

Humboldt University of Berlin

Head of [Theoretical Transport Physics \(T2P\)](#), Institute of Physics [2024 -]

- ✿ *Emmy Noether Grant, DFG*
 - Principal investigator

Postdoc, Institute of Physics & IRIS Adlershof [2022 - 2024]

- ✿ *Research Fellowship, Alexander von Humboldt Foundation*
- ✿ *German Language Fellowship, Alexander von Humboldt Foundation*
- ✿ *Research Fellowship, Max Planck Institute Stuttgart*
 - Conducted research in the field of thermoelectric transport and superconductivity.
 - Published 4 research papers.
 - Gave 2 invited and 4 contributed talks.
 - Co-supervised 2 Bachelor's theses.

Catalan Institute of Nanoscience and Nanotechnology

Postdoc, Theory and Simulation [2021 - 2022]

- Developed scientific software ([elphbolt](#)) for thermoelectricity simulations.
- Published 2 research papers.
- Gave 2 talks.

Harvard University

Postdoc, School of Engineering & Applied Sciences [2019 - 2021]

- Wrote software for thermoelectricity and superconductivity simulations.
- Published 3 research papers.
- Gave 1 talk.

Boston College

PhD student, Department of Physics [2014 - 2019]

- ✿ *Conference travel grants, Boston College*
 - Developed an original theoretical and computational framework for thermoelectric transport simulations, solving a century-old problem.
 - Wrote scientific software for simulating thermoelectric transport.
 - Published 6 research papers.
 - Wrote 1 PhD thesis.
 - Gave 4 talks.
 - Taught undergraduate level physics.

University of Ottawa

Master's student, Department of Physics [2011 - 2013]

- ✿ *Differential Admission Scholarship, University of Ottawa*
 - Implemented a many-body quantum chemistry method for studying laser-matter interactions.
 - Published 2 research papers.
 - Wrote 1 MSc thesis.
 - Taught undergraduate level physics.
 - Gave 1 talk.

Brac University

Teaching assistant, Department of Physics [2010 - 2011]

- Taught undergraduate level physics and mathematics.

Bachelor's student, Department of Physics [2006 - 2010]

- ✿ *Highest Distinction & Vice Chancellor's Medal, Brac University*
- ✿ *6-month scholarship to Romania, Erasmus Mundus*
 - Got training in physics (major) and computer science (minor).
 - Wrote scientific software for simulating quantum field theories on non-commutative geometries.
 - Wrote 1 BSc thesis.
 - Gave 2 talks..

Contact

- ✉ nakib.haider.protik@gmail.com
- in [LinkedIn](#)
- 🌐 [Theoretical Transport Physics \(T2P\)](#)
- 🐙 [Github](#)
- 📄 [Google Scholar](#)

Education

2019	PhD Physics, Boston College
2013	MSc Physics, U of Ottawa
2010	BSc Physics, Brac U

Skills

★ Physics	●●●
★ Research	●●●
★ Project management	●●●
★ Scientific communication	●●●
★ Peer reviewing	●●●
★ Funding acquisition	●●○
★ Teaching	●●●
★ Mentoring	●●○
★ Software development	●●●
★ Scientific computation	●●●
★ High-performance computing	●●●
★ Modern Fortran [coarrays and OO]	●●●
★ Python [numpy, matplotlib, scipy]	●●○
★ Julia	●○○
★ C	●○○
★ Mathematica	●●○
★ Shell	●●○
★ Linux	●●●
★ Lisp	●○○
★ \LaTeX	●●●
★ Bangla	●●●
★ English	●●●
★ German	●○○


Attachments

I	Research
II	Teaching
III	Service

I Research

My research is on the physics of interactions and transport phenomena in condensed matter. Specifically, using *ab initio* theoretical and computational tools, I study how the scattering processes in matter – electron-phonon, phonon-phonon, phonon-defects, electron-defects, etc. – affect the transport properties. I am also generally interested in superconductivity, topological defects, and topological phases among various other topics.

Published code

2021	 A solver for the coupled and decoupled electron and phonon Boltzmann transport equations.
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Theses

2019	PhD Thesis, Physics, Boston College. Topic: Theoretical/computational condensed matter physics with an emphasis on semiclassical transport. Title: <i>Phonon and carrier transport in semiconductors from first principles.</i> Committee: David Broido (chair), Kenneth Burch, Krzysztof Kempa, Fazel Tafti, and Natalio Mingo.
2013	MSc Thesis, Physics, University of Ottawa. Topic: Attosecond phenomena in laser-matter interaction using computational many-body quantum methods. Title: <i>The multiconfiguration time dependent Hartree-Fock method for cylindrical systems.</i> Advisor: Thomas Brabec.
2010	BSc Thesis, Physics, BRAC University. Topic: Numerical studies of quantum field theories on non-commutative geometries. Title: <i>Chern-Simons action on the noncommutative plane.</i> Advisor: Arshad Momen.

Publications (* = equal contribution)

2024	Nakib H. Protik and Claudia Draxl. Beyond the Tamura model of phonon-isotope scattering. <i>Physical Review B</i> .
2023	Mahmoud Elhajhasan, Wilken Seemann, Katharina Dudde, Daniel Vaske, Gordon Callsen, Ian Rousseau, Thomas F. K. Weatherley, Jean-François Carlin, Raphaël Butté, and Nicolas Grandjean, Nakib H. Protik, and Giuseppe Romano. Joined optical and thermal characterization of a III-nitride semiconductor membrane by micro-photoluminescence spectroscopy and Raman thermometry. <i>Physical Review B</i> .
2023	Krzysztof Kempa, Nakib H. Protik, Tyler Dodge, Claudia Draxl, and Michael J. Naughton. Enhancing superconductivity with resonant anti-shielding and topological plasmon-polarons. <i>Physical Review B</i> .
2023	Yu Xie, Jonathan Vandermause, Senja Ramakers, Nakib H. Protik, Anders Johansson, and Boris Kozinsky. Uncertainty-aware molecular dynamics from Bayesian active learning for phase transformations and thermal transport in SiC. <i>npj Computational Materials</i> .
2023	Chunhua Li, Nakib H. Protik, Navaneetha K. Ravichandran, and David Broido. High-frequency phonons drive large phonon-drag thermopower in semiconductors at high carrier density. <i>Physical Review B</i> .
2022	Chunhua Li, Nakib H. Protik, Pablo Ordejón, and David Broido. Colossal phonon drag enhanced thermopower in lightly doped diamond. <i>Materials Today Physics</i> .
2022	Nakib H. Protik, Chunhua Li, Miguel Pruneda, David Broido, and Pablo Ordejón. The elphbolt ab initio solver for the coupled electron-phonon Boltzmann transport equations. <i>npj Computational Materials</i> .

- 2021 Zhe Cheng, Weifang Lu, Jingjing Shi, Daiki Tanaka, **Nakib H. Protik**, Shangkun Wang, Motoaki Iwaya, Tetsuya Takeuchi, Satoshi Kamiyama, Isamu Akasaki, Hiroshi Amano, and Samuel Graham.
[Quasi-Ballistic Thermal Conduction in 6H-SiC](#).
Materials Today Physics.
- 2021 Mauro Fava*, **Nakib Haider Protik***, Chunhua Li, Navaneetha Krishnan Ravichandran, Jesús Carrete, Ambroise van Roekeghem, Georg K. H. Madsen, Natalio Mingo, and David Broido.
[How dopants limit the ultrahigh thermal conductivity of boron arsenide: a first principles study](#).
npj Computational Materials.
- 2020 **Nakib Haider Protik** and Boris Kozinsky.
[Electron-phonon drag enhancement of transport properties from a fully coupled *ab initio* Boltzmann formalism](#).
Physical Review B, 102, 245202.
- 2020 **Nakib Haider Protik** and David Broido.
[Coupled transport of phonons and carriers in semiconductors: A case study of n-doped GaAs](#).
Physical Review B, 101, 075202 [Editors' Suggestion].
- 2019 Xueyuan Wu*, Jiantao Kong*, **Nakib Haider Protik***, David Broido, and Krzysztof Kempa.
[Tailoring the electron-phonon interaction with metallic plasmonic structures](#).
In *Materials Today Physics* 8, 86-91.
- 2017 **Nakib Haider Protik**, Ankita Katre, Lucas Lindsay, Jesús Carrete, Natalio Mingo, and David Broido.
[Phonon thermal transport in 2H, 4H and 6H silicon carbide from first principles](#).
In *Materials Today Physics* 1C, 31-38.
- 2016 **Nakib Haider Protik**, Jesús Carrete, Nebil A. Katcho, Natalio Mingo, and David Broido.
[Ab initio study of the effect of vacancies on the thermal conductivity of boron arsenide](#).
In *Physical Review B* 94, 045207.
- 2014 G. Orlando, C. R. McDonald, **N. H. Protik**, G. Vampa, and T. Brabec.
[Tunneling time, what does it mean?](#)
In *Journal of Physics B* 47, 204002.
- 2014 G. Orlando, C. R. McDonald, **N. H. Protik**, and T. Brabec.
[Identification of the Keldysh time as a lower limit for the tunneling time](#).
In *Physical Review A* 89, 014102.

Invited/Workshop/Long Talks

- 2024 **Nakib Haider Protik**.
Completing the transport circuit in the interacting electron-phonon system.
At ETSF Electron-phonon collaboration team workshop, UCLouvain, Louvain-la-Neuve, September 24.
- 2024 **Nakib Haider Protik**.
Probing the transport of the interacting electron-phonon system self-consistently and *ab initio*.
At [DPG Meeting](#), Berlin, March 19.
- 2022 **Nakib Haider Protik**.
Coupled transport of the interacting electron-phonon gas – state of the art and the future.
At Solid State Seminar, Institute of Solid State Physics and Institute of Theoretical Physics, University of Bremen, Bremen, November 1.
- 2021 **Nakib Haider Protik**, Chunhua Li, Miguel Pruneda, David Broido, and Pablo Ordejón.
[elphbolt - A free software for coupled electron-phonon Boltzmann transport](#). Video [here](#).
At International Workshop on Advanced Materials-to-Device Solutions for Synaptic Electronics, Session 4, Barcelona, November 12.

Other Talks

- 2023 **Nakib Haider Protik**.
Dragful electron-phonon transport – elphbolt a year and a half on.
At [HoW xciting! 2023](#), Berlin, August 9.

2023	Nakib Haider Protik and Claudia Draxl. When does the Tamura model of phonon-isotope scattering break down?. At DPG Meeting , Dresden, March 27, 2023. At APS March Meeting , Virtual, March 21.
2022	Nakib Haider Protik and Claudia Draxl. Electron-phonon drag in MgB₂ . At DPG Meeting, Regensburg, September 7.
2022	Nakib Haider Protik , Chunhua Li, Miguel Prudena, David Broido, and Pablo Ordejón. elphbolt: An ab initio solver for the coupled and decoupled electron and phonon Boltzmann transport equations . At APS March Meeting, March 15.
2021	Nakib Haider Protik and Boris Kozinsky. Electron-phonon drag enhancement of transport properties from fully coupled <i>ab initio</i> Boltzmann formalism . At APS March Meeting, Online, March 17.
2019	Nakib Haider Protik , Mauro Fava, Natalio Mingo, Jesús Carrete, George Madsen, Navaneetha Ravichandran and David Broido. Effect of substitutional defects on the thermal conductivity of boron arsenide . At APS March Meeting, Boston, March 4.
2018	Nakib Haider Protik and David Broido. Effect of plasmon-LO phonon coupling on the mobility of GaN . At APS March Meeting, Los Angeles, March 7.
2017	Nakib Haider Protik , Ankita Katre, Lucas Lindsay, Jesús Carrete, Bonny Dongre, George K. H. Madsen, Natalio Mingo, David Broido. Phonon thermal transport in 2H, 4H and 6H silicon carbide from first principles . At APS March Meeting, New Orleans, March 13.
2016	Nakib Haider Protik , Jesús Carrete, Natalio Mingo, Nebil A. Katcho and David Broido. Ab initio study of the effect of vacancies on the thermal conductivity . At APS March Meeting, Baltimore, March 15.
2014	Nakib Haider Protik . Quantum Manybody Physics (Or what I've been up to since I left BRACU) . At BRAC University, Dhaka, June 19.
2013	Nakib Haider Protik . Manybody Quantum Dynamics . At Ottawa-Carleton Institute of Physics Graduate Symposia, Ottawa, April 30.
2010	Nakib Haider Protik and Arshad Momen. Simulating the Topologically Massive Maxwell Theory on the Moyal Plane . At International Conference on Recent Advance in Physics - 2010, Dhaka, March 29. Technical Session 4B: Statistical and Theoretical Physics - 1.
2009	Arshad Momen and Nakib Haider Protik . Simulating the Abelian Chern-Simons Theory on the Moyal Plane . At Physics Conference, TIM - 09, Timisoara, November 27. Section: Theoretical and Computational Physics.

II Teaching

- **Teaching Assistant @ Boston College**

Quantum Physics I: generating homework solutions and grading.

Intro to Physics Recitation I, II: recitations and grading.

1st year physics labs: experiments demonstration and lab report grading.

- **Teaching Assistant @ University of Ottawa**

Fundamentals of Applied Physics III: grading.

Advanced Optics & Introduction to Photonics: grading.

Principles of Physics I: recitations and grading.

Electricity and Magnetism: recitations and grading.

Fundamentals of Physics for Engineers: recitations and grading.

1st year physics lab: experiments demonstration and lab report grading.

- **Teaching Assistant @ BRAC University**

Applied Physics Lab I: lab management, experiments demonstration, exam preparation and grading.

Principles of Physics I, II labs: lab management, experiments demonstration, exam preparation and grading.

Mathematics II lab: lectures, exam preparation and grading.

- **Lab Assistant @ BRAC University**

Physics Lab I, III: experiments demonstration and lab report grading.

III Service

PhD thesis committee member

- International expert and jury member in Dr. Martí Raya Moreno's PhD dissertation committee at Universitat Autònoma de Barcelona.

Thesis title: *Heat transport in binary semiconductor polytypes and devices based on 2D materials: an ab initio study.*

Journal reviewer

- *Physical Review Letters, Physical Review B, Physical Review Materials, Materials Today Physics, Acta Physica Polonica A, Journal of Physics and Chemistry of Solids*

Other

- Student representative in Graduate Affairs Committee (2018-2019), Boston College.
- Graduate Teaching Committee liaison person (2017-18), Boston College.