RongChun Ge, PhD.

Address
Department of Physics, PHY36
The University of Texas at Dallas
800 West Campbell Road Richardson, Texas 75080

Email
rcge@ntu.edu.sg
Phone
+65 84371771

Experience

Postdoctoral Fellow (PDF), The University of Texas at Dallas — 09/2018 – present
Supervisor: Prof. Michael Kolodrubetz

PDF, Nanyang Technological University — 01/2016 – 08/2018
Supervisor: Prof. Timothy Liew

PDF, Queen's University — 09/2012 — 12/2015
Supervisor: Prof. Stephen Hughes/Co Prof. Jeff F. Young

Education

PhD in physics, — 09/2007 — 07/2012
University of Science and Technology of China (USTC), Hefei, China
Dissertation: "Quantum correlations of few-body systems and quantum ratchet"
Supervisors:
Prof. Chuan-Feng Li

Professional Services

Referee of *Phys. Rev. Lett.*, *Phys. Rev. A*, *Phys. Rev B*, *Phys. Rev. E*, *Phys. Rev. Applied*, *Opt. Lett.*, *Opt. Express*, *J. Opt. Soc. Am. B*, *J. Opt.*

Research experience and selected publications/preprints

Nanyang Technological University — 01/2016 — present

Currently I am working on Floquet topological insulator and its physical realization in exciton-polariton system; beside, I also work on the condensation of exciton-polaritons in complex pumping geometry. I have experience with *Floquet analysis*, *non-equilibrium systems*, and have *active collaboration with experimental groups*.

- **Floquet topological polaritons**
  By working at the low Floquet frequency limit, we have presented an experimental proposal to achieve Floquet topological polaritons. The topological phase transition from Chern insulator to Floquet topological insulator proclaimed with an unpaired Dirac cone is observed at the critical point.
  Phys. Rev. B **97**, 195305 (2017), "Floquet topological polaritons in semiconductor microcavities"
  R.-C. Ge, W. Broer, and T. C. H. Liew.

- **Energy relaxation of incoherently pumped exciton-polaritons**
  We have developed a quasi-normal mode technique to describe the energy relaxation of incoherent pumping exciton-polaritons. And our theory could explain the experimentally observed condensation of the system which deviates from the geometry of pumping field.
  In review for PRB (2017), "Phonon induced reconfiguration of exciton-polariton condensates in ring traps"
  R.-C. Ge, C. Schneider, and T. C. H. Liew.

Queen's University — 09/2012 —12/2015

During this time, I was working on understanding and tailoring quantum *light-matter interactions at the nano-scale* for solid state structures. I have experience with *master equation technique*, *exciton and polariton*, and *Green function*.

- **Nano metallic resonators**
  We have developed a generalized mode expansion technique of the photon Green function working for arbitrary shaped lossy structure.

  Published papers:

  New J. Phys. **16**, 113048 (2014), "Quasinormal mode approach to modelling light-emission and propagation in nanoplasmonics"
  R.-C. Ge, W. Broer, and T. C. H. Liew.

  Optica **2**, 246 (2015), "A quasinormal mode approach to the local-field problem in quantum optics: applications to quantum-dot nanoplasmonic systems"
  R.-C. Ge, Jeff F. Young and S. Hughes.

- **Phonon/Plamon effect on the physics of QD optics**
  Use the master equation technique and Quantum toolbox, we studied the dynamics of spectrum of a QD under the effect of LA phonons, and localized surface plasmons. We found and explained the Mollow quintuplets structure by including anisotropic exchange split of excitons, and asymmetric Mollow triplet.

  Published papers:

  Opt. Lett. **38**, 1691 (2013), "Mollow quintuplets from coherently-excited quantum dots
  R.-C. Ge, Ata Ulhaq, S. Weiler, A. Ulhaq, S. M. Ulrich, M. Jetter, P. Michler and S. Hughes.

  Phys. Rev. B **87**, 205425 (2013), "Accessing quantum nanoplasmonics in a hybrid quantum-dot metal nanosystem: Mollow triplet of a quantum dot near a metal nanoparticle
  R.-C. Ge, C. Van Vlack, P. Yao, Jeff F. Young and S. Hughes.

Research assistant, USTC 09/2007 — 07/2012

As a graduate researcher, I had worked on *quantum information*, *quantum phase transition*, and the quantum ratchet. I had experience with *quantum correlation, decoherence*, *superconductor circuit quantum electrodynamics*, *quantum many-body systems in condensed matter physics*.

- **Spin-boson model**
  We studied the dynamics of the quantum and classical correlations initially stored between two spins, and found at last all the correlations transfer into their reservoirs with the amount of correlations conversed.

  Published papers:

  Phys. Rev. A **81**, 064103 (2010), "Quantum correlation and classical correlation dynamics in the spin-boson model"
  R.-C. Ge, M. Gong, C.-F. Li, J.-S. Xu and G.-C. Guo

Research interests

- Novel phases and transport behaviour in AMO systems
- Quantum optics and quantum simulation
- Quantum nanoplasmonics and nanophotonics, and hybrid quantum systems
- Quantum phase transition (employing quantum information)
- Work extraction, thermodynamics and quantum information

Skills

Coding: C, Fortran, C++.
Software: Matlab, Mathematica, Lumerical, quantum toolbox, Inkscape.

Full publication list

- Antichiral edge states in an exciton polariton strip
  S. Mandal, **R. Ge**, and T. C. H. Liew, Phys. Rev. B **99**, 115423 (2019)
- Exciton-polariton topological insulator
  S. Klembt, T. Harder, O. Egorov, K. Winkler, **R. Ge**, M. Bandres, M. Emmerling, T.C.H. Liew, M. Segev, C. Schneider and S. Hofling, Nature **562**, 552 (2018)
- Design for a Nanoscale Single-Photon Spin Splitter for Modes with Orbital Angular Momentum
  G. Li, A. S. Sheremet, **R. Ge**, T. C. H. Liew, and A. V. Kavokin, Phys. Rev. Lett. **121**, 053901 (2018)
- Topological protected edge states with single band
  in preparation (2017)
- Floquet Topological Polaritons in Semiconductor Microcavities
  R. Ge, W. Broer, and T. C. H. Liew, Phys. Rev. B **97**, 195305 (2018)
- Phonon induced reconfiguration of exciton-polariton condensates in ring traps
  R. Ge, C. Schneider, and T. C. H. Liew, in review for Phys. Rev. B (2017)
- Reply to "Comment on 'Normalization of quasinormal modes in leaky optical cavities and plasmonic resonators' "
  P. T. Kristensen, **R.-C. Ge**, and S. Hughes, Phys. Rev. A **96**, 017802 (2017)
- Self-consistent numerical modelling of radiatively damped Lorentz oscillators
  E. Schelew, **R. Ge**, S. Hughes, J. Pond, and J. F. Young, Phys. Rev. A **95**, 063853 (2017)
- Quasinormal mode theory and design of on-chip single photon emitters in photonic crystal coupled-cavity waveguides
  T. Malhotra, **R.-C. Ge**, M. Kamandar Dezfouli, A. Badolato, N. Vamivakas, and S. Hughes, Opt. Express **24**, 13574 (2016)
- Quasinormal mode theory and modelling of electron energy loss spectroscopy for plasmonic nanostructures
  R.-C. Ge, S. Hughes, J. Opt. **18**, 054002 (2016)
- Theoretical investigation of carrier transfer by an optical contacting scheme for optoelectronic application
  J. Yang, **R. Ge**, Z. Zhang, W. Chen, B. Wang, Y. Feng, S. Huang, S. Shrestha, R. Patterson, and G. Conibeer, J. Appl. Phys. **119**, 153102 (2016)
- Quantum dynamics of two quantum dots coupled through localized plasmons: An intuitive and accurate quantum optics approach using quasinormal modes
  R.-C. Ge, S. Hughes, Phys. Rev. B **92**, 205420 (2015)
- Normalization of quasinormal modes in leaky optical cavities and plasmonic resonators
  P. T. Kristensen, **R.-C. Ge** and S. Hughes, Phys. Rev. A **92**, 053810 (2015)
- A quasinormal mode approach to the local-field problem in quantum optics: applications to quantum-dot nanoplasmonic systems
  R.-C. Ge, Jeff F. Young, S. Hughes, Optica **2**, 246 (2015)
- Quasinormal mode approach to modelling light-emission and propagation in nanoplasmonics
  R.-C. Ge, P. T. Kristensen, Jeff. F. Young, S. Hughes, New J. Phys. **16**, 113048 (2014)
- Quasinormal mode theory and applications of light-matter interactions in nanoplasmonics
  R.-C. Ge, S. Hughes, Proc. SPIE 9162, 916202 (2014)

- Design of an efficient single photon source from a metallic nanorod dimer: a quasi-normal mode finite-difference time-domain approach
  R.-C. Ge, S. Hughes, Opt. Lett. **39**, 4235 (2014)

- Accessing quantum nanoplasmonics in a hybrid quantum-dot metal nanosystem: Mollow triplet of a quantum dot near a metal nanoparticle
  R.-C. Ge, C. Van Vlack, P. Yao, Jeff F. Young and S. Hughes, Phys. Rev. B **87**, 205425 (2013)
- Mollow quintuplets from coherently-excited quantum dots
  R.-C. Ge, Ata Ulhaq, S. Weiler, A. Ulhaq, S. M. Ulrich, M. Jetter, P. Michler and S. Hughes, Opt. Lett. **38**, 1691 (2013)
- Efficient Quantum Ratchet
  C.-F. Li, **R.-C. Ge**, G.-C. Guo, arXiv:1206.3644
- Violation of Leggett-Garg inequalities in single quantum dot
  Y.-N. Sun, Y. Zou, **R.-C. Ge**, J.-S. Tang, C.-F. Li and G.-C. Guo, Chin. Phys. Lett. **29**, 120302(2012)
- Spin dynamics in the XY model
  R.-C. Ge, C.-F. Li and G.-C. Guo, Chin. Phys. Lett. **29**, 030307 (2012)
- Non-classical correlation of cascaded photon pairs emitted from quantum dot
  Y. Zou, C.-F. Li, J.-S. Xu, **R.-C. Ge** and G.-C. Guo, Phys. Rev. A **84**, 054302 (2011).
- Non-Markovian Dynamics of Quantum and Classical Correlations in the Presence of System-Bath Coherence
  C.-F. Li, H.-T. Wang, H.-Y. Yuan, **R.-C. Ge** and G.-C. Guo, Chin. Phys. Lett. **28**, 120302 (2011)
- Non-Markovian Entanglement Sudden Death and Rebirth of a Two-Qubit System in the Presence of System-Bath Coherence
  H.-T. Wang, C.-F. Li, Y. Zou, **R.-C. Ge** and G.-C. Guo, Physica A **390**, 3183 (2011)
- Quantum correlation and classical correlation dynamics in the spin-boson model
  R.-C. Ge, M. Gong, C.-F. Li, J.-S. Xu and G.-C. Guo, Phys. Rev. A **81**, 064103 (2010)
- Partial-measurementinduced entanglement dynamics in a Josephson-junction system
  R.-C. Ge, C.-F. Li, M. Gong and G.-C. Guo, EuroPhys. Lett. **89**, 48005 (2010)