. Greig, Bosman, Davies, **Ďurovčíková**, Fathivavsari, Liu, Meyer, Sun, D'Odorico, Gallerani, Mesinger, Ting. Blind QSO reconstruction challenge: Exploring methods to reconstruct the Lyα emission line of QSOs. arXiv:2404.01556 (2024).
8. **Ďurovčíková**, Sudhir. Scheme for continuous force detection with a single electron at the 10^{-27} N level. arXiv:2402.05998 (2024).

7. **Ďurovčíková**, Eilers, Chen, Satyavolu, Kulkarni, Simcoe, Keating, Haehnelt, Bañados. Chronicling the reionization history at $6 \lesssim z \lesssim 7$ with emergent quasar damping wings. ApJ 969 162 (2024).
6. Eilers, Simcoe, Yue, Mackenzie, Matthee, **Ďurovčíková**, Kashino, Bordoloi, Lilly. EIGER III. JWST/NIRCam observations of the ultra-luminous high-redshift quasar J0100+2802. ApJ 950 68 (2023).
5. Komori, **Ďurovčíková**, Sudhir. Quantum theory of feedback cooling of an anelastic macro-mechanical oscillator. PRA 105(4) p.043520 (2022).
4. Bosman, **Ďurovčíková**, Davies, Eilers. A comparison of quasar emission reconstruction techniques for $z \geq 5.0$ Lyman-α and Lyman-β transmission. MNRAS 503(2) pp.2077–2096 (2021).
3. Reiman, Tamanas, Prochaska, **Ďurovčíková**. Fully probabilistic quasar continua predictions near Lyman-α with conditional neural spline flows. arXiv: 2006.00615 (2020).
2. Katz, **Ďurovčíková**, Kimm, Rosdahl, Blaizot, Haehnelt, Devriendt, Slyz, Ellis, Laporte. New Methods for Identifying Lyman Continuum Leakers and Reionization-Epoch Analogues. MNRAS 498(1) pp.164–180 (2020).
1. **Ďurovčíková**, Katz, Bosman, Davies, Devriendt, Slyz. Reionization history constraints from neural network based predictions of high-redshift quasar continua. MNRAS 493(3) pp.4256–4275 (2020).

CONFERENCES & TALKS

* invited
† virtual

Talk:†*	*Quasars in the early Universe*, Summer Conference on Particle Physics Solid State Physics, University of Tennessee, TN	07/2024
Talk:	*Chronicling the reionization history with* $6 < z < 7$ *quasars*, First Stars VII, New York City, NY	05/2024
Talk:*	*A journey to the most distant black holes in the Universe*, Slovak Astrophysicists in Boston, Cambridge, MA	03/2024
Talk:†*	*Chronicling the reionization history with* $6 < z < 7$ *quasars*, Science coffee at Charles University, Prague, Czech Republic	02/2024
Talk:†*	*Chronicling the reionization history with* $6 < z < 7$ *quasars*, State of the Universe seminar, Tata Institute of Fundamental Research, Mumbai, India	12/2023
Attendee:	Boston-Area Black Hole Accretion Meeting, Harvard & Smithsonian Center for Astrophysics, Cambridge, MA	10/2023
Talk:*	*Machine learning use cases in Reionization studies*, Modern statistics of galaxies seminar, University Observatory of LMU, Munich, Germany	09/2023
Talk:	*Chronicling the reionization history with redshift* $6 < z < 7$ *quasars*, Reionization in the Summer, Heidelberg, Germany	06/2023
Poster:	*Chronicling the reionization history with redshift* $z \sim 6.5$ *quasars*, First Light Conference, Cambridge, MA	06/2023
Talk:†	*Theory of ground state cooling of a macroscopic anelastic mechanical oscillator*, Conference on Lasers and Electro-Optics (CLEO), San Jose, CA	05/2022
Talk:†	*Intensity interferometry & more quantum optics*, MIT Kavli Institute Journal Club, Cambridge, MA	02/2022
Poster:†	*Prospects for high-sensitivity continuous force detection with a single trapped ion*, MIT QSEC Annual Research Conference, Cambridge, MA	02/2022
Talk:†	*On the Unruh effect and its measurement*, MIT Kavli Institute Graduate Lunch, Cambridge, MA	04/2021
Workshops:†	*Solving Laplace equation; Building a precision force detector*, EWAAB Young Professionals Program, online	03/2021
Video:†*	*Exploring the Quantum-Gravity Interface through Precision Measurements* Global Young Scientists Summit, Singapore	01/2021
Talk:†	*Neural networks for the early Universe*, Summer All Zoom Epoch of Reionization Astronomy Conference (SAZERAC), online	07/2020
Attendee:†	APS Virtual Division of Atomic, Molecular and Optical Physics (DAMOP) Meeting	06/2020
Poster:*	*Neural networks for the early Universe*, Royal Society-FAPESP Frontiers of Science Meeting, São Paulo, Brazil	03/2020
Talk:*	*Neural networks for the early Universe*, Particle Physics/Astrophysics/Machine learning Seminar, Oxford, UK	02/2020
Attendee:	First Light and Reionisation Epoch Meeting at Royal Astronomical Society, London, UK	02/2020

Poster:	*Developing a motion-weighted micro-optical coherence tomography for in vivo dynamical imaging*, Wellman Scientific Retreat, Boston, MA	09/2019
Poster:	*Developing a motion-weighted micro-optical coherence tomography for in vivo dynamical imaging*, Harvard-MIT Summer Institute for Biomedical Optics Poster Day, Boston, MA	08/2019
Talk:	*Dynamical micro-OCT: principles and challenges*, Harvard-MIT Summer Institute for Biomedical Optics Presentations, Boston, MA	07/2019
Attendee:*	FUTURE of Physics at California Institute of Technology, Pasadena, CA	11/2018
Poster:	*Building a laser intensity stabilisation servo (ISS) for the use of optomechanical squeezing in future GW detectors*, Laidlaw Research and Leadership Programme Poster Event, Oxford, UK	10/2018
Talk:	*How to quiet a laser? Laser Intensity Stabilisation Servo for Optomechanical Squeezing Experiment*, MIT Kavli Institute Undergraduate Research Symposium, Cambridge, MA	08/2018
Talk:	*Squeezed States of Light & GW detection*, Presentations at New College, Oxford, UK	02/2018

CERTIFICATES & SCHOLARSHIPS

MIT School of Science Service Fellowship	2022
MIT Physics Graduate Service Award	2021
Bruno Rossi Graduate Fellowship	2020 - 2021
Scholarship of the College of the Blessed Mary of Winchester	2017 - 2020
Harvard-MIT Summer Institute for Biomedical Optics Completion Certificate	2019
Institute of Leadership & Management (ILM) Certificate Level 3	2019
McKinsey&Company Next Generation Women Leaders Award	2019
Laidlaw Research and Leadership Scholarship	2018
Distinction in Physics	2017

TEACHING & COMMUNITY ENGAGEMENT

Local Organizing Committee Member | First Light Conference 06/2023

Co-director | MIT Astrogazers 05/2023 - present

Bringing the wonders of observational astronomy to the streets of Cambridge and Boston (and occasionally beyond).

Lecturer | Discover Summer Academy 08/2020 - present

Designed and taught a week-long course on quantum physics (twice) and on black holes (once) to high school students from Slovakia and Czech Republic.
Facilitated team-building and self-reflection sessions in three teams of ∼10 students.

Teaching Assistant | MIT Department of Mechanical Engineering 02/2022 - 05/2022

Co-developed a new course on classical and quantum stochastic processes (course number 2.S982).
Created and marked 7 problem sets, hosted weekly office hours, and marked final presentations.

Vice-President for Admissions | MIT Physics Graduate Student Council 08/2021 - 06/2022

Oversaw and coordinated student initiatives related to admissions to the MIT Physics graduate program.
Collaborated with the Physics Graduate Student Council leadership on improving the student experience at MIT Physics.

Student Leader | MIT Physics Department Graduate Admissions Advisory Council 07/2020 - 06/2022

Co-designed and launched three new student-led resources under the umbrella of PhysGAAP to increase equity in the MIT Physics graduate admissions process.
Prepared and led weekly council meetings with the Admissions Chair and the Academic Programs Office focused on analysing and assessing the current graduate admissions process and improving its equity and inclusivity to applicants from diverse and untraditional backgrounds.
Collaborated with student leaders from other MIT departments to achieve a more uniform change in admissions across MIT.

Co-Founder | EWAAB Nonprofit Organisation 06/2019 - present

Co-founded EWAAB as an initiative to support confidence in university-level women. We aim to encourage young women to step out of their comfort zone, to provide them with a set of leadership and communication skills to be able to do so, and to connect them to a global network of peers and supporters.
Transformed the original initiative into a 501(c)3 nonprofit organisation currently supported by 9 Trustees.

Co-designed the curriculum of the 2019/20 mentorship program and managed a successful launch of its inaugural year at 8 universities around the world, spanning Canada to Australia, together impacting 27 mentees in 6 countries.

Featured in the Scientific American and SME (the largest Slovak newspaper).

President, STEM Leader, STEM Advisor | Unimak 09/2016 - 09/2020

Led over 80 members of this organisation to spread awareness of the possibilities for young Slovaks and Czechs to study at world leading universities via outreach talks, online media, and advice on issues related to choosing and applying to universities.