

# Mankei Tsang

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Year of Birth: 1980  
Birth Place: Hong Kong  
Citizenship: Hong Kong  
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## Education

- ◇ **Ph.D. and M.S. in Electrical Engineering**  
California Institute of Technology (Sep 2002–Jun 2006)
  - Advisor: Prof. Demetri Psaltis
  - Ph.D. Thesis Title: Classical and Quantum Nonlinear Optical Information Processing
- ◇ **B.S. in Electrical Engineering and Physics (*Double Major, Summa Cum Laude*)**  
University of California - Los Angeles (Oct 1998–Jun 2002)

## Research Interests

- ◇ **Quantum Optics:** Quantum Limits to Sensing and Imaging
- ◇ **Nano-Optics:** Nano-Imaging, Metamaterials, Transformation Optics
- ◇ **Nonlinear Optics:** Ultrafast Parametric Processes and Devices

## Research and Teaching Experience

- ◇ **Postdoctoral Fellow**  
Keck Foundation Center for Extreme Quantum Information Theory, Massachusetts Institute of Technology (Jan 2008–present)
  - Advisors: Prof. Seth Lloyd and Prof. Jeffrey H. Shapiro
  - investigate fundamental quantum limits to sensing, imaging, and control.
- ◇ **Postdoctoral Scholar and Graduate Researcher**  
Optical Information Processing Group, California Institute of Technology (Sep 2002–Dec 2007)
  - Advisor: Prof. Demetri Psaltis
  - performed fundamental and applied research in quantum optics, nano-optics, and nonlinear optics,
  - gave lectures for the “Electromagnetic Engineering” course.
- ◇ **Teaching Assistant**  
Department of Electrical Engineering, California Institute of Technology (Sep 2002–Jun 2003)
  - gave review lectures, answered questions from students, and graded homeworks for the courses “Fourier Optics,” “Electromagnetic Engineering,” and “Optics in Nano-structures.”
- ◇ **Undergraduate Researcher**  
Electro-Physical Integration Group, University of California - Los Angeles (Jun 2001–Jun 2002)
  - Advisor: Prof. Elliott R. Brown
  - performed analytic modeling and numerical analysis for the Acoustic Dental Imaging Project.

### Professional Activities

- ◇ **Manuscript Referee** for *Physical Review Letters*, *Optics Letters*, *Physical Review A*, *Physical Review B*, *Physical Review E*, *Applied Physics B*, *Optics Communications*, *Journal of Electromagnetic Waves and Applications*, and *Optics and Laser Technology*
- ◇ **Proposal Referee** for the National Science Foundation
- ◇ **Presider** for CLEO/IQEC 2009

### Honors

- ◇ E. Lee Kinsey Outstanding Senior Award, Department of Physics, UCLA
- ◇ UCLA Dean's Honors List for every quarter
- ◇ Southern California Hong Kong Student Alumni Federation Scholarship
- ◇ Fan's Charitable Foundation Scholarship

### Peer-Reviewed Journal Publications

21. **Mankei Tsang**,  
"Optimal waveform estimation for classical and quantum systems via time-symmetric smoothing,"  
*Physical Review A* **80**, 033840 (2009).
20. **Mankei Tsang**,  
"Time-symmetric quantum theory of smoothing,"  
*Physical Review Letters* **102**, 250403 (2009).
19. **Mankei Tsang**,  
"Quantum imaging beyond the diffraction limit by optical centroid measurements,"  
*Physical Review Letters (Editors' Suggestion)* **102**, 253601 (2009).  
*See also the accompanying Viewpoint by P. M. Anisimov and J. P. Dowling, Physics* **2**, 52 (2009). *Physics is an American Physical Society publication that "highlights exceptional papers from the Physical Review journals."*
18. **Mankei Tsang**, Jeffrey H. Shapiro, and Seth Lloyd,  
"Quantum theory of optical temporal phase and instantaneous frequency. II. Continuous time limit and state-variable approach to phase-locked loop design,"  
*Physical Review A* **79**, 053843 (2009).
17. **Mankei Tsang**, Jeffrey H. Shapiro, and Seth Lloyd,  
"Quantum theory of optical temporal phase and instantaneous frequency,"  
*Physical Review A* **78**, 053820 (2008).
16. **Mankei Tsang**,  
"Fundamental quantum limit to multiphoton absorption rate for monochromatic light,"  
*Physical Review Letters* **101**, 033602 (2008).<sup>1</sup>
15. **Mankei Tsang** and Demetri Psaltis,  
"Magnifying perfect lens and superlens design by coordinate transformation,"  
*Physical Review B* **77**, 035122 (2008).
14. Ye Pu, Jie Wu, **Mankei Tsang**, and Demetri Psaltis,  
"Optical parametric generation in periodically poled KTiOPO<sub>4</sub> via extended phase matching,"  
*Applied Physics Letters* **91**, 131120 (2007).<sup>1,2</sup>
13. **Mankei Tsang** and Demetri Psaltis,  
"Theory of resonantly enhanced near-field imaging,"  
*Optics Express* **15**, 11959 (2007).<sup>3,4</sup>

12. **Mankei Tsang**,  
“Decoherence of quantum-enhanced timing accuracy,”  
Physical Review A **75**, 063809 (2007).<sup>1</sup>
11. **Mankei Tsang**,  
“Relationship between resolution enhancement and multiphoton absorption rate in quantum lithography,”  
Physical Review A **75**, 043813 (2007).<sup>1</sup>
10. **Mankei Tsang** and Demetri Psaltis,  
“Reflectionless evanescent wave amplification via two dielectric planar waveguides,”  
Optics Letters **31**, 2741 (2006); Erratum: **32**, 86 (2007).
9. **Mankei Tsang**,  
“Quantum temporal correlations and entanglement via adiabatic control of vector solitons,”  
Physical Review Letters **97**, 023902 (2006); Erratum: **99**, 049901(E) (2007).
8. **Mankei Tsang**,  
“Spectral phase conjugation via extended phase matching,”  
Journal of the Optical Society of America B **23**, 861 (2006).
7. **Mankei Tsang** and Demetri Psaltis,  
“Propagation of temporal entanglement,”  
Physical Review A **73**, 013822 (2006).
6. Martin Centurion, Ye Pu, **Mankei Tsang**, and Demetri Psaltis,  
“Dynamics of filament formation in a Kerr medium,”  
Physical Review A **71**, 063811 (2005); Erratum: **74**, 069902(E) (2006).<sup>2</sup>
5. **Mankei Tsang** and Demetri Psaltis,  
“Spontaneous spectral phase conjugation for coincident frequency entanglement,”  
Physical Review A **71**, 043806 (2005).<sup>1</sup>
4. **Mankei Tsang** and Demetri Psaltis,  
“Spectral phase conjugation by quasi-phase-matched three-wave mixing,”  
Optics Communications **242**, 659 (2004).
3. **Mankei Tsang** and Demetri Psaltis,  
“Spectral phase conjugation with cross-phase modulation compensation,”  
Optics Express **12**, 2207 (2004).
2. **Mankei Tsang**, Demetri Psaltis, and Fiorenzo G. Omenetto,  
“Reverse propagation of femtosecond pulses in optical fibers,”  
Optics Letters **28**, 1873 (2003).
1. **Mankei Tsang** and Demetri Psaltis,  
“Dispersion and nonlinearity compensation by spectral phase conjugation,”  
Optics Letters **28**, 1558 (2003).

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<sup>1</sup> Selected by Virtual Journal of Quantum Information (<http://www.vjquantuminfo.org/>).

<sup>2</sup> Selected by Virtual Journal of Ultrafast Science (<http://www.vjultrafast.org/>).

<sup>3</sup> Selected by Virtual Journal for Biomedical Optics (<http://vjbo.osa.org/>).

<sup>4</sup> Selected by Virtual Journal for Nanoscale Science and Technology (<http://www.vjnano.org/>).

## Conferences

17. **Mankei Tsang**, Jeffrey H. Shapiro, and Seth Lloyd,  
 “Quantum optical temporal phase estimation by homodyne phase-locked loops,”  
 Oral Presentation, Conference on Lasers and Electro Optics/International Quantum Electronics Conference,  
 Baltimore, Maryland, Jun 2009, paper ITuI6 (*Peer-Reviewed*).
16. **Mankei Tsang**, Jeffrey H. Shapiro, and Seth Lloyd,  
 “Quantum optical phase estimation by phase-locked loops,”  
 Oral Presentation, MIT Center for Extreme Quantum Information Theory Conference, Cambridge, Mas-  
 sachusetts, Nov 2008 (*Invited*).
15. **Mankei Tsang**, Martin Centurion, Demetri Psaltis, Jeffrey H. Shapiro, and Seth Lloyd,  
 “Optical hydrodynamics,”  
 Oral Presentation, Frontiers in Optics/Laser Science, Rochester, New York, Oct 2008, paper FWO3 (*Invited*).
14. **Mankei Tsang**, Jeffrey H. Shapiro, and Seth Lloyd,  
 “Quantum optical phase and instantaneous frequency in the time domain,”  
 Poster, International Conference on Quantum Communication, Measurement and Computing, Calgary,  
 Canada, Aug 2008 (*Peer-Reviewed*).
13. **Mankei Tsang** and Demetri Psaltis,  
 “Resonantly enhanced near-field lithography,”  
 Oral Presentation, Conference on Lasers and Electro-Optics/Quantum Electronics and Laser Science Confer-  
 ence, San Jose, California, May 2008, paper QTuG1 (*Peer-Reviewed*).
12. **Mankei Tsang**,  
 “Quantum enhancement of beam position accuracy by self-focusing,”  
 Oral Presentation, Conference on Lasers and Electro-Optics/Quantum Electronics and Laser Science Confer-  
 ence, San Jose, California, May 2008, paper QWD5 (*Peer-Reviewed*).
11. **Mankei Tsang** and Demetri Psaltis,  
 “Magnifying metamaterial lens design by coordinate transformation,”  
 Oral Presentation, Conference on Lasers and Electro-Optics/Quantum Electronics and Laser Science Confer-  
 ence, San Jose, California, May 2008, paper QFL5 (*Peer-Reviewed*).
10. **Mankei Tsang**,  
 “Particle, wave, and fluid properties of light,”  
 Oral Presentation, Winter Colloquium on the Physics of Quantum Electronics, Snowbird, Utah, Jan 10, 2008  
 (*Invited*).
9. Ye Pu, Jie Wu, **Mankei Tsang**, and Demetri Psaltis,  
 “Ultrafast mirrorless optical parametric oscillator in periodically poled  $\text{KTiOPO}_4$  via extended phase match-  
 ing,”  
 Oral Presentation by Pu, Conference on Lasers and Electro-Optics/Quantum Electronics and Laser Science  
 Conference, Baltimore, Maryland, May 2007, paper CMB5 (*Peer-Reviewed*).
8. **Mankei Tsang** and Demetri Psaltis,  
 “Reflectionless evanescent wave amplification by two dielectric slabs,”  
 Oral Presentation, Frontiers in Optics/Laser Science, Rochester, New York, Oct 2006, paper FMB4 (*Peer-  
 Reviewed*).
7. **Mankei Tsang** and Demetri Psaltis,  
 “Quantum lithography has a reduced multiphoton absorption rate,”  
 Oral Presentation, Frontiers in Optics/Laser Science, Rochester, New York, Oct 2006, paper LWH3 (*Peer-  
 Reviewed*).
6. **Mankei Tsang** and Demetri Psaltis,  
 “Quantum temporal imaging,”  
 Oral Presentation, Conference on Lasers and Electro-Optics/Quantum Electronics and Laser Science Confer-  
 ence, Long Beach, California, May 2006, paper QWB5 (*Peer-Reviewed*).

5. Martin Centurion, **Mankei Tsang**, and Demetri Psaltis,  
“Nonlinear signal processing,”  
Oral Presentation by Centurion, IEEE Lasers and Electro-Optics Society Annual Meeting, Oct 2005, paper TuEE2 (*Invited*).
4. **Mankei Tsang** and Demetri Psaltis,  
“Metaphoric optical computing of fluid dynamics,”  
Oral Presentation, Conference on Lasers and Electro-Optics/Quantum Electronics and Laser Science Conference, Baltimore, Maryland, May 2005, paper QML6 (*Peer-Reviewed*).
3. Martin Centurion, Ye Pu, **Mankei Tsang**, and Demetri Psaltis,  
“Phase transition in the filament generation process in a Kerr medium,”  
Oral Presentation, Conference on Lasers and Electro-Optics/Quantum Electronics and Laser Science Conference, Baltimore, Maryland, May 2005, paper QMI3 (*Peer-Reviewed*).
2. **Mankei Tsang** and Demetri Psaltis,  
“Metaphoric optical computing for fluid dynamics,”  
Proceedings of the Society of Photographic Instrumentation Engineers, **5735**, 1 (Apr 2005) (*Invited*).
1. **Mankei Tsang** and Demetri Psaltis,  
“Spectral phase conjugation with cross-phase modulation compensation,”  
Poster, Frontiers in Optics/Laser Science, Rochester, New York, Oct 2004, paper FWH44 (*Peer-Reviewed*).

### Seminars

3. **Mankei Tsang**,  
“Reversing time and space in classical and quantum optics,”  
CQuIC Seminar, University of New Mexico, Oct 8, 2009 (*Invited*).
2. **Mankei Tsang**,  
“Beating classical and quantum limits in optics,”  
EE 590 Colloquium, Pennsylvania State University, May 3, 2007 (*Invited*).
1. **Mankei Tsang**,  
“Beating classical and quantum limits in optics,”  
ECE 294/296 Seminar, University of California - San Diego, Mar 2, 2007 (*Invited*).

### Preprints

5. **Mankei Tsang**,  
“Optimal waveform estimation for classical and quantum systems via time-symmetric smoothing. II. Applications to atomic magnetometry and Hardy’s paradox,”  
e-print arXiv:0909.2432 (2009).
4. **Mankei Tsang** and Demetri Psaltis,  
“Coupled-resonator optical near-field lithography,”  
e-print arXiv:0804.3374 (2008).
3. **Mankei Tsang**,  
“Ultimate energy densities for electromagnetic pulses,”  
e-print arXiv:0803.0779 (2008).
2. **Mankei Tsang**,  
“Beating the spatial standard quantum limits via adiabatic soliton expansion,”  
e-print quant-ph/0604132 (2006).
1. **Mankei Tsang** and Demetri Psaltis,  
“Metaphoric optical computing of fluid dynamics,”  
e-print physics/0604149 (2006).