Frank Koppens

Date of birth: 27 June 1976
Nationality: Netherlands
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Positions

Jan 2010 - present	Professor and Leader of group “Quantum Nano-optoelectronics” ICFO, Institute of Photonic Sciences, Castelldefels - Barcelona, Spain.
Aug 2020 – present	Board-of-directors and co-founder of Qurv technologies, a spin-off company aiming to commercialize graphene-based image sensors.
Dec 2015 – present	ICREA research Professor (chairs awarded in Catalonia to a few elite scientists).
2010 - 2014	ICFO Cellex Nest Fellowship (Junior group leader). Awarded to <1% of the applicants.
2013 – 2015	RyC fellowship (ranked no. 1).
2008 - 2010	IQSE post-doctoral fellow at Harvard University with Profs. Lukin, Park and Marcus.

Eduction

2003 – 06/2007	PhD in Quantum Nanoscience on spin-based quantum bits. Kavli Institute of Nanoscience Delft. Cum Laude, awarded to top 5%. Promotor: Leo Kouwenhoven.
2002 - 2003	Management program NUON (energy sourcing: technology and business development).
1994 - 2001	Master of physics, University of Technology Eindhoven (Cum Laude, top 10%).

Scientific production

- Since 2018 Frank Koppens is on the **Clarivate list for highly cited researchers**, in the physics category.

- >150 publications in refereed international journals, including:
  - 8 publications in Science
  - 5 publications in Nature
  - 49 publications in the Nature family journals
  - 35 publications in ACS journals
  - 10 publications in Physical Review Letters

- Total number of citations: > 38.700 (Google Scholar).
- H-index: 72 (Google Scholar).

- Most-cited Nano Letters paper of 2011 (>2800 citations)
- Ten publications have been cited more than 1000 times
- 18 patents
- Book chapter on graphene plasmonics

Honors/awards

- 2022 — Fellow of the American Physical Society (APS)
- 2019 — ACS Photonics Young Investigator Award Lectureship
- 2018 – present — Clarivate highly cited scientist
- 2017 - 2022 — ERC Consolidator Grant (*TOPONANOP*)
- 2017 — ERC Proof of Concept (*GTRACK*)
- 2016 — ERC Proof of Concept (GRAPHEALTH)
- 2015 – present — ICREA Fellow
- 2015 — IUPAP Young Scientist Prize in Optics (International Union of Pure and Applied Physics)
- 2015 — Premis Nacional (National Research Award), Young Talent category, FCRI
- 2014-2018 — Ramón y Cajal Fellowship. Spanish Ministry of Economy (*renounced in 2015 due to being awarded an ICREA research professorship*)
- 2014-2015 — ERC Proof of Concept (*GRAQUADOT*)
- 2012-2017 — ERC Starting Grant (*CARBONLIGHT*)
- 2011-2015 — FP7 Marie Curie-CIG (*GRANOP*)
- 2011 — Christiaan Huygens award for best Dutch PhD thesis

Organization of Scientific Conferences

2017-2023	Committee member of several of the most important conferences in the field such as Graphene20xx series, Graphene week, SPIE, CLEO, E-MRS, MRS, etc.
2018	Chair of the Cellex workshop on optics with topological and quantum materials
2017	Organizer and Chair of Graphene2017 conference, one of largest graphene conference in the world with ~1000 visitors
2016 -2018	Chair and initiator of the “Graphene Innovation Zone” at the Mobile World Congress Barcelona (2016, 2017, 2018, 2019)
2015	Organizer of SPIE workshop in Brussels on graphene science and applications.
2015	Organizer of Graphene connect workshop in Barcelona.
2015	Scientific committee of OSA Topical Meeting on Integrated Photonics Research.
2014-2021	Scientific committee CLEO conferences (USA and Europe) and organizer of session on 2d materials.

Commissions of trust

2022 – present	Program chair of the international QTWIST program
2020 – present	Steering board member of AMPT, a task force tackling societal challenges (amptnetwork.com)

2017 – 2023	Co-chair of the Graphene Flagship Executive board
2016 - present	Graphene Flagship: Work-Package leader of “optoelectronics and photonics” (~25 academic and industrial partners, responsible for a budget ~5MEuro per year).
2016 - 2017	Secretary of the Scientific Advisory board, Graphene flagship.
2013 - present	Member of the Graphene Flagship executive board.
2013 - 2015	Graphene Flagship Deputy Work-Package leader of Opto-electronics

Most notable awarded grants in the last 5 years

2023 – 2027	Moore foundation grant (1.4M$) on quantum materials QED
2022 – present	QTWIST program (large government-funded international program on quantum materials)
2018 – 2023	Quantum flagship
2017 - 2022	ERC Consolidator Grant (TOPONANOP)
2012 - 2017	ERC Starting Grant (*CARBONLIGHT*)
2017	ERC Proof of Concept (GTRACK)
2016	ERC Proof of Concept (GRAPHEALTH)
2014 - 2015	ERC Proof of Concept (*GRAQUADOT*)
2013 - present	Graphene flagship (~1MEuro per year)

Evaluations and editorial duties

- Editorial board member of:
    - Nature-springer: 2D materials and applications
    - AIP (American Institute of Physics) Applied Physics Materials

- Reviewer for several funding agencies including ERC, Marie-Curie, National funding agencies (Spain, UK, France, Switzerland, Netherlands)

- Reviewer for Nature, Science, Nature Physics, Nature Photonics, Nature Nanotechnology, Nano Letters, Nature Communications, Nature Materials, PRL, ACS Nano, ACS Photonics, Optics Letters, etc.

Patents

In total, more than 18 patent applications, including:

US-2023231063-A1	Optoelectronic apparatus and fabrication method of the same
US-11860502-B2	Electro-optical modulator and a method for obtaining an electro-optical modulator
US-2021173281-A1	Electro-optical modulator and a method for obtaining an electro-optical modulator
EP-4014260-A1	Sensor for detecting photons incident on the surface thereof and/or foreign substances accumulating on the surface thereof
WO-2020157299-A1	Charge sensing device with gate voltage selected to operate around the charge neutrality point and tune the quantum capacitance
WO-2020157286-A1	Charge sensing device with readout of signal by detecting a change of capacitance of combined gate and quantum capacitance compared to a reference capacitance

US-11811378-B2	Electronic device and a method for suppressing noise for an electronic device
US-2022028919-A1	An optoelectronic apparatus, a reading-out method, and a uses of the optoelectronic apparatus
US-2021376181-A1	A device for operating with thz and/or ir and/or mw radiation
EP-3652931-B1	An optoelectronic apparatus, a method for suppressing noise for an optoelectronic apparatus, and uses thereof
US-2018217665-A1	Gaze tracking apparatus
ES-1210888-Y	Look tracking device
US-9955100-B2	Image sensor with non-local readout circuit and optoelectronic device comprising said image sensor
US-2016366354-A1	Image sensor, optoelectronic system comprising said image sensor, and method for manufacturing said image sensor
US-11527662-B2	Optoelectronic apparatus with a photoconductive gain
WO-2014044702-A1	Electronic platform comprising an abo3 type crystal and graphene, method for its manufacture and chip comprising the same
WO-2013110803-A3	Photoconversion device based on graphene with enhanced photon absorption
US-9233845-B2	Optoelectronic platform with carbon-based conductor and quantum dots and transistor comprising such a platform

Selection of invited talks

Koppens has given more than 150 invited talks and courses at international events, including plenary talks at SPIE, Graphene week, Graphene 20xx series, CLEO, Mobile World Congress, etc.

Selection of talks and lectures:

Invited talks at APS March meetings (USA): Baltimore 2013, San Antonio 2015 and Los Angeles 2018, Colorado 2020, Online 2021, Las Vegas 2023

Invited and plenary talks at Graphene 2012 (plenary), Graphene 2014, Graphene 2015 (plenary), Graphene 2016 (plenary) and Graphene 2018 (plenary), Graphene 2020, Graphene2021

Invited and plenary talks at Nanometa, Seefeld, Austria, 2015 and 2017 (plenary), 2019

Invited and plenary talks at Graphene Week, Delft 2012, Chemnitz 2013, Gothenburg 2014 (plenary), Warsaw 2016, San Sebastian 2018 (plenary)

Invited talks at CLEO, talk, San Jose, 2013 and 2017

Invited talks at Photonics West, San Francisco, USA, 2015 and 2018

Invited and plenary talks at Grapchina, 2015, 2016 and 2017 (plenary)

Invited talks at NanoLight Benasque, Spain, 2012, 2014, 2016 and 2018

Plenary talk at PQE, USA, 2018

Plenary talk at SPIE Photonics Europe, Strasbourg, France, 2018

Plenary talk at IRMMW, Hong Kong, 2015

Plenary talk SPIE Photonics Europe Brussels, Belgium, 2014

Invited talks at MRS meetings (USA): Boston 2013, Boston 2014, San Francisco 2014, Phoenix 2016, 2017

Invited talks at SPIE Optics and Photonics, San Diego 2012 and 2014

Invited talks at NFO San Sebastian, 2012 and Hamamatsu, Japan 2016

Invited talks at E-MRS Strasbourg 2012, Lille 2014

Invited talks at SPP6 Ottawa, 2013 and SPP7, Jerusalem, 2015, SPP8, Taipei, 2017

Invited talk at the Rank Prize symposium, 2019

Invited talk at workshop Quantum Nanophotonics, Benasque, Spain, 2019

Invited talk at N2D conference, Fudan University, Shanghai, 2019

Colloquium talk at the LMU, Munich, Germany, 2018

Colloquium talk at the Technion, Haifa, Israel, 2018

Invited talk at the opening of the Bejing Graphene Institute, Bejing, China, 2018

Invited talk at the initiative seminar on 2D materials, Chalmers University, Sweden, 2018

Invited talk at CeNS workshop on Nanoimaging, Harvard University, USA, 2018

Invited talk at IUVSTA workshop, Rehovot, Israel, September 2018

Invited talk at HIOS symposium, Berlin, Germany, 2018

Invited talk at FET workshop Groningen, Netherlands, 2018

Invited talk at Frontiers in photonics nanoelectronics and plasmonics with 2D nano systems, Erice, Sicily, 2018

Invited talk at OSA Advanced Photonics Congress, Zurich, Switzerland, 2018

Invited talk at Gordon conference on 2d materials, Stonehill college, USA, 2018

Invited talk at QTN, Singapore, 2018

Invited talk at IWEPNM, Kirchberg, Austria, 2018

Keynote talks at Mobile World Congress Barcelona 2015, 2016 and 2017

Keynote talk at Mobile World Congress Shanghai 2016

Plenary talk at the FOM annual meeting, Veldhoven, Netherlands, 2015

Invited talk at the Fundacion Areces workshop, Madrid, Spain, 2016

Keynote lecture at ESOF, Manchester, 2016

Invited talk at PQE, Snowbird, USA, 2016

Invited talk at Big Ideas workshop, San Diego, 2015

Invited talk at Graphene Canada, Montreal, Canada, 2015

Invited talk at EP2DS, Sendai, Japan, 2015

Plenary talk at ECIO, Sitges, Spain, April 2012

Colloquium at Columbia University, 2012

Colloquium at MIT, USA, 2012

Invited talk at the graphene flagship pilot action workshop, Madrid, 2011

Invited talk at Quantum dot 2010, Nottingham, UK, 2010

Invited talk at the 15th European Conference on Integrated Optics, Cambridge, UK, 2010

Colloquium, Walter Schotky institute, Munich, Germany, 2009

Colloquium at Leiden University, Netherlands, 2008

Invited talk at International Symposium on Advanced Nanodevices and Nanotechnology, Waikoloa, Hawaii, 2007

Invited talk at the 71st annual Meeting of the DPG, Regensburg, Germany 2007

Colloquium at the university of Göttingen, Germany, 2006

Invited talk at the International Conference on the Physics of Semiconductors (ICPS), Vienna, Austria, 2006

Publications and preprints

1. "*High quality nanocavities through multimodal confinement of hyperbolic polaritons in hexagonal boron nitride*" Sheinfux, H. H., Orsini, L., Jung, M., Torre, I., Ceccanti, M., Marconi, S., Maniyara, R., Ruiz, D. B., Hötger, A., Bertini, R., Castilla, S., Hesp, N. C. H., Janzen, E., Holleitner, A., Pruneri, V., Edgar, J. H., Shvets, G. & Koppens, F. H. L. ***Nature Materials (in press)*** (2024).
2. "*Heavy Fermion Quantum Simulator Realized in a Graphene Moiré Superlattice*" Porro, S. B., Calugaru, D., Hu, H., Kumar, R. K., Hesp, C. H., Ruiz, D. B., Sheinfux, H. H., Watanabe, K., Bernevig, B. A., Stepanov, P. & Koppens, F. H. L. ***In preparation*** (2024).
3. "*Single photon detection and negative differential resistance in bilayer graphene/hBN superlattice*" Nowakowski, K., Agarwal, H., Ruiz, D. B., Torre, I., Reserbat, A., Li, G., Wang, X., Smeyers, R., Slizovskiy, S., Covaci, L., Milošević, M. V., Fal'ko, V., Kumar, R. K. & Koppens, F. H. L. ***In preparation*** (2024).
4. "*Optical Spectroscopy for Diagnosing Superlattice Minibands in Magic-angle Twisted Bilayer Graphene*" Li, G., Kumar, R. K., Stepanov, P., Pantaleon, P. A., Zhan, Z., Agarwal, H., Bercher, A., Barrier, J., Watanabe, K., Taniguchi, T., Kuzmenko, A. B., Guinea, F., Torre, I. & Koppens, F. H. L. ***In preparation*** (2024).
5. "*Terahertz photocurrent probing quantum geometry of interacting electrons in twisted bilayer graphene*" Kumar, R. K., Nowakowski, K., Li, G. & Koppens, F. H. L. ***In preparation*** (2024).
6. "*Electrical Spectroscopy of Polaritonic Nanoresonators*" Castilla, S., Agarwal, H., Vangelidis, I., Bludov, Y., Iranzo, D. A., Grabulosa, A., Ceccanti, M., Vasilevskiy, M. I., Kumar, R. K., Edgar, J. H., Watanabe, K., Taniguchi, T., Peres, N., Lidorikis, E. & Koppens, F. H. L. ***Under review*** (2024).
7. "*Giant chirality-induced spin polarization in twisted transition metal dichalcogenides*" Menichetti, G., Cavicchi, L., Lucchesi, L., Taddei, F., Iannaccone, G., Jarillo-Herrero, P., Koppens, F. H. L. & Polini, M. Preprint at https://doi.org/10.48550/arXiv.2312.09169 (2023)
8. "*2D materials ratchet up biorealism in computing*" Koppens, F. H. L., Aimone, J. B. & Chance, F. S. ***Nature* 624,** 534–536 (2023).
9. "*Valley-hybridized gate-tunable 1D exciton confinement in MoSe2*" Heithoff, M., Moreno, Á., Torre, I., Feuer, M. S. G., Purser, C. M., Andolina, G. M., Calajo, G., Watanabe, K., Taniguchi, T., Kara, D., Hays, P., Tongay, S., Falko, V., Chang, D., Atatüre, M., Reserbat-Plantey, A. & Koppens, F. Preprint at http://arxiv.org/abs/2311.05299 (2023)
10. "*Engineering 2D material exciton lineshape with graphene/h-BN encapsulation*" Woo, S. Y., Shao, F., Arora, A., Schneider, R., Wu, N., Mayne, A. J., Ho, C.-H., Och, M., Mattevi, C., Reserbat-Plantey, A., Moreno, A., Sheinfux, H. H., Watanabe, K., Taniguchi, T., de Vasconcellos, S. M., Koppens, F. H. L., Niu, Z., Stéphan, O., Kociak, M., de Abajo, F. J. G., Bratschitsch, R., Konečná, A. & Tizei, L. H. G. Preprint at https://doi.org/10.48550/arXiv.2311.07085 (2023)

11. "*Deep Subwavelength Topological Edge State in a Hyperbolic Medium*" Orsini, L., Sheinfux, H. H., Li, Y., Lee, S., Andolina, G. M., Scarlatella, O., Ceccanti, M., Soundarapandian, K., Janzen, E., Edgar, J. H., Shvets, G. & Koppens, F. H. L. Preprint at https://doi.org/10.48550/arXiv.2310.02644 (2023)
12. "*Experimental signatures of the transition from acoustic plasmon to electronic sound in graphene*" Barcons Ruiz, D., Hesp, N. C. H., Herzig Sheinfux, H., Ramos Marimón, C., Maissen, C. M., Principi, A., Asgari, R., Taniguchi, T., Watanabe, K., Polini, M., Hillenbrand, R., Torre, I. & Koppens, F. H. L. ***Sci. Adv.*** **9,** eadi0415 (2023).
13. "*Ultra-broadband photoconductivity in twisted graphene heterostructures with large responsivity*" Agarwal, H., Nowakowski, K., Forrer, A., Principi, A., Bertini, R., Batlle-Porro, S., Reserbat-Plantey, A., Prasad, P., Vistoli, L., Watanabe, K., Taniguchi, T., Bachtold, A., Scalari, G., Krishna Kumar, R. & Koppens, F. H. L. ***Nat. Photon.*** (2023). doi:10.1038/s41566-023-01291-0
14. "*Dynamical correlations and order in magic-angle twisted bilayer graphene*" Rai, G., Crippa, L., Călugăru, D., Hu, H., Medici, L. de', Georges, A., Bernevig, B. A., Valentí, R., Sangiovanni, G. & Wehling, T. Preprint at http://arxiv.org/abs/2309.08529 (2023)
15. "*Semitransparent Image Sensors for Eye-Tracking Applications*" Mercier, G., Polat, E. O., Shi, S., Gupta, S., Konstantatos, G., Goossens, S. & Koppens, F. H. L. ***ACS Photonics*** acsphotonics.3c00473 (2023). doi:10.1021/acsphotonics.3c00473
16. "*Hysteresis-free high mobility graphene encapsulated in tungsten disulfide*" Soundarapandian, K. P., De Fazio, D., Bernal-Texca, F., Hoffmann, R., Ceccanti, M., De Bonis, S. L., Tongay, S. & Koppens, F. H. L. ***Applied Physics Letters*** **123,** 063103 (2023).
17. "*Deep-subwavelength Phase Retarders at Mid-Infrared Frequencies with van der Waals Flakes*" Enders, M. T., Sarkar, M., Deeva, A., Giteau, M., Sheinfux, H. H., Shokooh-Saremi, M., Koppens, F. H. L. & Papadakis, G. T. Preprint at http://arxiv.org/abs/2306.16110 (2023)
18. "*Dynamics of optical vortices in van der Waals materials*" Kurman, Y., Dahan, R., Herzig Shenfux, H., Rosolen, G., Janzen, E., Edgar, J. H., Koppens, F. H. L. & Kaminer, I. ***Optica*** **10,** 612 (2023).
19. "*Transverse Hypercrystals Formed by Periodically Modulated Phonon Polaritons*" Herzig Sheinfux, H., Jung, M., Orsini, L., Ceccanti, M., Mahalanabish, A., Martinez-Cercós, D., Torre, I., Barcons Ruiz, D., Janzen, E., Edgar, J. H., Pruneri, V., Shvets, G. & Koppens, F. H. L. ***ACS Nano*** **17,** 7377–7383 (2023).
20. "*Photon condensation, Van Vleck paramagnetism, and chiral cavities*" Mercurio, A., Andolina, G. M., Pellegrino, F. M. D., Di Stefano, O., Jarillo-Herrero, P., Felser, C., Koppens, F. H. L., Savasta, S. & Polini, M. Preprint at https://doi.org/arXiv:2302.09964 (2023)
21. "*Photocurrent as a multiphysics diagnostic of quantum materials*" Ma, Q., Krishna Kumar, R., Xu, S.-Y., Koppens, F. H. L. & Song, J. C. W. ***Nat Rev Phys*** **5,** 170–184 (2023).
22. "*Valley-hybridized gate-tunable 1D exciton confinement in MoSe2*" Preprint at https://arxiv.org/abs/2311.05299 (2023)
23. "*Quantitative scattering theory of near-field response for 1D polaritonic structures*" Preprint at https://arxiv.org/abs/2307.11512 (2023)

24. "*Can deep sub-wavelength cavities induce Amperean superconductivity in a 2D material?*" Andolina, G. M., De Pasquale, A., Pellegrino, F. M. D., Torre, I., Koppens, F. H. L. & Polini, M. Preprint at http://arxiv.org/abs/2210.10371 (2022)
25. "*Tunable and giant valley-selective Hall effect in gapped bilayer graphene*" Yin, J., Tan, C., Barcons-Ruiz, D., Torre, I., Watanabe, K., Taniguchi, T., Song, J. C. W., Hone, J. & Koppens, F. H. L. ***Science* 375,** 1398–1402 (2022).
26. "*Unbiased Plasmonic-Assisted Integrated Graphene Photodetectors*" Vangelidis, I., Bellas, D. V., Suckow, S., Dabos, G., Castilla, S., Koppens, F. H. L., Ferrari, A. C., Pleros, N. & Lidorikis, E. ***ACS Photonics* 9,** 1992–2007 (2022).
27. "*WSe2 as Transparent Top Gate for Infrared Near-Field Microscopy*" Hesp, N. C. H., Svendsen, M. K., Watanabe, K., Taniguchi, T., Thygesen, K. S., Torre, I. & Koppens, F. H. L. ***Nano Letters* 22,** 6200–6206 (2022).
28. "*Engineering high quality graphene superlattices via ion milled ultra-thin etching masks*" Barcons Ruiz, D., Herzig Sheinfux, H., Hoffmann, R., Torre, I., Agarwal, H., Kumar, R. K., Vistoli, L., Taniguchi, T., Watanabe, K., Bachtold, A. & Koppens, F. H. L. ***Nature Communications* 13,** (2022).
29. "*High-Harmonic Generation Enhancement with Graphene Heterostructures*" Alonso Calafell, I., Rozema, L. A., Trenti, A., Bohn, J., Dias, E. J. C., Jenke, P. K., Menghrajani, K. S., Alcaraz Iranzo, D., García de Abajo, F. J., Koppens, F. H. L., Hendry, E. & Walther, P. ***Advanced Optical Materials* 10,** (2022).
30. "*Single organic molecules for photonic quantum technologies*" Toninelli, C., Gerhardt, I., Clark, A. S., Reserbat-Plantey, A., Götzinger, S., Ristanović, Z., Colautti, M., Lombardi, P., Major, K. D., Deperasińska, I., Pernice, W. H., Koppens, F. H. L., Kozankiewicz, B., Gourdon, A., Sandoghdar, V. & Orrit, M. ***Nature Materials* 20,** 1615–1628 (2021).
31. "*Combining density functional theory with macroscopic QED for quantum light-matter interactions in 2D materials*" Svendsen, M. K., Kurman, Y., Schmidt, P., Koppens, F., Kaminer, I. & Thygesen, K. S. ***Nature Communications* 12,** (2021).
32. "*Quantum Nanophotonics in Two-Dimensional Materials*" Reserbat-Plantey, A., Epstein, I., Torre, I., Costa, A. T., Gonçalves, P. A. D., Mortensen, N. A., Polini, M., Song, J. C. W., Peres, N. M. R. & Koppens, F. H. L. ***ACS Photonics* 8,** 85–101 (2021).
33. "*Topological Graphene Plasmons in a Plasmonic Realization of the Su-Schrieffer-Heeger Model*" Rappoport, T. G., Bludov, Y. V., Koppens, F. H. L. & Peres, N. M. R. ***ACS Photonics* 8,** 1817–1823 (2021).
34. "*Hot-Carrier Cooling in High-Quality Graphene Is Intrinsically Limited by Optical Phonons*" Pogna, E. A. A., Jia, X., Principi, A., Block, A., Banszerus, L., Zhang, J., Liu, X., Sohier, T., Forti, S., Soundarapandian, K., Terrés, B., Mehew, J. D., Trovatello, C., Coletti, C., Koppens, F. H. L., Bonn, M., Wang, H. I., Van Hulst, N., Verstraete, M. J., Peng, H., Liu, Z., Stampfer, C., Cerullo, G. & Tielrooij, K.-J. ***ACS Nano* 15,** 11285–11295 (2021).
35. "*Imaging vibrations of electromechanical few layer graphene resonators with a moving vacuum enclosure*" Lu, H., Yang, C., Tian, Y., Lu, J., Xu, F., Zhang, C., Chen, F., Ying, Y., Schädler, K. G., Wang, C., Koppens, F. H. L., Reserbat-Plantey, A. & Moser, J. ***Precision Engineering* 72,** 769–776 (2021).
36. "*Spatiotemporal imaging of 2D polariton wave packet dynamics using free electrons*" Kurman, Y., Dahan, R., Sheinfux, H. H., Wang, K., Yannai, M., Adiv, Y., Reinhardt, O.,

Tizei, L. H. G., Woo, S. Y., Li, J., Edgar, J. H., Kociak, M., Koppens, F. H. L. & Kaminer, I. ***Science* 372,** 1181–1186 (2021).

37. "*Electrical tunability of terahertz nonlinearity in graphene*" Kovalev, S., Hafez, H. A., Tielrooij, K.-J., Deinert, J.-C., Ilyakov, I., Awari, N., Alcaraz, D., Soundarapandian, K., Saleta, D., Germanskiy, S., Chen, M., Bawatna, M., Green, B., Koppens, F. H. L., Mittendorff, M., Bonn, M., Gensch, M. & Turchinovich, D. ***Science Advances* 7,** (2021).
38. "*Hot plasmons make graphene shine*" Koppens, F. H. L. & Tielrooij, K.-J. ***Nature Materials* 20,** 721–722 (2021).
39. "*Observation of interband collective excitations in twisted bilayer graphene*" Hesp, N. C. H., Torre, I., Rodan-Legrain, D., Novelli, P., Cao, Y., Carr, S., Fang, S., Stepanov, P., Barcons-Ruiz, D., Herzig Sheinfux, H., Watanabe, K., Taniguchi, T., Efetov, D. K., Kaxiras, E., Jarillo-Herrero, P., Polini, M. & Koppens, F. H. L. ***Nature Physics* 17,** 1162–1168 (2021).
40. "*Nano-imaging photoresponse in a moiré unit cell of minimally twisted bilayer graphene*" Hesp, N. C. H., Torre, I., Barcons-Ruiz, D., Herzig Sheinfux, H., Watanabe, K., Taniguchi, T., Krishna Kumar, R. & Koppens, F. H. L. ***Nature Communications* 12,** (2021).
41. "*Quantum surface-response of metals revealed by acoustic graphene plasmons*" Gonçalves, P. A. D., Christensen, T., Peres, N. M. R., Jauho, A.-P., Epstein, I., Koppens, F. H. L., Soljačić, M. & Mortensen, N. A. ***Nature Communications* 12,** (2021).
42. "*Grating-Graphene Metamaterial as a Platform for Terahertz Nonlinear Photonics*" Deinert, J.-C., Alcaraz Iranzo, D., Pérez, R., Jia, X., Hafez, H. A., Ilyakov, I., Awari, N., Chen, M., Bawatna, M., Ponomaryov, A. N., Germanskiy, S., Bonn, M., Koppens, F. H. L., Turchinovich, D., Gensch, M., Kovalev, S. & Tielrooij, K.-J. ***ACS Nano* 15,** 1145–1154 (2021).
43. "*Coherent characterisation of a single molecule in a photonic black box*" Boissier, S., Schofield, R. C., Jin, L., Ovvyan, A., Nur, S., Koppens, F. H. L., Toninelli, C., Pernice, W. H. P., Major, K. D., Hinds, E. A. & Clark, A. S. ***Nature Communications* 12,** (2021).
44. "*Observation of giant and tunable thermal diffusivity of a Dirac fluid at room temperature*" Block, A., Principi, A., Hesp, N. C. H., Cummings, A. W., Liebel, M., Watanabe, K., Taniguchi, T., Roche, S., Koppens, F. H. L., van Hulst, N. F. & Tielrooij, K.-J. ***Nature Nanotechnology* 16,** 1195–1200 (2021).
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