

## Professor Yuping Huang

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### PROFESSIONAL EXPERIENCE:

October 2014-present	Assistant Professor, Department of Physics and Engineering Physics, Stevens Institute of Technology.
February 2013-September 2014	Group Leader, Center for Photonic Communication and Computing (CPCC), Northwestern University.
August 2013-September 2014	Adjunct Research Assistant Professor, Department of Physics and Astronomy, Northwestern University.
October 2012-September 2014	Research Assistant Professor, Department of Electrical Engineering & Computer Science, Northwestern University.
September 2011-September 2012	Research Associate, Department of Electrical Engineering & Computer Science, Northwestern University.
September 2009-August 2011	Postdoctoral fellow, Department of Electrical Engineering & Computer Science, Northwestern University. Director: Prof. Prem Kumar.
June 2007-August 2009	Graduate Research Assistant, Department of Physics & Astronomy, Michigan State University. Supervisor: Prof. Michael Moore.
August 2006-May 2007	Graduate Research Assistant, Department of Physics & Astronomy, Ohio University. Supervisor: Prof. Michael Moore.
September 2004-July 2006	Graduate Teaching Assistant, Department of Physics & Astronomy, Ohio University.

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### FUNDED RESEARCH (until October 1 2014)

- “Macroscopic Quantum Communications Using Photonic Qudits,” **PI** with S. J. Ben Yoo (Univ. California at Davis), W. Tittel (Univ. Calgary, Canada), M. Vasilyev (Univ. Texas at Arlington), Z. Dutton (Raytheon BBN), J. Jackel (Applied Communication Sciences), and R. Cone (Montana State Univ.) as co-PI’s, Defense Advanced Research Projects Agency (DAPAR), Grant No. W31P4Q-13-0004, 12/03/2012–11/28/2015, \$7,843,988.00 (PI’s share \$3,034,800.00)
- “A Quantum-Eraser Approach to Heralding High-Quality Single Photons,” **PI**, National Science Foundation, Grant No. ECCS-1232022, 09/01/2012–08/31/2015, \$345,414.00
- “High-Performance Single-Photon Sources via Spatial Multiplexing,” **PI**, US ARMY RDE-COM ACQ CTR, Grant No. W911NF-12-1-0397, 08/15/2012–05/31/2014, \$500,111.00
- “STTR Phase II: Novel Protocol for Quantum Key Distribution,” **PI**, United States Air Force, Grant No. FA8750-12-C-0241, 6/14/2012–6/13/2014, \$225,000

- “STTR Phase II: High Speed Room Temperature Single Photon Counters,” **PI**, United States Air Force, Grant No. FA8750-12-C-0241, 1/30/2013–1/29/2014, \$226,000

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## COURSES TAUGHT

Name	Departments, University	Time	Evaluation: Instructor / Course
Nonlinear Optics (Graduate)	Physics and Electrical Engineering, Northwestern University	Winter 2013	-
Independent Study (Undergraduate)	Electrical Engineering, Northwestern University	Fall 2013	-
Independent Study (Graduate)	Electrical Engineering, Northwestern University	Summer 2013	Missing
Nonlinear Optics (Graduate)	Physics and Electrical Engineering, Northwestern University	Spring 2013	89% / 83%
Nonlinear Optics * (Graduate)	Physics and Electrical Engineering, Northwestern University	Spring 2012	N/A
Nonlinear Optics * (Graduate)	Physics and Electrical Engineering, Northwestern University	Spring 2011	N/A
Physical Science Lab 105 (Undergraduate)	Physics and Astronomy, Ohio University	Fall 2004	89% / 81 %
Physical Science Lab 105 (Undergraduate)	Physics and Astronomy, Ohio University	Winter 2005	86% / 91 %
Physical Science Lab 201 (Undergraduate)	Physics and Astronomy, Ohio University	Spring 2005	92% / 91 %
Physical Science Lab 201 (Undergraduate)	Physics and Astronomy, Ohio University	Fall 2005	94% / 92 %

\* as guest lecturer for 1/5 quarter

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## EDUCATION:

Department of Physics & Astronomy, Michigan State University, Michigan, USA;  
Degree Awarded: August 2009;  
**Ph. D.** Dissertation title: “**Mixing Matter- and Light- Waves: Principles and Applications**”;  
Dissertation advisor: Prof. Michael Moore.

Department of Physics & Astronomy, Ohio University, OH, USA;  
Degree Awarded: May 2006;  
**M. S.** Research topic: **Ultracold gases and nonlinear optics in atomic ensembles**;  
Research advisor: Prof. Michael Moore.

Department of Modern Physics, University of Science and Technology of China, Hefei, Anhui, China;  
Degree Awarded: July 2004;  
**B. S.** Thesis title: **Quantum coherence and entanglement manipulation in bimodal Bose-Einstein condensates;**  
Thesis advisors: Prof. Zhen-Sheng Yuan and Prof. Lin-Fan Zhu.

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## SERVICES:

Member and Reviewer of

- ◆ The Optical Society of America
- ◆ American Physical Society

Reviewer for

- ◆ Institute of Electrical and Electronics Engineers
- ◆ Institute of Physics

Reviewers for *Nature Journals*, *Physical Review Letters*, *Physical Review A*, *Physical Review X*, *New Journal of Physics*, *Optics Letters*, *Optics Express*, *Journal of the Optical Society of America B*, *Journal of the Optical Society of America A*, *Journal of Selected Topics in Quantum Electronics*, *Journal of Optics*, and *Physics D: Applied Physics*.

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## Publications

- **Peer-reviewed Journal Publications and Preprints:**  
**(Total citation > 500; H Factor: 10)**

63. A. S. Kowligy,\* P. Manurkar,\* N. V. Corzo, V. G. Velev, M. Silver, R. P. Scott, S. J. B. Yoo, P. Kumar, G. S. Kanter and Y.-P. Huang, “Quantum optical arbitrary waveform manipulation and measurement in real time,” **Opt. Express** **22**, 27942 (2014).
62. K.-Y. Wang, V. G. Velev, K. F. Lee, A. S. Kowligy, P. Kumar, M. A. Foster, A. C. Foster, and Y.-P. Huang, “Multichannel Photon-pair Generation using Hydrogenated Amorphous Silicon Waveguides,” **Opt. Lett.** **39**, 914 (2014).
61. M. Patel, J. B. Altepeter, Y.-P. Huang, N. N. Oza and P. Kumar, “Quantum Indistinguishability in Independent Telecommunications-band Photons,” **New J. Phys.** **16**, 043019 (2014)
60. N. N. Oza, Y.-P. Huang, and P. Kumar, “Entanglement-Preserving Photonic Switching: Demonstration of Full Cross-Bar Operation with Quantum Data Streams,” **Photonic Technology Letters** **26**, 356 (2014).
59. D. V. Strekalov, A. S. Kowligy, Y.-P. Huang, and P. Kumar, “Optical sum-frequency generation in whispering gallery mode resonators,” **New J. Phys.** **16**, 053025 (2014).
58. D. V. Strekalov, A. S. Kowligy, Y.-P. Huang, and P. Kumar, “Progress towards interaction-free all-optical devices,” **Phys. Rev. A** **89**, 063820 (2014).
57. Y.-Z. Sun, Y.-P. Huang and P. Kumar, “Photonic Nonlinearities via Quantum Zeno Blockade,” **Phys. Rev. Lett.** **110**, 223901 (2013); arXiv: 1303.5666
56. K. T. McCusker, Y.-P. Huang A. G. Kowligy, and P. Kumar, “Experimental demonstration of interaction-free all-optical switching via the quantum Zeno effect,” **Phys. Rev. Lett.** **110**, 240403 (2013); arXiv: 1301.7631
55. Y.-P. Huang, V. Velev, and P. Kumar, “Quantum Frequency Conversion in Nonlinear Microcavities,” **Optics Letters** **38**, 2119 (2013)
54. Y.-P. Huang and P. Kumar “Mode-resolved Photon Counting via Cascaded Quantum Frequency Conversion,” **Optics Letters** **38**, 468 (2013)
53. J. Hu, Y.-P. Huang, and P. Kumar, “Self-stabilized Quantum Optical Fredkin Gate,” **Optics Letters** **38**, 552 (2013)

52. M. Patel, J. B. Altepeter, Y.-P. Huang, N. N. Oza and P. Kumar, "Erasing Quantum Distinguishability via Single-Mode Filtering," **Phys. Rev. A** **86**, 033809 (2012).
51. Y.-P. Huang and P. Kumar, "Quantum Theory of All-Optical Switching in Nonlinear Sagnac Interferometers," **New J. Phys.** **14**, 053038 (2012).
50. Y.-P. Huang and P. Kumar, "Anti-bunched Emission of Photon Pairs via Quantum Zeno Blockade," **Phys. Rev. Lett.** **108**, 030502(2012).
49. Y.-P. Huang and P. Kumar, "Distilling Quantum Entanglement via Mode-Matched Filtering," **Phys. Rev. A** **84**, 032315 (2011).
48. Y.-P. Huang, J. B. Altepeter, and P. Kumar, "Optimized Heralding Schemes for Single Photons," **Phys. Rev. A** **84**, 033844 (2011)
47. Y.-P. Huang, and P. Kumar, "Interaction-free quantum optical fredkin gates in  $\chi^{(2)}$  microdisks," **IEEE Journal of Selected Topics in Quantum Electronics** **18**, 600 (2012);
46. Y.-P. Huang, J. B. Altepeter, and P. Kumar, "Interaction-free all-optical switching via the quantum Zeno effect," **Phys. Rev. A** **82**, 063826 (2010).
45. Y.-P. Huang, J. B. Altepeter, and P. Kumar, "Heralding single photons without spectral factorability," **Phys. Rev. A** **82**, 043826 (2010).
44. K. G. Köprülü, Y.-P. Huang, G. A. Barbosa, and P. Kumar, "Lossless single-photon shaping via heralding," **Opt. Lett.** **36**, 1674 (2011).
43. Y.-P. Huang and P. Kumar, "Interaction-free all-optical switching in  $\chi^{(2)}$  microdisks for quantum applications," **Opt. Lett.** **35**, 2376 (2010).
42. Y. P. Huang and M. G. Moore, " Ultrabright omnidirectional collective emission, of correlated photon pairs from atomic vapors " **Phys. Rev. A** **81**, 033807 (2010).
41. T. C. Doan, Y. P. Huang, S. F. Wolf, and M. G. Moore, "Resonant matter wave amplification in Mean field theory ," arXiv:1112.3325
40. K. J. Xu, Y. P. Huang, M. G. Moore, and C. Piermarocchi, "Two-Qubit Conditional Phase Gate in Laser-Excited Semiconductor Quantum Dots Using the Quantum Zeno Effect," **Phys. Rev. Lett.** **103**, 037401 (2009), online: arXiv:0810.4489
39. Y. P. Huang and M. G. Moore, "Optimized Double-well quantum interferometry with Gaussian squeezed-states," **Phys. Rev. Lett.** **100**, 250406 (2008).
38. Y. P. Huang and M. G. Moore, "Interaction- and measurement-free Quantum Zeno gates asymptotically on-demand for single-atom and single-photon qubits," **Phys. Rev. A** **77**, 062332 (2008). *Selected to appear in the APS Virtual Journal of Quantum Information.*
37. Y. P. Huang and M. G. Moore, "On-demand entanglement of atomic qubits via optical interferometry," **Phys. Rev. A** **77**, 032349 (2008). *Selected to appear in the APS Virtual Journal of Quantum Information.*
36. Y. P. Huang and M. G. Moore, "Creation, detection, and decoherence of macroscopic quantum superposition states in double-well Bose-Einstein condensates," **Phys. Rev. A** **73**, 023606 (2006).
35. Z. -S. Yuan, Y.-P. Huang, Z. -L. Fan, X. -J. Liu, K. -Z. Xu, "Entanglement Manipulation in a tunneling two-mode Bose Einstein Condensate," **J. of Atomic and Molecular Phys.** **S1**, 053 (2004).
34. X.-J. Liu, L. - F. Zhu, Z. -S. Yuan, W. -B. Li, H. -D. Chen, Y. -P. Huang, Z. -P. Zhong, K. -Z. Xu, and J. -M. Li, "Dynamical Correlation in Double Excitations of Helium Studied by High-Resolution and Angular-Resolved Fast-Electron Energy-Loss Spectroscopy in Absolute Measurement," **Phys. Rev. Lett.** **91**, 193203 (2003).
33. X.-J. Liu, Y. -P. Huang, L. -F. Zhu, Z. -S. Yuan, W. -B. Li, and K.-Z. Xu, "Numerical determination of profile parameters for Fano resonance with definite energy resolution," **Nucl. Instr. & Meth. in Phys. Res. A** **508**, 448 (2003).

- **Other Publications: Books, Book Chapters, and *Full-length, Refereed* Conference Papers**

32. "Mixing light and matter waves: Principles and applications," Y. -P. Huang, Ph.D Dissertation Published by **BiblioLabsII**, ISBN 1243658665 (Sep. 2011).
31. "Four-Wave Mixing," in book "Single-Photon Generation and Detection: Physics and Applications", by A. McMillan, Y.-P. Huang, B. Bell, A. Clark, P. Kumar, and J. Rarity.
30. "Quantum Communications with Overlapping Time Modes: Optimal Receiver Capable of Dispersion Compensation," J. Larikova, V. G. Velev, P. Kumar, and Y.-P. Huang, FIO 2014
29. "Generation of Photon Pairs in Green Fluorescent Protein," S.-Y. Shi, A. Thomas, N. V. Corzo, P. Kumar, Y.-P. Huang, and K. F. Lee. FIO 2014
28. "Selective up-conversion of two orthogonal signal modes using shaped pump pulses," P. Manurkar, N. V. Corzo, P. Kumar, G. S. Kanter and Y.-P. Huang, FIO 2014
27. "Selective Manipulation of Overlapping Quantum Modes," V. G. Velev, C. Langrock, P. Kumar, M. M. Fejer, Y.-P. Huang, Invited talk at IEEE Summer Topicals 2014,
26. "Biological Source of Correlated Photon Pairs," A. Thomas, S.-Y. Shi, N. Corzo, J. Altepeter, Y.-P. Huang and P. Kumar, CLEO 2014, paper JW2A
25. "Natural Phase Matching in Microdisk Cavities," V. Velev, P. Kumar, and Y.-P. Huang, CLEO 2014, paper JTh2A
24. "Spatial-Mode-Selective Quantum Frequency Conversion in a  $\chi^{(2)}$  Slab Waveguide", M. Vasilyev, Y. B. Kwon, and Y.-P. Huang, Quantum Information and Measurement conference 2014
23. "Spatially Multiplexed Single-Photon Source with Low-Loss All-Optical Switching," K. T. McCusker, T. M. Rambo, K. F. Lee, S. J. Nowierski, and Y.-P. Huang, Single Photon Workshop 2013, Oak Ridge National Laboratory.
22. "High-dimensional quantum key distribution using quantum frequency conversion," H. Krovi, S. Guha, M. Takeoka, Z. Dutton, P. Kumar, G. Kanter, and Y.-P. Huang, Single Photon Workshop 2013, Oak Ridge National Laboratory.
21. "Small-Detuning Raman Scattering in KTP and LiNbO<sub>3</sub> Waveguides: Relative Comparison for Applications in Up-conversion based Single-Photon Detection," N. Corzo, M. Silver, Y.-P. Huang, and G. S. Kanter, Single Photon Workshop 2013, Oak Ridge National Laboratory.
20. "Highly mode-selective quantum frequency conversion in a slab waveguide," M. Vasilyev, Y. B. Kwon, and Y.-P. Huang, Photonics West 2014
19. "All-Optical Switching via the Quantum Zeno Effect," K. T. McCusker, Y.-P. Huang, A. S. Kowligy, D. V. Strekalov, Y.-Z. Sun, and P. Kumar, the Proceedings of the combined meetings of the 10th Rochester Conference on Coherence and Quantum Optics, CQO-X, and the Second Conference on Quantum Information and Measurement, QIM-2
18. "Mode-selective all-optical switching via quantum frequency conversion," A. Kowligy, P. Kumar, and Y.-P. Huang, Coherence and Quantum Optics 2013
17. "Experimental Demonstration of All-Optical Switching Using the Quantum Zeno Effect," K. T. McCusker, Y.-P. Huang, A. S. Kowligy, and P. Kumar, Coherence and Quantum Optics 2013.
16. "Low-Loss All-Optical Quantum Switching," T. M. Rambo, K. McCusker, Y.-P. Huang, and P. Kumar, IEEE Summer Topicals 2013
15. J. Hu, Y.-P. Huang and P. Kumar, "Self-stabilized Quantum Optical Fredkin Gate Enabled by the Raman Effect," CLEO 2013
14. D. V. Strekalov, A. S. Kowligy, Y.-P. Huang and P. Kumar, "Observation of Quantum Zeno Blockade in  $\chi^{(2)}$  Microresonators," CLEO 2013
13. A. Thomas, Y.-P. Huang T. M. Rambo, S.-Y. Shi, J. B. Altepeter, and P. Kumar, "Direct Measurement of Third-Order Nonlinearity of Green Fluorescent Protein," CLEO 2013
12. Y.-Z. Sun, Y.-P. Huang N. N. Oza, and P. Kumar, "Fiber-Based Multichannel Correlated Photon-Pair Source with High Efficiency and Low Crosstalk," CLEO 2013

11. N. N. Oza, Y.-P. Huang, and P. Kumar, “Entanglement-Preserving Photonic Switching: Demonstration of Full Cross-Bar Operation with 25-GHz Capability,” OFC/MFPEC 2013
10. M. Patel, J. B. Altepeter, Y.-P. Huang, N. N. Oza, and P. Kumar, “Quantum Interference of Independently Generated Telecom-band Single Photons,” QCMC 2012, paper **P2-75**.
9. N. N. Oza, Y.-P. Huang, and P. Kumar, “Ultrafast Switching of Photonic Entanglement,” 2012 IEEE Photonics Conference, IEEE Photonics Society
8. P. Kumar and Y.-P. Huang, “All-optical Quantum Switching,” 2012 International Conference on Fibre Optics and Photonics, Paper **W1C.1**
7. P. Kumar, Y.-P. Huang, J. B. Altepeter, M. Patel., N. N. Oza, and M. A. Hall, “Quantum information processing in the telecom waveband,” OFC/NFOEC 2012, Paper **OM3B**.
6. Y.-P. Huang, A. Kowligy, J. Altepeter, P. Kumar “Interaction-Free All-Optical Switching via Quantum Zeno Blockade,” Frontiers in Optics 2011
5. Y. P. Huang, G. Köprülü, G. A. Barbosa, and P. Kumar, “Lossless Single Photon Shaping via Heralding,” Nonlinear Optics 2011, paper **NMB6**
4. Y.-P. Huang, and P. Kumar, “Fredkin Gates in  $\chi^{(2)}$  Microdisks via Quantum Zeno Blockade,” Nonlinear Optics 2011, paper **NWE1**.
3. G. S. Kanter, Y.-P. Huang, and P. Kumar, “Addressing Security Issues in Quantum Key Distribution using Seed Keys and Entangled Sources,” Applications of Lasers for Sensing and Free Space Communications 2011, paper **LTuA1**
2. G. Kanter, S. Wang, Y.-P. Huang, and P. Kumar, “Engineering Fiber-Nonlinearity Based Entangled Photon Sources for Quantum Key Distribution Applications,” Optical Fiber Communication Conference and Exposition (OFC/NFOEC), 2011 and the National Fiber Optic Engineers Conference, paper **OMO2**.
1. M. Patel, J. B. Altepeter, Y. -P. Huang, M. A. Hall, and P. Kumar, “Fiber-based experiments on photon indistinguishability,” Photonics 2010

#### **Presentations (selective):**

- 17 “Interaction-free All-optical Switches for Quantum Applications,” Invited Talk at Frontier in Optics, Tucson, AZ (October 2014)
- 16 “Selective Manipulation of Overlapping Quantum Modes,” Invited talk at 2014 IEEE Summer Topicals, Quebec, CA (June 2014)
- 15 “Zeno’s Paradox of “Achilles and the Tortoise,” Physics Department Seminar, Stevens Institute of Technology, New Jersey (April 2014)
- 14 “Zeno’s Paradox of ”Achilles and the Tortoise” in Quantum Optics”, Physics Colloquium, State University of New York at Binghamton, Binghamton (March 2014)
13. “Quantum Zeno Effect and its Applications in Quantum Optics,” quantum optics seminar, University of Science and Technology of China, Hefei, China (February 2012);
12. “The *Achilles and the Tortoise* Paradox and its Applications in Quantum Optics,” Atomic, Molecular, and Optical Physics Seminar, Northwestern University, Evanston, Illinois (November 2011);
11. “ Lossless Single Photon Shaping via Heralding,” Nonlinear Optics 2011, Kauai, Hawaii (July 2011);
10. “Fredkin Gates in  $\chi^{(2)}$  Microdisks via Quantum Zeno Blockade,” Nonlinear Optics 2011, Kauai, Hawaii (July 2011);

8. "Optimized Double-Well Quantum Interferometry with Gaussian Squeezed States," DAMOP 2009, Charlottesville, Virginia (May 2009);
7. "Mean Field Theory of Resonant Matter Wave Amplification ," DAMOP 2009, Charlottesville, Virginia (May 2009);
6. "Interaction- and Measurement-Free Quantum Zeno Gates for Single-Atom and Single-Photon Qubits," DAMOP 2009, Charlottesville, Virginia (May 2009)'
5. "Ultra-bright Sources of Entangled Photon Pairs in Atomic Ensembles," Solid State Division Seminar, Northwestern University, Illinois (Feb 2009);
4. "An Ultra-Bright Omnidirectional Atomic-Vapor Photon-Pair Source Based on Doppler-Free Four-Wave-Mixing and Collective Emission," DAMOP 2009, Charlottesville, Virginia (May 2009);
3. "Generating Ultra-bright CW Beams of Entangled Photon Pairs from Atomic Ensembles," TAMU Physics of Quantum Electronics Workshop, College Station, Texas (Jan 2009);
2. "Optimized double-well interferometry with Gaussian squeezed-states," PGO seminar talk at Michigan State University, East Lansing, Michigan (May 2008);
1. "Gaussian number-squeezed input states for sub-shot-noise interferometry in a double-well Bose-Einstein condensate," DAMOP 2007, Calgary, Alberta, Canada, (June 2007);