SELIM M. SHAHRIAR

Curriculum Vitae

[*Note: In publications, my name appears as* **M.S. Shahriar (**most often**), S.M. Shahriar, Selim M. Shahriar,** or **Selim Shahriar]**

Table of Contents

A. BIOGRAPHICAL SUMMARY (P2)
B. FACULTY/SCIENTIST COLLABORATORS (P4)
C. KEY RESEARCH ACCOMPLISHMENTS (P5)
D. PUBLICATION SUMMARY (P7)
E. INVITED PRESENTATIONS, SEMINARS AND PUBLICITIES (P43)
F. UNIVERSITY AND PROFESSIONAL SERVICES (P46)
G. ENTREPRENEURIAL ACTIVITY (P48)
H. PREVIOUS RESEARCH GRANTS (P48)
I. CURRENT AND PENDING SUPPORT (P53)

A. BIOGRAPHICAL SUMMARY

Professional Preparation:

MIT	Physics	SB, 1986
MIT	EECS	SB, 1986
MIT	EECS	SM, 1989
MIT	EECS	Ph.D. 1992

Ph.D. Thesis Title: *Fundamental Studies and Applications in Three Level Atoms*
SM Thesis Title: *Raman Atomic Clock Studies*
Minor: *Relativistic Quantum Field Theory*

Appointments:

Professor, EECS Dept., Northwestern University, 9/1/08-
Professor, Physics and Astronomy Dept., Northwestern University, 9/1/08-
Professor, Applied Physics Graduate Program, 9/1/11-
Director, Division of Solid State and Photonics, EECS, Northwestern University, 9/1/08-

Associate Professor, EECS Dept., Northwestern University, 2001-2008

Research Laboratory of Electronics, MIT, Principal Research Scientist, 2001
Research Laboratory of Electronics, MIT, Research Scientist, 1992-2000
Research Laboratory of Electronics, MIT, Postdoctoral Associate, 1991-1992

Founder, Chairman of the Board, and Chief Scientific Adviser,
Digital Optics Technologies, Rolling Meadows, IL 60008, 6/1/98-

Associate Editor, Optical Engineering, 7/1/13-

Centers and Other Scientific Teams:

Acting Director, Center for Photonics Communications and Computing, 2001-
Member, Center for Interdisciplinary Exploration and Research in Astrophysics, 2009-
Member, NSF IGERT Center for Quantum Coherent Optical and Matter Fields, 2008-
Member, LIGO Scientific Collaboration, 2008-
Member, NSF Material Research Science and Engineering Center, 2011-

Professional Societies:

- Member: American Physical Society, IEEE-LEOS, Phi Beta Kappa, Sigma Xi
- Fellow, SPIE
- Fellow, OSA

Current Research Interests:

- Low Light Level Optical Switching with Nano-Fibers

- Quantum Communication and Quantum Computing
- Optical Data Buffering Using Fast Light
- Superluminal Ring Laser for Gyroscopes, Accelerometers, and Magnetometers
- Static and Dynamic Holographic Memory and Correlator
- Polarimetric Laser Radar and Optical Coherence Tomography
- Atom-Interferometric Rotation Sensing
- Gravitational Wave Detection
- Atomic Clock for GPS Applications
- Nanolithography using BEC

Mentoring:

- While at MIT, I graduated two Ph.D. students and six Master's students, and supervised three undergraduate theses.
- At NU, I have graduated six Ph.D. students, and three Master's student.
- I have supervised seven post-doctoral associates while at MIT, and seven more post-doctoral associates at NU.
- I have supervised a number of undergraduate student research projects at MIT and at NU.
- Currently supervising nine Ph.D. students, two MS students who are expected to continue to PhD programs, and two BS students.

Summary of Service at NU:

- Currently serving as Director of the Solid State and Photonics Research Interest Group
- Served on many departmental committees
- Served on a sub-committee to restructure and formalize the policy for Teaching Trainees, and to streamline the process for allocating Teaching Assistants to courses
- Headed a Steering Committee for the proposed Northwestern Institute for Photonic Science and Technologies under the NOW initiative conducted by the Dean's Office
- Served on EECS Chair Search Committee
- Served on the Dean's committee on the energy initiative
- Served on the sub-committee for restructuring EECS 202
- Served on the EECS Mission and Planning Committee
- Served on the EECS Structure and Procedure Committee
- Headed the EECS Faculty Search Committee 2011
- Served on a Physics and Astronomy Faculty Search Committee
- Currently serving on the following committees:
    - Instructional Labs Committee
    - Distinguished Seminar Committee
    - Computing Facilities Committee
    - McCormick Laser Safety Committee
    - Faculty Advisor, NU Student Chapter of SPIE

B. FACULTY/SCIENTIST COLLABORATORS

Prof. Shaoul Ezekiel, MIT, Thesis Supervisor
Prof. Jeffrey Shapiro, MIT
Prof. Seth Lloyd, MIT
Prof. Philip Hemmer, Texas A&M
Prof. Marlan Scully, Texas A&M, Princeton
Prof. Suhail Zubairy, Texas A&M
Prof. Mara Prentiss, Harvard University
Prof. Peter Zoller, University of Innsbruck, Austria
Prof. Nicholas Bigelow, University of Rochester
Prof. Harold Metcalf, SUNY, Stonybrook
Prof. Mark Cronin-Golomb, Tufts University
Prof. Rudolph Bonafacio, Universita Di Milano, Italy
Prof. Zameer Hasan, Temple University
Prof. Nasser Pyghemebarian, University of Arizona
Dr. Paul Raptis, ANL
Dr. Sami Gopalasami, ANL
Dr. Alexander Heifetz, ANL
Dr. Micah Yairi, LGR
Dr. Raymond Beausoleil, HP
Dr. Michi Yamamoto, NDT
Prof. Prem Kumar, NU
Prof. Seng Ho, NU
Prof. Hooman Mohseni, NU
Prof. Manijeh Razeghi, NU
Prof. Bruce Wessels, NU
Prof. Vicky Kalogera, NU
Prof. Thrasos Pappas, NU
Prof. Alan Sahakian, NU
Prof. Allen Taflove, NU
Prof. Aggelos Katsaggelos, NU
Prof. Ying Wu, NU
Prof. John Ketterson, NU
Dr. Frank Narducci, NAVAIR
Dr. Sean Spillane, Los Gatos Research
Dr. Joseph Schaar, Los Gatos Research
Dr. Mary Salit, Honeywell
Dr. Kenneth Salit, Honeywell
Prof. Jonathan Dowling, LSU
Prof. Gour Pati, Delaware State University
Prof. Renu Tripathi, Delaware State University
Prof. Tony Abi-Salloum, Widener University
Prof. Milivoj Belic, Texas A&M University, Qatar Campus
Prof. Antun Balaz, Institute of Physics Belgrade, Serbia
Prof. Maura McLaughlin, West Virginia University
Prof. Jacob Scheuer, Tel Aviv University, Israel

Prof. Uriel Levy, Hebrew University of Jerusalem, Israel

C. KEY RESEARCH ACCOMPLISHMENTS:

- Demonstrated an **ultra-low light level (few nW) optical switch** using a nano-fiber. In the future, this technique can be extended, via use of ultracold atoms, to produce optical swicthes controlled by only a few pW of light. It may also be useful for quantum non-demolition detection of single photons, for important applications in quantum information processing and quantum cryptography.

- Demonstrated a Fast-Light White Light Cavity, which can be used for enhancing the sensitivity of a **gravitational wave detector** by a factor of 30. It can also be used to implement a **long-delay, high-bandwidth data buffering** system for optical communication.

- Demonstrated how the **sensitivity of a Ring Laser Gyroscope can be enhanced by as much as six orders of magnitude** using the Fast-Light effect.

- Demonstrated a **Holographic Smart Eye** which combines a Holographic Video Disc with a Joint Transform Correlator to perform high speed image search.

- Demonstrated a **Holographic Stokesmeter** for high-speed polarization imaging. This Stokesmeter, aside from being compact and high-speed, has the unique feature that it can perform spectral multiplexinf simultaneously, a capability we have recently demonstrated.

- Developed an **In-Line, High-Speed Imaging Stokesmeter** that can be used with virtually any camera, including a flash ladar, for polarimetric imaging. This device can be used in a wide range of applications, including ladar based surveillance and biological imaging.

- Developed a model for realizing an **integrated quantum computer network** by using ensembles of atoms as quantum bits. This model has solved a key problem in using atomic ensembles for versatile quantum information processing using atomic ensembles, which are otherwise a leading contender for developing quantum memory and a quantum repeater. As such, this technique has the potential to make an ensemble based quantum computer network a reality in not-too-distant future.

- Demonstrated, for the first time in a solid, **slowing to a terrestrial-scale velocity (45 m/sec) and eventually halting/restarting a light pulse, using a crystal of Pr:YSO**. This followed our demonstration, again for the first time in a solid, of ***electromagnetically induced transparency***, and of optical data storage and recall using laser excited spin echo. The slowing of light to such a small velocity, especially in a solid medium, has sparked a strong interest in potential applications to buffering of high speed data streams. The halting/restarting of light pulse is one of the leading candidates for an easily retrievable storage system for single-photon quantum bits.

- Developed, and demonstrated in one dimension, **a novel theory of laser cooling**, which was instrumental in achieving a sub-recoil temperature in three dimensions by the group of Claude Cohen-Tannoudji. Two of my papers were referenced in this work, which in turn was cited by the

Nobel Prize committee in awarding the prize to Prof. Cohen-Tannoudji. This process can be used to produce an atomic beam with a long coherence length, necessary for atomic beam lithography.

- Developed a novel protocol for realizing a **quantum internet**, using entangles photon pairs and trapped rubidium atoms. This includes an explicit model for measuring all four Bell states in a ^{87}Rb atom, using Raman dark states, so that it would be possible to teleport the quantum state of a massive particle with near perfect fidelity.

- Invented and demonstrated the **super-parallel holographic optical correlator,** which is likely to be capable of searching through millions of images at once, taking only about 10 msec. This has a host of potential applications, including missile defense, computer vision, face recognition, and video data mining.

- Demonstrated a semiconductor laser pumped **optical phase conjugator using rubidium vapor, with high speed and high gain,** for only 100 mW of pump power. This will enable field deployment of phase conjugators for a host of applications. As an example, we have achieved dynamic aberration compensation in propagation through a turbulent medium. Several groups has adopted this phase conjugator as the device of choice for their work on adaptive optics. We also showed how this process can be used to produce **greater than 10 dB of squeezing**, which has now been demonstrated experimentally by several groups

- Developed a novel model for **quantum computing, using spectrally selective bands of atoms in a solid**. This work forms the heart of the so-called Type II Quantum Computing Program launched by AFOSR. We have already demonstrated the first step in this process, namely initialization of the quantum bits in a pure state, in the form of optically induced spin alignment in NV-Diamond. We have also identified new QED techniques based on the cavity dark state suitable for such a quantum computer.

- Discovered and demonstrated a new effect, called the **Bloch Siegert Oscillation**, which results from the interference between the positive and negative frequency components of a strong oscillating electromagnetic field as it interacts with a resonant atomic system. This has many potential applications, including quantum teleportation of wavelengths for synchronization of distant oscillators, controlling the precision of high-speed quantum bits, and high-resolution, in-situ mapping of the absolute phase distribution in microwave cavities.

- Invented and demonstrated the **continuously guided atom interferometer** which requires only a single optical zone. Because of its inherent simplicity, this device is potentially a better candidate for a practical rotation sensor than other interferometers that use multiple zones of excitations.

- Invented a technique for **arbitrary-pattern nanolithography with a resolution of 2 nm** via **Bose-Condensate based atom interferometry**. This process is suitable for taking a conventional optical lithography mask, and converting it to an atomic pattern, which in turn can be transferred to useful materials such as metals and semiconductors. With the emerging maturation of the technology for producing Bose-condensates, this technique may prove to be of practical interest in the near future.

D. PUBLICATION SUMMARY:

ISI Web of Science H-factor: 23
Google Scholar H-Factor: 31

Summary of Journal Publication:

- Number of Journal Papers Published: **131**
- Number of Journal Papers Preprints: **15**
- Average Number of Publications Per Year Since Getting Ph.D.: **6**

Summary of Conference Publication:

- Number of Total Conference Publications/Presentations: **265** (This includes **80** invited papers, **6** post-deadline papers, and 3 **plenary** talks)
- Average Number of Conference Publications Per Year Since Getting Ph.D.: **12**

Books, Book Chapters and Editing List

1. "Advanced Optical and Quantum Memories and Computing IV," Proceedings of Opto Conference 6482-07, SPIE Photonics West 2007, edited by Z.U. Hasan, A.E. Craig, and M.S. Shahriar.
2. "Advances in Slow and Fast Light I," Proceedings, SPIE Photonics West 2008, edited by M.S. Shahriar, P.R. Hemmer, and John Lowell.
3. "Quantum Electronic Metrology I," Proceedings, SPIE Photonics West 2008, edited by A.E. Craig and M.S. Shahriar.
4. "Advances in Slow and Fast Light II," Proceedings, SPIE Photonics West 2009, edited by M.S. Shahriar, P.R. Hemmer, and John Lowell.
5. "Advances in Slow and Fast Light III," Proceedings, SPIE Photonics West 2010, edited by M.S. Shahriar and P.R. Hemmer.
6. "Advances in Slow and Fast Light IV," Proceedings, SPIE Photonics West 2011, edited by M.S. Shahriar and P.R. Hemmer.
7. "Advances in Slow and Fast Light V," Proceedings, SPIE Photonics West 2012, edited by M.S. Shahriar and F. Narducci.
8. "Advances in Slow and Fast Light VI," Proceedings, SPIE Photonics West 2013, edited by M.S. Shahriar and F. Narducci.
9. "Advances in Slow and Fast Light VII," Proceedings, SPIE Photonics West 2013, edited by M.S. Shahriar and F. Narducci.
10. "Holography for the New Millennium," Jacques E. Ludman, H. John Caulfield, Juanita Riccobono, edited, Springer, 2002, co-authored the chapter on "Page Oriented, Bragg Selective, Holographic Memories."

11. "Fast Light: Fundamentals and Application," Selim M. Shahriar, edited, to be published by Cambridge University Press (2015)
12. "Rapid Introduction to Quantum Mechanics," Selim M. Shahriar, to be published by Cambridge University Press (2015)
13. "Atomics: Fundamental and Application," Selim M. Shahriar, to be published by Cambridge University Press (2015)

Journal Publication List:

Journal Papers Published/In-Press (Total: 131)

1. "Optically controlled waveplate at a telecom wavelength using a ladder transition in Rb atoms for all-optical switching and high speed Stokesmetric imaging," S. Krishnamurthy, Y. Tu, Y. Wang, S. Tseng, and M.S. Shahriar, to appear in Optics Express (2014)

2. "Rydberg assisted light shift imbalance induced blockade in an atomic ensemble," Y. Tu, M. E. Kim, and M.S. Shahriar, to appear in Optics Communications (2014)

3. "Incorporation of Polar Mellin Transform in a Hybrid Optoelectronic Correlator for Scale and Rotation Invariant Target Recognition," Mehjabin S. Monjur, Shih Tseng, Renu Tripathi, and M.S. Shahriar, J. Opt. Soc. Am. A, Vol. 31, No. 6, pp. 1259-1272 (June 2014)

4. "First all-sky search for continuous gravitational waves from unknown sources in binary systems," J. Aasi, M.S. Shahriar, et al., Physical Review D 90, 062010, pp. 1-17, (September, 2014).

5. "Implementation of an F-statistic all-sky search for continuous gravitational waves in Virgo VSR1 data," J. Aasi, M.S. Shahriar, et al., Class. Quantum Grav. 31, 165014, pp. 1-27, (August, 2014).

6. "Search for Gravitational Waves Associated with γ-ray Bursts Detected by the Interplanetary Network," J. Aasi, M.S. Shahriar, et al., Physical Review Letters 113, 011102, pp. 1-10, (July, 2014).

7. "Methods and results of a search for gravitational waves associated with gamma-ray bursts using the GEO 600, LIGO, and Virgo detectors," J. Aasi, M.S. Shahriar, et al., Physical Review D 89, 122004, pp. 1-17, (June, 2014).

8. "Search for gravitational radiation from intermediate mass black hole binaries in data from the second LIGO-Virgo joint science run," J. Aasi, M.S. Shahriar, et al., Physical Review D 89, 122003, pp. 1-15, (June, 2014).

9. “Search for gravitational wave ringdowns from perturbed intermediate mass black holes in LIGO-Virgo data from 2005–2010,” J. Aasi, M.S. Shahriar, et al., Physical Review D 89, 102006, pp. 1-18, (May, 2014).

10. “The NINJA-2 project: detecting and characterizing gravitational waveforms modelled using numerical binary black hole simulations, “ J. Aasi, M.S. Shahriar, et al., Class. Quantum Grav. 31, 115004, pp. 1-45, (May, 2014).

11. “Gravitational Waves From Known Pulsars: Results From The Initial Detector Era,” J. Aasi, M.S. Shahriar, et al., The Astrophysical Journal, 785:119, pp 1-18, (April, 2014).

12. “Constraints on Cosmic Strings from the LIGO-Virgo Gravitational-Wave Detectors,” J. Aasi, M.S. Shahriar, et al., Physical Review Letters 112, 131101, pp. 1-10, (April, 2014).

13. “Application of a Hough search for continuous gravitational waves on data from the fifth LIGO science run,” J. Aasi, M.S. Shahriar, et al., Class. Quantum Grav. 31, 085014, pp. 1-35, (April, 2014).

14. “First Searches For Optical Counterparts To Gravitational-Wave Candidate Events,” J. Aasi, M.S. Shahriar, et al., The Astrophysical Journal, Supplement Series, 211:7, pp 1-25, (March, 2014).

15. “Evolution of an N-level system via automated vectorization of the Liouville equations and application to optically controlled polarization rotation,” M.S. Shahriar, Ye Wang, S.Krishnamurthy, Y. Tu , G.S. Pati, and S. Tseng, Volume 61, Issue 4, pp. 351-367 (February 2014).

16. “Hybrid Optoelectronic Correlator Architecture for Shift Invariant Target Recognition,” Mehjabin S. Monjur, Shih Tseng, Renu Tripathi, John Donoghue, and M.S. Shahriar, J. Opt. Soc. Am. A, Vol. 31, Issue 1, pp. 41-47, (January, 2014).

17. “Optically controlled polarizer using a ladder transition for high speed Stokesmetric Imaging and Quantum Zeno Effect based optical logic,” K. Subramanian, Y. Wang, S. Tseng, Y. Tu, and M.S. Shahriar, Optics Express, Vol. 21, Issue 21, pp. 24514-24531 (Oct, 2013).

18. “Trap-door optical buffering using top-flat coupled microring filter: the superluminal cavity approach,” J. Scheuer and M. S. Shahriar, Optics Letters Vol. 38, Iss. 18, pp. 3534–3537 (Sept, 2013)

19. “Demonstration of white light cavity effect using stimulated Brillouin scattering in a fiber loop,” H. N. Yum, J. Scheuer, Senior Member, IEEE, M. Salit, P. R. Hemmer and M. S. Shahriar, Journal of Lightwave Technology, 31 No. 23, 3865-3872 (Dec, 2013)

20. “Search for long-lived gravitational-wave transients coincident with long gamma-ray bursts,” J. Aasi, M.S. Shahriar, et al., Physical Review D 88, 122004 (Dec. 2013)

21. “Directed search for continuous gravitational waves from the Galactic center,” J. Aasi, M.S. Shahriar, et al., Physical Review D 88, 102002 (Nov. 2013)

22. “Enhanced sensitivity of the LIGO gravitational wave detector by using squeezed states of light,” J. Aasi, M.S. Shahriar, et al., Nature Photonics, Vol. 7, pp. 613-619 (Aug, 2013)

23. “Effective dispersion in an inhomogeneously broadened single mode laser,” T.Y. Abi-Salloum, J. Yablon, S. Tseng, M. Salit, and M.S. Shahriar, Journal of Modern Optics, Vol. 60, No. 11, 880-885 (Aug, 2013).

24. “The fundamental limitations on the practical realizations of white light cavities,” H. N. Yum, X. Liu, P. R. Hemmer, J. Scheuer, and M. S. Shahriar, Optics Communications 305, pp 260-266 (May, 2013)

25. “Theoretical study on Brillouin fiber laser sensor based on white light cavity,” O. Kotlicki, J. Scheuer, and M.S. Shahriar, Optics Express, Vol. 20, Issue 27, pp 28234-28248, 17 December (2012).

26. “Visualization of superluminal pulses inside a white light cavity using plane wave spatio temporal transfer functions,” H. N. Yum, Y. J. Jang, X. Liu, and M. S. Shahriar, Optics Express, Vol. 20, Issue 17, pp. 18898-18910, 13 August (2012).

27. “High efficiency optical modulation at a telecom wavelength using the quantum Zeno effect in a ladder transition in Rb atoms,” S. Krishnamurthy, Y. Wang, Y. Tu, S. Tseng, and M.S. Shahriar, Optics Express 13798, Vol. 20, No. 13, 18 June (2012).

28. “Automated Stokesmetric Imaging Laser Radar System,” X. Liu, S. C. Tseng, R. Tripathi, and M.S. Shahriar, Optical Engineering 51(7), 073201 (July 2012).

29. “Connecting processing-capable quantum memories over telecommunication links via quantum frequency conversion,” M.S. Shahriar, P. Kumar, and P.R. Hemmer, J. Phys. B: At. Mol. Opt. Phys. 45, 124018 (June, 2012).

30. “Observation of query pulse length dependent Ramsey interference in rubidium vapor using pulsed Raman excitation,” G. S. Pati, F. K. Fatemi, and M.S. Shahriar, Optics Express, Vol. 19, No. 23, 22388 (2011).

31. “Ultra-Low Power, Zeno Effect Based Optical Modulation in a Degenerate V-System with a Tapered Nanofiber in Atomic Vapor,” K. Salit, M. Salit, K. Subramanian, Y. Wang, P. Kumar, and M.S. Shahriar, Optics Express, Vol. 19, No. 23, 22874 (2011).

32. “A long-distance quantum repeater gets one step closer,” Selim M. Shahriar, Physics 4, 58 (2011).

33. “Pulse delay via tunable white light cavities using fiber optic resonators”, H.N. Yum, X. Liu, Y. Jang, M. Kim, and M.S. Shahriar, Journal Of Lightwave Technology, Vol. 29, No. 18, September 15 (2011).

34. “White Light Interferometric Detection of Unpolarized Light for Complete Stokesmetric Optical Coherence Tomography,” X. Liu, S. C. Tseng, R. Tripathi, A. Heifetz, and M.S. Shahriar, Optics Communications 284 (2011) 3497–3503

35. “Distortion free pulse delay system using a pair of tunable white light cavities” H. N. Yum, M. E. Kim, Y. J. Jang, and M. S. Shahriar, Optics Express, Vol. 19, Issue 7, pp 6705 (2011).

36. “Pump-probe model for the Kramers-Kronig relations in a laser,” H.N. Yum and M. S. Shahriar, J. Opt. 12, 104018 (2010).

37. “Superluminal ring laser for hypersensitive sensing,” H.N. Yum, M. Salit, J. Yablon, K. Salit, Y. Wang, and M.S. Shahirar, Optics Express, Vol. 18, Issue 17, pp. 17658-17665 (2010).

38. “Enhancement of Sensitivity-Bandwidth Product of Interferometric Gravitational Wave Detectors using White Light Cavities,” M. Salit and M.S. Shahriar, J. Opt. 12, 104014 (2010).

39. “Effects of Parameter Variations and Noises on a Double-Raman White Light Cavity,” Q. Sun, M.S. Shahriar, and M.S. Zubairy, Phy. Rev. A **81**, 033826 (2010).

40. "Simultaneous slow and fast light effects using probe gain and pump depletion via Raman gain in atomic vapor," G. S. Pati, M. Salit, K. Salit, and M. S. Shahriar, Opt. Express **17**, 8775-8780 (2009).

41. “A Volume-Grating Stokesmeter based on a Photonic Band Gap Structure,” J-K. Lee, J.T. Shen, and M.S. Shahriar, Applied Optics, Vol. 48 Issue 17, pp.3212-3215 (2009).

42. “A High Speed Inline Holographic Stokesmeter,” X. Liu, A. Heifetz, S.C. Tseng, and M.S. Shahriar, Applied Optics, Vol. 48 Issue 19, pp.3803-3808 (2009).

43. “Optical limiting in a periodic material with relaxational nonlinearity,” X. Liu, J.W. Haus, and M. S. Shahriar, Optics Express, Vol. 17 Issue 4, pp. 2696-2706 (2009)

44. “Suppression of error in qubit rotations due to Bloch–Siegert oscillation via the use of off-resonant Raman excitation,” P. Pradhan, G. Cardoso, and M.S. Shahriar , *J. Phys. B: At. Mol. Opt. Phys.* **42** No 6 (28 March 2009) 065501.

45. “Holographic Optical Beam Combining, Splitting and Cross-Coupling: Numerical Analysis and Experimental Investigation,” H.N.Yum, P.R. Hemmer, R. Tripathi, and M.S. Shahriar, Journal of Holography and Speckles, Volume 5, Number 2, August, pp. 197-209(13) (2009).

46. “A Simple Method for Bragg Diffraction in Volume Holographic Gratings,” J. T. Shen, A. Heifetz, and M. S. Shahriar, Am. J. Phys. **77** 623 (2009).

47. “Fast-Light in a Photorefractive Crystal for Gravitational Wave Detection,” H.N. Yum, M. Salit, G.S. Pati, S. Tseng, P.R. Hemmer, and M.S.Shahriar, Optics Express, Vol. 16 Issue 25, pp.20448-20456 (2008)

48. "Application of Fast Light in Gravitational Wave Detection with Interferometers and Resonators," M.S. Shahriar and M. Salit, Journal of Modern Optics Vol. 55, Nos. 19–20, 10–20 November 2008, 3133–3147

49. "Modulation instability for a relaxational Kerr medium," X. Liu, J. Haus and M.S. Shahriar, Optics Communications, 281, 2907-2912 (2008).

50. "Observation of Ultra-Low Light Level Nonlinear Optical Interactions in a Tapered Optical Nanofiber Embedded in a Hot Rubidium Vapor," S. Spillane, G.S. Pati, K. Salit, M. Hall, P. Kumar, R. Beausoleil, and M.S. Shahriar, Phys. Rev. Lett. 100, 233602 (2008).

51. "Electromagnetically induced transparency inside the laser cavity: switch between first-order and second-order phase transitions," Q. Sun, M.S. Shahriar, and M.S. Zubairy, Phys. Rev. A 78, 013805 (2008).

52. "Demonstration of displacement–measurement–sensitivity proportional to inverse group index of intra-cavity medium in a ring resonator," G.S. Pati, M. Salit, K. Salit, and M.S. Shahriar, Optics Communications, 281 (19), p.4931-4935, (2008).

53. "Demonstration of Raman-Ramsey fringes using time delayed optical pulses in rubidium vapor," G.S. Pati, K. Salit, and M.S. Shahriar, Optics Communications, 281 (18), p.4676-4680, (2008).

54. "Angular Directivity of Diffracted Wave in Bragg-Mismatched Readout of Volume Holographic Gratings," A. Heifetz, J.T. Shen, S.C. Tseng, G.S. Pati, J.-K. Lee, M.S. Shahriar, Optics Communications 280, 311-316, (December, 2007).

55. "Fast-Light for Astrophysics: Super-sensitive Gyroscopes And Gravitational Wave Detectors," M. Salit, G.S. Pati, K. Salit, and M.S. Shahriar, Journal of Modern Optics, Volume 54, Issue 16 & 17, pages 2425 – 2440, (November 2007).

56. "Light-Shift Imbalance Induced Blockade of Collective Excitations Beyond the Lowest Order," M.S. Shahriar, P. Pradhan, G.S. Pati, and K. Salit, Optics Communications, 278, 94-98, (October, 2007).

57. "Demonstration of a Tunable-Bandwidth White Light Interferometer using Anomalous Dispersion in Atomic Vapor," G.S. Pati, M. Salit, Messal, K. Salit, and M.S. Shahriar, Phys. Rev. Lett. 99, 133601 (September 28, 2007).

58. "Demonstration of a spectrally scanned holographic Stokesmeter," Jong-Kwon Lee, John.T. Shen, Alex. Heifetz, and M.S. Shahriar, Optics Communications 277, 63-66, (September , 2007).

59. "Quantum Communication and Computing With Atomic Ensembles Using Light-Shift Imbalance Induced Blockade," M.S. Shahriar, G.S. Pati, and K. Salit, Physical Review A 75 (2): Art. No. 022323 FEB 2007.

60. "Ultrahigh enhancement in absolute and relative rotation sensing using fast and slow light", M.S. Shahriar, G.S. Pati, R. Tripathi, V. Gopal, M. Messall and K. Salit, Physical Review A 75 (5): Art. No. 053807 MAY 2007.

61. "Experimental constraints of using slow-light in sodium vapor for light-drag enhanced relative rotation sensing," R. Tripathi, G.S. Pati, M. Messall, K. Salit and M.S. Shahriar, Optics Communications. 266, (2006) 604-608.

62. "Wavelength locking via teleportation using distant quantum entanglement and Bloch-Siegert oscillation," M.S. Shahriar, P. Pradhan, V. Gopal, J. Morzinski, G. Cardoso, and G.S. Pati, Optics Communications 266, (2006) 349–353.

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Journal Papers Under Review / Preprints

132. "Generalized collective states and their role in a collective-state atomic interferometer and atomic clock", R. Sarkar, M. E. Kim, R. Fang, Y. Tu, and M.S..Shahriar, submitted to Phys.Rev. A (preprint available at http://arxiv.org/abs/1408.2296)
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134. An N-atom Collective State Atomic Clock with Root-N Fold Increase in Effective Frequency and Root-N Fold Reduction in Fringe Width, " (2014), M. E. Kim, R. Sarkar, R. Fang, and M.S. Shahriar, submitted to Phys. Rev. A (preprint available at http://arxiv.org/abs/1410.2268)
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137. "A Superluminal Ring Laser for High-Sensitivity Accelerometry," J. Yablon, S. Tseng and M.S. Shahriar, preprint, to be submitted to Optics Express
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141. "Computational Studies of Light Shift in Raman-Ramsey Interference-Based Atomic Clock," G. S. Pati1, Z. Warren, N. Yu, and M.S. Shahriar, to be submitted to Optics Communications.
142. "A subluminal ring laser: modeling, stability, and applications," Z. Zhou, J. Yablon, Y. Wang, and M.S. Shahriar, preprint, to be submitted to Optics Communications.
143. "Theoretical modeling of a DPAL based superluminal laser and comparison with experiment ," Z. Zhou, J. Yablon, Y. Wang, D. Hilleman, S. Tseng, and M.S. Shahriar, preprint, to be submitted to Optics Express.
144. "All Optical Three Dimensional Spatio-Temporal Correlator for Video Clip Recognition," M. S. Monjur and M.S. Shahriar, preprint, to be submitted to JOSA A.
145. "Photon lifetime and the linewidth in a superluminal laser," J. Scheuer and M.S. Shahriar, preprint, to be submitted to Optics Express.
146. "Generation of Arbitrary Lithographic Patterns and Three-Dimensional Atomic Holograms Using BEC Interferometry," M.F. Fouda, R. Fang, M.S. Monjur, J. Ketterson and M.S. Shahriar, preprint, to be submitted to Phys. Rev. A.

Conference Publication List:

1. "Quantum Noise Limit of the Sensitivity of a White Light Cavity Enhanced, Signal Recycled GW Detector," M.S. Shahriar and M. Zhou, LIGO-VIRGO Collaboration Meeting, Stanford University, Stanford, CA, August, 2014.

2. "Constraints in Collective State Atomic Interferometry Due to Inhomogeneities in Laser Intensity and Atomic Velocity," R. Sarkar, M. E. Kim, R. Fang, and M.S. Shahriar, in Proceedings of the Frontiers in Optics and Laser Science Conference, Tucson, AZ, October, 2014.

3. "All Optical Three Dimensional Spatio-Temporal Correlator for Video Clip Recognition," M. S. Monjur and M.S. Shahriar, in Proceedings of the Frontiers in Optics and Laser Science Conference, Tucson, AZ, October, 2014.

4. "Broadening the Sub-Standard-Quantum-Limit Region in Quantum Noise Limited Sensitivity for Gravitational Wave Detectors," M. Zhou and M.S. Shahriar, in Proceedings of the Frontiers in Optics and Laser Science Conference, Tucson, AZ, October, 2014.

5. "Hybrid optoelectronic correlator (HOC) architecture for shift, scale, and rotation invariant target recognition incorporating polar mellin transform (PMT)," M. Monjur, S. Tseng, and M.S. Shahriar, in Proceedings of the SPIE OPTO Conference, San Diego, CA, August, 2014.

6. "Rydberg excitation assisted light shift blockade in Rb atoms for realizing a collective state quantum bit and quantum memory," M.S. Shahriar, M.E. Kim, and Y. Tu, in Proceedings of the SPIE OPTO Conference, San Diego, CA, August, 2014 (**Invited**)

7. "Effect of Interatomic Separation in Ensembles in Determining the Fidelity of Collective Excitation," R. Sarkar, M.E. Kim, Y. Tu, R. Fang, and M.S. Shahriar, in Proceedings of the Division of Atomic, Molecular and Optical Physics Conference, Madison, WI, June, 2014.

8. "Collective State Raman Atomic Clock Using Trapped Atoms," M.E. Kim, R. Sarkar, R. Fang, Y. Tu, and M.S. Shahriar, in Proceedings of the Division of Atomic, Molecular and Optical Physics Conference, Madison, WI, June, 2014.

9. "Quantum Noise Limited Spectral Width of a Superluminal Laser for Gravitational Wave Detection," M.S. Shahriar, J. Scheuer, J. Yablon, and M. Zhou, in Proceedings of the 23rd Conference on Laser Physics, Sofia, Bulgaria, July, 2014 (**Invited**).

10. "Photon lifetime and the linewidth in a superluminal laser," J. Scheuer and M.S. Shahriar, in Proceedings of the Conference on Lasers and Electro-Optics, San Jose, CA, June, 2014.

11. "The Rydberg-assisted Light-shift Blockade for Ensemble Quantum Computing," M. E. Kim, Y. Tu, and M.S. Shahriar, in Proceedings of the Conference on Lasers and Electro-Optics, San Jose, CA, June, 2014.

12. “Quantum noise limit of the White-Light-Cavity assisted LIGO interferometer sensitivity,” M. Zhou and M.S. Shahriar, in Proceedings of the Conference on Lasers and Electro-Optics, San Jose, CA, June, 2014.

13. “Rotational sensitivity enhancement in a ring laser gyroscope using Raman gain,” Sean Spillane and M.S. Shahriar, SPIE Photonics West Conference, San Francisco, CA, February, 2014 (**Invited**).

14. “Coupled microrings data buffer using fast light,” Jacob Scheuer and M.S. Shahriar, SPIE Photonics West Conference, San Francisco, CA, February, 2014 (**Invited**).

15. “A subluminal ring laser: modeling, stability, and applications,” Zifan Zhou, Joshua Yablon, Minchuan Zhou, M.S. Shahriar, SPIE Photonics West Conference, San Francisco, CA, February, 2014.

16. “Quantum noise limits in fast-light enhanced gravitational wave detectors,” Minchuan Zhou, Jacob Scheuer, Joshua Yablon, M.S. Shahriar, SPIE Photonics West Conference, San Francisco, CA, February, 2014.

17. “Investigations of AC Stark Shift in Pulsed Raman-Ramsey Interaction for Vapor Cell Clock Development,” Gour Pati and M.S. Shahriar, SPIE Photonics West Conference, San Francisco, CA, February, 2014 (**Invited**).

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21. “Generation of Arbitrary Lithographic Patterns and Three-Dimensional Atomic Holograms Using BEC Interferometry,” M.F. Fouda, R. Fang, M.S. Monjur, J. Ketterson and M.S. Shahriar, OSA Annual Meeting, Orlando, FL, October 2013.

22. “Stabilization, Tuning and Optimization of Relative Phases of Reference Interferometers in a Hybrid Optoelectronic Correlator,” M.S. Monjur, S. Tseng, and M.S. Shahriar, OSA Annual Meeting, Orlando, FL, October 2013.

23. “Sensitivity Enhancement via Detection of Interference With All Orders in a Collective State Atom Interferometer,” Resham Sarkar, May E. Kim, Yanfei Tu, and Selim Shahriar, OSA Annual Meeting, Orlando, FL, October 2013.

24. "Buffer-Gas Assisted High Speed Optical Modulator using Ladder Transitions in Rb," Subramanian Krishnamurthy, Y. Wang, Y. Tu, S. Tseng, and M.S. Shahriar, OSA Annual Meeting, Orlando, FL, October 2013.

25. "Rydberg Interaction Assisted Light Shift Blockade Of Collective Excitations For Quantum Information Processing," Y. Tu, M. Kim, R. Sarkar, and M.S. Shahriar, OSA Annual Meeting, Orlando, FL, October 2013.

26. "Investigation of a Superluminal Ring Laser using Double-Raman Gain," Y. Wang, J. Yablon, Zifan Zhou, S. Tseng, S. Neda, Y. Tu, T. Abi-Salloum, and M.S. Shahriar, OSA Annual Meeting, Orlando, FL, October 2013.

27. "From Hypersensitive Gyroscopy to Gravitational Wave Detection: Superluminal Ring Laser as a Holy Grail of Precision Metrology," Selim M. Shahriar, Frontiers in Nonlinear Physics, Nizhniy Novgorod, Russia, July 2013 (**Invited**).

28. "New Directions in Atom Optics: Collective State Atomic Interferometry and Atomic Holography with BEC," Selim M. Shahriar, Quantum Optics and Nanomaterials VI, Beijing, China, May 2013. (**Invited**).

29. "Superluminal ring laser gyroscopes and accelerometers for hypersensitive and compact inertial measurement units," Selim M. Shahriar, Joshua Yablon, Zifan Zhou, Ye Wang, Shih Tseng, SPIE Optics and Photonics conference, San Diego, CA, August, 2013. (**Invited**).

30. "Verification of light shift blockade via collective state Raman-Rabi oscillations for ensemble based quantum computing," Selim M. Shahriar, May Kim, Yanfei Tu, Resham Sarkar, SPIE Optics and Photonics conference, San Diego, CA, August, 2013. (**Invited**).

31. "Effect of Interatomic Separation and Spatial Spread of Individual Atoms in a Collective State Interferometer," Resham Sarkar, May E. Kim, Yanfei Tu, and Selim M. Shahriar, Conference on Lasers and Electro-Optics, San Jose, CA, June 2013.

32. "Application of Hybrid Optoelectronic Correlator to Gabor Jet images for Rapid Object Recognition & Segmentation," Mehjabin Sultana Monjur, Shih Tseng, Adnan Mujahid, Nasir Rajpoot, and Selim M. Shahriar, Conference on Lasers and Electro-Optics, San Jose, CA, June 2013.

33. "Observation of Raman Resonance of a Probe in a Rb Cell Added to an Ethane-Rb Laser for Realizing a Superluminal Laser," Joshua Yablon, Shih Tseng, Zifan Zhou, Selim M. Shahriar, Conference on Lasers and Electro-Optics, San Jose, CA, June 2013.

34. "Double-Raman Gain for Realizing a Superluminal Ring Laser ," Ye Wang, Tony Abi-Salloum, Joshua Yablon, Shih Tseng, Yanfei Tu and Selim M. Shahriar, Conference on Lasers and Electro-Optics, San Jose, CA, June 2013.

35. “All-Optical Switch at Telecom Wavelength based on the Quantum Zeno Effect (QZE),” Subramanian Krishnamurthy, Ye Wang, Yanfei Tu, Shih Tseng; Selim M. Shahriar, Conference on Lasers and Electro-Optics, San Jose, CA, June 2013.

36. “Experimental verification of light shift imbalance induced blockade in an atomic ensemble via collective state Rabi oscillation and coincidence detection,” M. Kim, Y. Tu, S. Krishnamurthy and M.S. Shahriar, APS DAMOP conference in Quebec City, Canada, June 2013.

37. “Generation of atomic holograms using interferometry, digital holography and BEC”, R. Fang, M. Fouda, M. Monjoor, M. Kim, J. Trossman, J. Ketterson, and M.S. Shahriar, APS DAMOP conference in Quebec City, Canada, June 2013.

38. “Effect of Interatomic Separation and Wavepacket Spreading on the Behavior of a High Compton Frequency Collective State Interferometer, “ R. Sarkar, M. Kim, Y. Tu, and M.S Shahriar, APS DAMOP conference in Quebec City, Canada, June 2013.

39. “Optically controlled polarizer and waveplate at telecom wavelength for Quantum Zeno Effect based all-optical switch,” S. Krishnamurthy, Y. Wang, Y. Tu, S. Tseng and M.S. Shahriar, APS DAMOP conference in Quebec City, Canada, June 2013.

40. “Superluminal Ultrasensitive Optical Gyroscope in an Inverted Double-Raman Lambda System,” T.Y. Abi-Salloum, Y. Wang, J. Yablon, S. Tseng, Z. Zhu and M.S. Shahriar, APS DAMOP conference in Quebec City, Canada, June 2013.

41. “Verification of light shift imbalance induced blockade in an atomic ensemble via collective state Rabi oscillations,” M. Kim, Y. Tu, S. Tseng, R. Sarkar, M. Fouda, and M.S. Shahriar, Conference on Quantum Information And Computation XI (DS222), SPIE International Symposium on Defense, Security and Sensing, 29 April - 3 May 2013, Baltimore, MD, USA.

42. “Progress towards the demonstration of a superluminal DPAL ring laser,” J. Yablon, S. Tseng and M.S. Shahriar, SPIE Photonics West, San Francisco, CA, 2013.

43. “Brillouin fast-light fiber laser super-sensor,” O. Kotlicki, Jacob Scheuer, and M.S. Shahriar, SPIE Photonics West, San Francisco, CA, 2013 (invited).

44. “A comprehensive study of light shift in optical Ramsey interference for estimating the performance of a rubidium vapor cell atomic clock,” G. S. Pati, Z. Warren and M.S. Shahriar, SPIE Photonics West, San Francisco, CA, 2013 (invited).

45. “A Brillouin fast light fiber laser sensor,” O. Kotlicki, Jacob Scheuer, and M.S. Shahriar, Optical Fiber Sensor 22, Beijing, China, 2012 (invited).

46. “Interferometry with Atom Lasers and Schrodinger Cats: Nanolithography, Atomic Holograms, and High Compton Frequency Gyroscopes,” M.S. Shahriar, M. Fouda, R.P. Fang, R. Sarkar, M. Kim, and Y. Tu, presented at the Laser Physics Conference 12, Calgary, Alberta, CA, 2012 (invited).

47. “Demonstration of a Tunable Narrowband-Pumped Ring Alkali Laser for Superluminal Applications,” J. Yablon, S. Tseng, Y. Wang, T. Abi-Salloum, and M.S. Shahriar, presented at the OSA annual meeting, Rochester, NY (2012).

48. “An Optoelectronic Correlator Architecture for Shift, Scale & Rotation Invariant Target Recognition,” M.S. Monjur, S. Tseng, P. Schnettler, R. Tripathi, and M.S. Shahriar, presented at the OSA annual meeting, Rochester, NY (2012).

49. “Cold Atom Based Ballistic Single Zone Atom Interferometer,” R. Sarkar, M.E. Kim, M. Fouda, Y. Tu, S. Tseng, and M.S. Shahriar, presented at the OSA annual meeting, Rochester, NY (2012).

50. “Quantum Zeno effect based high speed optical modulator at a telecom wavelength in a ladder transition in Rb atoms,” K. Subramanian, Y. Wang, S. Tseng, Y. Tu, and M.S. Shahriar, presented at the OSA annual meeting, Rochester, NY (2012).

51. “Ultra-low Power Optical Modulation within Tapered Nano-fiber using 5S-5P-5D Ladder Transition of Rb Atoms,” Y. Wang, K. Subramanian, S. Tseng, Y. Tu, and M.S. Shahriar, presented at the OSA annual meeting, Rochester, NY (2012).

52. “A Schrödinger Cat Matter Wave Gyroscope Using Collective Excitation of Atomic Ensembles,” R. Sarkar, M. Kim and M.S. Shahriar, DAMOP, 2012, Anaheim, CA.

53. “Atom Interferometric Holography and Arbitrary Pattern Nanolithography Using Bose-Einstein Condensates,” M. Fouda, R. Fang, M. Kim, J. Trossman, J. Ketterson, and M.S. Shahriar, DAMOP, 2012, Anaheim, CA.

54. “Enhanced Sensitivity in a Superluminal Single Mode DPAL Cavity at Room Temperature,” Tony Abi-Salloum and M.S. Shahriar, DAMOP, 2012, Anaheim, CA

55. “Light-Shift Blockaded Collective States for Atomic Interferometry and Quantum Information Processing,” M. Kim, Y. Tu, R.P. Fang and M.S. Shahriar, presented at the Midwest Cold Atom Workshop, Evanston, November 2011 (invited).

56. “Ultra-High Compton Frequency Atomic Interferometric Gyroscope Using Collective States,” R. Sarkar, M. Kim, Y. Tu and M.S. Shahriar, presented at the Conference on Lasers and Electro-Optics, Anaheim, CA, May 2012

57. “Enhancement of Sensitivity of an Atom Interferometer by a Factor of N Using High Compton Frequency of N-atom Collective-States,” R. Sarkar, M. Kim, Y. Tu and M.S. Shahriar, presented at the Physics of Quantum Electronics conference, Snowbird, Utah, January 2012 (invited).

58. “Effect of Zeeman sublevels on light shifts in CPT-based Raman-Ramsey atomic clocks,” G.S. Pati and M.S. Shahriar, presented at the SPIE Photonics West, 2012, San Francisco, CA (invited).

59. “Sensitivity enhancement in a superluminal semiconductor optical amplifier ring laser,” S. Spillane and M.S. Shahriar, presented at the SPIE Photonics West, 2012, San Francisco, CA (invited).

60. “A Brillouin gain based fast light fiber laser for sensing applications,” J. Scheuer and M.S. Shahriar, presented at the SPIE Photonics West, 2012, San Francisco, CA (invited).

61. “Effect of inhomogeneous broadening and buffer-gas collisions on a DPAL based Superluminal laser for precision sensing,” T. Abi-Salloum and M.S. Shahriar, presented at the SPIE Photonics West, 2012, San Francisco, CA (invited).

62. “Rb-based superluminal DPAL laser: properties and applications to sensing,” J. Yablon, S. Tseng, and M.S. Shahriar, presented at the SPIE Photonics West, 2012, San Francisco, CA.

63. “Constant- and variable-chirp gratings for a broadband white light cavity for data buffering,” X. Liu, H. Yum, P.R. Hemmer and M.S. Shahriar, presented at the SPIE Photonics West, 2012, San Francisco, CA.

64. “Ultrafast Automatic Target Recognition System using a Hybrid Holography-FPA-VLSI Correlator Invariant Under Shift, Rotation and Scaling,” M.S. Shahriar, presented at the SPIE Photonics West, 2012, San Francisco, CA (invited).

65. “An Inhomogeneously Broadened Superluminal Ring Laser for Rotation Sensing and Accelerometry,” J. Yablon, S. Tseng, M. Salit and M.S. Shahriar, presented at the OSA annual meeting, San Jose, CA, Oct. 2011.

66. “Optically Controlled Waveplate at a Telecom Wavelength Using a Ladder Transition in Rb Atoms for All-Optical Switching via the Quantum Zeno Effect,” K. Subramanian, Y. Wang, S. Tseng, Y. Tu, and M.S. Shahriar, presented at the OSA annual meeting, San Jose, CA, Oct. 2011.

67. “High Efficieny, High Speed Optical Modulation at a Telecom Wavelength Using the Quantum Zeno Effect in a Ladder Transition in Rb Atoms,” K. Subramanian, Y. Wang, Y. Tu, S. Tseng, and M.S. Shahriar, presented at the OSA annual meeting, San Jose, CA, Oct. 2011.

68. “A White Light Cavity Using Chirped Gratings for Optical Data Buffering,”
H. Yum, P.R. Hemmer, X. Liu, and M.S. Shahriar, presented at the OSA annual meeting, San Jose, CA, Oct. 2011.

69. “Quantum Information Processing with Light Shift Blockaded Atomic Ensembles Coupled to a Cavity,” M.S. Shahriar, M. Kim and Y. Tu, presented at the SPIE Quantum Communications and Quantum Imaging IX Conference (OP514), San Diego, California, August 2011 (**Invited**)

70. “An Ultra-sensitive DC and AC Accelerometer Using Dual Superluminal Zero-Area L-shaped Ring Lasers.” S.M. Shahriar, S. Tseng, J. Yablon, and H. Yum, presented at the Conference on Lasers and Electro-Optics, Baltimore, MD 2011 (http://www.opticsinfobase.org/abstract.cfm?URI=CLEO:%20A%20and%20T-2011-ATuE1) .

71. “Demonstration of a Video Frame Rate Full Muller-metric Eye-safe Imaging Laser Radar” S. M. Shahriar, S. Tseng and X. Liu, presented at the Conference on Lasers and Electro-Optics, Baltimore, MD 2011.

72. “A Chirped Grating Based White Light Cavity for High-Speed Data Buffering and Gravitational Wave Detection” Young Jang, Honam Yum, P.R. Hemmer, and M.S. Shahriar, presented at the SPIE Photonics West, 2011, San Francisco, CA.

73. “Optical Ramsey Interference and Its Performance in D1 Line Excitation in Rubidium Vapor for Implementation of a Vapor Cell Clock,” Gour Pati, Fredrik Fatemi, Mark Bashkansky, and M.S. Shahriar, presented at the SPIE Photonics West, 2011, San Francisco, CA (invited).

74. " Theoretical Description and Design of a Fast-Light Enhanced Helium-Neon Ring-Laser Gyroscope ", J. Schaar, H. Yum, and M.S. Shahriar, Proc. SPIE 7949, Advances in Slow and Fast Light IV, 794914 (February 17, 2011); doi:10.1117/12.880786; http://proceedings.spiedigitallibrary.org/proceeding.aspx?articleid=722633 presented at the SPIE Photonics West, 2011, San Francisco, CA (invited).

75. “ Pulse propagation through a dispersive intracavity medium” Honam Yum, Young Jang, and M.S. Shahriar, presented at the SPIE Photonics West, 2011, San Francisco, CA.

76. “A zero-area Sagnac Superluminal Ring Laser for High-Sensitivity Accelerometry” Joshua Yablon, Honam Yum, Yanfei Tu, and M.S. Shahriar, presented at the SPIE Photonics West, 2011, San Francisco, CA.

77. “Ultra-sensitive Acclerometry Using Anomalous Dispersion in a Sagnac Laser,” J. Yablon, H. Yum, and M.S. Shahriar, presented at the OSA Annual Meeting, Rochester, NY (2010)

78. “Ultra-sensitive Sensing with A Superluminal Ring Laser,” H. Yum, J. Yablon, Y. Wang and M.S. Shahriar, presented at the OSA Annual Meeting, Rochester, NY (2010).

79. “Demonstration of a White Light Cavity for High-Speed Data Buffer Using Bi-Frequency Pumped Brillouin Gain,” H. Yum, M. Kim, P.R. Hemmer and M.S. Shahriar, presented at the OSA Annual Meeting, Rochester, NY (2010).

80. “An Automated Stokesmetric Imaging Laser Radar,” S. Tseng, X. Liu, and M.S. Shahriar, presented at the OSA Annual Meeting, Rochester, NY (2010).

81. “Electromagnetically induced transparency inside the laser cavity: Switch between first-order and second-order phase transitions,” Q. Sun, M.S. Shahriar, and S. Zubairy, Joint Fall Meeting of the Texas Sections of the APS, AAPT, and SPS, (2009), Postdeadline Paper.

82. Yum, H., Salit, M., Yablon, J., Salit, K., Wang, Y., and Shahriar, M. S. (2010). Ultra-precise Rotation Sensing with a Superluminal Ring Laser, Proceedings of IEEE SENSORS Conference, Hawaii, September (invited). Pages 10-14. Can be found on line at http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=5690987

83. "Properties and Applications of a Superluminal Ring Laser: Accelerometry, Rotation Sensing, and Gravitational Wave Detection," M.S. Shahriar, H. Yum, and J. Yablon, presented at the International Conference on Laser Physics 10, Iguazu Falls, Brazil, July 2010 (invited)
84. "Fast-Light in Optical Fiber Resonator: White Light Cavity, High Speed Data Buffering and Rotation Sensing," M.S. Shahriar, J. Yablon, M.E. Kim and H. Yum, European Conference on Optical Communication, Torino, Italy, October, 2010 (invited)

85. "High Bandwidth, Ultra-Low Power All Optical Modulation with a Nano-Fiber Embedded in Rb Vapor," K. Salit, M. Salit, S. Krishnamurthy, Y. Wang, P. Kumar, and M.S. Shahriar, presented at the Conference on Lasers and Electro-Optics, San Jose, CA, May 2010.

86. "A Compound Mirror Incorporating a Fast-Light Medium for Gravitational Wave Detection with High Sensitivity, Broadband Signal Recycling," M.S. Shahriar and M. Salit, presented at the Conference on Lasers and Electro-Optics, San Jose, CA, May 2010.

87. "Prospect for Development of Pulsed CPT Raman Ramsey Clock using Atomic Vapor" G. S. Pati, F. K. Fatemi, M. Bashkansky, and M.S. Shahriar, proceedings of the SPIE Photonics West, San Francisco, CA, (January 2010) (invited).

88. "Superluminal Laser: Properties and Applications." H. Yum, J. Yablon, Y. Wang, P. Hemmer and M. S. Shahriar, presented at the SPIE Photonics West, San Francisco, CA, (January 2010).

89. "Superluminal Laser for Rotation Sensing and Other Application," M.S. Shahriar, H. Yum, J. Yablon, and Y. Wang, presented at the Stanford Photonic Research Center Annual Conference, Stanford, CA, Sept. 2009.

90. "Atto-Joules, High Bandwidth All Optical Modulation with a Nano-Fiber Embedded in Alkali Vapor," K. Salit, M. Salit, S. Krishnamurthy, Y. Wang, P. Kumar, and M.S. Shahriar, presented at OSA Annual Meeting, San Jose, CA, Oct. 2009.

91. "A White Light Cavity as a Non-Invasive, Compound Mirror for High Sensitivity, Broadband Signal Recycling in a Gravitational Wave Detector," M. Salit, H. Yum, and M.S. Shahriar, presented at OSA Annual Meeting, San Jose, CA, Oct. 2009.

92. "A 3CCD Imaging System Based on Holographic Gratings," M.S. Shahriar, X. Liu, and S. Tseng, presented at OSA Annual Meeting, San Jose, CA, Oct. 2009.

93. “Complete Two-Dimensional Muellermetric Imaging of Biological Tissue Using Heterodyned Optical Coherence Tomography,” M.S. Shahriar, X. Liu, and S. Tseng, presented at OSA Annual Meeting, San Jose, CA, Oct. 2009.

94. “Interdependence of Quantization of Massive Particles and Electromagnetic Fields, and the Need for Photons in Quantum Computing” M.S. Shahriar, SPIE Optical Engineering and Applications, Conference on *Nature of Light, What is a Photon*, San Diego, CA, August 2009, (**Plenary Talk**).

95. “Fast Light in Optical Fiber for Trap-Door Data Buffering” M.S. Shahriar, M. Salit and H.N. Yum, OSA Topical Meeting on Slow and Fast Light, Honolulu, HI, July 2009 (invited).

96. “Distortion Free, High Delay-Bandwidth Product Data Buffer Using Fast-Light Based White Light Cavities,” H.N. Yum, M. Salit, and M.S. Shahriar, presented at CLEO 2009 (Baltimore, MD)

97. "Putting Superluminosity to Work: From Data Buffering to Ultraprecise Magnetometry" M.S. Shahriar, M. Salit, and H. Yum, Physics of Quantum Electronics Conference, 2009, Snowbird, Utah (invited).

98. “Gravitational Wave Detection with active and passive superluminal cavities,” M.S. Shahriar, Laser Physics Conference, 2009, Barcelona, Spain.

99. “A Superluminal Ring Laser as a Versatile, Hypersensitive Sensor” M. Salit, H. Yum, and M.S. Shahriar, Proceedings of SPIE Photonics West, San Jose, CA, (January 2009) (invited).

100. “Buffering and Sensing Applications of SBS Induced Fast Light in a Fiber Resonator” H. Yum, P. Hemmer, M. Salit and M.S. Shahriar, Proceedings of SPIE Photonics West, San Jose, CA, (January 2009) (invited).

101. “High-Speed, Ultra-low Light Level Optical Switching with a Nano-fiber via Degenerate V-System EIT” K. Salit, M. Salit, S. Krishnamurthy, and M.S. Shahriar, Proceedings of SPIE Photonics West, San Jose, CA, (January 2009).

102. “Fast light in a photorefractive crystal for broadband gravitational wave detection with an augmented advanced-LIGO interferometer,” M. Salit, M. Kellner, S. Krishnamurthy, M. S. Shahriar, H. Yum, P. Hemmer, Proceedings of SPIE Photonics West, San Jose, CA, (January 2009) (invited).

103. “Heterodyned Optical Coherence Tomography for Complete Stokesmetric Imaging,” M.S. Shahriar, X. Liu, S. Tseng, and A. Heifetz, Frontiers in Optics and Laser Science, OSA Annual Meeting, Rochester, NY (2008).

104. “A Superluminal Ring Laser for Rotation Sensing,” M.S. Shahriar and M. Salit, Frontiers in Optics and Laser Science, OSA Annual Meeting, Rochester, NY (2008).

105. "A Zero-Area Sagnac Ring Laser Gravitational Wave Detector with Fast-Light Enhanced Strain Sensitivity," M.S. Shahriar and M. Salit, Frontiers in Optics and Laser Science, OSA Annual Meeting, Rochester, NY (2008).

106. "Demonstration of Two-Pump Photorefractive Gain in a BaTiO3 Crystal for Realizing a Whitelight Cavity," Gour S. Pati, M. Salit, M. S. Shahriar, CLEO 2008, San Jose, CA

107. "An Inline Automated Stokesmeter" Alexander Heifetz, Shih C. Tseng, M.S. Shahriar, , CLEO 2008, San Jose, CA

108. "Raman Resonant Probe Gain and Pump Depletion in Rubidium Vapor for Simultaneous Slow and Fast Light Effects," Gour S. Pati, M. Salit and M.S. Shahriar, CLEO 2008, San Jose, CA.

109. "Anomalous-Dispersion Enhanced Active Sagnac Interferometry for Gravitational Wave Detection," M.S. Shahriar, G.S. Pati, M. Salit, K. Salit, and K. Richardson, Proceedings of SPIE Photonics West, San Jose, CA, (January 2008) (invited)

110. "Study of Raman-Ramsey Fringes for Enhanced Precision in a Chip Scale Rb Clock," M.S. Shahriar, G.S. Pati, M. Salit, and K. Salit, Proceedings of SPIE Photonics West, San Jose, CA, (January 2008) (invited)

111. "Quantum Interference Spectroscopy in Vapors and Trapped Atoms with Nano-Fibers," K. Salit, M. Salit, S. Spillane, R. Beausoleil, P. Kumar, and M.S. Shahriar, presented at SPIE Photonics West, San Jose, CA, (January 2008) (invited).

112. "Simultaneous generation of slow and fast light for Raman coupled beams," G.S. Pati, K. Salit, and M.S. Shahriar, Proceedings of SPIE Photonics West, San Jose, CA, (January 2008).

113. "Angular Directivity of Diffracted Wave in Bragg-Mismatched Readout of Volume Holographic Gratings," A. Heifetz, J. T. Shen, S. C. Tsang, G. S. Pati, J-K. Lee, and M.S. Shahriar, presented at the OSA Annual Meeting (Oct. 2007).

114. "Observation of Raman Ramsey Fringes using Delayed Optical Pulses in Atomic vapor Medium," G.S. Pati, K. Salit, and M.S. Shahriar, presented at the OSA Annual Meeting (Oct. 2007).

115. "Low Light Level V-Type Electromagnetically Induced Transparency using Tapered Fiber Embedded in Rubidium Vapor," G.S. Pati, S. Spillane, R. Beausoleil, K. Salit, M. Hall, P. Kumar, and M.S. Shahriar, presented at the OSA Annual Meeting (Oct. 2007).

116. "Low Light Level Saturated Absorption in Tapered Fiber Embedded in Alkali Vapor," G.S. Pati, S. Spillane, R. Beausoleil, K. Salit, M. Hall, P. Kumar, and M.S. Shahriar, presented at the CLEO/QELS Meeting, Baltimore, MD (May 2007).

117. "A Tunable-Bandwidth White Light Interferometer Using Bi-frequency Raman Gain in Atomic Vapor," G.S. Pati, M. Messal, K. Salit, and M.S. Shahriar, presented at the CLEO/QELS Meeting, Baltimore, MD (May 2007).

118. "Sensitivity, bandwidth and SNR constraints in fast-light enhanced precision metrology for applications to rotation sensing and gravity wave detection," M.S. Shahriar, G. Pati, M. Messal, K. Salit, SPIE Symposium on Fluctuation and Noise, Florence, Italy (May, 2007) (invited).

119. "Anomalous Dispersion in Atomic Vapor for Measuring the Lense-Thirring Rotation and Detecting Gravitational Waves," MS. Shahriar, Princeton-TAMU Seminar Series, (April 2007) (invited).

120. "Fast-Light for Astrophysics: Testing Theories of Gravity and Detecting Gravitational Waves," M.S. Shahriar, Physics of Quantum Electronics Conference, Snowbird, Utah (Jan, 2007) (Plenary Talk).

121. "Application of Fast Light to Enhancing the Bandwidth-Sensitivity Product of a Gravitational Wave Detector," M.S. Shahriar, presented at the Slow-Light 2007 Conference of the Optical Society of America, Salt Lake City, Utah, (July 2007), (invited).

122. "Holographic polarimetry enhanced target recognition and remote sensing." M.S. Shahriar, proceedings of the SPIE Photonics West Conference, San Jose, CA, (Jan 2007) (invited).

123. "Ultra-low Light Level Saturation Spectroscopy and EIT using a tapered fiber in a hot vapor cell" G.S. Pati, M. Hall, K. Salit, P. Kumar, S. Spillane, R. Beausoleil, and M.S. Shahriar, proceedings of the SPIE Photonics West Conference, San Jose, CA, (Jan 2007).

124. "Demonstration of a White Light Interferometer Using Fast Light," G.S. Pati, M. Messal, and M.S. Shahriar, proceedings of the SPIE Photonics West Conference, San Jose, CA, (Jan 2007).

125. "Demonstration of Interferometer Sensitivity varying as the Inverse of the Group Index," M. S. Shahriar, G.S. Pati, and M. Messal, proceedings of the SPIE Photonics West Conference, San Jose, CA, (Jan 2007) (invited).

126. "An Optical Network Integration Platform Based On Holographic Super-Dense WDM Filters," M.S. Shahriar, M. Andrews, S. Tseng, J. Kuykendall, A. Meshal and N. Vallestero, presented at the 25th Army Science Conference, Orlando, Fl (Nov. 2006).

127. "Multi-Spectral Raman Gain in Atomic Rubidium Vapor," J.E. Vornehm, G.S. Pati, K. Salit, and M.S. Shahriar, presented at the OSA Annual Meeting, Rochester, NY (Oct. 2006).

128. "Fast-Light For Enhanced-Sensitivity White-Light Resonant Interferometry," M.S. Shahriar, G.S. Pati, M. Messall, and K. Salit, presented at the OSA Annual Meeting, Rochester, NY (Oct. 2006).

129. "A Volume-Grating Stokesmeter Based on Photonic Band Gap Structures," J-K. Lee, J. Shen, S. Tseng, G.S. Pati, and M.S. Shahriar, presented at the OSA Annual Meeting, Rochester, NY (Oct. 2006).

130. "Slow-Light Based Control of Interferometer Sensitivity," M.S. Shahriar, G.S. Pati, M. Messall, and K. Salit, presented at the OSA Annual Meeting, Rochester, NY (Oct. 2006).

131. "Demonstration of a Spectrally Multiplexed Holographic Stokesmeter," J-K. Lee, J. Shen, S. Tseng, G.S. Pati, and M.S. Shahriar, presented at the OSA Annual Meeting, Rochester, NY (Oct. 2006).

132. "Deterministic quantum storage, communication, and computing with atomic ensembles using light-shift imbalance induced blockade of collective excitations," M.S. Shahriar, presented at the SPIE conference on Photonic Devices and Algorithms for Computing, San Diego, CA (Aug., 2006) (invited).

133. "Making a Quantum Internet Using Schroedinger Cats," M.S. Shahriar, presented at the Third Feynman Festival, University of Maryland, College Park, MD (August, 2006) (invited).

134. "Quantum-Interference Based White-Light Interferometry for Detection of Gravitational Waves," M.S. Shahriar, presented at the 31st International Nathiagali Summer College, Pakistan (June 2006) (invited).

135. "Quest for a Quantum Internet Using Schroedinger Cats," M.S. Shahriar, presented at the 31st International Nathiagali Summer College, Pakistan (June 2006) (invited).

136. "Shift-Invariant Real-Time Edge-Enhanced VanderLugt Correlator Using Video-Rate Compatible Photorefractive Polymer," A. Heifetz, G.S. Pati, J.T. Shen, J.-K. Lee, M.S. Shahriar, C. Phan, and M. Yamomoto, presented at CLEO, Long Beach, California, (May 2006).

137. "Demonstration Of A Spectrally Multiplexed Holographic Stokesmeter," Jong-Kwon Lee, John.T. Shen, Alex. Heifetz, and M.S. Shahriar," presented at CLEO, Long Beach, California, (May 2006).

138. "Controllable Anomalous Dispersion and Group Index Nulling via Bi-Frequency Raman Gain for Ultraprecision Rotation Sensing," G.S. Pati, R. Tripathi, M. Messall, V. Gopal, K. Salit and M.S. Shahriar, presented at CLEO, Long Beach, California, (May 2006).

139. "Deterministic Quantum Storage, Communication and Computing With Atomic Ensembles Using Light-Shift Imbalance Induced Blockade of Collective Excitations," M.S.

Shahriar, P. Pradhan, G.S. Pati, V. Gopal, and K. Salit, presented at CLEO, Long Beach, California, (May 2006).

140. "Slow- and Fast-Light Enhanced Rotation Sensing and Fabry-Perot Interferometry," Renu Tripathi, Gour Pati, Venkatesh Gopal, Kenneth Salit, Mary Messal, M.S. Shahriar, presented at the SPIE Photonics West Conference, San Jose, CA, Jan 2006 (invited).

141. "Ensemble-based Quantum Memory, Quantum Communication, and Quantum Computing," Gour Pati, Kenneth Salit, Prem Kumar, and M.S. Shahriar, presented at the SPIE Photonics West Conference, San Jose, CA, January 2006 (invited).

142. "Holographic Eye for UAV Navigation" M.S. Shahriar, presented at the SPIE Defense and Security Symposium, Orlando, FL, April 2006 (invited).

143. "Light-Shift Imbalance Induced Dipole Blockade for Deterministic Quantum Information Processing using Atomic Ensembles", M.S. Shahriar, presented at the International Conference on Quantum Optics, Hong Kong, December, 2005 (invited).

144. "Slow-Light in Cold Atoms for Single Photon Detection," M.S. Shahriar, Midwest Workshop on Cold Atoms, Urbana, IL, November, 2005 (invited).

145. "Observation of Slow-Light and Matched Dispersion in Sodium Vapor for Applications to Laub-Drag Enhanced Rotation Sensing," Renu Tripathi, Gour Pati, Mary Messall, Kenneth Salit, Venkatesh Gopal, Selim M. Shahriar, presented at the OSA Annual Meeting, Tucson, AZ, October, 2005.

146. "Slow and Superluminal Light Enhanced Ultrahigh Precision Optical Rotation Sensing," Selim M. Shahriar, Gour Pati, Renu Tripathi, Venkatesh Gopal, Mary Messall, Kenneth Salit, presented at the OSA Annual Meeting, Tucson, AZ, October, 2005.

147. "Poly(Methyl Methacrylate)-Based Material for Thick Holographic Memory Plates and Ultra-Narrow Filters," John Shen, Jong-Kwon Lee, Alexander Heifetz, Gour Pati1, Renu Tripathi, John Donoghue, Shih Tseng, Selim M. Shahriar, presented at the OSA Annual Meeting, Tucson, AZ, October, 2005.

148. "Enhancement of Interferometric Precision Using Fast Light," Selim M. Shahriar, Renu Tripathi, Gour Pati, Venkatesh Gopal, Kenneth Salit, Mary Messall, presented at the OSA Annual Meeting, Tucson, AZ, October, 2005.

149. "Spectrally Scanned Polarimetric Imaging Using a Thick Holographic Stokesmeter," Jong-Kwon Lee, John Shen, Alexander Heifetz, Renu Tripathi, Selim M. Shahriar, presented at the OSA Annual Meeting, Tucson, AZ, October, 2005.

150. "Demonstration of a Multiwave Coherent Holographic Beam Combiner in a Polymeric Substrate," Ho Yum, Philip Hemmer, Alexander Heifetz, John Shen, Jong-Kwon Lee, Renu Tripathi, Selim M. Shahriar, presented at the OSA Annual Meeting, Tucson, AZ, October, 2005.

151. “Precision Rotation Sensing and Interferometry Using Slow Light,” M.S. Shahriar, G.S. Pati, V. Gopal, R. Tripathi, G. Cardoso, P. Pradhan, M. Messal, and R. Nair, presented at CLEO/QELS, Baltimore, MD, May 2005.

152. “Demonstration of a Thick Holographic Stokesmeter,” M.S. Shahriar, J-K. Lee, J. T. Shen, A. Heifetz, R. Tripathi, presented at CLEO/QELS, Baltimore, MD, May 2005.

153. M.S. Shahriar, R. Tripathi, J.T. Shen, et al., "High speed data-search and pattern identification using a hybrid super-parallel holographic RAM-JTC geometry," presented by J.T. Shen at the SPIE Defense & Security Symposium, Orlando, FL (2005).

154. “Pseudo-random noise in high-speed operation of quantum bits,” M.S. Shahriar, P. Pradhan, and J. Morzinski, presented at the Conference on Fluctuations and Noise in Photonics and Quantum Optics III, SPIE, Austin, Texas, 2005. (invited)

155. “Investigation towards realizing a slow-light based rotation sensor” G.S. Pati, R. Tripathi, P. Pradhan, R. Nair, V. Gopal, G. Cardoso, and M.S. Shahriar, presented at SPIE, Photonics West, 2005, San Jose, CA (invited).

156. "A Landmark Identification Based Navigation System using A Hybrid Holographic Correlator" M.S. Shahriar, A. Heifetz, J.T. Shen, J-K. Lee, R. Tripathi, presented at SPIE, Photonics West, 2005, San Jose, CA (invited).

157. “High speed data search and pattern identification using a hybrid super-parallel holographic RAM-JTC geometry,” M.S. Shahriar, Renu Tripathi, J.T. Shen, A. Heifetz, J-K. Lee, presented at SPIE Aerosense, 2005 (invited).

158. “Solid State Quantum Computing Via Spectral Hole Burning,” M.S. Shahriar, presented at the International Workshop on Quantum Informatics, Dec 2004, Hong Kong (invited).

159. “Integrated Quantum Communication and Computing: The Quantum Internet,” M.S. Shahriar, presented at the International Workshop on Quantum Informatics, Dec 2004, Hong Kong (invited).

160. “Quantum Teleportation Using Neutral Atoms and Cavity-QED,” M.S. Shahriar, presented at the International Workshop on Quantum Informatics, Dec 2004, Hong Kong (invited).

161. “Holographic Polarimeter Utilizing the Polarization Dependency of Thick Holographic Substrates,” M.S. Shahriar, J.T. Shen, J-K. Lee, R. Tripathi, and A. Heifetz, presented at the OSA Annual Meeting, Rochester, NY (2004).

162. “Effects of the Bloch-Siegert Oscillation on the Precision of Qubit Rotations: Direct Two-Level vs. Off-Resonant Raman Excitation,” P. Pradhan, G. Cardoso, J. Morzinski, and M.S. Shahriar, presented at the OSA Annual Meeting, Rochester, NY (2004).

163. “Spatio-Angular Parallelism in a Holographic Correlator and Random Access Memory,” M.S. Shahriar, J.T. Shen, R. Tripathi, J-K. Lee, and A. Heifetz, presented at the OSA Annual Meeting, Rochester, NY (2004).

164. “Single-Photon Raman Gain for Single-Photon Detection,” G. Cardoso, G.S. Pati, V. Gopal, A. Heifetz, M.S. Shahriar, and P. Kumar, presented at the OSA Annual Meeting, Rochester, NY (2004).

165. "Application of Slow-Light to Quantum Information Processing,” presented at the OSA Annual Meeting, Rochester, NY (2004) (Invited Paper).

166. “Quantum Communication and Computing Using Neutral Atoms,” M.S. Shahriar, presented at The Feynman Festival, University of Maryalnd (2004) (Invited Paper).

167. “Quantum communication via atomic-state teleportation for game theoretic applications, M. S, Shahriar, presented at the Quantum Communications and Quantum Imaging II session of SPIE Annual Meeting, Denver, CO (August, 2004) (Invited Paper).

168. M.S. Shahriar, J.T. Shen, J.K. Lee, R. Tripathi, "Super-parallel holography and holographic polarimetry for optical pattern recognition," presented by J.T. Shen at the SPIE Defense & Security Symposium, Orlando, FL (2004).

169. "Single Atom Interferometry and Its Application to Generation of Motional Entanglement," M.S. Shahriar, A. Heifetz, K. Salit, G. Pati, and V. Gopal, presented at Progress in Quantum Electronics, Snowbird, Utah (January 2004) (Invited Paper).

170. "Atomic Ensemble Quantum Memory Using Rb Vapor for Quantum Entanglement and Teleportation," G. Cardoso, A. Heifetz, V. Gopal, G.S. Pati, and M.S. Shahriar, presented at the SPIE Photonics West, San Jose, CA (Jan., 2004) (Invited Paper).

171. " Photonic Bandgap Structures In NV-Diamond For Quantum Computing" R. Tripathi, J.K. Lee, and M.S. Shahriar, presented at the SPIE Photonics West, San Jose, CA (Jan., 2004) (Invited Paper).

172. "A Hybrid Correlator and RAM Using Super-Parallel Holography," M. Andrews, M. Huq, J. Shen, R. Tripathi, and M.S. Shahriar, presented at the SPIE Photonics West, San Jose, CA (Jan., 2004). (Invited Paper).

173. "Demonstration of a single exposure technique for determining the M/# of a holographic substrate," H.N. Yum, P.R. Hemmer, R. Tripathi, J. T. Shen, and M.S. Shahriar, presented at the CLEO/IQEC, San Fancisco, CA (2004).

174. "Holographic Stokesmeter Using Polarization-Sensitive Volume Gratings," M.S. Shahriar, J.T. Shen, Renu Tripathi, J.K Lee, and M.A. Hall, presented at CLEO/IQEC, San Fancisco, CA (2004).

175. "Demonstration of a super-parallel holographic RAM using the super-parallel holographic optical correlator architecture," M.S. Shahriar, R. Tripathi, M. Huq, and J.T. Shen, presented at CLEO/IQEC, San Fancisco, CA (2004).

176. "Local observation of the absolute phase of a microwave field," G. Cardoso, J. Morzinski, P. Pradhan, and M.S. Shahriar, presented at CLEO/IQEC, San Fancisco, CA (2004).

177. "Observation of the Phase Of a Microwave Field via the Bloch-Siegert Oscillation," G. Cardoso, P. Pradhan, and M.S. Shahriar, the OSA Annual Meeting, Tucson, Az (October 2003) (Postdeadline Paper).

178. "Strongly Pump-Suppressed Raman Gain in 85Rb for Generation of Macroscopic Entanglement of Vapor Cells," A. Agarwal, A. Heifetz, A. Agarwal, A. Heifetz, G. Cardoso, V. Gopal, P. Kumar, and M.S. Shahriar, presented at the Progress In Electromagnetic Research Symposium 2003, Honolulu, HI, (October 2003) (Invited Paper).

179. "Observation of the Phase Of a Microwave Field Using Single-Atom Nonlinear Optics," G. Cardoso, P. Pradhan, and M.S. Shahriar, presented at the Progress In Electromagnetic Research Symposium 2003, Honolulu, HI, (October 2003) (Invited Paper).

180. "Progress toward long-distance, high-fidelity quantum communication," N.C. Wong, P. Kumar, M.S. Shahriar, and Jeffrey Shapiro, presented at the OSA Annual Meeting, Tucson, AZ (October 2003) (Invited Paper).

181. "Absence of Bloch-Siegert shift and oscillation in optically excited microwave transitions," M.S. Shahriar, P. Pradhan, and G. Cardoso, presented at CLEO, Baltimore, MD, 2003.

182. "Imaging Stokesmeter utilizing holographic diffraction gratings," M.S. Shahriar, R. Tripathi, M. Kleinschmit, and T. Nee, presented at CLEO, Baltimore, MD, 2003.

183. "Ultrafast Database Search Using Holographic Memory Vs. Quantum Computing," M.S. Shahriar, SPIE Photonic West, San Jose, CA, Jan 2003. (Invited Paper).

184. "Quantum Versus Super-Parallel Holographic Database Search," M.S. Shahriar, presented at the SPIE Aerosense Meeting, Orlando, FL, April 2003.

185. "Experimental Demonstration of a Continuously Guided, Single-Zone Atom Interferometer," M.S. Shahriar, Y. Tan, J. Morzinski, M. Jheeta, and P.R. Hemmer, presented at the Annual Meeting of the Optical Society of America, Orlando, FL (2002).

186. "Measurement and Teleportation of The Phase of An Electromagnetic Field via Flourescence Detection," M.S. Shahriar, P.Pradhan, and J. Morzinski, presented at the Annual Meeting of the Optical Society of America, Orlando, FL (2002).

187. "A Super-Parallel Holographic Correlator for Ultrafast Database Search," M.S. Shahriar, M. Kleinschmit, W. Weathers, J. Donoghue, and J. Shen, presented at the Annual Meeting of the Optical Society of America, Orlando, FL (2002).

188. "Determination and Teleportation Of The Phase Of An Electromagnetic Field Via Incoherent Detection Of Fluorescence," M. S. Shahriar and P. Pradhan, presented at the APS Annual Meeting, March 2002.

189. "Measurement and Teleportation of The Phase of An Electromagnetic Wave using the Bloch-Siegert Oscillation," P. Pradhan, J. Morzinski, and M.S. Shahriar, proceedings of the 6th International Conference on Quantum Communication Measurement and Computing, , Cambridge, MA (July 2002).

190. "Teleportation of Atomic States via Complete Measurement of Bell States" V. Gopal, J. Morzinsky, and M.S. Shahriar, presented at the Progress In Electromagnetic Research Symposium 2002, Cambridge, MA (July 2002).

191. "Determination of the Phase of an Electromagnetic Field via Incoherent Detection of Fluorescence using the Bloch-Siegert Oscillation," P. Pradhan, J. Morzinsky and M.S. Shahriar, presented at the Progress In Electromagnetic Research Symposium 2002, Cambridge, MA (July 2002).

192. "Demonstration of a Super-Parallel Holographic Optical Correlator for Ultrafast Database Search," M.S. Shahriar, M. Kleinschmit, W. Weathers, and R. Tripathi, , CLEO 2002 (Post-Deadline).

193. "Quantum Computing using NV-Diamond," M.S. Shahriar and P.R. Hemmer, presented at the Progress in Quantum Electronics conference, Snowbird, UT, Jan. 2002 (Invited).

194. "Applications of Slow and Stopped Light in Solid," P.R. Hemmer and M.S. Shahriar, presented at the Progress in Quantum Electronics conference, Snowbird, UT, Jan. 2002 (Invited).

195. "Long-distance, unconditional teleportation of atomic states via complete measurement of all Bell-states," M.S. Shahriar, S. Lloyd, J.H. Shapiro, and P.R. Hemmer, proceedings of the International Conference on Quantum Information, Rochester, NY, July 2001.

196. M.S. Shahriar, "Bloch-Siegert oscillation for detection and quantum teleportation of the phase of an oscillating field," proceedings of the Conference on Quantum Optics 8, Rochester, NY, July 2001.

197. "Raman Excited Spin Coherence in NV Diamond," P.R. Hemmer, A. Turukhin, M.S. Shahriar, and J.A. Musser, proceedings of the SPIE Conference, San Diego, CA August 2001 (Invited).

198. "First Observation of Ultraslow Group Velocity of Light in a Solid," Turukhin, V.S. Sudarshanam, M.S. Shahriar, J.A. Musser, and P.R. Hemmer, proceedings of the SPIE Conference, San Diego, CA August 2001 (Invited).

199. A.V. Turukhin, M.S. Shahriar, J.A. Musser, and P.R. Hemmer, "Spin Mediated Slowing and Stoppage of Light in a Solid," presented at Spintech 1, Maui, Hawaii, May 2001.

200. "First Observation of Ultraslow Group Velocity of Light in a Solid," A. Turukhin, V.S. Sudarshanam, M.S. Shahriar, J.A. Musser, and P.R. Hemmer, presented at the International Quantum Electronics Conference, Baltimore, MD, May 2001.

201. "Observation of Ultraslow Group Velocity of Light in a Pr:YSO crystal," V.S. Sudarshanam, M.S. Shahriar, and P.R. Hemmer, 31st Winter Colloquium in Quantum Electronics, Snowbird, Utah (Jan 2001).

202. P.R. Hemmer, A. Turukhin, M.S. Shahriar, and J.A. Musser, "Raman Excited Spin Coherence in NV Diamond," presented at the International Quantum Electronics Conference, Baltimore, MD, May 2001.

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206. J.H. Shapiro, F. Wong, M.S. Shahriar, and S. Lloyd, "Long-distance high-fidelity teleportation using singlet states," Quantum Communication, Measurement and Computing, Capri, Italy, July 3-8, 2000.

207. P.R. Hemmer, M.S. Shahriar, and A. Turukhin, "Raman excited spin coherences for high-temperature spectral hole-burning memories" Conference on L asers and Electro-Optics, San Francisco, CA, 2000.

208. M.K. Kim, B. Ham, M.S. Shahriar, and P.R. Hemmer, "Sub-kHz resonance structure in rf-optical double resonance of rare-earth ions in solids," OSA Annual Meeting, Santa Clara, CA, 1999.

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234. M.S. Shahriar, P.R. Hemmer, T.T. Grove, M. Cronin-Golomb, and P. Kumar, "Diffraction Limited Propagation and High Gain in Optically Dense Sodium Vapor at Low Pump Intensity," Quantum Electronics and Laser Science Conference, 1996, OSA Technical Digest Series, (Opt. Soc. of Am., Washington, D.C., 1996) p. 194.

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261. M.G. Prentiss, N.P. Bigelow, M.S. Shahriar, and P.R. Hemmer, "Forces on three level atoms including the trapped state contribution," Bulletin of the American Physical Society, Series II, Vol. 36, No. 4, p. 1311 (1991), (presented in the 1991 Annual Meeting of the Division of Atomic, Molecular, and Optical Physics, Washington, DC, 1991).

262. M.S. Shahriar, P. Hemmer, N. Bigelow and M. Prentiss, "Forces on Three Level Atoms Including Trapped State Contribution," in Quantum Electronics and Laser Science Conference, 1991 Technical Digest Series, Vol. 11 (Opt. Soc. of Am., Washington, D.C., 1991) pp 118-9.

263. M.S. Shahriar and P. Hemmer, "Bloch Vector Model For Dressed States of Resonant Raman Interaction," in OSA Annual Meeting Technical Digest 1990 (Opt. Soc. of Am., Washington, D.C., 1990), Vol. 21, p 186.

264. M.S. Shahriar and P. Hemmer, "Microwave Phase-Dependent Optical Absorption," in International Quantum Electronics Conference, 1990 OSA Technical Digest Series, Vol. 8 (Opt. Soc. of Am., Washington, D.C., 1990) pp 286-7.

265. P. Hemmer, V. Natoli, M.S. Shahriar, B. Bernacki, H. Rivera, S. Smith and S. Ezekiel, "Study of Several Error Sources in a Laser Raman Clock," in Proceedings of the 41st Annual Symposium on Frequency Control (IEEE, New York, 1987), p.42.

E. INVITED PRESENTATIONS, SEMINARS AND PUBLICITIES:

1. INVITED CONFERENCE PRESENTATIONS:

As shown in the list of conference papers, I presented 80 invited papers at conferences. I have also presented 6 post-deadline papers, and 3 plenary talks.

2. INVITED SEMINARS AT UNIVERSITIES AND ORGANIZATIONS:

University of Nice, France (2014)
College of William and Mary, Physics Colloquium (2014)
University of Ottawa, Canada (2013)
University of Nevada, Las Vegas (2013)

Wright Patterson Air Force Base, Dayton, OH (2013)
Fudan University, Shanghai, China (2012)
Eglin Air Force Base, Eglin, FL (2011)
Naval Research Laboratory, Patuxent, MD (2011)
Hebrew University in Jerusalem (2010)
Tel Aviv University (2010)
University of Rochester (2010)
Temple University (2010)
Bangladesh University of Engineering and Technology (2010)
Jawaherlal Nehru University (2010)
Stanford University (2009)
Delaware State University (2009)
Princeton University (2006)
University of Illinois, Chicago (2005)
University of Illinois, Urbana-Champagne (2004)
Temple University (2003)
MIT (2002)
Texas A&M University (2000)
SUNY, Buffalo, NY (1999)
SUNY, Stonybrook, NY (1998)
Stanford University (1997)
JILA, University of Colorado (1996)
Michigan State University (1995)

3. PUBLICITY:

The popular articles and references to my work, as listed below, can be viewed at:
http://lapt.eecs.northwestern.edu/publicity

[a]. The content of the following paper:

"Observation of Ultraslow and Stored Light Pulses in a Solid," A. V. Turukhin, V.S. Sudarshanam, M.S. Shahriar, J.A. Musser, B.S. Ham, and P.R. Hemmer, Phys. Rev. Lett. ***88****, 023602 (2002).*

generated world-wide publicity, and was reported in (among possibly others),

- **Nature News,**
- **Science News,**
- **Business Week,**
- **New Scientist,**
- **Laser Focus World,**
- **Photonic Spectra,**
- **EE-Times,**
- **A German Radio Station,**
- **An Italian Daily, and**
- **The Physics News Update**

[b]. The content of the following paper:

"Demonstration of a super-parallel holographic correlator for ultrafast database search," M.S. Shahriar, R. Tripathi, M. Kleinschmit, J. Donoghue, W. Weathers, and J. Shen, Opt. Letts. **28,** 7, pp. 525-527(2003).

was featured in an article in the **Laser Focus World**

[c]. My other work on holographic and spectral-holeburning memory has been mentioned in articles in the following publications:

- **Photonic Spectra**
- **Laser Focus World**
- **Optics and Photonics News**

[d]. The content of the following paper:

"Long Distance, Unconditional Teleportation of Atomic States via Complete Bell State Measurements," S. Lloyd, M.S. Shahriar, J.H. Shapiro, and P.R. Hemmer, Phys. Rev. Lett. ***87****, 167903 (2001).*

was featured in a cover article in **the New Scientist**

[e] The superluminal ring laser gyroscope, invented by me, was recently selected as one of five "**Game Changing Technologies**" by NASA. See the following URL for a news article about it; it also contains links to corresponding NASA news release: http://www.eecs.northwestern.edu/the-news/1618-superluminal-ring-laser-gyroscope-invented-by-selim-shahriar-is-selected-as-one-of-five-game-changing-technologies-by-nasa-and-awarded-a-three-year-grant-for-development.html

F. UNIVERSITY AND PROFESSIONAL SERVICES

F.1. PROFESSIONAL AND SYNERGISTIC ACTIVITIES:

- I have been appointed as an Associate Editor for the journal Optical Engineering, starting from July, 2013, in the areas of Quantum Optics and Photonics, Nonlinear Optics, Ultrafast Optics, and Slow and Fast Light

- I have created two new conferences under SPIE Photonics West. These are: (a) Advances in Slow Light, Fast Light, and Opto-Atomic Precision Metrology, and (b) Quantum Electronic Metrology.

- I currently serve as Chair of one of these new conferences (Advances in Slow Light, Fast Light, and Opto-Atomic Precision Metrology), and on the program committee for another one (Advanced Optical Concepts in Quantum Computing, Memory, and Communication), under SPIE Photonics West.

- I have joined the editorial board of the journal ISRN Optics.

- I participated in the National Nanotechnology Initiative workshop on Nanotechnology-Enabled Sensing, 2009, and helped write the final report for it.

- I have served on the Program Committee of Conference on Lasers and Electro-Optics (CLEO) and the Quantum Electronics and Laser Science conference (QELS), sponsored by the Optical Society of America and the American Physical Society

- I have served on the Program Committee for SPIE Symposium on Fluctuations and Noise, 2007.

- I have served as a Session Organizer for Progress In Electromagnetics Research Symposium 2002, sponsored by the IEEE.

- I founded a company called Digital Optics Technologies, Inc.

- I have served on NSF Review Panel for Information Technology Research

- I have served on NSF Review Panel for Atomic, Molecular and Optical Physics

- I have served on NSF Review Panel for Quantum Information Processing under EMT

- I have served on NSF Review Panel for Emerging Technologies for Computing

- I have served twice on NASA Review Panels for Space-borne Atomic Physics Projects

- I have served as a reviewer for Physical Review Letters, Physical Review A, Optics Letters, Optics Communications, Journal of Modern Optics, and other journals.

F.2. SERVICE AT NU:

- Currently serving on the following committees:
  - Instructional Labs Committee
  - Distinguished Seminar Committee
  - Computing Facilities Committee
  - McCormick Laser Safety Committee
  - McCormick Promotion and Tenure Committee
  - Graduate Admission Committee, Physics and Astronomy
  - Graduate Admission and Recruitment Committee, Applied Physics Graduate Program
  - Faculty Advisor, NU Student Chapter of SPIE

- Served on the EECS Mission and Planning Committee
- Served on the EECS Structure and Procedure Committee
- Headed the EECS Faculty Search Committee 2011
- Served on a Physics and Astronomy Faculty Search Committee

- Previously, I have served on many departmental committees.

- I am currently serving also as the Faculty Adviser for the NU Student Chapter of SPIE. In this role, I have met with members of the chapter several times, and have provided guidance to them for making this chapter a vibrant one, with national visibility.

- I served on a sub-committee for Teaching Trainees and Teaching Assistants. As part of this sub-committee, I played a key role in formulating a comprehensive policy for Teaching Trainees, and in restructuring the manner in which Teaching Assistance is to be allocated to courses. For example, a spread-sheet, accessible on the web, has been created to document the teaching assistance need for each course. The spread-sheet uses an algorithm we developed to determine the exact amount of teaching help a course would need, based on factors such as enrollment, laboratory requirements, etc. This spread-sheet is now routinely and effectively used by all faculty members. Establishment of this process has eliminated any source of randomness that may have existed in assigning teaching help to courses.

- I put together and then headed a Steering Committee for the proposed Northwestern Institute for Photonic Science and Technologies (NIPSAT) under the NOW initiative conducted by the Dean's Office. After a yearlong process during which we recruited more than thirty faculty members from many departments (covering McCormick, Weinberg and Feinberg Schools) at NU, as well several members from outside, as potential members of the NIPSAT, the process culminated in a NOW presentation that was attended by most of the potential members, the Dean of McCormick School, as well as the VP of Research. The presentation appeared to have been very well received. A decision regarding the future of the NIPSAT is pending with the Dean's office.

- I served on the EECS Chair Search Committee.

- I have served on an ad hoc committee convened by the Dean of McCormick school for studying the prospect of starting an Energy-oriented initiative. The work of this committee, headed by Prof. Kung, has culminated in establishing the Center for Energy Efficient Transportation (CEET), with initial seed funding approved by the Dean's office.

- As part of the sub-committee to restructure EECS 202, which was initiated at my urging, and is headed by Prof. Sahakian, we have met over ten times so far, and have discussed a wide range of potential alternatives to EECS 202. We have also performed a comprehensive review of the current content of this course, and have come up with a concrete set of recommendations for restructuring the course, which have been implemented.

G. ENTREPRENEURIAL ACTIVITY

I founded Digital Optics Technologies, Inc., a start-up company, in July 1998. The goal of DOT is to carry out research activities in the fields of optical memory, holography and precision metrology. I am the majority stock-holder for DOT, and serve as the Chairman of the Board for DOT. I also do consulting work for DOT.

Under my guidance, DOT has received funding from non-SBIR and SBIR sources of federal funding, as well as private investments. To date, it has received 12 Phase I SBIR/STTR grants, and 8 SBIR Phase II grants. It has also received subcontracts for an SBIR Phase II grant, an STTR Phase II grant, and an SBIR Phase I grant. Currently, it has four SBIR Phase II grants, two SBIR Phase I Grants, and a SBIR Phase I subcontract. It has five employees. It has developed several commercial products, mostly resulting from projects supported by SBIR funding.

H. PREVIOUS RESEARCH GRANTS

1. **"Application of Multiphoton Resonance Technologies to *Data Storage, High Speed Imaging, and Precision Metrology*."**
Co-Principal Investigators: M.S. Shahriar and S. Ezekiel
Funding Source: Rome Laboratory, US Air Force
Amount: **$160K/year**
Duration: **Renewed annually since 1994 to 2000.**

2. ***"Studies of Optical Spectral Holeburning using Raman Coherent Population Trapping."***
Co-Principal Investigators: M.S. Shahriar and S. Ezekiel
Funding Source: NSF
Amount: **$460K**
Duration: **August 96 - July 99 (3 Years)**

3. ***"Non-Spatial Filters for Laser Beams."***
Co-Principal Investigators: M.S. Shahriar and S. Ezekiel
Funding Source: BMDO STTR, Phase I
Amount: **$16K** (Shahriar share)
Duration: **January 95 - June 95.**

4. ***"Non-spatial Filters for Laser Beams."***

Co-Principal Investigators: M.S. Shahriar and S. Ezekiel
Funding Source: BMDO STTR Phase II
Amount: **$150K** (Shahriar share)
Duration: **November 95 – October 97 (2 Years).**

5. ***"Holographic Beam Shaper for Master Oscillator Power Amplifiers."***
Co-Principal Investigators: M.S. Shahriar and S. Ezekiel
Funding Source: BMDO SBIR, Phase II
Amount: **$100K** (Shahriar share)
Duration: **November 97 – October 99 (2 Years).**

6. ***"Read-Write Head for Room Temperature Holographic Optical Memory."***
Co-Principal Investigators: M.S. Shahriar, S. Ezekiel, and C. Warde.
Funding Source: BMDO STTR Phase I
Amount: $18K (Shahriar share)
Duration: **August 97 – February 98.**

7. ***"Application of Porous Glass Based Thick Holograms for Optical Data Storage and Narrow-band Wavelength Filtering."***
Co-Principal Investigators: M.S. Shahriar and S. Ezekiel
Funding Source: BMDO AASERT
Amount: **$270K**
Duration: **July 96 – June 99**

8. ***"Nano-Kelvin Cooling of Dense Atoms for an Ultra-Stable Fountain Atomic Clock."***
Co-Principal Investigators: M.S. Shahriar and S. Ezekiel
Funding Source: AFOSR DURIP
Amount: **$132K**
Duration: **September 95 – August 96.**

9. ***"Generation of Nanometer Scale Structures Using Atom Interferometry and Creation of a Coherent Atomic Source."***
Co-Principal Investigators: M.S. Shahriar and S. Ezekiel
Funding Source: ARO DURIP
Amount: **$145K**
Duration: **May 97 – April 98.**

10. ***"Quantum Computing and Optical Memory using Spectral Hole-Burning Techniques."***
Co-Principal Investigators: M.S. Shahriar, S. Ezekiel, and S. Lloyd
Funding Source: AFOSR DURIP
Amount: **$158K**
Duration: **February 98 – January 99.**

11. ***"Quantum Logic and Parallel Computing Using Spectral Hole Burning Techniques."***
Co-Principal Investigators: M.S. Shahriar, S. Ezekiel, and S. Lloyd
Funding Source: AFOSR
Amount: **$615K**
Duration: **February 98 – January 01 (3 Years)**

12. ***"Quantum Computing using the Dark Resonance."***
Co-Principal Investigators: M.S. Shahriar and S. Ezekiel
Funding Source: ARO and NSA
Amount: **$300K**
Duration: **April 98 – March 01 (3 Years)**

13. **"Quantum Computing in Solids via the Dark Resonance"**
Co-Principal Investigators: M.S. Shahriar, S. Ezekiel, and S. Lloyd

Funding Source: AFOSR DURIP
Amount: **$100K**
Duration: **February 99 – January 01.**

14. "Feasibility of Spectral Holeburning Memories and Processors for Space Based Applications"
Co-Principal Investigators: M.S. Shahriar, S. Ezekiel, and C. Warde
Funding Source: AFOSR
Amount: **$330K**
Duration: **April 99 – March 02.**

15. *"Quantum Information Technology: Entanglement, Teleportation, and Quantum Memory."*
Co-Principal Investigators: M.S. Shahriar, S. Lloyd, J. Shapiro, P. Kumar, and H.Yuen
Funding Source: ARO MURI 2000.
Amount: **$5.25 MILLION (Shahriar share: $1.15 Million)**
Duration: **April 2000 – March 2005.**

16. "Development of Multispectral Detector and Source for a ladar system using two-photon resonant techniques."
Co-Principal Investigators: M.S. Shahriar, S.Ezekiel, and J. Shapiro
Funding Source: AFRL.
Amount: **$160K**
Duration: **August 2000 – February 2002**

17. "Utility of Quantum Entangled State Transfer (QUEST) for Time Synchronization"
Co-Principal Investigators: M.S. Shahriar, J. Shapiro, F. Wong, and S. Lloyd
Funding Source: NRO.
Amount: **$525K**
Duration: **August 2000 – July 2003**

18. "Ultra-Precise Clock Synchronization Via Distant Entanglement"
Principal Investigator for Whole Project: M.S. Shahriar
Subcontractor: JPL, Caltech
Funding Source: DARPA Quist Program
Amount: **$1.2 Million (Shahriar share: $840 K)**
Duration: **January 2002 – September 2006**

19. "Spin-Based Lattice Gas Quantum Optics in Solids Using Optical Addressing"
Principal Investigator for Whole Project: Marlan Scully, Texas A&M University
Subcontractor PI: M.S. Shahriar
Funding Source: DARPA Quist Program
Amount: **$3.2 Million (Shahriar share: $533 K)**
Duration: **June 2002 – September 2007**

20. "Large Scale Type II Quantum Computing in NV-Diamond Using PBG-Based Cavities"
Principal Investigator: M.S. Shahriar
Funding Source: AFOSR
Amount: **$425 K**
Duration: **October 2001 – December 2004**

21. "Ultrafast Target Recognition VIA Super-Parallel Holography BASED Correlator, RAM, And Associative Memory"
Principal Investigator: M.S. Shahriar
Funding Source: AFOSR
Amount: **$270 K**
Duration: **July 2003 – July 2006**

22. "Nanophotonic Modulator Using Electromagnetically Induced Transparency"
Co-Principal Investigators: M.S. Shahriar and B. Wessels
Funding Source: AFOSR STTR Phase I
Amount: **$30 K** (Shahriar share)
Duration: **January 2003 – September 2003**

23. "Instrumentation For Ultrafast Target Recognition Via Super-Parallel Holography Based Joint Transform Correlator "
Principal Investigator: M.S. Shahriar
Funding Source: AFOSR DURIP
Amount: **$225 K**
Duration: **March 2004 – February 2005**

24. "Type-Two Quantum Computing in PBG-Based Cavities for Efficient Simulation of Lattice Gas Dynamics"
Principal Investigator: M.S. Shahriar
Funding Source: AFOSR
Amount: **$265 K**
Duration: **April 2004 – September 2006**

25. "Bootstrapping a Quantum Information Technology Industry"
Principal Investigator: Ray Beausoleil, HP
Subcontractor PI: M.S. Shahriar (*Subcontractor Co-PI*: Prem Kumar)
Funding Source: DARPA Seed Fund
Amount: **$500 K** (NU share: $100K; Shahriar share: $67K)
Duration: **February 2005 – January 2006**

26. "Applications of Slow Light to Information Processing "
Principal Investigator: Ray Beausoleil, HP
Subcontractor PI: M.S. Shahriar (*Subcontractor Co-PI*: Prem Kumar)
Funding Source: DARPA Slow Light Program
Amount: **$4.45 Million K** (NU share: $1.475 Million; Shahriar share: $985K)
Duration: **March 2005 – December 2009**

27. "Polarimetric Smart Eye For UAV Navigation And Spatio-Spectral Correlator For Video Clip Correlation Using Holography"
Principal Investigator: M.S. Shahriar
Funding Source: AFOSR
Amount: **$516 K**
Duration: **August 2006 – September 2009**

28. "Cognitive Processing of Biometric Information for Determination of Intent"
Principal Investigator: Apostolos Raptis, Argonne National Laboratory
Subcontractor Co-PIs at NU: M.S. Shahriar, A. Katsaggelos, T. Pappas
Funding Source: DTO (Disruptive Technology Office)
Amount: **$3 Million** (NU Share: $1.05 Million)
Duration: **June 2008 – May 2011**

29. "SBIR Phase I: High Power DBR Lasers for Optimized Pumping of Chip-scale He:Rb Alkali Lasers"
Principal Investigator: M.S. Shahriar
Funding Source: Photodigm, Inc. / AFRL
Amount: **$45 K**
Duration: **November 2011 – August 2012**

30. "DARPA ZOE Program: Quantum Zeno Blockade for Next Generation Optical Switching in Fiber Systems"
Principal Investigator: Prem Kumar, NU

Co-Principal Investigator: M.S. Shahriar
Funding Source: DARPA (administered by ARO)
Amount: **$750K** (Co-PI Share)
Duration: **September 2009 – September 2012**

31. "STTR Phase II: Highly Sensitive Light-Weight Gyroscope"
Award Number: Agmt 12/23/10 // MDA08-T005
Project Dates: 9/6/10 - 6/4/14
Sponsor (include prime if a subcontract): Los Gatos Research, Inc./Missile Defense Agency
Requested funds with IDC (your University's portion only): $300,000
PI Selim Shahriar: 0.51 summer months

32. "IGERT: Quantum Coherent Optical and Matter Fields" (PI: John Ketterson, Northwestern U.)
Award Number: DGE-0801685
Project Dates: 09/01/08 – 08/31/13
Sponsor (include prime if a subcontract): National Science Foundation
Requested funds with IDC (your University's portion only): $3,000,000 (Student Support Only)

33. "SBIR Phase II : Novel Precision Fiber Optic Gyroscope"
Award Number: Agmt 10-26-09//HQ0006-09-C-7029
Project Dates: 8/17/09 - 8/6/13
Sponsor (include prime if a subcontract): Los Gatos Research, Inc./ Missile Defense Agency
Requested funds with IDC (your University's portion only): $379,977

34. "STTR Phase I: Development of high energy laser analysis software along with experimental verification of DPAL rate constants,"
Award Number: Agmt 3/26/2013 // HQ0277-13-C-7404
Project Dates: 3/1/13- 8/31/13
Sponsor (include prime if a subcontract): Digital Optics Technologies, Inc./Missile Defense Agency
Requested funds with IDC (your University's portion only): $30,001

I. CURRENT AND PENDING SUPPORT

CURRENT

Project Title: Optically Controlled Distributed Quantum Computing Using Atomic Ensembles as Qubits Award Number: FA9550-09-1-0652/P00006
Project Dates: 8/15/09 - 8/14/15
Sponsor (include prime if a subcontract): Air Force Office of Scientific Research
Requested funds with IDC (your University's portion only): $738,624
PI Selim Shahriar: 0.51 summer months

Project Title: Optical Buffering Switching and On-Line Data Sampling via Engineered Dispersion Award Number: FA9550-10-1-0228/P00005
Project Dates: 5/15/10 - 5/14/15
Sponsor (include prime if a subcontract): Air Force Office of Scientific Research
Requested funds with IDC (your University's portion only): $815,999
PI Selim Shahriar: 1.00 summer months

Project Title: Compact and Integrated IMU for GPS Denied Navigation Using Fast-Light Gyroscopes and Accelerometers
Award Number: Agreement 3/26/2013 // FA8651-13-C-0018
Project Dates: 1/22/13 - 4/30/15
Sponsor (include prime if a subcontract): Digital Optics Technologies, Inc./Air Force Research Laboratory
Requested funds with IDC (your University's portion only): $225,000 PI
Selim Shahriar: 0.09 summer months

Project Title: Next Generation Nano-electronic Circuit Elements Using Graphene Nano Ribbons Award Number: Agreement 11/3/13//FA9453-13-C-0045
Project Dates: 10/1/13 - 8/31/15
Sponsor (include prime if a subcontract): Digital Optics Technologies, Inc./Air Force Research Laboratory
Requested funds with IDC (your University's portion only): $160,000 PI
Selim Shahriar: 0.21 academic months

Project Title: Ultrasensitive and Compact Superluminal Ring Laser Accelerometer for Inertial Navigation Award Number: Agreement 3/26/13//FA8651-13-C-0011
Project Dates: 1/11/13 - 4/30/15
Sponsor (include prime if a subcontract): Digital Optics Technologies, Inc./Air Force Research Laboratory
Requested funds with IDC (your University's portion only): $100,000 PI
Selim Shahriar: 0.06 summer months

Project Title: A New and Comprehensive Approach for the Development of a Compact, High-Performance Rubidium Clock using Raman-Ramsey Interference in Atomic Vapor
Award Number: 14-001HEH/01//W911NF-13-1-0152
Project Dates: 5/1/13 - 4/30/16
Sponsor (include prime if a subcontract): Delaware State University/Army Research Office
Requested funds with IDC (your University's portion only): $105,000
PI Selim Shahriar: 0.06 summer months

Project Title: Novel Light Sources Based On Nonlinearity Enhanced By Nano- Antennas Award Number: PO#4440432059
Dates: 2/8/13 - 2/7/15
Sponsor (include prime if a subcontract): Government of Israel Ministry of Defense Mission to the U.S.A./Defense Security Cooperation Agency
Requested funds with IDC (your University's portion only): $180,000 PI
Selim Shahriar: 0.18 summer months

Project Title: Fast Light Optical Gyroscopes for Precision Inertial Navigation Award Number: NNM13AA60C
Project Dates: 3/7/13 - 3/6/16
Sponsor (include prime if a subcontract): NASA George C. Marshall Space Flight Center
Requested funds with IDC (your University's portion only): $250,000
PI Selim Shahriar: 1.0 summer months

Project Title: CEMRI: Multifunctional Nanoscale Material Structures
Award Number: DMR-1121262
Project Dates: 09/15/11 – 08/31/17
Sponsor (include prime if a subcontract): National Science Foundation
Requested funds with IDC (your University's portion only): $140,926 PI
Selim Shahriar: 0.18 academic months

Project Title: REU Site: Preparing a Diverse Workforce through Interdisciplinary Astrophysics Research Project Dates: 9/1/14 - 8/31/17
Sponsor (include prime if a subcontract): National Science Foundation
Requested funds with IDC (your University's portion only): $287,784 PI
Selim Shahriar: 0.09 academic months

PENDING

Project Title: Development of a Portable Microwave Atomic Clock Using Pulsed Coherent Population Trapping
Award Number: Subcontract Agreement//D14PC00134
Project Dates: 6/01/14 – 03/31/15
Sponsor (include prime if a subcontract): Digital Optics Technologies, Inc./Defense Advanced Research Projects Agency
Requested funds with IDC (your University's portion only): $22,453 PI
Selim Shahriar: 0.1 summer months

Project Title: High-Performance, Low SWaP, Radiation Hardened and Vibrationally Robust Inertial Measurement Unit Employing Fast Light Technology For Missile Defense
Status: Approved for funding; Contract Negotiation in Progress
Project Dates: 11/01/14 - 5/31/15
Sponsor (include prime if a subcontract): Digital Optics Technologies, Inc./Missile Defense Agency
Requested funds with IDC (your University's portion only): $16,999
PI Selim Shahriar: 0.05 academic months

Project Title: Ultrafast Automatic Target Recognition System using a Hybrid Holography-VLSI Correlator Invariant Under Shift, Rotation and Scaling
Project Dates: 5/1/15 - 4/30/19
Sponsor (include prime if a subcontract): Air Force Office of Scientific Research
Requested funds with IDC (your University's portion only): $875,000
PI Selim Shahriar: 0.2 summer months

Project Title: Trapping and Manipulating Cold Atoms at Optically Active Surfaces (PI: John Ketterson, Northwestern University)
Project Dates: 6/1/14 - 5/31/17
Sponsor (include prime if a subcontract): National Science Foundation
Requested funds with IDC (your University's portion only): $535,364 PI
Selim Shahriar: 0.10 summer months

Project Title: A Superluminal Ring Laser Gyroscope for Inertial Navigation and Precision Test of General Relativity
Project Dates: 7/1/15 - 6/30/18
Sponsor (include prime if a subcontract): National Science Foundation
Requested funds with IDC (your University's portion only): $494,259 PI
Selim Shahriar: 0.5 summer months

Project Title: Interference at Nonillion Hz Compton Frequency and Attometer de Broglie Wavelength: Collective State Atomic Interferometer and Atomic Clock
Project Dates: 7/1/15 - 6/30/18
Sponsor (include prime if a subcontract): National Science Foundation
Requested funds with IDC (your University's portion only): $489,624 PI
Selim Shahriar: 0.5 summer months

Project Title: Investigation of a White Light Cavity Configuration for Enhancing Sensitivity-Bandwidth Product in Next Generation LIGO
Project Dates: 7/1/15 - 6/30/18
Sponsor (include prime if a subcontract): National Science Foundation
Requested funds with IDC (your University's portion only): $480,354 PI
Selim Shahriar: 0.5 summer months