



理論光學研究群

Theoretical Optics Group



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Research topics

Nonlinear Optical/Atomic systems:

- ◆ **Light Bullets** [12], with Y.S. Kivshar (Australia) in Theory
- ◆ **Nonlinear photonic crystals**, with 孔慶昌 A. Kung (Sinica) in Exp.
- ◆ **Nonlocal solitons** [18], with B.A. Malomed (Israel) in Theory
- ◆ **Bose-Einstein condensates** [10], with 江進福 T.J. Jiang (NCTU) in Theory
- ◆ **Cavity solitons in VCSELs** [3], with 李晉東 T.D. Lee (ITRI) in Exp.
- ◆ **Pattern formations** [4], with 鄭建宗 C.J. Cheng (NCHU) in Exp.
- ◆ **Slow lights** [13], with 郭浩中 H.C. Kuo (NCTU) in Exp.
- ◆ **Fiber lasers**, with 項維巍 W.W. Hsiang (FJU) in Exp.

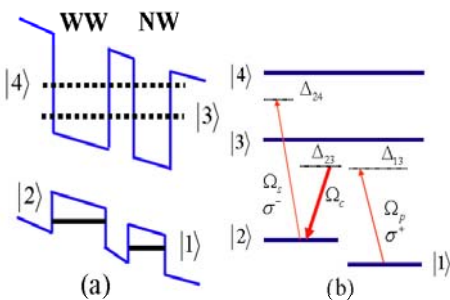
Quantum Optics:

- ◆ **Quantum soliton squeezing** [19], with 賴映杰 Y. Lai (NCTU) in Theory
- ◆ **Quantum phase transition of light** [20], with 吳大琪 T.K. Ng (Hong Kong) in Theory
- ◆ **Quantum memory**, with G. Leuchs (Germany) in Exp.
- ◆ **Quantum gates** [6-9], with 楊文星 W.X. Yang (China) in Theory
- ◆ **Light storage and retrieval**, with 余怡德 I.A. Yu (NTHU) in Exp.
- ◆ **Quantum cryptography**, with 蔡慶宇 Q. Cai (China) in Theory
- ◆ **Quantum optics in Comb lasers**, with 鄭王耀 W.Y. Cheng (Sinica) in Exp.
- ◆ **Quantum optics in ultracold atoms**, with 王道維 D.W. Wang (NTHU) in Theory.
- ◆ **Optics in attosecond physics**, with 林啟東 C.D. Lin (Kansas) in Theory

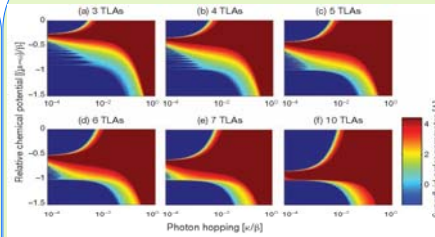
Optical device inverse design:

- ◆ **Optical device synthesis** [16-17], with 李澄琳 C.L. Lee (NUU) in Algorithm

Highlights of Research Gallery

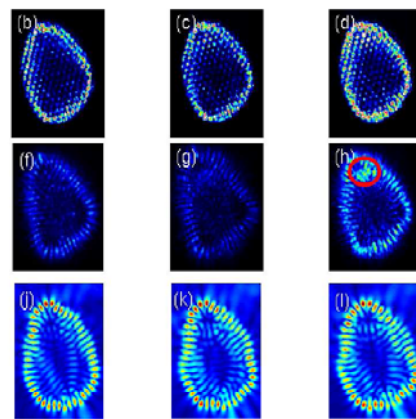


Controllable quantum phase gate in quantum-wells [6]

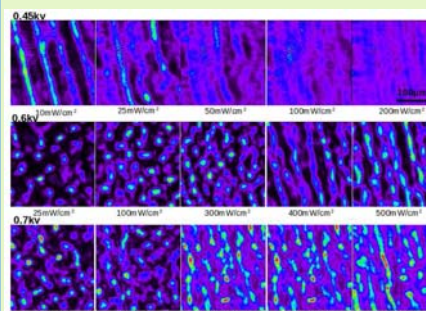


Optics in 2008

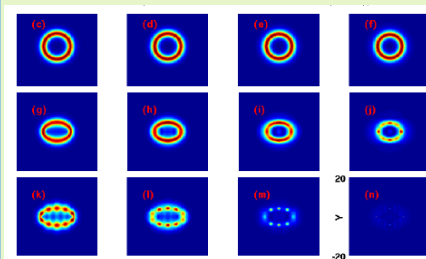
Quantum phase transition of light [1]



Surface-structure-assisted chaotic mode lasing in VCSELs [3]



Modulation instability patterns [4]



Evolutions of elliptical solitons [5]



Publications:

1. Soi-Chan Lei and RKL, "Quantum Phase Transitions of Light for Two-level Atoms," **Optics & Photonics News**, Dec., 44 (**Optics in 2008**, 2008).
2. RKL, Second place winner in the 2008 OPN **After Image photo contest**, OPN Nov., 20 (2008) and OPN calendar (2009).
3. Tsin-Dong Lee, Chih-Yao Chen, YuanYao Lin, Ming-Chiu Chou, Te-ho Wu, and RKL, "Surface-structure-assisted chaotic mode lasing in vertical cavity surface emission lasers," **Phys. Rev. Lett.** **101**, 084101 (2008).
4. Chien-Chung Jeng, YuanYao Lin, Ray-Ching Hong, and RKL, "Optical pattern transition from modulation to transverse instabilities in photorefractive crystals," **Phys. Rev. Lett.** **102**(in press, 2009).
5. YuanYao Lin and RKL, "Symmetry-breaking instabilities of generalized elliptical solitons," **Opt. Lett.** **33**, 1377 (2008).
6. Wen-Xing Yang and RKL, "Controllable entanglement and polarization phase gate in coupled double quantum-well structures," **Opt. Express** **16**, 17161 (2008).
7. Wen-Xing Yang and RKL, "Slow optical solitons via intersubband transitions in a semiconductor quantum well," **EuroPhys. Lett.** **83**, 14002 (2008).
8. Wen-Xing Yang, Jing-Min Hou, YuanYao Lin, and RKL, "Detuning management of optical solitons in coupled quantum wells," **Phys. Rev. A** **79**, 033825 (2009).
9. Wen-Xing Yang, Jing-Min Hou, and RKL, "Ultraslow bright and dark solitons in semiconductor quantum wells," **Phys. Rev. A** **77**, 033838 (2008).
10. YuanYao Lin, RKL, Yee-Mou Kao, and Tsin-Fu Jiang, "Band structures of a dipolar Bose-Einstein condensate in one-dimensional lattices," **Phys. Rev. A** **78**, 023629 (2008).
11. Soi-Chan Lei and RKL, "Quantum Phase Transitions of Light in the Dicke-Bose-Hubbard model," **Phys. Rev. A** **77**, 033827 (2008).
12. YuanYao Lin, RKL, and Yuri S. Kivshar, "Soliton transverse instabilities in nonlocal nonlinear media," **J. Opt. Soc. Am. B** **25**, 576 (2008).
13. Chia-Sheng Chou, RKL, Peng-Chun Peng, Hao-chung Kuo, Gray Lin, Hung-Ping Yang and Jim Y. Chi, "A Simple Model for Cavity Enhanced Slow Lights in Vertical Cavity Surface Emission Lasers," **J. Opt. A** **10**, 044016 (special issue, 2008).
14. YuanYao Lin, I-Hong Chen, and RKL, "Breather-like Collision of Gap Solitons in Bragg Gap Regions within Nonlocal Nonlinear Photonic Crystals," **J. Opt. A** **10**, 044017 (special issue, 2008).
15. Wen-Xing Yang, Jing-Min Hou, and RKL, "Highly efficient four-wave-mixing via intersubband transitions in InGaAs/AlAs coupled double quantum well structures," **J. Modern Optics** **56** (in press, special issue, 2009).
16. Cheng-Ling Lee, RKL, and Yee-Mou Kao, "A Lagrange Multiplier Constrained Optimization Method for the Design of Narrowband Dispersionless Fiber Bragg Gratings," **Optical Engineering** **47**, 015005 (2008).
17. Cheng-Ling Lee, RKL, and Yee-Mou Kao, "Synthesis of Long-Period Fiber Gratings with a Lagrange Multiplier Optimization Method," **Optics Comm.** **281**, 61 (2008).
18. YuanYao Lin, RKL, and Boris A. Malomed, "Formation of standing-light solitons through collisions of Bragg solitons in nonlocal media," submitted (2009).
19. Yinchieh Lai and RKL, "Entangled quantum nonlinear Schrodinger solitons," submitted (2009).
20. Soi-Chan Lei, Tai-Kai Ng, and RKL, "Quantum phase transitions of light with two atomic species," submitted (2009).
21. You-Lin Chuang and RKL, "Conditions to preserve quantum entanglement of quadrature fields in Electromagnetically Induced Transparency Media," submitted (2009).
22. Wen-Xing Yang, Xiaoxue Yang, and RKL, "Carrier-envelope phase-dependent coherent effects in double well structure," submitted (2009).