

# Curriculum Vitae

Date: 9/01/2022

## NAME AND CURRENT POSITION

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| Name                   | Dr. Oliver Slattery   |
| Position title         | Physicist / Leader – Quantum Communications and Networking Project (ITL)          |
| Division/Department    | Applied and Computational Mathematics Division/Information Technology Laboratory. |
| Branch                 | National Institute of Standards and Technology (NIST)                             |
| Google Scholar Profile | <a href="#">Oliver Slattery - Google Scholar</a>                                  |

## WORK EXPERIENCE

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|--------------|--|
| 2018-present | <b>Leader: Quantum Communication and Networking project</b><br>National Institute of Standards & Technology (NIST), Gaithersburg, MD, USA.<br>⇒ <i>Leading research team on quantum repeater and quantum networking systems and components including development and characterization.</i> |
| 2004-2018    | <b>Research Scientist</b><br>National Institute of Standards & Technology (NIST), Gaithersburg, MD, USA.<br>⇒ <i>Research on optical storage, data preservation, quantum communication.</i>  |
| 1998-2004    | <b>Guest Research Associate</b><br>National Institute of Standards & Technology (NIST), Gaithersburg, MD, USA.<br>⇒ <i>Research on electronic books (ebooks), Braille and tactile display technology, optical media compatibility and longevity.</i>                                       |
| 1997         | <b>Engineering Intern – Physicist.</b><br>Mechatronic Control Corporation (MCC), Oxford, MI, USA.<br>⇒ <i>Development and testing of antilock brake systems (ABS) for heavy truck-trailers.</i>  |

## EDUCATION

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| 2009-2015 | <b>Ph.D.</b> Department of Physics, University of Limerick (UL), Casteltroy, Limerick, Ireland<br>Ph.D. Thesis: Development of Single-Photon Sources, Detectors, Spectrometers and Interfaces for Quantum Communication Systems. |
| 2003-2007 | <b>M.Sc.</b> Applied Physics Laboratory (APL), Johns Hopkins University, Laurel, MD.   |
| 1998-2000 | <b>M.Sc.</b> Department of Physics, UL, Casteltroy, Limerick, Ireland.<br>M.S. Thesis: Development of a New Braille Display and Characterization of Displays for Electronic Books.   |
| 1994-1998 | <b>B.Sc.</b> Department of Applied Physics, UL, Casteltroy, Limerick, Ireland.   |

## PATENTS

1. L. Ma, **O. Slattery**, X. Tang, “Direct absolute spectrometer for direct absolute spectrometry” 10641655 (2019)
2. J. Roberts, **O. Slattery**, D. Kardos, E. Mulkens, B. Swoope, V. Min, M. Sutton, G. Rodgers, N. Guttenburg, T. Comstock, “Extended refreshable tactile graphic array for scanned tactile display,” 7009595 (2006)
3. J. Roberts, **O. Slattery**, D. Kardos, “Refreshable Braille Reader,” 6776619 (2004)
4. J. Roberts, **O. Slattery**, D. Kardos, E. Mulkens, B. Swoope, “Apparatus and method utilizing bi-directional relative movement for refreshable tactile display,” 6692255 (2004)

## HONORS AND AWARDS:

1. **Bronze Medal Award**, 2015, Department of Commerce, USA. (For the development of single-photon conversion systems.)
2. **Outstanding Contribution Award**, 2011, National Institute of Standards and Technology, USA. (For the development of a laser safety program for the Information Technology Laboratory)
3. **Bronze Medal Award**, 2003, Department of Commerce, USA. (For the development of electronic book readers, rotating Braille display for ebooks and tactile graphics display.)
4. **R&D 100 Award**, 2001, R&D Magazine, USA. (For the development of a rotating Braille display for electronic books).

## PUBLICATIONS:

### Special Invitations:

- [1] O. Slattery and Y. Kim. "Breakthrough in teleportation furthers quantum network development", Nature, 605: 624-625 (2022).

### Peer-reviewed Journals:

- [1] L. Ma, O. Slattery, and X. Tang. "Optical quantum memory and its applications in quantum communications systems", NIST JRes, 125: 125002 (2020).
- [2] O. Slattery, L. Ma, K. Zong and X. Tang. "Background and review of cavity-enhanced spontaneous parametric down-conversion", NIST JRes, 124: 124019 (2019).
- [3] L. Ma, O. Slattery, and X. Tang. "Noise Reduction in Optically Controlled Quantum Memory", Modern Physics Letter B 32 (14): 1830001 (2018).
- [4] L. Ma, O. Slattery, and X. Tang. "Optical quantum memory based on electromagnetically induced transparency." Journal of Optics 19(4): 043001 (2017).
- [5] L. Ma, O. Slattery, and X. Tang, "Spectral characterization of single photon sources with ultra-high resolution, accuracy and sensitivity." Optics Express 25(23): 28898-28907 (2017).
- [6] O. Slattery, L. Ma, P. Kuo, and X. Tang. "Narrow-linewidth source of greatly non-degenerate photon pairs for quantum repeaters from a short singly resonant cavity," Applied Physics B., 121, 413–419 (2015).
- [7] Y. Kim, O. Slattery, P. Kuo, and X. Tang, "Two-photon interference with continuous-wave operating multi-mode coherent light," Optics Express, Vol. 22, 003611 (2014).
- [8] P. Kuo, O. Slattery, Y. Kim, J. Pelc, M. Fejer and X. Tang, "Spectral response of an up-conversion detector and spectrometer," Optics Express, Vol. 21, 022523 (2013).
- [9] Y. Kim, O. Slattery, P. Kuo, and X. Tang, "Conditions for two-photon interference with coherent pulses," Phys. Rev. A, Vol. 87, 063843 (2013).
- [10] O. Slattery, L. Ma, P. Kuo, Y. Kim and X. Tang, "Frequency correlated biphoton spectroscopy using tunable upconversion detector," Laser Phys. Lett. 10, 075201 (2013).
- [11] P. Kuo, J. Pelc, O. Slattery, Y. Kim, M. Fejer and X. Tang, "Reducing noise in single-photon frequency conversion," Opt. Lett. 38 (8), 1310-1312 (2013).
- [12] L. Ma, O. Slattery and X. Tang, "Single photon frequency up-conversion and its applications," Physics Reports, Vol. 521 (2), 69-94 (2012).
- [13] J. Pelc, P. Kuo, O. Slattery, L. Ma, X. Tang, "Dual-channel, single-photon upconversion detector at 1.3 microns", Optics Express, Vol. 20 (17), 19075 (2012).
- [14] J. Pelc, L. Ma, C. Phillips, C. Langrock, Q. Zhang, O. Slattery, X. Tang, M. Fejer, "Long-wavelength-pumped upconversion single-photon detector at 1550 nm: performance and noise analysis," Optics Express, Vol. 19(22), 21445–21456 (2011).

- [15] M. Rakher, L. Ma, O. Slattery, X. Tang, and K. Srinivasan, “Simultaneous wave-length translation and amplitude modulation of single photons from a quantum dot,” Physical Review Letter, Vol. 107, 083602 (2011).
- [16] L. Ma, M. Rakher, M. Stevens, O. Slattery, K. Srinivasan and X. Tang, “Temporal correlation of photons following frequency up-conversion,” Optics Express, Vol. 19 10501-10510 (2011).
- [17] L. Ma, J. Bienfang, O. Slattery and X. Tang, “Up-conversion single-photon detector using multi-wavelength sampling techniques,” Optics Express, Vol. 19 (6), 5470-5479 (2011).
- [18] M. Rakher, L. Ma, O. Slattery, X. Tang, and K. Srinivasan, “Quantum transduction of telecommunications-band single photons from a quantum dot by frequency upconversion,” Nature Photonics, Vol. 4, 786–791, doi:10.1038/nphoton.2010.221 (2010).
- [19] L. Ma, O. Slattery and X. Tang, “Single photon level spectrum measurement at fiber communication band using frequency up-conversion technology,” Laser Physics, Vol. 20 (7), 1216-1617 (2010).
- [20] L. Ma, O. Slattery and X. Tang, “Detection and spectral measurement of single photons in communication bands using up-conversion technology,” Laser Physics, Vol. 20 (5), 1244-1250 (2010).
- [21] L. Ma, O. Slattery, T. Chang and X. Tang, “Non-degenerated sequential time-bin entanglement generation using periodically poled KTP waveguide,” Optics Express, Vol. 17(18), 15799–15807 (2009).
- [22] L. Ma, O. Slattery and X. Tang, “Experimental study of high sensitivity infrared spectrometer with waveguide-based up-conversion detector,” Optics Express, Vol. 17(16), 14395–14404 (2009).
- [23] L. Ma, S. Nam, H. Xu, B. Baek, T. Chang, O. Slattery, A. Mink and X. Tang, “1310 nm differential phase shift QKD system using superconducting single photon detectors,” New Journal of Physics, Vol. 11: 054020 (2009).
- [24] L. Ma, T. Chang, A. Mink, O. Slattery, B. Hershman and X. Tang “Experimental demonstration of a detection-time-bin-shift polarization encoding quantum key distribution system,” IEEE Communications Letters, Vol. 12(6): 459~461 (2008).
- [25] L. Ma, A. Mink, H. Xu, O. Slattery and X. Tang, “Experimental demonstration of an active quantum key distribution network with over Gbps clock synchronization,” IEEE Communication Letters, Vol 11(12): 1019-1021 (2007).
- [26] O. Slattery, R. Lu, J. Zheng, F. Byers, and X. Tang, “Stability comparison of recordable optical discs – A study of error rates in harsh conditions,” NIST JRes, Vol 109(5): 517-524 (2004).
- [27] K. Lee, O. Slattery, R. Lu, X. Tang and V. McCrary, “State of the art and practice in digital preservation,” NIST JRes, Vol 107(1): 93-106 (2002).
- [28] J. Roberts, O. Slattery and D. Kardos, “Rotating wheel Braille display for continuous refreshable Braille,” J. Soc. Inf. Display, Vol 31: 1 (2000).

#### **Book Chapters:**

- [1] L. Ma, O. Slattery and X. Tang, “Single photon detection using frequency up-conversion with pulse pumping,” in Photodiodes - Communications, Bio-Sensing, Measurements and High-Energy Physics, 2011.
- [2] L. Ma, O. Slattery and X. Tang “NIR Single photon detectors with up-conversion technology and its applications in quantum communication systems” in Advances in Lasers and Electro optics, N. Costa and A. Cartaxo, 2010.

#### **Conference Proceedings Papers:**

- [1] In review: A. Rahmouni, L. Ma, L. Cai, X. Tang, T. Gerrits, Q. Li and O. Slattery, “Towards entangled photon pair generation from SiC-based microring resonator”. (2022)

- [2] In review: A. Rahmouni, S. Saha, O. Slattery and T. Gerrits, "Hyperspectral photon-counting optical time domain reflectometry
- [3] In review: A. Rahmouni, T. Gerrits, P. Kuo, D. Reddy, L. Ma, X. Tang and O. Slattery, "Portable polarization-entangled photon source & receiver toolset for quantum network metrology" (2022)
- [4] A. Rahmouni, T. Gerrits and O. Slattery, "Progress towards a portable polarization-entangled photon source sand receiver for quantum network metrology". OSA Quantum 2.0, Proc. OSA Technical Digest (2022).
- [5] T. Gerrits, I. Burenkov, Y. Li-Baboud, A. Rahmouni, D. Anand, Hala, O. Slattery, A. Battou, and S. Polyakov, "White rabbit assisted quantum network node synchronization with quantum channel coexistence", Conference on Lasers and Electro-Optics (CLEO), Proc. CLEO Technical Digest (2022).
- [6] A. Rahmouni, T. Gerrits, A. Migdall, O. Slattery, P. Shaw and J. Rice, "A self-validated detector for characterization of quantum network components", Conference on Lasers and Electro-Optics (CLEO), Proc. CLEO Technical Digest (2022).
- [7] O. Slattery, L. Ma, T. Gerrits, A. Rahmouni, S. Bhushan and X. Tang, "The quantum communications and networking project at the Information Technology Laboratory at NIST", IEEE Conference on Communications and Network Security / International Workshop on Quantum Communications and Quantum Cryptography (virtual) (2021), IEEE Digital Library (2021).
- [8] S. Bhushan, O. Slattery, L. Ma and X. Tang, "Terahertz electromagnetically induced transparency in Cesium atoms," Frontier in Optics (FIO) (virtual), Proc. OSA Technical Digest (2020).
- [9] L. Ma, O. Slattery, and X. Tang, "Optical quantum memory application in quantum communication," Quantum Communications and Quantum Imaging XVII, Proc. SPIE 11134 (2019).
- [10] O. Slattery, L. Ma and X. Tang, "A cascaded interface to connect quantum memory, quantum computing and quantum transmission frequencies," Frontier in Optics (FIO), Proc. OSA Technical Digest (2019).
- [11] L. Ma, O. Slattery, A. Battou and X. Tang, "A testbed for quantum communications and quantum networks," Quantum Information Science, Sensing, and Computation XI, Proc. SPIE 10984 (2019).
- [12] L. Ma, O. Slattery, and X. Tang, "Ultra-high spectral resolution spectrometer for single photon source characterization", Quantum Information Science, Sensing, and Computation X, Proc. SPIE 10660 (2018).
- [13] P. Kuo, T. Gerrits, V. Verma, S. Nam, O. Slattery, L. Ma and X. Tang, "Spectral correlations and interference in CW non-degenerate photons pairs at telecom wavelengths", Conference on Lasers and Electro-Optics (CLEO), Proc. CLEO Technical Digest (2016).
- [14] P. Kuo, T. Gerrits, V. Verma, S. Nam, O. Slattery, L. Ma and X. Tang "Characterization of type-II spontaneous parametric down-conversion in domain-engineered PPLN," Advances in Photonics of Quantum Computing, Memory, and Communication IX, Proc. of SPIE 9762 (2016)
- [15] L. Ma, O. Slattery, and X. Tang, "Atomic filters for noise reduction in EIT quantum memory base on warm Cs atomic ensembles," SPIE Quantum Communications and Quantum Imaging, Proc. SPIE, 9980 (2016).
- [16] O. Slattery, L. Ma, P. Kuo and X. Tang, "Comparing the Linewidths from Single-Pass SPDC and Singly-Resonant Cavity SPDC", SPIE Quantum Communications and Quantum Imaging, Proc. SPIE 9615 (2015).
- [17] L. Ma, O. Slattery, P. Kuo and X. Tang, "EIT Quantum Memory with Cs Atomic Vapor for Quantum Communication", SPIE Quantum Communications and Quantum Imaging, Proc. SPIE 9615 (2015).
- [18] P. Kuo, J. Pelc, O. Slattery, L. Ma and X. Tang, "Polarization entangled photons from domain-engineered, periodically poed LiNbO<sub>3</sub>," Conference on Lasers and Electro-Optics (CLEO), Proc. CLEO Technical Digest (2014).

- [19] P. Kuo, J. Pelc, O. Slattery, L. Ma and X. Tang, "Domain-engineered PPLN for entangled photon generation and other quantum information applications," Nonlinear Optics and Its Applications VIII; and Quantum Optics III, Proc. SPIE 9136 (2014).
- [20] P. Kuo, O. Slattery, Y. Kim, J. Pelc, M. Fejer and X. Tang, "Spectral response and characterization of high-efficiency upconverter for single-photon-level detection," Single Photon Workshop (2013).
- [21] P. Kuo, J. Pelc, Y. Kim, O. Slattery and X. Tang, "Entangled photon generation in a phase-modulated, quasi-phasematched crystal," Quantum Communications and Quantum Imaging XI, Proc. SPIE 8875 (2013).
- [22] P. Kuo, J. Pelc, O. Slattery, Y. Kim, M. Fejer and X. Tang, "Efficient, low-noise, single-photon frequency conversion," Conference on Lasers and Electro-Optics (CLEO), Proc. CLEO Technical Digest (2013).
- [23] O. Slattery, L. Ma, P. Kuo, Y. Kim, and X. Tang "Tunable up-conversion detector for single photon and bi-photon infrared spectroscopic applications," SPIE Defense, Security, and Sensing, Proc. SPIE 8726 (2013).
- [24] P. Kuo, J. Pelc, O. Slattery, M. Fejer and X. Tang, "Dual-channel, single-photon upconversion detector near 1310 nm," Quantum Communications and Quantum Imaging X, Proc. SPIE 8518 (2012).
- [25] O. Slattery, P. Kuo, Y. Kim, L. Ma and X. Tang, "SPDC correlated photon source filtered for narrowed bandwidth using Volume Bragg Grating", SPIE Quantum Communications and Quantum Imaging X, Proc. SPIE 8518 (2012).
- [26] P. Kuo, J. Pelc, O. Slattery, M. Fejer and X. Tang, "Photon temporal correlations measured using a dual-channel upconversion detector," Frontier in Optics/Laser Sciences 2012, Proc. OSA Technical Digest (2012).
- [27] L. Ma, J. Bienfang, O. Slattery and X. Tang, "Multi-wavelength pumping technique for upconversion single-photon detectors," Conference on Lasers and Electro-Optics (CLEO), Proc. CLEO Technical Digest (2011).
- [28] L. Ma, J. Bienfang, O. Slattery and X. Tang, "Frequency up-conversion single-photon detectors for quantum communication systems," SPIE Advanced Photon Counting Techniques V, Proc. SPIE 8033 (2011).
- [29] L. Ma, O. Slattery and X. Tang, "Ultra low dark-count-rate up-conversion single photon detector," IEEE Photonics Society 2010, Proc. 2010 IEEE Photonics Society Annual Meeting (2010).
- [30] L. Ma, O. Slattery and X. Tang, "Study on noise reduction in up-conversion single photon detectors," SPIE Quantum Communications and Quantum Imaging VIII, Proc. SPIE 7815 (2010).
- [31] L. Ma, O. Slattery and X. Tang, "Ultra-sensitive NIR-spectrometer based on frequency up-conversion detector," SPIE Next-Generation Spectroscopic Technologies III. Proc. SPIE 7680 (2010)
- [32] O. Slattery, L. Ma and X. Tang, "Correlated Photon Pair Generation by a Single Dual-Element PPKTP Waveguide at over GHz Repetition Rate", Frontier in Optics/Laser Sciences 2009, Proc. OSA Technical Digest (2009).
- [33] O. Slattery, L. Ma and X. Tang, "Optimization of photon pair generation in dual element PPKTP waveguide", SPIE Quantum Communications and Quantum Imaging VII, Proc. SPIE 7465 (2009).
- [34] L. Ma, O. Slattery, A. Mink and X. Tang, "Low noise up-conversion single photon detector and its applications in quantum information systems," SPIE Quantum Communications and Quantum Imaging VII, Proc. SPIE 7465 (2009).
- [35] L. Ma, O. Slattery, T. Chang and X. Tang, "Sequential time-bin entanglement generation using periodically poled KTP waveguide," Conference on Lasers and Electro-Optics (CLEO)/International Quantum Electronics Conference, Proc. CLEO Technical Digest (2009).

- [36] X. Tang, L. Ma, A. Mink, T. Chang, H. Xu, O. Slattery, A. Nakassis, B. Hershman, D. Su, and R. F. Boisvert, "High-Speed Quantum Key Distribution System for Optical Fiber networks in campus and metro areas," SPIE Quantum Communications and Quantum Imaging VI, Proc. SPIE 7092 (2008).
- [37] L. Ma, T. Chang, A. Mink, O. Slattery, B. Hershman and X. Tang, "Detection-time-bin-shift Schemes for Polarization Encoding Quantum Key Distribution System," SPIE Quantum Communications and Quantum Imaging VI, Proc. SPIE 7092 (2008).
- [38] L. Ma, H. Xu, O. Slattery, T. Chang and X. Tang, "Experimental demonstration of 1310 nm differential phase shift QKD system with up-conversion detector," Conference on Lasers and Electro-Optics (CLEO)/ Quantum Electronics and Laser Science (QuELS) Conference, Proc. CLEO Technical Digest (2008).
- [39] A. Mink, L. Ma, A. Nakassis, H. Hu, O. Slattery, B. Hershman and X. Tang, "A quantum network manager that supports a one-time pad stream," International Conference on Quantum, Nano, and Micro Technologies (ICQNM), IEEE Digital Library (2008).
- [40] H. Xu, L. Ma, A. Mink, O. Slattery and X. Tang, "Low-noise PPLN-based single-photon detector," SPIE Quantum Communications Realized, Proc. SPIE 6780 (2007).
- [41] J. Roberts, O. Slattery, D. Kardos and B. Swope, "New technology enabled many-fold reduction in the cost of refreshable Braille displays," International ACM Conference on Assistive Technologies, Proc. ASSETS 2000 (2000).
- [42] J. Roberts and O. Slattery, "Display characteristics and the impact on usability for stereo," SPIE Stereoscopic Displays and Virtual Reality Systems VII, Proc. SPIE 3957 (2000).

#### **Special Publications and Methods:**

- [1] J. Zheng, O. Slattery, F. Byers, A. Klepchukov, A. Nhan, M. Youket, E. Eusman and C. Shahani, "NIST/Library of Congress Optical Media Longevity Study," NIST SP 500-263 (2005).
- [2] O. Slattery, "Drive compatibility test (Phase 2) for DVD-R (general) and DVD+R discs, including DVD creation plan," NIST SP 500-258 (2004).
- [3] O. Slattery, "DVD-ROM drive compatibility test for DVD-R (general), DVD-RW, DVD+R, DVD+RW, and DVD-RAM discs" NIST SP 500-254 (2003).