6 February, 2014

Avi Pe'er

Physics Department and BINA Center for Nano-technology,
Bar Ilan University, Ramat Gan 52900, Israel
Tel: +972 3 5317482 (W) +972 8 9470797 (H) +972 54 2572852 (C)
Email: avi.peer@biu.ac.il

Employment

Sept. 2008 - **Physics Department and Center for Nanotechnology, Bar Ilan University**
Ramat Gan, Israel
Leading an experimental group for advanced research in precision measurement and control, quantum optics and laser physics. The group explores new schemes for measurement and control of quantum matter and quantum light. Specifically, new methods to visualize and manipulate fast vibrational dynamics in molecules, as well as concepts to measure optical phase with resolution beyond the classical limit. The key experimental tools are novel light sources that combine both ultrahigh coherence (~1 s coherence time) and ultrabroad emission spectrum (~100 THz).

2005 – 2008 **JILA, University of Colorado**
Boulder, USA
Post doctoral research in the field of precision spectroscopy and coherent control with an ultrafast frequency comb in the group of Jun Ye. My research focused on schemes to precisely control and stabilize ultracold molecules formed by association of ultracold atoms. I developed a scheme to use the frequency comb light directly for precision control of molecular dynamics. In collaboration with Debbie Jin's group, I conducted experiments that generated for the first time ultracold KRb polar molecules at their absolute ground state from an ultracold ensemble of K and Rb Atoms using a frequency-comb stabilized laser system.

Education

2000 – 2005 **Weizmann Institute of Science**
Rehovot, Israel
Ph.D in Physics in the field of non-linear optics and quantum optics under supervision of Prof. Asher Friesem. During my Ph.D research, titled **"Broadband Spectrally Correlated Light - Properties, Sources and Applications"**, I explored aspects of broadband down-converted light such as it's special coherence properties, applications and efficient generation.

1997 - 1999 **Weizmann Institute of Science**
Rehovot, Israel
M.Sc. in Physics in the field of Physical optics and holography. The research thesis titled **"Optical correlation with totally incoherent light"** dealt with image processing and object identification operations by optical systems. Investigations included design of various optical systems that obtain wavelength independent diffraction, analysis and optimization of the design using the Wigner distribution function and Wigner algebra and experimental evaluation. Related investigations included design, optimization and

recording of computer generated holograms to be used as diffractive filters.

1993 - 1996

Tel-Aviv University
Tel-Aviv, Israel
B.Sc in Physics and computer science. Graduated with an average of 95.

Awards

Fulbright Scholarship for post doctoral research (2005).

Feinberg school award for excellence in the Ph.D studies (2005).

A fellowship for excellent Ph.D students in the field of high technology from the Israeli Council for Higher Education (2001-2004)

Feinberg school dean award for excellence in the M.Sc studies (1999).

Tel-Aviv university rector's award for excellence in the B.Sc studies (1996)

Exact Sciences faculty dean award for undergraduate students (1995)

Tel-Aviv university rector's award for undergraduate students (1994).

Publications

1. Shai Yefet and Avi Pe'er, "A review of cavity design for Kerr lens mode locked solid state lasers", *Appl. Sci.* **3**, 694-724 (2013)
2. Faina Shikerman and Avi Pe'er, "Sum-frequency generation as a detector of high-power two-mode squeezing", *Phys. Rev. A.* **88**, 043808 (2013)
3. Shai Yefet and Avi Pe'er, "Mode locking with enhanced nonlinearity - a detailed study", *Opt. Express* **21**, 19040–19046 (2013)
4. Shai Yefet, Valery Jouravsky and Avi Pe'er, "Kerr-lens Mode Locking Without Nonlinear Astigmatism, *J. Opt. Soc. Am. B* **30**, 482–488 (2013)
5. Rafi Vered, Michael Rosenbluh and Avi Pe'er, "Two-Photon Correlation of Amplified Spontaneous Four Wave Mixing", *Phys.Rev. A* **86**, 043837 (2012)
6. Shai Yefet, Na'aman Amer, and Avi Pe'er, "Intra-cavity gain shaping of mode-locked Ti:Sapphire laser oscillations", *Optics Express* **20**, 9991-9998 (2012)
7. Y. Stern, O. Klinger, T. Schneider, K. Jamshidi, A. Peer and A. Zadok, "Low-distortion long variable delay of linear frequency modulated waveforms," *IEEE Photonics* **4**, 499-503 (2012).
8. Faina Shikerman, Avi Pe'er and Larry P, Horwitz, "Semigroup evolution in the Wigner-Weisskopf pole approximation with Markovian spectral coupling", *Phys. Rev. A* **84**, 012122 (2011).
9. Kang Kuen Ni, Silke Ospelkaus, Marcio H. G. de Miranda, Avi Pe'er, Brian Neyenhuis, Josh J. Zirbel, Svetlana Kotochigova, Paul S. Julienne, Deborah S. Jin and Jun Ye, "A High Phase-Space-Density Gas of Polar Molecules in the Rovibrational Ground State", *Science* **322**, 231-5 (2008).
10. Silke Ospelkaus, Avi Pe'er, Kang Kuen Ni, Josh J. Zirbel, Brian Neyenhuis, Svetlana Kotochigova, Paul S. Julienne, Jun Ye, Deborah S. Jin, "Efficient state transfer in an ultracold dense gas of heteronuclear molecules", *Nature Physics* **4**, 622 - 6 (2008).

11. Evgeny A. Shapiro, Avi Pe'er, Jun Ye and Moshe Shapiro, “Piecewise adiabatic population transfer in a molecule via a wave packet”, *Phys. Rev. Lett.* **101**, 023601 (2008).
12. Matthew C. Stowe, Avi Pe'er and Jun Ye , “Control of Four-Level Quantum Coherence via Discrete Spectral Shaping of an Optical Frequency Comb”, *Phys. Rev. Lett.* **100**, 203001 (2008).
13. Mathew C. Stowe, Michael J. Thorpe, Avi Pe'er, Jun Ye, Jason E. Stalnaker, Vladislav Gerginov, and Scott A. Diddams, "Direct Frequency Comb Spectroscopy", in *Advances in Atomic, Molecular, and Optical Physics*, **55**, page 1-60 (Elsevier, Amsterdam 2008).
14. Avi Pe’er, Evgeny A. Shapiro, Matthew C. Stowe, Moshe Shapiro and Jun Ye, “Precision control of molecular dynamics with an ultrafast frequency comb”, *Phys. Rev. Lett.* **98,** 113004 (2007).
15. Avi Pe'er, Yaron Bromberg, Barak Dayan, Yaron Silberberg and Asher A. Friesem, "Broadband sum-frequency generation as an efficient two-photon detector for optical tomography", *Opt. Express* **15,** 8760-9 (2007).
16. Evgeny A. Shapiro, Moshe Shapiro, Avi Pe’er and Jun Ye, “Photoassociation adiabatic passage of ultracold Rb atoms to form ultracold Rb_2 molecules”, *Phy. Rev. A*, **75,** 013405 (2007).
17. Avi Pe'er, Yaron Silberberg, Barak Dayan, Asher A. Friesem, "Design of a high-power continuous source of broadband down-converted light", *Phys. Rev. A* **74,** 053805 (2006).
18. Nirit Dudovich, Thomas Polack, Avi Pe'er and Yaron Silberberg, "Simple route to strong field coherent control", *Phys. Rev. Lett* **94,** 083002 (2005).
19. Avi Pe'er, Barak Dayan, Asher A. Friesem and Yaron Silberberg, "Temporal shaping of entangled photons", *Phys. Rev. Lett.* **94,** 073601 (2005).
20. Barak Dayan, Avi Pe'er, Asher A Friesem and Yaron Silberberg, "Nonlinear interactions with an ultrahigh flux of broadband entangled photons", *Phys. Rev. Lett.* **94,** 043602 (2005).
21. Avi Pe'er, Barak Dayan, Marija Vucelja, Yaron Silberberg and Asher A. Friesem, "Quantum lithography by coherent control of classical light pulses", *Opt. Express* **12,** 6600-6 (2004).
22. Avi Pe'er, Barak Dayan, Yaron Silberberg and Asher A Friesem, "Optical code-division multiple access using broadband parametrically generated light", *J. Lightwave Technol.* **22**, 1463-71 (2004).
23. Barak Dayan, Avi Pe'er, Asher A Friesem and Yaron Silberberg, "Two photon absorption and coherent control with broadband down-converted light", *Phys. Rev. Lett.* **93**, 023005 (2004).
24. Barak Dayan, Avi Pe'er, Asher A Friesem and Yaron Silberberg “Coherent control with broadband squeezed vacuum”, arXiv: quant-ph 302038 Feb (2003).
25. Adolf W. Lohmann, Avi Pe'er, Dayong Wang, Asher A Friesem, "Flatland optics. III. Achromatic diffraction", *J. OSA A* **18**, 2095-7 (2001).
26. Adolf W. Lohmann, Dayong Wang, Avi Pe'er, Asher A. Friesem. "Flatland optics. II. Basic experiments", *J. OSA A* **18**, 1056-61 (2001).

27. Avi Pe'er, Dayong Wang, Adolf W. Lohmann, Asher A. Friesem, "Wigner formulation of optical processing with light of arbitrary coherence", *Appl. Opt.* **40**, 249-56 (2001).
28. Dayong Wang, Avi Pe'er, Adolf W. Lohmann, Asher A. Friesem, "Wigner algebra as a tool for the design of achromatic optical processing systems", *Opt. Eng.* **39**, 3014-24 (2001).
29. Adolf W. Lohmann, Avi Pe'er, Dayong Wang, Asher A. Friesem, "Flatland optics: fundamentals", *J. OSA A* **17**, 1755-62 (2000).
30. Dayong Wang, Avi Pe'er, Asher A. Friesem, Adolf W. Lohmann, "General linear optical coordinate transformations", *J. OSA A* **17**, 1864-9 (2000).
31. Avi Pe'er, Dayong Wang, Adolf W. Lohmann, Asher A. Friesem, "Apochromatic optical correlation", *Opt. Lett.* **25**, 776-8 (2000).
32. Avi Pe'er, Dayong Wang, Adolf W. Lohmann, Asher A. Friesem, "Optical correlation with totally incoherent light", *Opt. Lett.* **24**, 1469-71 (1999).

Conference Presentations

1. Rafi Vered, Michael Rosenbluh and Avi Pe'er, " Quantum and Classical Two-Photon Correlations in Broadband Four-Wave Mixing", Conference on Coherent Raman Scattering Microscopy (microCARS2012), Naurod, Germany (2012)
2. Roey Pomeranz, Yaakov Shaked and Avi Pe'er, "Complete Measurement of the Two-Photon Wave Function using High Contrast Quantum Interference", QIM – Conference on Quantum Information and Measurement, Berlin (2012).
3. Shai Yefet, Naaman Amer & Avi Pe'er, "Controlling mode competition in mode locked oscillators", IPS – Israel Physics Society Conference (2011)
4. Shai Yefet, Naaman Amer & Avi Pe'er, "Precise Spectral Shaping of Mode-locked Oscillations", CLEO Conference on Lasers and Electro-Optics (2011)
5. Rafi Vered, Michael Rosenblu & Avi Pe'er, "Two-Photon Correlations of Broadband Four Wave Mixing", CLEO Conference on Lasers and Electro-Optics (2011)
6. Shai Yefet, Naaman Amer & Avi Pe'er, "Shaping pulses before they are born", FRISNO-11 The French-Israely conference on nonlinear & quantum optics (2011)
7. Rafi Vered, Michael Rosenblu & Avi Pe'er, "Two-Photon Correlation of Broadband Four Wave Mixing", FRISNO-11 The French-Israely conference on nonlinear & quantum optics (2011)
8. Shai Yefet, Naaman Amer & Avi Pe'er, "Intra-Cavity pulse shaping", 3rd OASIS meeting on optical engineering and Science in Israel, ***Invited*** (2011)
9. Rafi Vered, Michael Rosenblu & Avi Pe'er, "Two-Photon Coherence of Broadband Four Wave Mixing", 3rd OASIS meeting on optical engineering and Science in Israel (2011)
10. Avi Pe'er, "SFG as an Ultrafast Quantum Detector for Heisenberg Scaled Measurement", CLEO Conference on Lasers and Electro-Optics (2010)
11. Avi Pe'er, "An ultrafast detector of quantum mechanical squeezing", Israeli Physics Society meeting (2009)
12. Avi Pe'er, "Ultracold polar molecules at the absolute ground state", 2nd OASIS meeting on optical engineering and Science in Israel, ***Invited*** (2009)

13. Avi Pe'er, "Polar molecules near quantum degeneracy", 4th Indo-Israel conference on solid state physics, ***Invited*** (2008)
14. Avi Pe'er, Evgeny A. Shapiro, Moshe Shapiro and Jun Ye, "Direct frequency comb measurement and control of vibrational dynamics in ultracold molecular samples", 2008 APS March Meeting (2008)
15. Avi Pe'er, Evgeny A. Shapiro, Matthew C. Stowe, Moshe Shapiro and Jun Ye, "Direct Frequency Comb Control of Molecular Dynamics", The Brijuni Conference on Laser Pulse Shaping and Coherent Control of Molecules, ***Invited talk*** (2007)
16. Avi Pe'er, Evgeny A. Shapiro, Matthew C. Stowe, Moshe Shapiro and Jun Ye, "Vibrational stabilization of cold molecules using a phase coherent train of ultrashort pulses ,", 38th Annual Meeting of the Division of Atomic, Molecular, and Optical Physics (DAMOP), (2007)
17. Avi Pe'er, Evgeny A. Shapiro, Matthew C. Stowe, Moshe Shapiro and Jun Ye, "Precise Control over Molecular Dynamics with an Ultrafast Frequency Comb for Photo-Association of Ultracold Molecules", 15th International Conference on Ultrafast Phenomena (UP), (2006)
18. Avi Pe'er, Barak Dayan, Asher A. Friesem, Yaron Silberberg, "Coherent Control of Two-Photon Phenomena with Broadband Non-Classical Light", Conference on Lasers and Electro-Optics, Quantum Electronics and Laser Science (CLEO / QELS), ***Invited talk*** (2005).
19. Dayong Wang, Avi Pe'er, Adolf W. Lohmann and Asher A Friesem, "Theory of the variable coordinate transformation systems in the framework of Wigner algebra", Proceedings of Spie **4221**, 410-14 (2000).
20. Adolf W. Lohmann, Avi Pe'er, Asher A. Friesem, Dayong Wang, "Flatland optics", Trends in Optics and Photonics. Diffractive Optics and Micro-Optics **41**, 223-5 (2000).
21. Dayong Wang, Avi Pe'er, Asher A. Friesem, Adolf W. Lohmann, "Wigner algebra for achromatic optical Fourier transformation", Proceedings of the 11th International Meeting on Electro-optics and Microelectronics in Israel (Annals of the Israel Physical Society) **14**, 194-6 (2000).
22. Avi Pe'er, Wang D, Asher A. Friesem, Adolf W. Lohmann, "Design of an optical correlator with totally incoherent light", Proceedings of Spie **3749**, 278-9. (1999).
23. Dayong Wang, Avi Pe'er, Asher A. Friesem, Adolf W. Lohmann, "Controlling distortion in an optical imaging system", Proceedings of Spie **3749**, 245-6 (1999).
24. Adolf W. Lohmann, Wang D, Avi Pe'er, Asher A. Friesem, "Design of an achromatic Fourier system by means of Wigner algebra", Proceedings of Spie **3749**, 6-7 (1999).

Patents

1. Avi Pe'er, Barak Dayan, Yaron Silberberg and Asher A Friesem, "Method and System for Use in Optical Code Division Multiple Access (OCDMA)", US patent no. 7339717 (2003).
2. Shai Yefet and Avi Pe'er, "Method and System for Intra-Cavity Pulse Shaping", Patent pending (2011)