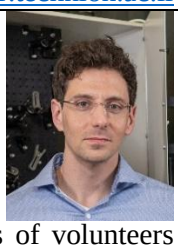
Ido Kaminer Email: kaminer@technion.ac.il Web: kaminer.technion.ac.il

Phone: +972-523-991-543 Date and Place of Birth: 29/12/1985 Haifa Israel



Ido is the head of the Technion's Ad Quanta lab and leads the Ramanujan Machine group.

Research interests at the Ramanujan Machine group:
Inspired by his previous work in experimental physics, Ido established the Ramanujan Machine group and collaboration, to pursue *AI for mathematics*, developing computer-algorithms that inspire new "experimental" discoveries in pure math. Using the group's algorithms, thousands of volunteers contribute their computing resources to participate in the discovery of new formulas for mathematical constants such as π and e. Through their specialized algorithms, Ido's team discovered thousands of such formulas, now surpassing the combined number found by humans over hundreds of years. This initiative contributed to the foundations of AI for scientific discovery and to its penetration into domains of mathematics.

Research interests at the Ad Quanta lab:
Ido works at the frontiers of quantum optics and photonics, investigating their implications in attosecond science and free-electron physics. He is known for discovering quantum phenomena in conditions thought to be classical, such as the radiation of relativistic charged particles, or the interaction of light and matter under intense fields.

The Ad Quanta lab established the foundations of quantum electrodynamics with photonic quasiparticles, and now develops novel theoretical and experimental methods. Their discoveries predict new phenomena arising from engineering the wavefunctions of matter and photons to create physical situations impossible in natural settings.

Ido's lab employs femtosecond lasers in transmission electron microscopes, reaching unparalleled resolution in space & time, and enabling new kinds of experiments. Their experiments on light–matter interactions in nanophotonics and 2D materials are leading to disruptive applications for novel light sources (e.g., tunable X-ray sources for spectroscopy) and for ultrafast detectors (e.g., ultrafast scintillators for medical imaging).

Career: Ido is a Professor at the Technion. In his PhD research, he discovered new classes of accelerating beams in nonlinear optics and electromagnetism, for which he received the 2014 American Physical Society (APS) Award for Outstanding Doctoral Dissertation in Laser Science. Ido was the first Israeli to win an APS award for his PhD thesis. As a postdoc at MIT, he established the foundations of macroscopic quantum electrodynamics (MQED) for photonic quasiparticles and used it to enable forbidden electronic transitions in atoms. As a faculty member, Ido created a paradigm shift in the understanding of free-electron radiation, connecting it to the field of quantum optics, establishing the area now known as *free-electron quantum optics*. He performed the first experiment on electron microscopy with non-classical light, demonstrating that the quantum statistics of photons can be imprinted on the electron. For his achievements as a faculty member, Ido was **elected to the Israeli Young Academy**, which includes 30 young Israeli faculty members below the age of 45. He has won multiple awards and grants, including **two ERC Grants**, the Moore foundation grant, and the **2022 Schmidt Science Polymath Award**. Ido is the laureate of the 2021 Krill Prize, the **2021 Blavatnik Award** in Physical Sciences & Engineering in Israel, and the **2022 Adolph Lomb Medal**, the top international award for a young scientist (age 35 or younger) in the field of optics. He was selected for the 2023 Lem European Research Prize and for the 2024 ACS Photonics Young Investigator Award.

Academic Degrees:

2003–2007 B.Sc. Electrical Engineering and Physics, Technion – Israel Institute of Technology
- Psagot Excellence Program, Technion's Excellence Program (selecting 16 students from all fields each year)
- GPA: 98/100, President's list for academic achievement, every semester

2008–2014 Ph.D. Physics, Technion – Israel Institute of Technology
- Thesis: *Shaping Light in Complex Systems*
- Advisor: Distinguished Professor Mordechai Segev

Academic Appointments:

Faculty of Electrical and Computer Engineering, Solid-State Institute Technion – Israel Institute of Technology
2018–2021 Assistant Professor
2021–2023 Associate Professor
2024–current Professor
- Academic Excellence in Teaching (top 4% of Technion lecturers): Winter 2021-2022, Spring 2022

Department of Physics and Research Laboratory of Electronics, Massachusetts Institute of Technology
2014–2017 Postdoctoral Fellow (Marie Curie Outgoing Fellowship)
- Hosts: Professor Marin Soljačić and Professor John Joannopoulos

Awards, Honors, and Fellowships: (selected)

2024 **ERC** Consolidator Grant

ACS Photonics Young Investigator Lectureship

2023 Stanisław Lem European Research Prize, recognized for *pioneering experimental and theoretical contributions to quantum electrodynamics of photonic quasiparticles, and establishing the foundations of quantum optics with free electrons*

2022 **Schmidt Science Polymath Award**

Adolph Lomb Medal by the Optical Society, recognized for *pioneering contributions which led to the creation of a paradigm shift in light-matter interactions of photonic quasiparticles*
the top international award for a young scientist (age 35 or younger) in the field of optics

2021 **Blavatnik Awards** for Young Scientists in Israel – Laureate in Physical Sciences & Engineering

Krill Prize for Excellence in Scientific Research, by the Wolf Foundation

Israeli Young Academy, which includes 30 young Israeli faculty members below the age of 45, selected based on excellence in research and social involvement

2020 TheMarker's 40 under 40

ERC Starting Grant

2018 Jacques Lewiner Career Advancement Chair - Leaders in Science and Technology

2017 **Azrieli Faculty Fellow** (most prestigious fellowship for a starting faculty member in Israel)

2015 Invited as Young Researcher at the 65th Lindau Nobel Laureate Meeting

2014 American Physical Society (APS) **Award for Outstanding Doctoral Dissertation** in Laser Science (first Israeli to win an APS thesis award)

Rothschild Fellowship (the most prestigious postdoc fellowship for Israelis going abroad)

Marie Curie IOF Fellowship

2012 Israel Physical Society (IPS) **Prize for a Graduate Student in Theoretical Physics** (awarded to one Israeli student every year)

2007 The Knesset (Israeli Parliament) Award for Outstanding Undergraduate Achievements

Academic Achievements:

- First proposition and first observation of X-ray generation from 2D material platforms
  [Nature Photonics 2016 & 2020, respectively Refs #40,#8]
- New discoveries about the Cherenkov effect: prediction and first demonstration of its quantum nature
  [PRX 2016 & Nature Physics (October) 2020, respectively Refs #43,#4]
- The first measurement of coherent interaction between free electrons and a photonic cavity
  [Nature 2020, OPN's "Optics in 2020" Ref #2]
- First observation of coherent spatiotemporal dynamics of optical wavepackets in 2D materials
  [Science (June) 2021, Nature Photonics 2024 Ref #3,#15]
- First experiment of free-electron interaction with quantum photon statistics
  [Science (September) 2021 Ref #9]
- Developing the theory of macroscopic quantum electrodynamics (MQED) with photonic quasiparticles
  [Science 2016 & Nature Reviews Physics 2020 Refs #41,#5]
- Discovery of ultrastrong coupling at optical frequencies and bandgap renormalization by vacuum fluctuations
  [Nature Photonics 2018 & Nature Physics (May) 2020 Refs #10,#37]
- Finding the first self-accelerating solutions of Maxwell's equations and of Dirac's equation
  [PRL 2012 & Nature Physics 2015, respectively Refs #45,#44]
- The first algorithm to generate formulas of fundamental constants ("The Ramanujan Machine")
  [Nature 2021, ICML 2023, PNAS 2024, NeurIPS204 Refs #1,#24,#19,#12]
- Breaking the mindset that high-intensity light interacts classically: quantum-optics in high-harmonic generation
  [Nature Phys (Feb) 2023, Nature Phot 2023, Nature Phys (Aug) 2023, Nature Phys 2024 Refs #6,#26,#27,#14]
- First experiment of electron diffraction by surface light waves, observing the 1933 prediction by Kapitza&Dirac
  [Nature Materials 2023 Ref #21]

Selected Talks: plenary, keynote, invited, colloquia

- Nine contributed submissions to CLEO upgraded to invited highlighted talks (**top 1-2% of abstracts**), once as a student and eight times as a PI, among them:
  - Q. Yan, et al. *Imprinting Chirality on Free-Electrons by Breaking All Mirror Symmetries*, CLEO (2024)
  - J. Sloan, et al. *Entangling X-Rays Through High Harmonic Down Conversion*, CLEO FW4M.1 (2023)
  - K. Rustomji, et al., *Near-Field Terahertz Emission Spectroscopy of Non-Linearities using Free Electrons*, CLEO SF2I.2 (2023)
  - A. Gorlach, et al., *High Harmonic Generation Driven by Quantum Light: General Formalism and Extended Cutoff*, CLEO FM3B.1 (2022)
  - R. Dahan, et al., *Observation of the Stimulated Quantum Cherenkov Effect*, CLEO FF1Q.1 (2020)
  - I. Kaminer, et al., *Self-Accelerating Beams in Photonic Crystal Slabs*, CLEO QM2E.1 (2013)
- Contributed submission upgraded to a **breakthrough talk (top abstract)** in NANOMETA 2017
  - N. Rivera*, I. Kaminer*, and M. Soljacic, *Turning Forbidden Transitions into Dominant Transitions: Towards Efficient Sources of Entangled Light*, NANOMETA, Seefeld, Austria, January 2017
- Three **keynote talks**, among them, *Quantum Optics with Free Electrons*, International Quantum Cascade Lasers School and Workshop (IQCLSW), ETH Zürich and Monte Verità Ascona, Switzerland, August 2022
- Four **plenary talks** in conferences and one in industry (at Thermo Fisher Scientific, electron microscopy leader)
  - *Quantum Optics with Free Electrons*, NANOMETA, Seefeld, Austria, April 2022
  - *Free-Electron Quantum Optics*, IVNC, Cambridge, Massachusetts USA, July 2023
  - *Free-Electron Quantum Optics*, NANOP, Barcelona, Spain, November 2023
  - *Mapping Light-Matter Interactions Using Ultrafast Free Electrons*, Polariton Science Conference, Odense, Denmark, June 2024
- Speaker at the University of Ottawa's Schawlow-Townes Symposium, October 2023
- Special Optica Webinar by the Optical Society, *Attosecond Quantum Optics*, April 2024
- **Colloquia** in ETH, Stanford, Max Planck Institute for Nuclear Physics, The Vienna Center for Quantum Science and Technology (VCQ), Argonne National Lab, ER-C Jülich (PGI Colloquium), and ten other institutes

(Additional >60 seminars, >100 invited talks, and >200 contributed talks by the group in refereed conferences)

Other academic activities and services

Conference organization:

- Member of the CLEO Nano-Optics and Plasmonics Subcommittee (2018)
- Scientific program committee member in ICOAM (2020), Q-Sort (2021), and ISM (2022)
- Member of the program committee and session organizer in FiO-LS (2015) and PIERS (2019)
- Head of the organizing & scientific committees of Novel Concepts in Photonics Research (2024-2025)
- Co-organizer of a special symposium "Photonics meets free-electron science" **selected for CLEO2024**

Special activities:

- Co-leader, SMART-electron European collaboration, developing innovative electron microscopy capabilities
- Member of *Mada Gadol Baktana*, the largest Israeli society for explaining science to the public, voluntary association advocating scientific accuracy and fighting fake news

Services

2022-	Preparatory Committee of the Department of Electrical and Computer Engineering, which votes on recruitment of new faculty members (special early nomination before full Prof.)
2021-	Steering Committee and Faculty Search Committee of the Technion Helen Diller Quantum Center
2022, 2023	Chairman of the Helen Diller excellence scholarships committee, Technion Quantum Center
2022-2024	Member of the selection committee for the Israeli Young Academy
2021	Member of the Israel Physics Society (IPS) awards committee

Reviewer (selected): *Nature, Science, Nature Photonics, Nature Physics, Nature Materials, Nature Communications, Science Advances, Advanced Materials, Chemical Society Reviews, Physical Review Letters, …*

Supervision: 3 postdocs currently in the group (first 3 postdocs are now assistant Profs.)
12 PhD and 6 MSc students currently working on their theses (12 alumni graduated so far)
Ido is proud of more than 25 undergrads that published 1st-author papers under his supervision

Selected Journal Publications **184** papers in refereed journals; **15** patents; >**10,000** citations; h-index **58**

1 G. Raayoni, … **I. Kaminer**, *The Ramanujan Machine: Automatically Generated Conjectures on Fundamental Constants*, ***Nature*** 590, 67–73 (2021); with follow-up works in ***ICML*** (2023), ***NeurIPS*** (2024)

- In the past, new mathematical formulas of fundamental constants such as π and e were discovered sporadically by luminaries such as Euler, Gauss, and Ramanujan. This paper proposed the first *computer algorithm* to generate formulas for constants in a blind search, discovering thousands of formulas and a new mathematical structure.
- By now, three years later, this algorithm and following ones [***ICML*** 202, 28809 (2023), ***NeurIPS*** accepted (2024)]. discovered more formulas of famous constants than the combined discoveries by humanity over hundreds of years.
- Discovered formulas for values of the Riemann zeta function, leading to new irrationality proofs [***PNAS*** (2024)].
- Launched a website with the goal of inspiring people to leverage algorithms to discover new mathematics and work together toward collaborative proofs. Thousands of volunteers are running these algorithms daily.
- The first ***arXiv*** version of this work went viral in social networks and many media outlets, reaching millions of people, becoming the #1 topic in artificial intelligence worldwide for about a week.
- Received commentaries: John Baez, Fermat Library, Phys.org, NewScientist, ScienceDaily, Science Alert, Vice, Nature News, Inverse, The Indian Express, India's Who Wants to be a Millionaire, Wikipedia, and many more.

2 K. Wang, R. Dahan, M. Shentcis, Y. Kauffmann, A. Ben- Hayun, O. Reinhardt, S. Tsesses, **I. Kaminer**, *Coherent Interaction between Free Electrons and a Photonic Cavity*, ***Nature*** 582, 50, (2020)

- Until 2019, all work on interactions between cavity-confined light and quantum matter focused on *bound electron* systems. Ido's group was the first to demonstrate coherent cavity interactions of *free electrons*.
- Selected for *Research Highlights* in ***Nature Reviews Physics*** and featured in various media outlets.

3 Y. Kurman, … **I. Kaminer**, *Spatiotemporal imaging of 2D polariton wave packet dynamics using free electrons*, ***Science*** 372, 1181-1186 (2021)

- Constituted the first observation of coherent optical dynamics in any 2D material.
- Led to Ido's lab pioneering demonstration of *coherent amplification in electron microscopy* [***Nature Phot.*** (2024)]

4 R. Dahan, … **I. Kaminer**, *Resonant phase-matching between a light wave and a free-electron wavefunction*, ***Nature Physics*** 16, 1123-1131, (2020); selected for Research Highlights

- The first experiment on the quantum nature of the Cherenkov effect, following Ido's first prediction of such effects in [***Phys. Rev. X*** 6, 011006 (2016)], spawning a series of papers showing the quantum nature of free-electron interactions in places where they were modelled as classical point-particles for over a hundred years.
- Highlighted in ***OPN*****'s special issue "Optics in 2020"**, selecting the top contributions to the field of optics.

5 N. Rivera and **I. Kaminer**, *Light–matter interactions with photonic quasiparticles*, ***Nature Reviews Physics*** 2, 538 (2020) (Review); based on the graduate class that Ido developed and taught at the Technion

- A textbook problem in physics solves the electronic transitions in the hydrogen atom, revealing its selection rules. Ido's earlier discovery showed how photonic quasiparticles in 2D materials can break these selection rules, allowing electrons to undergo forbidden optical transitions [***Science*** 353, 263 (2016)].
- Over the last few years, the formalism developed in that work led to a surge of fundamental discoveries by different groups and by Ido's, e.g., [***PRL*** 122, 53901 (2019); ***Nature Phys.*** 15,1284 (2019); ***Nature Mat.*** 22, 345 (2023)].

6 A. Pizzi, … **I. Kaminer**, *Light emission from strongly driven many-body systems*, ***Nature Physics*** 19, 551-561 (2023); Selected for News & Views, covered by ***Scientific American*** and other media outlets

- Spawned a sequence of discoveries that mark the beginning of a new subfield of high-intensity quantum optics, with each of the two follow-up papers by Ido's group highlighted and selected for News & Views by the editors [***Nature Photonics*** 17, 501-509 (2023); ***Nature Phys.*** 19, 1689-1696 (2023); ***Nature Phys.*** adv. online (2024)].
- Posing a general concept: correlations between quantum emitters transfer onto quantum states of radiation.
- Suggesting high-harmonic generation as a tool for characterizing correlations in many-body systems with attosecond temporal resolution, *bringing the field quantum optics to attosecond timescales*.

7 X. Lin, … **I. Kaminer**, *Controlling Cherenkov angles with resonance transition radiation*, ***Nature Physics***, 14, 816–821 (2018); selected for Research Highlights in ***Nature Photonics***

- High-energy particle detectors are limited by a fundamental trade-off between their efficiency and resolution.
- Breaking this trade-off, Ido and his colleagues at CERN proposed the concept of *nanophotonic particle detectors*.
- This work is the first proposal and design of a nanophotonic Cherenkov detector for particle identification.
- Immediate interest and follow up by colleagues in CERN LHCb assembled an experiment to test the concept, showing the first results of a Cherenkov ring from a photonic crystal radiator designed by Ido's group.
- Led to the emerging field of *nanophotonic scintillators*, based on Ido's theory proposal [***PRL*** 125, 040801 (2020)] and first demonstration by his collaboration with MIT [***Science*** 375, eabm9293 (2022)].

8 M. Shentcis, … **I. Kaminer**, *Tunable free-electron X-ray radiation from van der Waals materials*, ***Nature Photonics*** 14, 686–692 (2020); Selected for News & Views in ***Nature Photonics***

· The first compact source of tunable X-ray radiation. First observation of X-ray generation from vdW materials.
· Emerged from Ido's earlier work posing the first prediction of X-ray emission from electron interactions with 2D materials [***Nature Photonics*** 10, 46 (2016)], which opened the area of nanophotonic X-ray sources.

9 R. Dahan, … **I. Kaminer**, *Imprinting the quantum statistics of photons on free electrons*, ***Science*** 6561, 1309-1310 (2021); selected for Perspective in ***Science***

· For over 100 years, all works on the interaction between light and free electrons treated light as a classical wave. This experiment is the first to show free-electron interaction with the quantum photon statistics of light.
· First observation in the field following major theoretical interest, first by Kfir et al. and di Giulio et al., and by Ido's lab [***Nature Comm.*** 12, 1700 (2021); ***Science Adv.*** 7, eabe4270 (2021); ***Science Adv.*** 7, eabf8096 (2021)].

10 Y. Kurman, ... **I. Kaminer**, *Control of semiconductor emitter frequency by increasing polariton momenta*, ***Nature Photonics***, 12, 423–429 (2018)

· It is well-known that the optical environment of an emitter alters its transition rate (the Purcell effect); however, it was believed to leave the *transition frequency* mostly unchanged. We showed how polaritons enable substantial control of transition frequencies: a paradigm shift from viewing these frequencies as intrinsic.
· First prediction of *nonlocality* and non-vertical optical transitions in indirect-bandgap materials like silicon.
· Led to our discovery of ultra-strong coupling at optical frequencies [***Nature Phys.*** 16, 868 (2020)].

Other high-impact publications

11 R. Ruimy†, A. Karnieli†, **I. Kaminer**, Perspective on free-electron quantum optics, upcoming **Nature Physics** (2025) (**Perspective**)

12 M. Shalyt†, U.Seligmann†, I. Beit Halachmi, O. David, R. Elimelech, and **I. Kaminer**, Unsupervised Discovery of Formulas for Mathematical Constants, accepted to **NeurIPS** (2024)

13 R. Ruimy†, O. Tziperman†, A. Gorlach, K. Mølmer, and **I. Kaminer**, Many-Body Entanglement via 'Which-Path' Information, **npj Quantum Inf.** 10, 121 (2024)

14 A. Rasputnyi, Z. Chen, M. Birk, O. Cohen, **I. Kaminer**, M. Krueger, D. Seletskiy, M. Chekhova, F. Tani, High Harmonic Generation by Bright Squeezed Vacuum, advanced online publication **Nature Physics** (2024)

15 T. Bucher†, H. Nahari†, H. H. Sheinfux†, R. Ruimy†, A. Niedermayr, R. Dahan, Q. Yan, Y. Adiv, M. Yannai, J. Chen, Y. Kurman, S. T. Park, D. J. Masiel, E. Janzen, J. H. Edgar, F. Carbone, G. Bartal, S. Tsesses, F. H. L. Koppens, G. M. Vanacore, **I. Kaminer**, Coherently amplified ultrafast imaging in a free-electron interferometer, **Nature Photonics** 18, 809-815 (2024)

16 Y. Kurman†, N. Lahav†, R. Schuetz†, A. Shultzman†, C. Roques-Carmes, A. Lifshits, S. Zaken, T. Lenkiewicz, R. Strassberg, O. Be'er, Y. Bekenstein, and **I. Kaminer**, Purcell-enhanced X-ray scintillation, **Science Advances** 10, eadq6325 (2024)

17 M. Yannai, M. Haller, R. Ruimy, A. Gorlach, D. N. Basov, **I. Kaminer**, Opportunities in Nano-scale Imaging of Optically Driven Phase Transitions, **Nature Physics** 20, 1383–1388 (2024) (**Perspective**)

18 X. Shi, L. W. Wong, S. Huang, L. J. Wong, and **I. Kaminer**, Transverse Recoil Imprinted on Free-electron Radiation, **Nature Commun.** 15, 7803 (2024)

19 R. Elimelech, O. David, C. De la Cruz Mengual, R. Kalisch, W. Berndt, M. Shalyt, M. Silberstein, Y. Hadad, **I. Kaminer**, Algorithm-assisted discovery of an intrinsic order among mathematical constants, **PNAS** 121, e2321440121 (2024)

20 M. Yannai, R. Dahan, A. Gorlach, Y. Adiv, K. Wang, I. Madan, S. Gargiulo, F. Barantani, E. J. C. Dias, G. M. Vanacore, N. Rivera, F. Carbone, F. J. García de Abajo, **I. Kaminer**, Ultrafast Electron Microscopy of Nanoscale Charge Dynamics in Semiconductors, **ACS Nano** 17, 3645–3656 (2023)

21 S. Tsesses†, R. Dahan†, K. Wang, O. Reinhardt, G. Bartal, **I. Kaminer**, Tunable photon-induced spatial modulation of free electrons, **Nature Materials** 22, 345–352 (2023) § Selected as the journal cover

22 R. Dahan†, G. Baranes†, A. Gorlach, R. Ruimy, N. Rivera, and **I. Kaminer**, Creation of Optical Cat and GKP States Using Shaped Free Electrons, **Phys. Rev. X** 13, 031001 (2023)

23 Y. Yang, C. Roques-Carmes, S.E. Kooi, H. Tang, J. Beroz, E. Mazur, **I. Kaminer**, J.D. Joannopoulos, M. Soljačić, Observation of enhanced free-electron radiation from photonic flatband resonances, **Nature** 613, 42 (2023)

24 O. Razon, Y. Harris, S. Gottlieb, D. Carmon, O. David, **I. Kaminer**, Automated Search for Conjectures on Mathematical Constants using Analysis of Integer Sequences, **ICML** 202, 28809-28842 (2023)

25 M. Yannai†, Y. Adiv†, R. Dahan†, K. Wang, A. Gorlach, N. Rivera, T. Fishman, M. Krueger, **I. Kaminer**, Lossless Monochromator in an Ultrafast Electron Microscope Using Near-field THz Radiation, **Phys. Rev. Lett.** 131, 145002 (2023) § selected for Editors' Suggestion and featured in Physics

26 M. Even Tzur†, M. Birk†, A. Gorlach, M. Krüger, **I. Kaminer**, O. Cohen, Photon-statistics force in ultrafast electron dynamics, **Nature Photonics** 17, 501-509 (2023) § selected for News & Views

27 A. Gorlach†, M. Even Tzur†, M. Birk, M. Krüger, N. Rivera, O. Cohen, **I. Kaminer**, High harmonic generation driven by quantum light, **Nature Physics** 19, 1689–1696 (2023) § selected for News & Views

28 G Baranes, R Ruimy, A Gorlach, **I Kaminer**, Free electrons can induce entanglement between photons, **npj Quantum Information** 8, 32 (2022)

29 R. Ruimy†, A. Gorlach†, C. Mechel, N. Rivera, and **I. Kaminer**, Towards atomic-resolution quantum measurements with coherentl shaped free electrons, **Phys. Rev. Lett.** 126, 233403 (2021)

30 A. Karnieli, N. Rivera, A. Arie, **I. Kaminer**, The coherence of light is fundamentally tied to the quantum coherence of the emitting particle, **Science Advances** 7, eabf8096 (2021)

31 A. Ben Hayun, O. Reinhardt, J. Nemirovsky, A. Karnieli, N. Rivera, **I. Kaminer**, Shaping Quantum Photonic States Using Free Electrons, **Science Advances** 7, eabe4270 (2021)

32 Y. Adiv, K. Wang, R. Dahan, P. Broaddus, Y. Miao, D. Black, K. Leedle, R. L Byer, O. Solgaard, J. England, **I. Kaminer**, Quantum nature of dielectric laser accelerators, **Phys. Rev. X** 11, 041042 (2021)

33 A. Luski†, Y. Segev†, R. David, O. Bitton, H. Nadler, R. Barnea, A. Gorlach, O. Cheshnovsky, **I. Kaminer**, and E. Narevicius, Vortex beams of atoms and molecules, **Science** 373, 1105 (2021) § Selected for a Perspective in Science and received commentaries in Science News and other avenues

34 C. Mechel, Y. Kurman, A. Karnieli, N. Rivera, A. Arie, **I. Kaminer**, Quantum correlations in electron microscopy, **Optica** 8, 70-78 (2021) § In the list of **Optica**'s top downloaded papers in quantum information

35 O. Reinhardt†, C. Mechel†, M. H. Lynch, and **I. Kaminer**, Free-Electron Qubits, **Ann. Phys.** 533, 2000254 (2021)

36 A. Gorlach, O. Neufeld, N. Rivera, O. Cohen, and **I. Kaminer**, On the Quantum-Optical Nature of High Harmonic Generation**, Nature Commun.** 11, 4598 (2020)

37 Y. Kurman and **I. Kaminer**, Tunable Bandgap Renormalization by Nonlocal Ultra-Strong Coupling in Nanophotonics, **Nature Physics** 16, 868–874 (2020)

38 N. Rivera, L. J. Wong, J. D. Joannopoulos, M. Soljačić, and **I. Kaminer**, Light emission based on nanophotonic vacuum forces, **Nature Physics** 15, 1284–1289 (2019)

39 C. Roques-Carmes, N. Rivera, J. D. Joannopoulos, M. Soljacic, and **I. Kaminer**, Nonperturbative Quantum Electrodynamics in the Cherenkov Effect, **Phys. Rev. X**, 8, 041013 (2018)

40 L. J. Wong†, **I. Kaminer**, O. Ilic, J. D. Joannopoulos, and M. Soljačić, Toward Graphene Plasmon-Based Free-Electron infrared to X-ray Sources, **Nature Photonics** 10, 46 (2016) § selected for News & Views in **Nature Phot.**

41 N. Rivera†, **I. Kaminer**†, B. Zhen, J. D. Joannopoulos, and M. Soljačić, Shrinking light to allow forbidden transitions on the atomic scale, **Science** 353, 263-269 (2016)

42 B. Zhen, C. W. Hsu, Y. Igarashi, L. Ling, **I. Kaminer**, A. Pick, S.-L. Chua, J. D. Joannopoulos, and M. Soljačić, Spawning rings of exceptional points out of Dirac cones, **Nature** 525, 354-358 (2015)

43 **I. Kaminer**, M. Mutzafi, A. Levy, G. Harari, H. Herzig Sheinfux, S. Skirlo, J. Nemirovsky, J. D. Joannopoulos, M. Segev, M. Soljačić, Quantum Čerenkov Radiation: Spectral Cutoffs and the Role of Spin and Orbital Angular Momentum, **Phys. Rev. X** 6, 011006 (2016) § Selected for Research Highlights in **Nature Physics**

44 **I. Kaminer**, J. Nemirovsky, M. Rechtsman, R. Bekenstein, M. Segev, Self-accelerating Dirac particles and prolonging the lifetime of relativistic fermions, **Nature Physics** 11, 261-267 (2015). § Selected as the journal cover and for News & Views in **Nature Physics**

45 **I. Kaminer**, R. Bekenstein, J. Nemirovsky, M. Segev, Nondiffracting accelerating wave packets of Maxwell's equations, **Phys. Rev. Lett.** 108, 163901 (2012) § Selected for Editors' Suggestion and for Viewpoint in Physics, received commentaries in Science and in New Scientist

Selected patents

- Novel Radiation Sources from the Interaction of Electron Beams with Surface Plasmon Systems, USSRN 62/111180 (Feb. 2015).
- Improving Electron Microscopy by Shaping Electronic Wavefunctions, USSRN 62/158591 (May. 2015).
- Apparatus and Methods for Spectroscopy and Broadband Light Emission Using Two-Dimensional Plasmon Fields, USSRN 62/266762 (Dec. 2015).
- X-ray radiation source system and method for design of the same, USSRN 62/899,249 (Sept. 2019).
- Scintillation emission control using the Purcell effect, U.S. Provisional Patent. USSRN 62/913,298 (Oct. 2019).
- Increased TEM spatial and energy resolution using THz radiation, USSRN 63/223,805 (July 2021).
- Generation of quantum light states, USSRN 63/294,585 (Dec. 2021).
- Compact X-ray sources, Provisional patent 63/516,583 (Aug. 2023).