Tao Wang

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Xidian University
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EDUCATION

Institut Non Linéaire de Nice - Sophia Antipolis (INLN), Nice, France 2013 - 2016
- *Ph.D.* in Physics

Anhui University, Anhui, China 2009 - 2012
- *Master* in Material Science

Hengshui University, Hebei, China 2005 - 2009
- *Bachelor* in Physics

WORK EXPERIENCE

Institut Non Linéaire de Nice - Sophia Antipolis (INLN) , Nice, France 2013 - 2016
Junior researcher

Institut national de la recherche scientifique, Canada 2016 - 2017
Postdoctoral researcher

Hangzhou Dianzi University, China 2017 - 2003
Associate professor

Xidian University, China 2017 - 2003
Associate professor

RESEARCH INTEREST

- Lasers Physics
- Optical Neural Network
- Optical Reservoir computing
- Semiconductor Laser Dynamics
- Photonic Materials Science: Fabrication and Characterization

PROFESSIONAL SKILLS

Semiconductor laser device design/characterization
- *Skilled in* semiconductor laser devices design/chracterization
- *Skilled in* optical experiments design
- *Skilled in* optical semiclassical theory study.

Material Fabrication and Characterization
- *Skilled in* CVD and PVD fabrication and different characterization methods on semiconductor materials, e.g. hydrothermal, sol-gel, PLD (familiar), sputtering (familiar).
- *Skilled in* microcavity laser's characterization, photodetector, oscilloscope and optical analyzer, single photon counting.

- *Be familiar with* some other material characterization techniques (FI-IR, TEM, DSC, SEM, XRD, AFM, XPS, etc).

Programming and Data Analysis Tools

- *Skilled in* Microsoft office software (Microsoft Word, PowerPoint, Excel, Visio), Origin, Programming Language (Matlab, Python), etc.

HONORS & AWARDS

- *Excellent Report* in Ten Major Progresses in Optics of China
- *Excellent Foreign Language Teacher* of Hangzhou Dianzi University
- *Undergraduate Thesis Excellent Tutor* of Hangzhou Dianzi University
- *Excellent Teacher Training Program* of Hangzhou Dianzi University
- *Best paper awards*, section SC2 Metamaterials, Plasmonics and Complex Media (PIERS 2015).

SELECTED PUBLICATIONS AND CONTRIBUTIONS

List of international, peer-reviewed journal publications:

1. G.L. Lippi**, T. Wang*,** and G.P. Puccioni: "*Phase transitions" in small systems: Why standard threshold definitions fail for nanolasers*," in Chaos, Solitons & Fractals 157: 11850, 2022.
2. J. Zou (student), H. Zhou, C. Jiang, G. Wang, G. L. Lippi, and **T. Wang***: "*Spontaneous-emission-enabled dynamics at the threshold of a directly modulated semiconductor laser*," in Journal of the Optical Society of America B 39: 891-899, 2022.
3. **T. Wang**, C. Jiang, J. Zou, J. Yang, K. Xu, C. Jin, G. Wang, G. P. Puccioni, G. L. Lippi: *Nanolasers with Feedback as Low-Coherence Illumination Sources for Speckle-Free Imaging: A Numerical Analysis of the Superthermal Emission Regime*. Nanomaterials 11, 3325, 2021.
4. H. Zhang, **T. Wang***, J. Tian, J. Sun, S. Li, I. De Leon, R. P. Zaccaria, L. Peng, F. Gao, X. Lin, H. Chen, and G. Wang, "*Quasi-BIC laser enabled by high-contrast grating resonator for gas detection*" Nanophotonics, 11, 297-304, 2022.
5. **T. Wang*** *et al*., "*Second-Order Correlation Function Supported Optical Sensing for Particle Detection*," in IEEE Sensors Journal, 21, 19948-19958, 2021.
6. **T. Wang***, J. Zou, G. P. Puccioni, W. Zhao, X. Lin, H. Chen, G. Wang, and G. L. Lippi: "*Methodological investigation into the noise influence on nanolasers' large signal modulation*," in Optics Express 29, 5081-5097, 2021.
7. J. Sun, **T. Wang***, *et al*., "*High-Q Plasmonic Crystal Laser for Ultra-Sensitive Biomolecule Detection*," in IEEE Journal of Selected Topics in Quantum Electronics, 27, 1-7, 2021.
8. H. Zhang, J. Sun, J. Yang, I. D. Leon, R. P. Zaccaria, H. Qian, H. Chen, G. Wang, and **T. Wang*** "*Biosensing Performance of a Plasmonic-Grating-Based Nanolaser*" (Invited Paper) in 171, 159-169, 2021.
9. H. Zhang, J. Sun, Z. Deng, J. Zou, J. Chen, X. He, **T. Wang***, G. Wang: *Nanolasers: Progress, New Physics and Technical Challenges*. In Chinese Journal of Lasers 47(7): 0701013, 2020.
10. **T. Wang,** Zhilei Deng, Jiacheng Sun, Xianghu Wang, G.P. Puccioni, Gaofeng Wang and G.L. Lippi: "*Photon statistics and dynamics of nanolasers subject to intensity feedback*" in Physical Review A 101: 023803, 2020.

11. **T. Wang,** D. Aktas, O. Alibart, É. Picholle, G.P. Puccioni, and S. Tanzilli, and G.L. Lippi: "*Superthermal-light emission and nontrivial photon statistics in small lasers*" in Physical Review A 101: 063835, 2020.
12. A. Nana Koya, J. Cunha, T.L. Guo, A. Toma, D. Garoli, **T. Wang**, S. Juodkazis, D. Cojoc, R.P. Zaccaria: "*Novel plasmonic nanocavities for optical trapping-assisted biosensing applications*" in Advanced optical materials 8: 1901481, 2020.
13. A. Aadhi, Anton V. Kovalev, M. Kues, P. Roztocki, C. Reimer, Y. Zhang, **T. Wang**, B.E. Little, S.T. Chu, Z. Wang, D.J. Moss, E. A. Viktorov, and R. Morandotti: "*Highly reconfigurable hybrid laser based on an integrated nonlinear waveguide*" in Optics Express 27: 25251-25264, 2019.
14. C. Liu, N. Zhang, J. Li, L. Dong, **T. Wang**, Z. Wang, G. Wang, X. Zhou, J. Zhang: "*Harvesting ultralow frequency (< 1 Hz) mechanical energy using triboelectric nanogenerator*" in Nano Energy 65: 104011, 2019.
15. **T. Wang,** Xianghu Weng, Zhilei Deng, Jiacheng Sun, G.P. Puccioni, Gaofeng Wang and G.L. Lippi: "*Dynamics of a micro-VCSEL operated in the threshold region under low-level optical feedback*" in IEEE Journal of Selected Topics in Quantum Electronics 25: 1700308, 2019.
16. **T. Wang,** G.P. Puccioni, and G.L. Lippi: "*Photon bursts at lasing onset and modeling issues in mesoscale devices*" in Journal of modern optics, https://doi.org/10.1080/09500340.2019.1684585.
17. **T. Wang,** G.P. Puccioni, and G.L. Lippi: "*Exploration of VCSEL ultra-low biasing scheme for pulse generation*" in Journal of the Optical Society of America B 36(3):799, 2019.
18. **T. Wang,** G.P. Puccioni, and G.L. Lippi: "*Onset of lasing in small devices: the identification of the first threshold through autocorrelation resonance*" in Anni. Phys. 1-7, 1800086, 2018.
19. **T. Wang**, H. Vergnet, G.P. Puccioni, G.L. Lippi: "*Dynamics at Threshold in Mesoscale Class-B Lasers*" in Physical Review A 013803, 96, 2017.
20. **T. Wang** and G.L. Lippi: "*Polarization-resolved cartography of light emission of a vertical-cavity surface-emitting laser with high space and frequency resolution*" in Appl. Phy. Lett. 107, 181103, 2015.
21. **T. Wang**, G.P. Puccioni and G.L. Lippi: "*Dynamical Buildup of Lasing in Mesoscale Devices*" in Sci. Rep. 5, 15858, 2015.
22. **T. Wang** and G.L. Lippi: "*Synchronous Characterization of Semiconductor Microcavity Laser Beam*" in Rev. Sci. Instrum. 86, 063111, 2015.
23. **T. Wang**, Y.M. Liu, Y.G. Xu, G. He, G. Li, J.G. Lv, M.Z. Wu, Z.Q. Sun, Q.Q. Fang and J.L. Li: "*Synthesis and optical properties of 1D $Zn_{1-x}Co_xO$ Six-prism nanorods: improvement of blue-green emission*" in J. Mat. Chem. 21, 18810-18816, 2011.
24. **T. Wang**, Y.M. Liu, G. Li, Z.Q. Sun, J.G. Lu, B.B. Liu and M.Z. Wu: "*Synthesis of highly-transparent Al-doped ZnO porous network thin films*" in CrystEngComm 13, 2661, 2011.
25. **T. Wang**, Y.M. Liu, Q.Q. Fang, Y.G. Xu, G. Li, Z.Q. Sun, M.Z. Wu, J.L. Li, and H. He: "*Morphology and optical properties of Co doped ZnO textured thin films*" in J. Alloys Compd. 509, 9116-9122, 2011.
26. **T. Wang**, Y.M. Liu, Q.Q. Fang, M.Z. Wu, X. Sun, F. Lu: "*Low temperature synthesis wide optical band gap Al and (Al, Na) co-doped ZnO thin films*" in Appl. Sur. Sci. 257, 2341–2345, 2011.
27. Y.M. Liu, **T. Wang**, X. Sun, Q.Q. Fang, Q.R. Lv, X.P. Song, Z.Q. Sun: "*Structural and photoluminescent properties of Ni doped ZnO nanorod arrays prepared by hydrothermal method*" in Appl. Sur. Sci. 257, 6540-6545, 2011.

28. J.G. Lv, C.L. Liu, W.B. Gong, Z.F. Zi, X.S. Chen, **T. Wang**: "*Effect of Surface Topography on Wettability of ZnO Thin Films Deposited by Hydrothermal Method*" in Sci. Adv. Mat. 4, 757, 2012.
29. J.G. Lv, C.L. Liu, W.B. Gong, Z.F. Zi, X.S. Chen, **T. Wang**, and G. He: "*Temperature-dependent shifts of near band-edge emission and their second-order diffraction for ZnO nanorods*" in Opt. Mat. 34, 1917-1920, 2012.
30. J.G. Lv, C.L. Liu, W.B. Gong, Z.F. Zi, X.S. Chen, **T. Wang**, and G. He, K. Huang, X.P. Song, Z.Q. Sun: "*Effect of solution concentrations on crystal structure, surface topographies and photoluminescence properties of ZnO thin films*" in Superlattices and Microstructures 51, 886-892, 2012.
31. J.G. Lv, C.L. Liu, W.B. Gong, Z.F. Zi, X.S. Chen, K. Huang, F. Liu, **T. Wang**, G. He: "*Facile Synthesis of $Zn_{1-x}Cu_xO$ Nanorods with a Very Broad Visible Band*" in Electronic Materials Letters 8, 477-480, 2012.

List of contributions to peer reviewed international conferences:

1. **T. Wang**, G. P. Puccioni, and G. L. Lippi, *"Threshold dynamics in meso- and nanoscale lasers: why Vertical Cavity Surface Emitting Lasers?"*, ***Proc. SPIE*** 10682, 106820Q (2018).
2. **T. Wang**, D. Aktas, O. Alibart, É Picholle, S. Tanzilli, G.P. Puccioni, and G.L. Lippi *Superthermal light from single-mode VCSEL*, ***Nonlinear Photonics***, OSA Advanced Photonics Congress, Zürich (CH), July 2-5, (2018).
3. **T. Wang**, G.P. Puccioni, and G.L. Lippi, *Measuring the different "thresholds" of a micro-VCSEL* – Poster ***Nonlinear Photonics***, OSA Advanced Photonics Congress Zürich (CH), July 2-5, (2018).
4. **T. Wang**, G.P. Puccioni, and G.L. Lippi, *Threshold dynamics in meso- and nanolasers -- Why VCSELs?* -- Invited paper ***SPIE Photonics Europe 2018*** Strasbourg (F), 23-26 April, (2018).
5. **T. Wang**, D. Aktas, O. Alibart, É. Picholle, G.P. Puccioni, S. Tanzilli, and G.L. Lippi *Photon-statistical repercussions of nanolasers' spontaneous spiking dynamics*, ***SPIE Photonics Europe 2018*** Strasbourg (F), 23-26 April, (2018).
6. **T. Wang**, G.P. Puccioni and G.L. Lippi: "*Investigating the threshold properties of very small VCSELs through relaxation-resonance-induced amplification*." ***SPIE Photonics Europe***, (2016).
7. **T. Wang**, G.P. Puccioni and G.L. Lippi: "*How mesoscale lasers can answer fundamental questions related to nanolasers.*" ***SPIE Photonics Europe,*** (2016).
8. D. Aktas, **T. Wang**, O. Alibart, G.L. Lippi, E. Picholle, and S. Tanzilli: "*Quantum Coherence in Semiconductor Microlasers*" ***CLEO: Science and Innovations***, (2016).
9. **T. Wang**, G.P. Puccioni and G.L. Lippi: "*Modulation of nanolaser output for information encoding*" ***PIERS*** 1652-1656, (2015).
10. **T. Wang**, G.P. Puccioni and G.L. Lippi: "*An efficient and innovative modelisation for nanolasers*" ***PIERS*** 228-232, (2015).

List of contributions to non-peer reviewed national conferences:

1. **T. Wang** and G.L. Lippi: "Threshold features of a microlaser", 1ères Journées Doctorales de la Physique Niçoise, 2014
2. **T. Wang** and G.L. Lippi: "Characterization of threshold in vertical emission microcavities", European Semiconductor Laser Workshop, Paris, France, September 18-19, 2014.
3. **T. Wang** and G.L. Lippi: "Characteriazation of threshold in microcavity laser", Sino-French "Photonics and optoelectronics" workshop, Paris, 2014

4. **T. Wang** and G.L. Lippi: “Simultaneous, high-resolution mapping of the wavelength and intensity distributions of a VCSEL”, VCSEL Day 2015, Lodz, Poland, May 29, 2015.
5. **T. Wang**, G.P. Puccioni and G.L. Lippi: “Dynamical buildup of lasing in mesoscale devices”, International Symposium on Physics and Applications of Laser Dynamics 2015 (IS-PALD 2015), Metz, France, November 4-6, 2015.
6. **T. Wang**, G.P. Puccioni, and G.L. Lippi, Exploiting the threshold region of very small VCSELs VCSEL Day 2018, Ulm (D), April 12-13, (2018).
7. **T. Wang**, H. Vergnet, G.P. Puccioni, and G.L. Lippi, Symmetries and asymmetries with photons and lasers, First European Asymmetry Symposium, Nice (F), March 15-16, (2018).
8. **T.Wang**, G.P. Puccioni and G.L. Lippi, Self-organization and noise in small scale lasers and beyond Complex Days, Nice (F), January 11, (2018).
9. H. Vergnet, **T. Wang**, G.P. Puccioni, and G.L. Lippi, Transient polarisation turn-on statistics in a micro-VCSEL – Poster SPIE Photonics Europe 2018, Strasbourg (F), 23-26 April, (2018).
10. **T. Wang**, G.P. Puccioni, J. Mørk, and G.L. Lippi, Coherence and photon dynamics in meso- and nanolasers, FocusSession.SC3: Nanolasers: Physics, Technology, Applications 1 -- Invited Paper, Progress In Electromagnetic Research Symposium 2017, St. Petersburg Russia, May 22-25, (2017).
11. **T. Wang**, D. Aktas G.P. Puccioni, O. Alibart, E. Picholle, S. Tanzilli, and G.L. Lippi, Photon statistics at the mesoscale laser threshold. FocusSession.SC3: Nanolasers: Physics, Technology, Applications 1, Progress In Electromagnetic Research Symposium 2017, St. Petersburg, Russia, May 22-25, (2017).
12. **T. Wang**, H. Vergnet, G.L. Lippi, Exploration of pulse generation at the meso- and nanolaser threshold. FocusSession.SC3: Nanolasers: Physics, Technology, Applications 2 Progress In Electromagnetic Research Symposium 2017, St. Petersburg, Russia, May 22-25, (2017).
13. D. Aktas, **T. Wang**, O. Alibart, G.L. Lippi, E. Picholle and S. Tanzilli, Characterization of the Nonlinear Response of Class B Microlasers in the Threshold Region, paper JT4A.4 – Poster Photonics and Fiber Technology, Sidney (AUS), September 5-8, (2016).
14. **T. Wang**, G.P. Puccioni, and G.L. Lippi, Identification of threshold in a mesoscale laser, paper JT4A.3 – Poster Phtonics and Fiber Technology, Sidney (AUS), September 5-8, (2016).
15. D. Aktas, **T. Wang**, O. Alibart. G.L. Lippi, E. Picholle, and S. Tanzilli, Route vers la cohérence de microlasers – Poster, COLOQ'16, Bordeaux (F), July 4-7, (2016).
16. D. Aktas, **T. Wang**, O. Alibart. G.L. Lippi, E. Picholle, and S. Tanzilli, Caractérisation par corrélations quantiques de la région de seuil de microlasers de classe B, JNOG 2016, Bordeaux (F), July 4-7, (2016).
17. D. Aktas, **T. Wang**, O. Alibart, G.L. Lippi, E. Picholle, and S. Tanzilli, Quantum Coherence in Semiconductor Microlasers (paper SF2L.6) CLEO 2016, San Jose (CA, USA) June 5-10, (2016).
18. **T. Wang,** Z. L. Deng, “Nonlinear dynamics of High-β semiconductor lasers operated in threshold region under optical feedback,” PIERS, Xiamen, 2019.
19. **Tao Wang**, Junlong Zou, Gian Piero Puccioni and Gian Luca Lippi, Dynamical response of high-β laser to direct large-signal-modulation, MOTA, Chengdu, 2020.
20. **Tao Wang**, Can Jiang, Junlong Zou, Hanxu Zhou, Xiao Lin, Hongsheng Chen, Gian Piero Puccioni, Gaofeng Wang, Gian Luca Lippi, “Particle detection supported by the photon statistics of laser emission with feedback,” OGC, Shenzhen, 2021.

RESEARCH PROJECTS

1. **T. Wang** et al., NAFC 61804036, Principle Investigator, 2019-2021.
2. **T. Wang** et al., Zhejiang Province Naturial Science Project LGJ20A040001, Principle Investigator, 2020-2022.
3. **T. Wang** et al, Key Grant of National Natural Science Foundation of China NSFC62141409, Main Participant, 2022-2025
4. L. Wang et al., NAFC 11804071, Main Participant, 2019-2021.
5. C. Yu et al., NAFC 61805061, Main Participant, 2019-2021.

Collaborations

1. Institut de Physique de Nice, CNRS, France
2. Istituto dei Sistemi Complessi, CNR, Florence, Italy
3. INRS-EMT, Varennes, (QC), J3X 1S2, Canada
4. Department of Physics, University of Strathclyde, Scotland, UK
5. Tecnológico de Monterrey, Mexico
6. B.I. Stepanov Institute of Physics, NASB, 220072 Minsk, Belarus