Dominika Ďurovčíková

Cirriculum Vitae

Office: 37-626K
Massachusetts Institute of Technology
McNair Building (MIT Building 37)
70 Vassar St, Cambridge, MA 02139

Phone: +1 (857) 260-9585
Email: dominika@mit.edu
Website: dominikadu.github.io
ORCiD: 0000-0001-8986-5235

Education

PhD in Physics 2020 - 2026 *(expected)*

Massachusetts Institute of Technology, Cambridge, MA, USA

- Advisors: Prof. Anna-Christina Eilers, Prof. Robert A. Simcoe
- Primary research area: high-redshift astrophysics
- Other research areas: precision quantum metrology (with Prof. Vivishek Sudhir)

Master of Physics (4-year MPhys) 2016 - 2020

University of Oxford, Oxford, United Kingdom

- Degree classification: First class
- Graduate thesis in astrophysics with Prof. Adrianne Slyz and Prof. Julien Devriendt
- Graduate concentration in theoretical physics, laser physics and quantum information processing

International Baccalaureate Diploma 2014 - 2016

Gymnazium Jur Hronec, Bratislava, Slovak Republic

- Score: 42/45 (top of the class)
- Subjects: Physics HL (high-level), Mathematics HL, English B HL, German B SL (standard-level), Psychology SL, Slovak A SL

Research Experience

Astrophysics:

PhD Research | Cosmic Dawn Group, MIT Kavli Institute 2022 - present

- Advisors: Prof. Anna-Christina Eilers, Prof. Robert A. Simcoe
- Projects: constraining the timing of Epoch of Reionization and quasar lifetimes using quasar damping wings and proximity zones (1 publication), measuring quasar lifetimes using extended nebular emission with IFU spectroscopy (1 publication, 1 publication in preparation), possible signatures of Population III stars in damped Lyman α systems (1 publication).

Undergradute Research | Beecroft Institute of Particle Astrophysics and Cosmology 2017 - 2020

- Advisors: Prof. Adrianne Slyz, Prof. Julien Devriendt
- Projects: role of cooling in galaxy formation simulations (using the FIRE simulation), using machine learning to predict quasar continua for constraining the Epoch of Reionization (1 publication), super-resolution imaging of galaxies using machine learning (Master's thesis).

High-School Thesis | M.R. Štefánik Observatory 2015 - 2016

- Advisor: Dr. Karol Petrík
- Co-initiated transiting exoplanetary research at the observatory and published observations through the Exoplanet Transit Database.

Quantum sensing:

PhD Research | Quantum and Precision Measurements Group, MIT 2020 - 2022

- Advisor: Prof. Vivishek Sudhir
- Designed an experiment that promises to use a single trapped electron to perform precision force sensing to study quantum-gravitational effects (1 publication).

Laidlaw Scholar | LIGO Laboratory, MIT 2018

- Advisor: Prof. Nergis Mavalvala
- Designed and built an opto-electronic control system to stabilize a laser to its quantum limit, enabling the preparation of a squeezed light state for the improvement of gravitational wave detectors.

Other:

Internship | Tearney Laboratory, Massachusetts General Hospital 2019

- Advisor: Prof. Guillermo J. Tearney, M.D.
- Developing a new modality of micro-optical coherence tomography.

Internship | Research Center for Quantum Information, Bratislava 2017

- Advisor: Dr. Daniel Nagaj
- Simulated the Quantum Approximate Optimization Algorithm (QAOA) in MATLAB.

Awards and Honors

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

Telescope Use

Keck/MOSFIRE (PI, 0.5 nights) 2025
A potential weak-line quasar transition at $z \sim 6$

Magellan/FIRE,LDSS3 (PI, 1 nights) 2024
A candidate metal-poor absorption system at $z \sim 6$

Magellan/FIRE (PI, 7 nights) 2024
Exploring the connection between supermassive black hole lifetimes and the history of their galactic environment

Magellan/FIRE (PI, 1 night) 2023
Chronicling the reionization history with redshift $z \sim 6.5$ *quasars*

Co-I: JWST Cycle 2 GO #3079 (NIRSpec IFU), JWST Cycle 4 GO #6827 (NIRCam WFSS, MIRI), Magellan/LLAMAS, multiple Magellan/FIRE proposals

Observing experience: Magellan/FIRE (24 nights), Magellan/LDSS3 (0.5 night), Magellan/LLAMAS (2 nights), Keck/MOSFIRE (0.5 night)

Data reduction experience: JWST reduction pipeline, PypeIt

Other astronomical data/tool use: SDSS, DESI, VLT/MUSE, CLOUDY

Teaching and Mentoring

Research Mentor | MIT Undergraduate Research Opportunities Program 2023 - 2024

- Supervised two undergraduate students on a high-redshift quasar research project.

Teaching Assistant | MIT Department of Mechanical Engineering 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.

Lecturer | Discover Summer Academy 2020 - 2022

- 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.

Research Mentor | EWAAB Young Professionals Program 2021

- Supervised a team of 5 female undergraduate students for a period of 6 weeks on a research project related to simulating electric fields in an electromagnetic trap.
- Led online workshops on solving the Laplace equation and building precision force detectors.

Invited Talks

ENIGMA Group Meeting, UC Santa Barbara, Santa Barbara, CA	05/2025
Astro Lunch, UC Santa Barbara, Santa Barbara, CA	05/2025
High-redshift Meeting, Harvard & Smithsonian Center for Astrophysics, Cambridge MA	04/2025
Slovak Technical University, Trnava, Slovak Republic	03/2025
IEEE Buenaventura Section	11/2024
Summer Conference on Particle Physics Solid State Physics, University of Tennessee, TN	07/2024
Science coffee at Charles University, Prague, Czech Republic	02/2024
State of the Universe seminar, Tata Institute of Fundamental Research, Mumbai, India	12/2023
Modern statistics of galaxies seminar, University Observatory of LMU, Munich, Germany	09/2023
MIT Kavli Institute Journal Club, Cambridge, MA	02/2022
Particle Physics/Astrophysics/Machine learning Seminar, Oxford, UK	02/2020

Conference Talks

The First Gigayear(s) Conference, Hilo, HI	10/2024
EREBUS/JWST workshop, Hilo, HI	09/2024
First Stars VII, New York City, NY	05/2024
Reionization in the Summer, Heidelberg, Germany	06/2023
* First Light Conference, Cambridge, MA	06/2023
Conference on Lasers and Electro-Optics (CLEO), San Jose, CA	05/2022
* MIT QSEC Annual Research Conference, Cambridge, MA	02/2022
Global Young Scientists Summit, Singapore	01/2021
Summer All Zoom Epoch of Reionization Astronomy Conference (SAZERAC)	07/2020
* Royal Society-FAPESP Frontiers of Science Meeting, São Paulo, Brazil	03/2020
* Wellman Scientific Retreat, Boston, MA	09/2019
* Harvard-MIT Summer Institute for Biomedical Optics Poster Day, Boston, MA	08/2019
Harvard-MIT Summer Institute for Biomedical Optics Presentations, Boston, MA	07/2019
* Laidlaw Research and Leadership Programme Poster Event, Oxford, UK	10/2018
MIT Kavli Institute Undergraduate Research Symposium Cambridge, MA	08/2018

* poster presentations

Conference Attendance

Boston-Area Black Hole Accretion Meeting, Harvard & Smithsonian Center for Astrophysics, Cambridge, MA	10/2023
APS Virtual Division of Atomic, Molecular and Optical Physics (DAMOP) Meeting	06/2020
First Light and Reionisation Epoch Meeting at Royal Astronomical Society, London, UK	02/2020
FUTURE of Physics at California Institute of Technology, Pasadena, CA	11/2018

Public Talks

Slovak PRO Summit, Consulate General of Slovakia in New York, New York City, NY	09/2024
Slovak Astrophysicists in Boston, Cambridge, MA	03/2024

Outreach and Service Work

Referee for: The Astrophysical Journal, Physical Review Journals

Co-director | MIT Astrogazers 2023 - 2024

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

Local Organizing Committee Member | First Light Conference 2023

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

- Oversaw and coordinated student initiatives related to improving equity in 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 2020 - 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.
- Collaborated with student leaders from other MIT departments to achieve a more uniform change in admissions across MIT.

Co-Founder | EWAAB Nonprofit Organisation 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. Featured in the Scientific American and SME (the largest Slovak newspaper).
- Transformed the original initiative into a 501(c)3 nonprofit organization 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.
- Impact to date: 280+ students across 15 institutions worldwide.

President, STEM Leader, STEM Advisor | Unimak 2016 - 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.

Publications

12. **Ďurovčíková**, Eilers, Meyer, Farina, Bañados, Davies, Hennawi, Mazzucchelli, Simcoe, Walter. Quasar lifetime measurements from extended Lyα nebulae at $z \sim 6$. ApJ 990 174 (2025).
11. **Ďurovčíková**, Eilers, Simcoe, Welsh, Meyer, Matthee, Ryan-Weber, Yue, Katz, Satyavolu, Becker, Davies, Farina. An extremely metal-poor Lyman-α emitter candidate at $z = 6$ revealed through absorption spectroscopy. ApJL 987 L33 (2025).
10. **Ďurovčíková**, Sudhir. Scheme for continuous force detection with a single electron at the level of 10^{-27} N. PR Applied 23(5) p.054088 (2025).
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. MNRAS 533(3) pp.3312–3343 (2024).
8. **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).
7. Soria, De, **Ďurovčíková**, Simcoe, Karambelkar, Hankins, Kasliwal, Sokoloski, Ashley, Babul, Lau, Moore, Ofek, Sharma, Soon, Travouillon. Magellan/FIRE spectroscopy of AT2023tow: Confirmation of a young, highly reddened Galactic Fe II nova with CO emission. ATel #16255 (2023).
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).