JAMES C. CAMPARO, Ph.D.

Areas of Expertise: Atomic radiative interactions, optical pumping, diode lasers, atomic clocks, system timekeeping.

Biography:

Dr. Camparo joined The Aerospace Corporation's Atomic Physics section in January 1981 immediately after obtaining his doctorate from Columbia University. His dissertation dealt with "laser snow" (i.e., photochemically produced cesium hydride) and the spin-exchange detection of free hydrogen/deuterium atoms created in the laser snow process. In addition to his adjunct faculty position at Whittier College, Dr. Camparo is a Distinguished Scientist in Aerospace Corporation's Physical Sciences Laboratories, where his interests include research and development of the laser-pumped atomic clock, the study of atomic timekeeping onboard spacecraft, and experiments investigating the stochastic-field/atom interaction problem. Since 2005, Dr. Camparo has been an adjunct professor of physics at Whittier College. Dr. Camparo was captain of the Columbia Fencing Team (1977) and holds a 2nd degree black belt in Tae-Kwon-Do.

Professional Experience:

January 1981 to present — The Aerospace Corporation
El Segundo, CA
- 2009-present: Distinguished Scientist
- 1999-2009: Senior Scientist
- 1994-1999: Research Scientist
- 1992-1994: Senior Member of the Technical Staff
- 1981-1992: Member of the Technical Staff

February 2005 to present — Whittier College
Whittier, CA
Adjunct Prof. Physics
- INTD-228: *Technological and Societal Change*

September 1985 to present — California State University Dominguez Hills
Carson, CA
Part-Time Faculty
- SMT-314: *Introduction to Cosmology*
- SMT-310: *Science and Technology*

Summer 1993 — Max-Planck-Institute for Quantum Optics
Garching, Germany
Visiting Fellow

Education:

Ph.D. 1980 — Chemical Physics
Columbia University, New York, NY

Thesis sponsored by Professor William Happer:
Magnetic resonance in cesium vapor: Detection of photoinduced paramagnetic species and spin-exchange amplification of rf broadening.

B.A. 1977 — Physics
Columbia University, New York, NY

Awards:

The 2012 IEEE International Frequency Control Symposium I.I. Rabi Award

The Aerospace Corporation 1990 Group Achievement Award:
Development of a theoretical model of the rubidium atomic clock

The Aerospace Corporation Inventor's Award

- 2013 – *The isoclinic point thermometer*
- 2009 – *Laser stabilization employing atomic/molecular isoclinic points*
- 2008 – *A method for a precision oscillator to autonomously detect frequency changes*
- 2004 – *Acoustic plasma oscillation technique for assessing rf-discharge lamp characteristics*
- 1997 – *A means for the atomic stabilization of electromagnetic field strength*
- 1995 – *A laser-based rubidium atomic clock employing laser-induced-fluorescence optical pumping*
- 1984 – *Technique for measuring microwave field strengths in atomic clock microwave cavities*

Patents:

Systems and methods for stabilizing laser frequency based on an isoclinic point in the absorption spectrum of a gas,
U.S. Patent No. 8,442,083 B2, 14 May 2013; continuation of U.S. Patent No. 8,050301 B2, 1 November 2011.

Precision frequency change detector,
U.S. Patent No. 7,847,597, 7 December 2010.

Discharge lamp stabilization system,
U.S. Patent No. 7,221,231, 22 May 2007.

Method of stabilizing electromagnetic field strength in an atomic system,
U.S. Patent No. 6,025,755, 15 February 2000.

Rubidium atomic clock with fluorescence optical pumping and method using same,
U. S. Patent No. 5,657,340, 12 August 1997.

Societies:

Association of Psychological Science
American Physical Society
Division of Atomic Molecular & Optical Physics
Forum on the History of Physics
Forum on Industrial & Applied Physics
Forum on Physics & Society
Topical Group on Precision Measurement & Fundamental Constants
California Section
IEEE
Ultrasonics, Ferroelectrics & Frequency Control Society
Western Psychological Association

PUBLICATIONS

IEEE Standards:

1. *IEEE Guide for Measurement of Environmental Sensitivities of Standard Frequency Generators*, IEEE Std 1193, 12 March 2004.

2. *IEEE Standard Definitions of Physical Quantities for Fundamental Frequency and Time Metrology – Random Instabilities*, IEEE Std 1139-1999, 21 July 1999.

Peer-Reviewed Journals:

1. *Coherent-population-trapping and polarization fluctuations: The independent modulator approximation for CPT lineshapes*, M. Huang, T. U. Driskell, and J. C. Camparo, Phys. Rev. A 87, 053419 (2013).

2. *A geometrical approach to Likert scaling and attitude measurements: The density matrix in psychology*, J. Camparo, J. Math. Psych. 57, 29-42 (2013).

3. *The analysis of Likert scales using state multipoles: An application of quantum methods to behavioral sciences data*, J. C. Camparo and L. B. Camparo, J. Educ. & Behav. Stat. 38(1), 81-101 (2013).

4. *rf-power and the ring-mode to red-mode transition in an inductively-coupled plasma*, J. Coffer and J. Camparo, J. Appl. Phys 111, 083304 (2012).

5. *Coherent population trapping under periodic polarization modulation*, M. Huang and J. Camparo, Phys. Rev. A 85, 012509 (2012).

6. *^{87}Rb D_1 isoclinic point*, N. Wells and J. Camparo, Phys. Rev. A 82, 062505 (2010).

7. *Coherent-population-trapping transients induced by rapid changes in laser polarization*, M. Huang, J. G. Coffer, and J. C. Camparo, J. Phys. B: At. Mol. Opt. Phys. 43, 135001 (2010).

8. *Self-monitoring and self-assessing atomic clocks*, Y. C. Chan, W. A. Johnson, S. K. Karuza, A. M. Young, and J. C. Camparo, IEEE Trans. Instrum. & Meas. 59(2), 330-334 (2010).

9. *In the eye of the beholder: Quantifying individuals' preferences and biases using peer nominations*, J. C. Camparo, L. B. Camparo, and J. T. Wagner, Appl. Psych. Meas.34(2), 90-104 (2010).

10. *Effects of rf-power on electron density and temperature, neutral temperature, and T_e fluctuations in an inductively-coupled plasma*, J. Camparo and G. Fathi, J. Appl. Phys. 105, 103302 (2009).

11. *Pressure sensitivity of the vapor-cell atomic clock*, H. Wang, G. Iyanu, and J. Camparo, IEEE Trans. Ultrason., Ferroelec., & Freq. Control. 56, 1139-1144 (2009).

12. *Do anti-immigrant sentiments track into Danish classrooms? Ethnicity, ethnicity salience, and bias in children's peer preferences*, J. T. Wagner, L. B. Camparo, V. Tsenkova, and J. C. Camparo, Internat. J. of Educ. Res. 47, 312-322 (2008).

13. *The rubidium atomic clock and basic research*, J. C. Camparo, Phys. Today 60(11), 33-39 (2007).

14. *Semiempirical theory of Carver rates in alkali/noble-gas systems*, J. C. Camparo, J. Chem. Phys, 126, 244310 (2007).

15. *Rb^{87} hyperfine-transition dephasing in mixed buffer-gas systems*, M. Huang, J. G. Coffer, and J. C. Camparo, Phys. Rev. A 75, 052717 (2007).

16. *Spectral mode changes in an alkali rf-discharge*, J. C. Camparo and R. Mackay, J. Appl. Phys. 101, 053303 (2007).

17. *Ion-wave stabilization of an inductively coupled plasma*, J. C. Camparo and R. Mackay, Appl. Phys. Lett. 88, 173510 (2006).

18. *Generation of ion-acoustic waves in an inductively-coupled, low-pressure discharge lamp*, J. C. Camparo and C. M. Klimcak, J. Appl. Phys. 99, 083306 (2006).

19. *Absorption cross-section fluctuations driven by continuous and discrete laser frequency variations*, M. Huang, J. G. Coffer, and J. C. Camparo, Opt. Commun. 265, 187-196 (2006).

20. *Breakdown of the Born approximation in laser phase noise to transmitted intensity noise conversion*, J. J. Townsend, J. G. Coffer, and J. C. Camparo, Phys. Rev. A 72, 033807 (2005).

21. *Evidence for a simple scaling law relating neutral and cation diatomic bond energies*, James Camparo, J. Molecular Structure: THEOCHEM 722(1-3), 239-243 (2005).

22. *Does the light shift drive frequency aging in the rubidium atomic clock?*, J. C. Camparo, IEEE. Trans. Ultrason. Ferroelec. and Freq. Control, 52(7), 1075-1078 (2005).

23. *Frequency equilibration in the vapor-cell atomic clock*, J. C. Camparo, C. M. Klimcak, and S. J. Herbulock, IEEE Trans. Instrum. Meas. 54(5), 1873-1880 (2005).

24. *A laser-pumped atomic clock exploiting pressure-broadened optical transitions*, J. C. Camparo, J. G. Coffer, J. J. Townsend, J. Opt. Soc. Am. B 22(3), 521-528 (2005).

25. *Spatial partitioning of the molecular wavefunction: Reexamination of the bond-charge model of covalent binding*, James Camparo, Int. J. Quantum Chem. 100, 41-52 (2004).

26. *Space system timekeeping in the presence of solar flares: Atomic clocks and crystal oscillators*, J. C. Camparo, S. C. Moss, and S. D. Lalumondiere, IEEE Aerospace and Electronic Systems Magazine 19(5), 3-8 (2004).

27. *Cavity-Q aging observed via an atomic-candle signal*, J. G. Coffer, B. Sickmiller, and J. C. Camparo, IEEE Trans. Ultrason. Ferroelec. Freq. Control 51(2), 139-145 (2004).

28. *Fluorescence fluctuations from a multi-level atom in a non-stationary, phase-diffusion field: Deterministic frequency modulation*, J. Camparo, Phys. Rev. A 69, 013802 (2004).

29. *A space experiment examining the response of a geosynchronous quartz-crystal oscillator to various levels of solar activity*, S. D. LaLumondiere, S. C. Moss, and J. C. Camparo, IEEE Trans. Ultrason. Ferroelec. Freq. Control 50(3), 210-213 (2003).

30. *Lineshapes of atomic-candle-type Rabi resonances*, J. G. Coffer, B. Sickmiller, A. Presser, and J. C. Camparo, Phys. Rev. A 66, 023806 (2002).

31. *Accessing mean photon number via an atomic time interval*, J. C. Camparo and J. G. Coffer, Phys. Rev. A. 66, 043416 (2002).

32. *Examination of crystal oscillator frequency noise during the enhanced space radiation environment of a solar flare*, A. Presser and J. C. Camparo, IEEE Trans. Nucl. Sci. 49(5), 2605 (2002).

33. *Collisional dephasing and the reduction of laser phase-noise to amplitude noise conversion in a resonant atomic vapor*, J. G. Coffer, M. Anderson, and J. C. Camparo, Phys. Rev. A 65, 033807 (2002).

34. *Multiphoton transitions in a colored vacuum: Coupling of the ac Stark shift with spontaneous decay and the Lamb shift*, J. Camparo and P. Lambropoulos, J.Opt. Soc. Am. B. 19(5), 1169 (2002).

35. *Semiclassical description of radiative decay in a colored vacuum*, James Camparo, Phys. Rev. A 65, 013815 (2002).

36. *Precision measurements of absorption and refractive-index using an atomic candle*, Tabitha Swan-Wood, J. G. Coffer and J. C. Camparo, IEEE Trans. Instrum. & Meas. 50(5) (2001).

37. *Stellar scintillation and the atmosphere's vertical turbulence profile,* James C. Camparo, J. Opt. Soc. Am. A 18(3), 631 (2001).

38. *Atomic stabilization of field intensity using Rabi-resonances,* J. G. Coffer and J. C. Camparo, Phys. Rev. A 62, 013812 (2000).

39. *Quantum-mechanical interference between optical transitions: The effect of laser intensity noise,* J. C. Camparo and P. Lambropoulos, Phys. Rev. A. 59(3), 2515 (1999).

40. *Semiclassical random electrodynamics: Spontaneous emission and the Lamb shift,* J. C. Camparo, J. Opt. Soc. Am. B 16(1), 173 (1999).

41. *Conversion of laser phase noise to amplitude noise in a resonant atomic vapor: The role of laser linewidth,* J. C. Camparo and J. G. Coffer, Phys. Rev. A 59(1), 728 (1999).

42. *Rabi-resonances induced by an off-resonant, stochastic field,* J. C. Camparo, J. G. Coffer, and R. P. Frueholz, Phys. Rev. A 58(5), 3873 (1998).

43. *Atomic stabilization of electromagnetic field strength using Rabi-resonances,* J. C. Camparo, Phys. Rev. Lett. 80(2), 222 (1998).

44. *Conversion of laser phase noise to amplitude noise in an optically thick vapor,* J. C. Camparo, J. Opt. Soc. Am. B 15(3), 1177 (1998).

45. *Temporal response of an atom to a stochastic field: Resonant enhancement of population fluctuations at the Rabi frequency,* J. C. Camparo, J. G. Coffer, and R. P. Frueholz, Phys. Rev. A 56(1), 1007 (1997).

46. *Precise time synchronization of two Milstar communications satellites without ground intervention,* J. C. Camparo, R. P. Frueholz, and A. P. Dubin, Int. J. Sat. Commun. 15, 135 (1997).

47. *AC Stark shifts in 3+2 photoionization with a pulsed, stochastic field,* J. C. Camparo and P. Lambropoulos, Opt. Commun. 137, 413 (1997).

48. *Quantum-mechanical interference between optical transitions and the effect of laser phase noise,* J. C. Camparo and P. Lambropoulos, Phys. Rev. A 55(1), 552 (1997).

49. *Underlying simplicity of atomic population variations induced by a stochastic phase fluctuating field,* R. P. Frueholz and J. C. Camparo, Phys. Rev. A. 54(4), 3499 (1996).

50. *Stochastic realization shift in the ground-state hyperfine transition of an alkali-metal vapor,* J. C. Camparo, Phys. Rev. A. 54(1), 410 (1996).

51. *Optical pumping with laser-induced-fluorescence,* J. C. Camparo and S. B. Delcamp, Opt. Commun. 120, 257 (1995).

52. *General atomic response to resonant, phase fluctuating fields in the adiabatic limit,* R. P. Frueholz and J. C. Camparo, Phys. Rev. A. 52, 472 (1995).

53. *Stochastic field effects and transform limited laser pulses*, J. C. Camparo and P. Lambropoulos, Opt. Lett., 19, 1562 (1994).

54. *Assessing entropy changes of Bloch-vector trajectories using experimental data*, R. P. Frueholz and J. C. Camparo, Phys. Rev. A 48, 4790 (1993).

55. *Entropy and attractor dimension as measures of the field-atom interaction*, R. P. Frueholz and J. C. Camparo, Phys. Rev. A 47, 4404 (1993).

56. *Monte Carlo simulation of field fluctuations in strongly driven resonant transitions*, J. C. Camparo and P. P. Lambropoulos, Phys Rev. A 47, 480 (1993).

57. *AC Stark shift of a 2-photon transition induced by a model stochastic field*, J. C. Camparo and P. P. Lambropoulos, J. Opt. Soc. Am. B9, 2163 (1992) .

58. *Resonance shift due to correlated amplitude and frequency variations*, J. C. Camparo and C. M. Klimcak, Opt. Commun. 91, 343 (1992).

59. *AlGaAs diode laser blue shift resulting from fast neutron irradiation*, J. C. Camparo, S. B. Delcamp, and R. P. Frueholz, J. Appl. Phys. 71, 5323 (1992).

60. *The stochastic realization shift*, J. C. Camparo and P. P. Lambropoulos, Opt. Commun. 85, 213 (1991).

61. *Comment on 'Localization of atoms in a three-dimensional standing wave (Phys. Rev. Lett. 65,33 (1990))'*, J. C. Camparo and R. P. Frueholz, Phys. Rev. Lett. 66, 2412 (1991).

62. *Attractor geometry of a quasiperiodically perturbed, two-level atom*, J. C. Camparo and R. P. Frueholz, Phys. Rev. A 43, 338 (1991).

63. *Dicke-narrowing in strong fields: the atom-as-antenna analogy*, J. C. Camparo, R. P. Frueholz, and H. G. Robinson, Phys. Rev. A. 40, 2351 (1989).

64. *Injection current calibration of diode laser wavelengths*, J. C. Camparo, Y. C. Chan, B. Jaduszliwer and J. Malenfant, Opt. Commun. 70, 416 (1989).

65. *Saturation broadening by inhomogeneous fields*, J. C. Camparo, Phys. Rev. A. 39, 69 (1989).

66. *A three dimensional model of the gas cell atomic frequency standard*, J. C. Camparo and R. P. Frueholz, IEEE Trans. Ultrason. Ferroelec. Freq. Contr. UFFC-36, 185 (1989).

67. *Observation of the Rabi resonance spectrum*, J. C. Camparo and R. P. Frueholz, Phys. Rev. A. 38, 6143 (1988).

68. *Photothermal wavelength modulation of a diode laser*, C. M. Klimcak and J. C. Camparo, J. Opt. Soc. Am. B 5, 211 (1988).

69. *A comparison of various alkali gas cell atomic frequency standards*, J. C. Camparo and R. P. Frueholz, IEEE Trans. Ultrason. Ferroelec. Freq. Contr. UFFC-34, 607 (1987).

70. *An examination of subnatural spectroscopy using optical pumping*, J. C. Camparo, R. P. Frueholz and C. M. Klimcak, Phys. Rev. A 36, 2072 (1987).

71. *Implications of the trapping-desorption and direct inelastic scattering channels on Dicke-narrowed lineshapes*, R. P. Frueholz and J. C. Camparo, Phys. Rev. A 35, 3768 (1987).

72. *Alkali reactions with wall coating materials used in atomic resonance cells*, J. C. Camparo, R. P. Frueholz and B. Jaduszliwer, J. Appl. Phys. 62, 676 (1987).

73. *Alkali <I·S> wall relaxation in dichlorodimethylsilane coated resonance cells*, J. C. Camparo, J. Chem. Phys. 86, 1533 (1987).

74. *Subnatural optical pumping dips*, C. M. Klimcak, J. C. Camparo, R. A. Cook and R. P. Frueholz, Phys. Rev. A 34, 1575 (1986).

75. *Fundamental stability limits for the diode laser pumped rubidium atomic frequency standard*, J. C. Camparo and R. P. Frueholz, J. Appl. Phys. 59, 3313 (1986).

76. *The single-mode diode laser as a source of variable bandwidth, fixed center frequency optical fields*, J. C. Camparo, Rev. Sci. Instrum. 57, 370 (1986).

77. *A non-empirical model of the gas cell atomic frequency standard*, J. C. Camparo and R. P. Frueholz, J. Appl. Phys. 59, 301 (1986).

78. *The diode laser in atomic physics*, J. C. Camparo, Contemp. Phys. 26, 443 (1985).

79. *Saturation of the 0-0 hyperfine transition linewidth enhancement factor in optically pumped alkali-metal vapors*, J. C. Camparo and R. P. Frueholz, Phys. Rev. A 32, 1888 (1985).

80. *Linewidths of the 0-0 hyperfine transition in optically pumped alkali-metal vapors*, J. C. Camparo and R. P. Frueholz, Phys. Rev. A 31, 1440 (1985).

81. *Microwave field strength measurement in a rubidium clock cavity via adiabatic rapid passage*, R. P. Frueholz and J. C. Camparo, J. Appl. Phys. 57, 704 (1985).

82. *A dressed atom interpretation of adiabatic rapid passage*, J. C. Camparo and R. P. Frueholz, J. Phys. B 17, 4169 (1984).

83. *Optical pumping dips in a homogeneously broadened fluorescence line*, C. M. Klimcak and J. C. Camparo, Phys. Rev. A 30, 1791 (1984).

84. *Parameters of adiabatic rapid passage in the 0-0 hyperfine transition of Rb87*, J. C. Camparo and R. P. Frueholz, Phys. Rev. A 30, 803 (1984).

85. *Laser spectroscopy on a "shoestring"*, J. C. Camparo and C. M. Klimcak, Am. J. Phys. 51, 1077 (1983).

86. *Use of wall coated cells in atomic frequency standards*, R. P. Frueholz, C. H. Volk and J. C. Camparo, J. Appl. Phys. 54, 5613 (1983).

87. *Inhomogeneous light shift in alkali-metal atoms*, J. C. Camparo, R. P. Frueholz and C. H. Volk, Phys. Rev. A 27, 1914 (1983).

88. *Anomalous tuning of single mode AlGaAs diode lasers*, J. C. Camparo and C. H. Volk, IEEE J. Quantum Electron. QE-18, 1990 (1982).

89. *Photoproduction of spin-polarized hydrogen atoms and electrons in mixtures of cesium vapor and hydrogen gas*, N. D. Bhaskar, J. Camparo, M. Ligare and W. Happer, Phys. Rev. Lett. 46, 1387 (1981).

90. *Light narrowing of magnetic resonance lines in dense, optically pumped alkali-metal vapor*, N. D. Bhaskar, J. Camparo, W. Happer and A. Sharma, Phys. Rev. A 23, 3048 (1981).

91. *Spin destruction in collisions between cesium atoms*, N. D. Bhaskar, J. Pietras, J. Camparo, W. Happer and J. Liran, Phys. Rev. Lett. 44, 930 (1980).

92. *Optical pumping of cesium atoms with second resonance light*, J. Liran, J. Pietras, J. Camparo and W. Happer, Opt. Commun. 31, 169 (1979).

Published Conference Proceedings:

1. *Long-term behavior of rubidium clocks in space*, J. Camparo, J. Hagerman, and T. McClelland, Proceedings of the 2012 European Frequency and Time Forum, 23-27 April, Gothenburg, Sweden.

2. *Atomic clocks research at The Aerospace Corporation*, J. Camparo, Y. Chan, J. Coffer, N. Ho, B. Jaduszliwer, C. Klimcak, F. Wang, H. Wang, and N. Wells, Proceedings 43rd Precise Time and Time Interval (PTTI) Systems and Applications Meeting (US Naval Observatory, 2012) pp. 125-132.

3. *Progress in the development of a compact laser-pumped atomic clock*, I. Bablewski, J. Coffer, and J. Camparo, Proceedings 43rd Precise Time and Time Interval (PTTI) Systems and Applications Meeting (US Naval Observatory, 2012) pp. 483-488.

4. *Spacecraft atomic clock flight simulation and test station*, H. Wang, G. Iyanu, and J. Camparo, Proceedings 43rd Precise Time and Time Interval (PTTI) Systems and Applications Meeting (US Naval Observatory, 2012) pp.341-351.

5. *Self-pulsing in alkali rf-discharge lamps*, J. Coffer, M. Huang, and J. Camparo, Proceedings 2012 IEEE International Frequency Control Symposium (IEEE Press, Piscataway, NJ, 2012) pp. 692-696.

6. *The influence of laser polarization variations on CPT atomic clock signals*, M. Huang and J. Camparo, Proceedings 2011 Joint Conference of the IEEE International Frequency Control Symposium & European Frequency and Time Forum (IEEE, Piscataway NJ, 2011) pp. 951-954.

7. *All-optical integrated rubidium atomic clock*, L. Maleki, A. A. Savchenkov, V. S. Ilchenko, W. Liang, D. Eliyahu, A. B. Matsko, D. Seidel, N. P. Wells, J. C. Camparo, and B. Jaduszliwer, Proceedings 2011 Joint Conference of the IEEE International Frequency Control Symposium & European Frequency and Time Forum (IEEE, Piscataway NJ, 2011) pp. 799-803.

8. *The 2nd harmonic signal in vapor-cell atomic clocks*, G. Fathi and J. Camparo, Proceedings 2011 Joint Conference of the IEEE International Frequency Control Symposium & European Frequency and Time Forum (IEEE, Piscataway NJ, 2011) pp. 564-569.

9. *Frequency Stabilization of Lasers by Locking to an Atomic Isoclinic Point*, N. P. Wells and J. C. Camparo, Proceedings 2010 IEEE International Frequency Control Symposium (IEEE, Piscataway NJ, 2010) pp. 329-332.

10. *Vapor-Cell Clock Frequency and Environmental Pressure: Resonance-Cell Volume Changes*, M. Huang, C. M. Klimcak, and J. C. Camparo Proceedings 2010 IEEE International Frequency Control Symposium (IEEE, Piscataway NJ, 2010) pp. 208-211.

11. *All-optical integrated atomic clock*, L. Maleki, V. S. Ilchenko, M. Mohageg, A. B. Matsko, A. A. Savchenkov, D. Seidel, N. P. Wells, J. C. Camparo, and B. Jaduszliwer, Proceedings 2010 IEEE International Frequency Control Symposium (IEEE, Piscataway NJ, 2010) pp. 119-124.

12. *A glimpse of the future: The 62nd PTTI systems & applications meeting November 2030*, L. Mallette and J. Camparo, Proceedings 41st Annual Precise Time and Time Interval (PTTI) Systems and Applications Meeting (US Naval Observatory, Washington DC, 2009) 349-358.

13. *Investigations into the Rb Clock's 2nd Harmonic Signal: A Status Report*, G. Fathi and J. Camparo, Proceedings 41st Annual Precise Time and Time Interval (PTTI) Systems and Applications Meeting (US Naval Observatory, Washington DC, 2009) 473-479.

14. *Autonomously measuring an atomic clock's Allan variance*, J. Camparo, Y. Chan, W. Johnson, S. Karuza, and A. Young, Proceedings 2009 European Time & Frequency Forum and IEEE International Frequency Control Symposium Joint Conference, (IEEE Press, Piscataway, NJ, 2009) pp. 1176-1179.

15. *Discharge Lamps for Rb Atomic Clocks: The Role of rf-Power*, J. Camparo and G. Fathi, Proceedings 2009 European Time & Frequency Forum and IEEE International Frequency Control Symposium Joint Conference, (IEEE Press, Piscataway, NJ, 2009) pp. 994-997.

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16. *The semiclassical stochastic-field/atom interaction problem*, J. Camparo, in Proceedings 7th Symposium on Frequency Standards and Metrology, ed. L. Maleki (World Scientific, Hackensack, New Jersey, 2009) pp. 109-117.

17. *Transient CPT Signals Arising from Rapid Changes in Laser Polarization*, J. Camparo, M. Huang, and J. Coffer, Proceedings 2008 IEEE International Frequency Control Symposium and Exposition (IEEE, Piscataway NJ, 2008) pp. 661-664.

18. *Influence of the Atmosphere on a Rubidium Clock's Frequency Aging*, J. Camparo and C. Klimcak, Proceedings 39th Annual Precise Time and Time Interval (PTTI) Systems and Applications Meeting (US Naval Observatory, Washington DC, 2007) 317-322.

19. *Development of a Conventional Laser-Pumped Rb Atomic Clock: Status Report*, C. Back and J. Camparo, Proceedings 39th Annual Precise Time and Time Interval (PTTI) Systems and Applications Meeting (US Naval Observatory, Washington DC, 2007) pp. 297-302.

20. *Effects of Polarization Fluctuations in CPT-Based Atomic Clocks*, M. Huang, J. Coffer and J. Camparo, Proceedings 39th Annual Precise Time and Time Interval (PTTI) Systems and Applications Meeting (US Naval Observatory, Washington DC, 2007) pp. 303-308.

21. *A Mechanism of Rubidium Atomic Clock Degradation: Ring-mode to Red-mode Transition in rf-Discharge Lamps*, J. Camparo and R. Mackay, Proceedings TimeNav '07 (IEEE, Piscataway NJ, 2007) pp. 45-48.

22. *Laser Polarization Noise and CPT Atomic Clock Signals*, J. Camparo, M. Huang, and J. Coffer, Proceedings TimeNav '07 (IEEE, Piscataway NJ, 2007) pp. 1056-1059.

23. *Lamp Stabilization Using Ion Waves: Smart-Clock Technology to Eliminate Light Shift Variations*, Proceedings 2006 IEEE International Frequency Control Symposium and Exposition (IEEE, Piscataway NJ, 2006) pp. 706-710.

24. *Ion-Acoustic Plasma Waves in rf-Discharge Lamps: Light-Shift Stabilization in Atomic Clocks*, J. Camparo and C. Klimcak, Proceedings 2005 Joint IEEE International Frequency Control Symposium and Precise Time and Time Interval (PTTI) Systems & Applications Meeting (IEEE, Piscataway NJ, 2005) pp. 477-480.

25. *Frequency Equilibration and the Light-Shift Effect for Block IIR GPS Rubidium Clocks*, J. Camparo, Proceedings 36th Annual Precise Time and Time Interval (PTTI) Systems and Applications Meeting (US Naval Observatory, Washington DC, 2004) pp. 393-409.

26. *Reducing PM-to-AM Conversion and the Light-Shift in Laser-Pumped, Vapor-Cell Atomic Clocks*, J. C. Camparo, J. G. Coffer, and J. J. Townsend, Proceedings 2004 IEEE International Ultrasonics, Ferroelectrics, and Frequency Control Joint 50th Anniversary Conference (IEEE, Piscataway NJ, 2004) pp. 134-136..

27. *Investigations of vapor-cell clock equilibration following initial activation: A progress report*, S. Herbulock, C. Klimcak, A. Presser, J. Milne, and J. Camparo, Proceedings 35th Annual Precise Time and Time Interval (PTTI) Systems and Applications Meeting (US Naval Observatory, Washington DC, 2004) pp. 435-443.

28. *Response of a geosynchronous spacecraft's crystal oscillator to solar flares: Results of a "space experiment,"* J. Camparo, A. Presser, S. Lalumondiere, and S. Moss, Proceedings 34th Annual Precise Time and Time Interval (PTTI) Systems and Applications Meeting (US Naval Observatory, Washington DC, 2003) pp. 193-200.

29. *Applications of the atomic candle: Accessing low-frequency amplitude variations via an atomic time interval*, James Camparo, Fluctuations and Noise in Photonics and Quantum Optics, eds., D. Abbott, J. H. Shapiro, Y. Yamamoto, Proceedings SPIE Volume 5111 (SPIE, Bellingham, WA, 2003), pp. 487-497.

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