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Research Interests

- **Theoretical condensed matter physics**
 - Topological phases of matter.
 - Non-Hermitian Physics.
 - Excitonic and polaritonic physics
 - Two-dimensional atomic crystals.
 - Strongly correlated systems.

Experiences

Apr. 2018-Present	JSPS Fellowship, RIKEN, Japan
Sep. 2017-Apr. 2018	Postdoctoral researcher, RIKEN, Japan
Feb. 2016-Aug. 2017	Research fellow, School of Physical and Mathematical Sciences, Nanyang Technological University, Singapore.
Jun.2014-Feb. 2016	Research fellow, School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore.
Oct.2013-Jun.2014	Research associate, School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore.
Jun.2010-Aug.2010	Visiting researcher, Temasek Laboratory, Singapore.

Education Background

Aug.2010-Jun.2014	Ph.D, School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore.
Sep.2007-Jun.2010	M.E., School of Materials Science and Engineering, South China University of Technology, China.

Teaching Assistant

- Computing (C Language), Labview.

Publications

1. Z. Y. Ge, Y. R. Zhang, **T. Liu**, S. W. Li, H. Fan, and F. Nori, Topological band theory for non-Hermitian systems from the Dirac equation, **Phys. Rev. B** 100, 054105 (2019).
2. **T. Liu**, Y. R. Zhang, Q. Ai, Z. Gong, K. Kawabata, M. Ueda, and F. Nori, Second-order topological phases in non-Hermitian systems, **Phys. Rev. Lett.** 122, 076801 (2019).
3. J. J. Cheng, Y. Q. Chu, **T. Liu**, J. X. Zhao, F. G. Deng, Q. Ai, and F. Nori, Broad-band negative refraction via simultaneous multi-electron transitions, **J. Phys. Commun.** 3, 015010 (2019).

4. **T. Liu**, J. J. He and F. Nori, "Majorana corner states in a two-dimensional magnetic topological insulator on a high-temperature superconductor," **Phys. Rev. B** 98, 245413 (2018).
5. B. Li, **T. Liu**, D. W. Hewak and Q. J. Wang, "Superradiant phase transition with graphene embedded in one dimensional optical resonator," **Superlattice Microst.**, 113, 401 (2018).
6. J. Li, **T. Liu** and T. C. H. Liew, "Tightly bound indirect exciton in single-layer hybrid organic-inorganic perovskite semiconductor," **Superlattice Microst.**, 110, 108 (2017).
7. **T. Liu** and Timothy C. H. Liew, "Spontaneous spin bifurcations in a Bose-Einstein condensate of indirect excitons," **Superlattice Microst.**, 108, 57 (2017), **invited paper**.
8. **T. Liu**, H. Qiu, T. Yin, *et al*, "Enhanced light-matter interaction in atomically thin MoS₂ coupled with 1D photonic crystal nanocavity," **Optics Express**, 25, 14691 (2017).
9. Q. Zeng, G. Liang, H. Liang, S. Mansha, B. Meng, **T. Liu**, *et al*, "Designer multimode random lasing in amorphous lattices at terahertz frequencies," **ACS Photonics** 3, 2453 (2016).
10. G. Liang, **T. Liu** and Q. J. Wang, "Recent development of terahertz quantum cascade laser," **IEEE Journal of Selected Topics in Quantum Electronics**, 23, 1200118 (2016), **invited review paper**.
11. B. Li, **T. Liu**, Q. J. Wang, *et al*, "Ultrastrong coupling of the cyclotron transition in monolayer MoS₂," **Phys. Rev. B** 93, 045420 (2016).
12. B. Li, **T. Liu**, Q. J. Wang, *et al*, "Ultrastrong coupling of the cyclotron transition in monolayer MoS₂," **Phys. Rev. B** 93, 045420 (2016).
13. X. Yu, Z. Dong, Y. Liu, **T. Liu**, *et al*, "High performance, visible to mid-infrared photodetector based on Graphene nanoribbons passivated by HfO₂," **Nanoscale**, 8, 327(2016).
14. X. Yu, Y. Shen, **T. Liu**, *et al*, "Photocurrent generation in lateral graphene p-n junction created by electron-beam irradiation," **Scientific Reports**, 5, 12014(2015).
15. Z. Yan, Y. Tang, B. Sun, **T. Liu**, *et al*, "Switchable multi-wavelength Tm-doped mode-locked fiber laser," **Opt. Lett.** 40, 1916(2015).
16. X. Yu, J. Tao, Y. Shen, G. Liang, **T. Liu**, *et al*, "Metal-dielectric-graphene sandwich for surface enhanced Raman spectroscopy," **Nanoscale**, 6, 9925(2014).
17. X. Hu, **T. Liu**, Y. Cao, *et al.*, "Relative intensity noise of silicon hybrid laser", **IEEE J. Quantum Electron.**, 50, 466(2014).
18. **T. Liu** and Q. J. Wang, "Magnetopolariton in bilayer graphene: a tunable ultrastrong light-matter coupling," **Phys. Rev. B** 89, 125306 (2014).
19. Y. Zhang, **T. Liu**, B. Meng, *et al*, "Broadband high photoresponse from pure monolayer graphene photodetector," **Nature Communication** 4, 1811(2013).
20. **T. Liu**, Kenneth E. Lee and Q. J. Wang, "Importance of the microscopic effects on the linewidth enhancement factor of terahertz quantum cascade lasers," **Optics Express**, 21, 27804 (2013).
21. **T. Liu**, Kenneth E. Lee and Q. J. Wang, "Microscopic density matrix model for optical gain of terahertz quantum cascade lasers: Many-body, nonparabolicity, and resonant tunneling effects," **Phys. Rev. B**, 86, 235306 (2012).
22. **T. Liu**, K. E. Lee, and Q. J. Wang, Effects of resonant tunneling and dynamics of coherent interaction on intrinsic linewidth of quantum cascade lasers, **Optics Express**, 20, 17145 (2012).
23. **T. Liu**, T. Kubis, Q. J. Wang, and G. Klimeck, "Design of three-well indirect pumping terahertz quantum cascade lasers for high optical gain based on nonequilibrium Green's function analysis," **Applied Physics Letters**, 100, 122110(2012).
24. **T. Liu** and Q. J. Wang, "Fundamental frequency noise and linewidth broadening caused by intrinsic temperature fluctuation in quantum cascade lasers," **Phys. Rev. B**, 84, 125322(2011).

25. **T. Liu**, Z. M. Yang, and S. H. Xu, “3-Dimensional heat analysis in short-length Er/Yb co-doped phosphate fiber laser with upconversion,” **Optics Express**, 17, 235 (2009).
26. **T. Liu**, Z. M. Yang, and S. H. Xu, “Analytical investigation on transient thermal effects in pulse end-pumped short-length fiber laser,” **Optics Express**, 17, 12875 (2009).
27. S. H. Xu, Z. M. Yang, and **T. Liu**, *et al.*, “An efficient compact 300 mW narrow-linewidth single frequency fiber laser at 1.5 μm ,” **Optics Express**, 18, 1249(2010).
28. X. P. Jiang, Z. M. Yang, **T. Liu**, *et al.*, “Energy transfer between Yb and Er in barium gallogermanate glass,” **J. Appl. Phys.**105, 103113(2009).

Conference

1. T. Liu, Y. R. Zhang, Q. Ai, *et al.*, Second-order non-Hermitian topological phases, Workshop of Non-Hermitian Quantum Mechanics, Tokyo, Japan, 2019, Poster.
2. T. Liu and Q. J. Wang “Ultrastrong light-matter coupling in bilayer graphene,” OCPA8, Singapore, Jun. 2014, poster.
3. T. Liu and Q. J. Wang “Linewidth in quantum cascade lasers,” ACP 2013, Beijing, Nov. 2013, invited talk.
4. T. Liu and Q. J. Wang, “The importance of microscopic analysis on linewidth enhancement factor in quantum cascade lasers,” ITQW, New York, Sep. 2013.
5. T. Liu, Q. J. Wang, “Microscopic analysis on optical gain of terahertz quantum cascade lasers,” Photonics Global Conference, Singapore, Dec. 2012.
6. T. Liu, Q. J. Wang, “Effects of resonant tunneling on intrinsic linewidth of quantum cascade lasers,” IEEE Photonics Conference, San Francisco, USA, Sep. 2012.
7. T. Liu, Q. J. Wang, “Thermodynamic fluctuation and Linewidth broadening in mid-infrared quantum cascade lasers,” Institute of Physics Singapore, Singapore, Feb. 2012
8. Q. J. Wang and T. Liu “Linewidth broadening caused by intrinsic temperature fluctuations in quantum cascade lasers”, in Photonics West, San Francisco, USA, Jan. 2012.

Awards and Honours

- Apr 2018 JSPS Fellowship, Japan
- Oct 2011 “Excellent master Dissertation” in *Guangdong Province*
- Jan 2010 “Excellent master” in *Guangdong Province*
- Oct 2009 “Exxon Mobil Scholarship” in South China University of Technology

Skills

Language	Native Mandarin, English
Programming	Matlab, Mathematica, VC++, Vasp, VB, Lumerical FDTD, Origin 8