

Haoning Tang

Biography

- 2024 – **Research Associate**, Harvard University, USA
2021 – 2024 **Harvard Quantum Initiative (HQI) Fellow**, Harvard University, USA
2018 – 2021 **Ph. D. in Applied Physics**, Harvard University, USA.
2016 – 2018 **M.S. in Applied Physics**, Harvard University, USA
2012 – 2016 **B.Eng in Electronic and Computer Engineering**, The Hong Kong University of Science and Technology, Hong Kong SAR

Research Directions

Metamaterials, quantum materials, micro(nano)electromechanical system (MEMS), nonlinear optics, quantum optics, integrated photonics, nanotechnology and nanofabrication, nanoelectronics device

Journal Articles

I have published 18 journal articles, including 7 first author papers and in top journals including [Nature](#), [Nature Photonics](#), [Science Advance](#), [Light: Science & Applications](#), [Nano Letters](#), [Applied Physics Letters](#), among others, and 2 last corresponding author papers published both on [Physical Review Letters](#). Below are selected publications of mine. (* corresponding author, †last corresponding author)

- 2024 Zhou, H., Ni, X., Lou, B., Fan, S., Cao, Y., **Tang, H.** ^{†*}, Control of chirality and directionality of nonlinear metasurface light source via twisting. [Physics Reveiw Letters](#) **Tang, H.**, Wang, Y., Ni, X., Watanabe, K., Taniguchi, T., Fan, S. Mazur, E., Yacoby, A., Cao, Y., An on-chip platform for multi-degree-of-freedom control of two-dimensional quantum and nonlinear materials, [Nature](#), 632, pages1038–1044
Tang, H. *, Lou, B., Du, F., Gao, G., Zhang, M., Ni, X., Yacoby, A., Cao, Y., Fan, S. and Mazur, E., On-Chip Multidimensional Dynamic Control of Twisted Moiré Photonic Crystal for Smart Sensing and Imaging. [Nature photonics](#), accepted and in press, arXiv:2312.09089
Lou, B., **Tang, H.**, Du, F., Gao, G., Mazur, E., and Fan, S., Free-space beam steering with twisted bi-layer photonic crystal slabs. [ACS photonics](#), 11, 9, 3636–3643
Ni, X., Liu, Y., Lou, B., Zhang, M., Hu, E. L. Fan, S., Mazur, E., and **Tang, H.** ^{†*}, Three Dimensional Reconfigurable Optical Singularities in Bilayer Photonic Crystals. [Physics Reveiw Letters](#), 132(7), 073804.
- 2023 **Tang, H.** *, Lou, B., Du, F., Zhang, M., Ni, X., Xu, W., Jin, R., Fan, S. and Mazur, E., Experimental probe of twist angle–dependent band structure of on-chip optical bilayer photonic crystal. [Science Advances](#), 9, eadh8498
Raun, A., **Tang, H.**, Ni, X., Mazur, E. and Hu, E. L., GaN Magic Angle Laser in a Merged Moiré Photonic Crystal. [ACS Photonics](#), 10, 3001–3007
Yang, Y., Roques-Carmes, C., Kooi, S. E., **Tang, H.**, Beroz, J., Mazur, E., Kaminer, I., Joannopoulos, J. D. and Soljačić, M. Photonic flatband resonances for free-electron radiation. [Nature](#), 613, 42–47
- 2022 **Tang, H.** *, Ni, X., Du, F., Srikrishna, V. and Mazur, E. On-chip light trapping in bilayer moiré photonic crystal slabs. [Applied Physics Letters](#), 121, 231702

- Mello, O., Yang, L., Camayd-Muñoz, S.A., Devault, C., **Tang, H.**, Loncar, M., and Mazur, E., Extended Many-Body Superradiance in Diamond Epsilon Near-Zero Metamaterials, *Applied Physics Letters*, 120, 061105
- Bi, H., Huo, C., Song, X., Li, Z., **Tang, H.**, Griesse-Nascimento, S., Huang, K.C., Cheng, J.X., Nienhaus, L., Bawendi, M.G. and Lin, H.Y.G., Room-Temperature Phosphorescence and Low-Energy Induced Direct Triplet Excitation of Alq3 Engineered Crystals. *The Journal of Physical Chemistry Letters*, 11(21), pp.9364-9370
- 2021 **Tang, H.***, Du, F., Carr, S., DeVault, C. Mello, O., and Mazur, E. Modeling the optical properties of twisted bilayer photonic crystals. *Light: Science & Applications*, 10, 157
- Tang, H.**, DeVault, C., Camayd-Muñoz, S.A., Liu, Y., Jia, D., Du, F., Mello, O., Vulis, D.I., Li, Y. and Mazur, E., Low-Loss Zero-Index Materials. *Nano Letters*, 21(2), pp.914-920
- Dong, T., Liang, J., Camayd-Muñoz, S., Liu, Y., **Tang, H.**, Kita, S., Chen, P., Wu, X., Chu, W., Mazur, E. and Li, Y., 2021. Ultra-low-loss on-chip zero-index materials. *Light: Science & Applications*, 10(1), pp.1-9.
- Zhang, Q., Lin, Y., Sun, X., Cao, B., **Tang, H.**, and Fan, Z., Design of a Horizontally Aligned Perovskite Nanowire LED with Improved Light Extraction, *IEEE Journal of the Electron Devices Society*, 1-1.
- 2016 **Tang, H.**, Jiang, Y., Tang, C.W. and Kwok, H.S., Grid optimization of large-area OLED lighting panel electrodes. *Journal of Display Technology*, 12(6), pp.605-609.
- 2014 Lin, Q., Leung, S.F., Lu, L., Chen, X., Chen, Z., **Tang, H.**, Su, W., Li, D. and Fan, Z. Inverted nanocone-based thin film photovoltaics with omnidirectionally enhanced performance. *ACS Nano*, 8(6), pp.6484-6490.
- 2012 Li, H., Kikuchi, R., Kumagai, M., Amano, T., **Tang, H.**, Lin, J.M., Fujiwara, K. and Ogawa, N., 2012. Nondestructive estimation of strength deterioration in photovoltaic backsheets using a portable near infrared spectrometer. *Solar energy materials and solar cells*, 101, pp.166-169.

U.S. Patents

- 2024 **Tang, H.**, Cao, Y., Mazur, E., Yacoby, A., MEMS for tuning of vdW heterostructure. PCT/US2024/016481
- 2023 **Tang, H.**, Cao, Y., Mazur, E., Yacoby, A., A MEMS based multilayer flat optics. PCT/US2023/037206

Invited Talks

- I have given 9 invited talks and colloquiums in international conferences such as MRS and CLEO, among others, and 17 invited talks in top universities in the U.S.
- 2025 Multi-degree-of-freedom control of optical two-dimensional quantum materials, *SPIE Photonic West*
Twisting light with a nano machine, *Stanford University, Optics and Electronics Seminar Series*
- 2024 Twisting light with a nano machine, *Materials Research Society (MRS)*
Twisting light with a nano machine, *UC Berkeley, Nanophotonic colloquium*
Twisting light with a nano machine, *University of Southern California, ECE*
Real-time Twisting on a Chip, *Hong Kong University, ECE*
Active twistoptics: on-chip multidimensional dynamic control for data hypercube reconstruction, *Conference on Lasers and Electro-Optics (CLEO)*

- An on-chip platform for multi-degree-of-freedom control of two-dimensional quantum and nonlinear materials, *Conference on Lasers and Electro-Optics (CLEO)*
- Topological Nonlinear Optics in Twisted h-BN Interface, *Conference on Lasers and Electro-Optics (CLEO)*
- Real-time Twisting on a Chip, *Cornell University, Applied Engineering Physics*
- Real-time Twisting on a Chip, *Rice University, ECE*
- Real-time Twisting on a Chip, *Purdue University, Physics*
- Real-time Twisting on a Chip, *Texas A&M University, ECE*
- Real-time Twisting on a Chip, *The Pennsylvania State University, Physics*
- Real-time Twisting on a Chip, *Northeastern University, NanoSI*
- Real-time Twisting on a Chip, *Rensselaer Polytechnic Institute, ECSE*
- 2023 Active Twistoptics, *Wesleyan University, Department of Physics*
- Active tuning of bilayer photonic crystals, *International Conference on Frontier Materials (ICFM)*
- Metamaterials for extreme optical properties, *UC Berkeley, Department of EECS*
- Reconfigurable Structured Light with On-Chip Bilayer Photonic Crystals, *University of Chicago, Department of Physics*
- Active tuning of bilayer photonic crystals, *International Conference on Frontier Materials (ICFM)*
- An optical twisted bilayer photonic crystal, *Harvard University, Center for Integrated Quantum Materials Colloquium*
- An optical twisted bilayer photonic crystal, *Harvard University, Harvard Quantum Initiative Colloquium*
- 2022 Moiré photonic metamaterials, *International Conference on Frontier Materials (ICFM)*
- Twisted bilayer photonic crystals, *International Conference on Information Optics and Photonics (ICOP)*
- 2021 Dirac-cone metamaterials, *Harvard University, Harvard Quantum Initiative Colloquium*

Conference Papers

- 2024 Raun, A., Ni, X., Xu, G., Tang, H.* , Mazur, E., Hu E., Fabrication methodology for GaN-based twisted bilayer photonic crystal lasers, *Active Photonic Platforms (APP), PC131100X (2024)*
- Tang, H.* , Wang, Y., Ni, X., Watanabe, K., Taniguchi, T., Fan, S. Mazur, E., Yacoby, A., Cao, Y., An on-chip platform for multidimensional control of two-dimensional quantum materials. *Frontiers in Optics + Laser Science Conference, FTu1C*
- Tang, H.* , Lou, B., Du, F., Gao, G., Zhang, M., Ni, X., Cao, Y., Fan, S. and Mazur, E., MEMS-based twisted bilayer flat optics for multidimensional optical modulation and hyperimaging. *Frontiers in Optics + Laser Science Conference, FTu6D*
- Tang, H.* , Wang, Y., Ni, X., Watanabe, K., Taniguchi, T., Fan, S. Mazur, E., Yacoby, A., Cao, Y., An on-chip platform for multidimensional control of two-dimensional quantum materials. *Conference on Lasers and Electro-Optics, SW4O.4*
- Tang, H.* , Lou, B., Du, F., Gao, G., Zhang, M., Ni, X., Cao, Y., Fan, S. and Mazur, E., Twistoptics in action: on-chip multidimensional dynamic control for data hypercube reconstruction. *Conference on Lasers and Electro-Optics, STh4R.4*
- Ni, X., Zhang, M., Lou, B., Fan, S., Cao, Y., Tang, H.* , Topological nonlinearity in two-dimensional quantum materials(*Conference on Lasers and Electro-Optics, FF2N.1*
- Ni, X., Liu, Y., Lou, B., Zhang, M., Hu, E. L. Fan, S., Mazur, E., and Tang, H.* , Three Dimensional Reconfigurable Optical Singularities in Bilayer Photonic Crystals. *Conference on Lasers and Electro-Optics, FF1N.3*

- Ni, X., Liu, Y., Lou, B., Zhang, M., Hu, E. L. Fan, S., Mazur, E., and Tang, H.*, Three Dimensional Reconfigurable Optical Singularities in Bilayer Photonic Crystals. *Conference on Lasers and Electro-Optics*, FF1N.3
- Du, F., Gao, G., Zhang, M., Ni, X., Liu, Y., Cao, Y., Fan, S., Mazur, E., and Tang, H.*, Generation of high-purity single chirality by tunable twisted bilayer photonic crystals. *Conference on Lasers and Electro-Optics*
- 2023 Tang, H., and Mazur, E. Photonic Crystals with a Twist, *Conference on Lasers and Electro-Optics*, pp. STh1H.5
- Tang, H.*, Lou, B., Du, F., Zhang, M., Ni, X., Xu, W., Jin, R., Fan, S. and Mazur, E. Direct Imaging of Band Structure in Twisted Bilayer Photonic Crystal Slabs, *Conference on Lasers and Electro-Optics*, pp. FF3D.5
- Raun, A., Tang, H., Ni, X., Mazur, E., & Hu, E. L. Gallium Nitride-based moiré photonic crystals for applications in low-threshold nano-lasers. *The Society of Photographic Instrumentation Engineers*
- 2022 Tang, H.*, Fan, D., Xue, Ni., and Mazur, E. Localization of the Twisted Bilayer Dielectric Photonic Crystal Slabs. *Conference on Lasers and Electro-Optics*, pp.FF3D. 5
- 2021 Tang, H.*, Fan, D., Carr, S., DeVault, C., and Mazur, E. Twisted Bilayer Dielectric Photonic Crystal Slabs. *Conference on Lasers and Electro-Optics*, pp.JTu3A. 49
- Yang, Y., Roques-Carmes, C., Kooi, S. E., Tang, H., and Soljačić, M, Enhanced Smith–Purcell radiation from photonic flatband resonances. *Conference on Lasers and Electro-Optics*, pp.FF2C. 7
- Zhang, Q., Lin, Y., Sun, X., Cao, B., Tang, H. and Fan, Z. A design of horizontal perovskite nanowire LED for better light extraction. *IEEE Electron Devices Technology & Manufacturing Conference*
- 2020 Tang, H., DeVault, C., Camayd-Muftoz, P., Jia, D., and Mazur, E. Low-loss Zero-Index Metamaterials with Bound State in the Continuum. *Conference on Lasers and Electro-Optics*, pp.FM1B.8
- 2017 Li, Y., Camayd-Muñoz, P., Vulis, D. I., Saeta, P., Peng, Y., Reshef, O., Mello, O., Tang, H., Lončar, M. and Mazur, E. Transition metamaterials for local-field enhancement. *Conference on Lasers and Electro-Optics*, pp. FM3G-6
- 2015 Jiang, Y., Tang, H., Chen, S. & Kwok, H.-S. 20.3: Optimizing the balance of holes and electrons in inverted quantum dot light-emitting diodes by inserting electron transportation barrier layer. *Dig. Tech. Pap.* 46, 274–277

Teaching

- 2024 Engineering Electromagnetic, Harvard, teaching assistant
- 2019 Introduction to Solid-state Physics, Harvard, teaching assistant

Synergistic Activities

- 2025 Special Symposium Chair and organizer, CLEO Conference, Twistoptics for Light-Matter Interactions
- Committee member, CLEO Conference FS8 metamaterial
- Session chair, SPIE Photonic West, Photonics with 2D Heterostructures
- 2024 NSF EPM panel reviewer
- Ad-hoc NSF EPM proposal reviewer
- Session chair, MRS Fall Conference EL06.07
- Session chair, FiO LS Conference FTh1B
- Session chair and committee member, CLEO Conference FS8 metamaterial
- 2023 Member and organizer, Optica Harvard SEAS Photonics Student Chapter
- NSF REU (Research Experiences for Undergraduate) mentor
- 2022 Attendee, Optica Innovation School

2021 NSF REU (Research Experiences for Undergraduate) mentor
Siegman International School on Lasers
NSF REU (Research Experiences for Undergraduate) mentor
Others Active paper reviewer for Nature, ACS, APS, Optica, IEEE, and MDPI series journals

Awards

2025 Rising Star of Light Award Winner
2021-2024 Harvard Quantum Initiative Fellow
2017-2020 Harvard Hong Kong Jockey Club Fellowship
2015-2016 BOE Varitronix Scholarship
2016 HKUST President's Cup Award

Language

English (Fluent), Japanese (Fluent), Chinese (Fluent)

Contacts

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Google Scholar: <https://scholar.google.com/citations?user=19lkE4MAAAAJ>