

John L. Hall

Degrees:

B.S. 1956, Carnegie Institute of Technology
M.S. 1958, Carnegie Institute of Technology
Ph.D. 1961, Carnegie Institute of Technology

Appointments:

NRC Postdoctoral Fellow, National Bureau of Standards, 1961-1962
Physicist, National Bureau of Standards, 1962-1971
Fellow, Joint Institute for Laboratory Astrophysics (now JILA), 1964-present
Lecturer, Physics Department, University of Colorado, 1967-present
Senior Scientist, National Bureau of Standards (now National Institute of Standards and Technology), 1971-present

Honors and Awards:

National Carbon Company Fellow in Physics, 1957-1961
Department of Commerce Gold Medal, 1969
Samuel W. Stratton Award, 1971
Department of Commerce Gold Medal, 1974 (group awards)
IR-100: Laser stabilizer selected as one of "100 best new products of the year," 1975
IR-100: Laser wavelength meter ("Lambdameter") selected as one of "100 best new products of the year," 1977
E. U. Condon Award, 1979
Charles Hard Townes Award of the Optical Society of America, 1984, jointly with V. P. Chebotayev (Academy of Sciences, USSR)
Davisson-Germer Prize of the American Physical Society, 1988
Docteur Honoris Causa de l'Universite Paris Nord, 1989
Frederic Ives Medal of the Optical Society of America, 1991
Arthur L. Shawlow Prize of the American Physical Society, 1993
Allen V. Astin Measurement Science Award, 2000
Max Born Award of the Optical Society of America, 2002
Presidential Rank Award from the Office of Personnel Management, 2002
Department of Commerce Gold Medal, 2002 (group awards)
I. I. Rabi Prize of the IEEE Society for Ultrasonic, FerroElectricity, and Frequency Control, 2004
Légion d'Honneur Membership, 2004

Professional Associations:

Fellow, American Physical Society
Fellow, Optical Society of America
Member, International Union of Radio Science (URSI) Commission VII
Delegate, Consultative Committee for the Definition of the Meter (BIPM) Sevres, France, 1970-present
Member, NAC/Army Research Office Committee on Recommendations, 1976-1979
Member, NRC/NAS National Research Committee on Fundamental Constants, 1976-1979
Member, Program Committee for International Conference on Quantum Electronics,

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1978, 1996

Member, Academy of Science, 1984-present

Member, Program Committee for CLEO/QELS Conference, 1996

Publications:

- “Electron spin resonance of interstitial hydrogen atoms in CaF_2 ,” unpublished Ph.D. thesis, Carnegie Institute of Technology, August 1961.
- “Paramagnetic spectrum of interstitial hydrogen atoms in CaF_2 ,” *Bull. Am. Phys. Soc.* 6, 247 (1961), with R. T. Schumacher.
- “Overhauser polarization of Li nuclei in irradiated LiH,” *Phys. Rev.* 125, 428 (1962), with R. T. Schumacher.
- “Electron spin resonance of hydrogen atoms in CaF_2 ,” *Phys. Rev.* 127, 1892 (1962), with R. T. Schumacher.
- “Electron spin resonance of interstitial hydrogen atoms in CaF_2 ,” in LOW Symposium on Paramagnetic Resonances (Academic Press, New York, 1963), Vol. 1, pp. 206-216, with R. T. Schumacher.
- “Study of anthracene fluorescence excited by the ruby giant-pulse laser,” *Phys. Rev. Lett.* 11, 364 (1963), with D. A. Jennings and R. M. McClintock.
- “Laser double-quantum photodetachment of IG,” *Phys. Rev. Lett.* 14, 1013 (1965), with E. J. Robinson and L. M. Branscomb.
- “Two-quantum photoionization of Cs and IG,” *IEEE J. Quantum Electron.* QE-2, 361 (1966).
- “Optical heterodyne measurement of neon laser’s millimeter wave difference frequency,” *Appl. Phys. Lett.* 10, 152 (1967), with W. W. Morey.
- “Electron affinity of helium via laser photodetachment of its negative ion,” *Phys. Rev. Lett.* 19, 737 (1967), with B. Brehm and M. A. Gusinow.
- “Angular dependence of the laser photodetachment of the negative ions of carbon, oxygen and hydrogen,” *J. Chem. Phys.* 48, 943 (1968).
- “Laser wavelength standards,” *IEEE J. Quantum Electron.* QE-4, 367 (1968).
- “Precision long-path interferometry and the velocity of light,” *IEEE J. Quantum Electron.* QE-4, 371 (1968), with R. L. Barger, P. L. Bender, H. S. Boyne, J. E. Faller and J. Ward.

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Publications: (continued)

- “The laser absolute wavelength standard problem,” IEEE J. Quantum Electron. QE-4, 638 (1968).
- “Pressure shift and broadening of methane line at 3.39 μ studied by laser-saturated molecular absorption,” Phys. Rev. Lett. 22, 4 (1969), with R. L. Barger.
- “Collision effects on the line shape of laser-saturated molecular resonance absorption,” in Vith International Conference on the Physics of Electronic and Atomic Collisions: Abstracts of Papers (M.I.T. Press, Cambridge, MA, 1969), pp. 994-996.
- “Use of laser saturated absorption of methane for laser frequency stabilization,” in Proceedings, Frequency Control Symposium, Atlantic City, New Jersey, May 6-8, 1969, p. 309, with R. L. Barger.
- “Precision long-path interferometry and the velocity of light,” Electron Technology (Warsaw) 2, 53 (1969), with R. L. Barger, P. L. Bender, H. S. Boyne and J. E. Faller.
- “Absolute strain measurements with a 30 meter vacuum interferometer,” in Laser Applications in the Geosciences (Western Periodicals, North Hollywood, CA, 1970), pp. 215-225, with H. S. Boyne, R. L. Barger, P. L. Bender, J. Ward, J. Levine and J. Faller.
- “Laser stabilization on the 3.39 micron line of methane using saturated absorption,” Summary in Proceedings of the Symposium on Physics of Gas Lasers, Novosibirsk USSR, June 30-July 4, 1969.
- “Precision acceleration of gravity and velocity of light experiments using lasers,” Abstract in Proceedings, URSI Conference, Ottawa, Canada, August, 1969.
- “Laser frequency standards,” invited paper presented at Sixth International Quantum Electronics Conference, Kyoto, Japan, September 1970.
- “A methane-absorption stabilized 3.39 micron laser interferometer,” paper presented at Sixth International Quantum Electronics Conference, Kyoto, Japan, September 1970, with J. Levine.
- “Precision wavelength measurement of the methane 3.39 μm saturated absorption line by laser-controlled interferometry,” paper presented at Sixth International Quantum Electronics Conference, Kyoto, Japan, September 1970, with R. L. Barger.
- “A tunable dye laser with narrow spectral output,” Appl. Phys. Lett. 17, 239 (1970), with H. Walther.
- “Precision wavelength measurement of the methane 3.39 μm saturated absorption line by

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laser-controlled interferometry,” in Precision Measurement and Fundamental Constants (D. N. Langenberg and B. N. Taylor, Eds., NBS Spec. Publ. 343, 1971), p. 51, with R. L. Barger.

“The implication of saturated molecular absorption for the laser wavelength standard problem,” in Precision Measurement and Fundamental Constants (D. N. Langenberg and B. N. Taylor, Eds., NBS Spec. Publ. 343, 1971), p. 49, with R. L. Barger.

“Precision infrared Zeeman spectra of CH₄ studied by laser-saturated absorption,” *Phys. Rev. Lett.* 26, 289 (1971), with E. E. Uzgiris and R. L. Barger.

“Design and operation of a methane absorption stabilized laser strainmeter,” *J. Geophys. Res.* 77, 2595 (1972), with J. Levine.

“Molecular photodetachment spectrometry. I. The electron affinity of nitric oxide and the molecular constants of NOG,” *Phys. Rev. A* 6, 607 (1972), with M. W. Siegel, R. J. Celotta, J. Levine and R. A. Bennett.

“Molecular photodetachment spectrometry. II. The electron affinity of O₂ and the structure of O₂G,” *Phys. Rev. A* 6, 631 (1972), with R. J. Celotta, R. A. Bennett, M. W. Siegel and J. Levine.

“Frequency reproducibility of saturated absorption-stabilized lasers: The line center problem,” for Conference on Precision Electro-magnet Measurements, Boulder, June 1972, with G. Kramer and R. L. Barger.

“Transient effects in saturated absorption,” in VIth International Conference on Quantum Electronics, Montreal, May 1972, Digest of Technical Papers, p. 74, with G. Kramer and R. L. Barger.

“The speed of light from direct frequency and wavelength measurements of the methane stabilized laser,” *Phys. Rev. Lett.* 29, 1346 (1972), with K. M. Evenson, J. S. Wells, F. R. Peterson, B. L. Danielson, G. W. Day and R. L. Barger.

“Saturated absorption optical heterodyne spectroscopy of some single methyl compounds,” VII International Quantum Electronics Conference, May 1972, Digest of Technical Papers, p. 44, with J. A. Magyar.

“The line shape problem in laser saturated molecular absorption,” in Lectures in Theoretical Physics, Vol. XII (K. T. Mahanthappa and W. E. Brittin, Eds., Gordon and Breach, New York, 1973), pp. 161-210.

“Saturated absorption line shape,” in Fundamental and Applied Laser Physics, Proceedings, Esfahan Symposium, August 29-September 5, 1971 (M. S. Feld, A. Javan and N. Kurnit, Eds., Wiley, New York, 1973), pp. 463-477.

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- “Wavelength of the 3.39-micron laser-saturated absorption line of methane,” *Appl. Phys. Lett.* 22, 196 (1973), with R. L. Barger.
- “Saturated absorption spectroscopy with applications to the 3.39 micron methane transition,” in Atomic Physics 3, Proceedings, Third International Conference on Atomic Physics, Boulder, CO, August 1972 (S. J. Smith and G. K. Walters, Eds., Plenum, New York, 1973), pp. 615-646.
- “Frequency stabilization of a cw dye laser,” *Appl. Phys. Lett.* 22, 573 (1973), with R. L. Barger and M. C. Sorem.
- “Measurement of methane hyperfine structure using laser saturated absorption,” *Phys. Rev. Lett.* 30, 1101 (1973), with C. J. Borde.
- “Measurement of the relativistic Doppler shift using laser standing-wave saturation spectroscopy,” in Fourth International Conference on Atomic Phys: Abstracts of Contributed Papers, Heidelberg, July 22-26, 1974, with J. J. Snyder and M. S. Sorem.
- “Sub-Doppler spectroscopy, methane hyperfine spectroscopy, and the ultimate resolution limits,” Colloques Internationaux du C.N.R.S. No. 217 - Methodes de Spectroscopie sans Largeur Doppler de Niveaux Excites de Systemes Moleculaires Simples (C.N.R.S., Paris, 1974), pp. 105-125.
- “Laser photodetachment determination of the electron affinities of OH, NH₂, NH, SO₂ and S₂,” *J. Chem. Phys.* 60, 1740 (1974), with R. J. Celotta and R. A. Bennett.
- “Ultrahigh resolution saturation absorption spectroscopy,” in Laser Spectroscopy, Proceedings of the Laser Spectroscopy Conference, Vail, Colorado, June 1973 (R. G. Brewer and A. Mooradian, Eds., Plenum, New York, 1974), pp. 125-142.
- “Accuracy limitation of saturated absorption optical frequency standards by transverse Doppler effect,” *Bull. Am. Phys. Soc.* 19, 448 (1974), with C. J. Borde and C. V. Kunasz.
- “A new measurement of the relativistic Doppler shift,” in Lecture Notes in Physics 43, Laser Spectroscopy, Proceedings, Second International Conference, Megeve, June 1975 (S. Haroche, J. C. Pebay-Peyroula, T. W. Hänsch and S. E. Harris, Eds., Springer-Verlag, Berlin, 1975), pp. 6-17, with J. J. Snyder.
- “Progress in the theory of saturated absorption line shape,” Proceedings of the 2nd Symposium on Gas Laser Physics, Novosibirsk, USSR, June 1975, with C. J. Borde.
- “Direct resolution of the recoil doublets using saturated absorption techniques,” Proceedings, Second Symposium on Gas Laser Physics, Novosibirsk, USSR,

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“Stabilized lasers and the speed of light,” in Atomic Masses and Fundamental Constants, Vol. 5 (J. H. Sanders and A. H. Wapstra, Eds., Plenum, New York, 1976), pp. 322-329.

“Saturated absorption line shape: Calculation of the transit time broadening by a perturbation approach,” *Phys. Rev. A* 14, 236 (1976), with C. J. Borde, C. V. Kunasz and D. G. Hummer.

“Interferometric real-time display of cw dye laser wavelength with sub-Doppler accuracy,” *Appl. Phys. Lett.* 29, 367 (1976), with S. A. Lee.

“High resolution saturated absorption studies of methane and some methyl-halides,” in Topics in Applied Physics, Vol. 13: High Resolution Laser Spectroscopy (K. Shimoda, Ed., Springer-Verlag, Berlin, 1976), pp. 173-199, with J. A. Magyar.

“Control techniques for cw dye lasers,” in Tunable Lasers and Applications, Proceedings, Leon Conference, Norway, 1976 (A. Mooradian, T. Jaeger and P. Stokseth, Eds., Springer-Verlag, Berlin, 1976), pp. 361-366, with S. A. Lee.

“Direct optical resolution of the recoil effect using saturated absorption spectroscopy,” *Phys. Rev. Lett.* 37, 1339 (1976), with C. J. Borde and K. Uehara.

“Shift and broadening of saturated absorption resonance due to curvature of the laser wave fronts,” *Appl. Phys. Lett.* 29, 788 (1976), with C. J. Borde.

“Saturated absorption with spatially separated laser fields: Observation of optical ‘Ramsey’ fringes,” *Phys. Rev. Lett.* 38, 159 (1977), with J. C. Bergquist and S. A. Lee.

“A traveling Michelson interferometer with phase-locked fringe interpolation,” in Laser Spectroscopy III, Proceedings, Third International Conference, Jackson Lake Lodge, Wyoming (J. L. Hall and J. L. Carlsten, Eds., Springer-Verlag, 1977), pp. 421-422, with S. A. Lee.

“Ramsey fringes in saturation spectroscopy,” in Laser Spectroscopy III, Proceedings, Third International Conference, Jackson Lake Lodge, Wyoming (J. L. Hall and J. L. Carlsten, Eds., Springer-Verlag, 1977), pp. 142-148, with J. C. Bergquist and S. A. Lee.

(Editor), Laser Spectroscopy III, Proceedings, Third International Conference, Jackson Lake Lodge, Wyoming (Springer-Verlag, 1977), with J. L. Carlsten.

“Spectroscopic investigations in ^{209}Bi I using tunable-cw-dye-laser spectroscopy,” *Phys. Rev. A* 18, 1089 (1978), with O. Poulsen.

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- “Two photon transitions to Rydberg levels: Convenient, useful and precise reference wavelengths for dye lasers,” *Opt. Lett.* 3, 141 (1978), with S. A. Lee, J. Helmcke and B. P. Stoicheff.
- “Stabilized lasers and precision measurements,” *Science* 202, 147 (1978).
- “An improved laser test of the isotropy of space,” *Phys. Rev. Lett.* 42, 549 (1979), with A. Brillet.
- “Hyperfine splitting of the $^{13}\text{CH}_4$ line at 3.39 μm observed by laser-saturated absorption,” *Opt. Lett.* 4, 214-215 (1979), with K. Uehara.
- “High resolution two-photon spectroscopy of Rb Rydberg levels,” in *Laser Spectroscopy IV*, Proceedings, 4th International Conference, Rottach-Egern, Germany (H. Walther and K.W. Rothe, Eds., Springer-Verlag, 1979), pp. 130-141, with S. A. Lee and J. Helmcke.
- “An improved test of the isotropy of space using laser techniques,” in *Laser Spectroscopy IV*, Proceedings, 4th International Conference, Rottach-Egern, Germany (H. Walther and K.W. Rothe, Eds., Springer-Verlag, 1979), pp. 12-20, with A. Brillet.
- “Frequency stabilization of a 0.633 μm He-Ne longitudinal Zeeman laser,” *Appl. Opt.* 19, 3173-3177 (1980), with T. Baer and F. V. Kowalski.
- “Accurate wave-number measurements of uranium spectral lines,” *J. Opt. Soc. Am.* 71, 948-952 (1981), with B. A. Palmer, R. A. Keller and F. V. Kowalski.
- “Stable lasers and optical frequency standards for testing the postulates of physics,” in *Atomic Physics*, Vol. 7 (D. Kleppner and F. M. Pipkin, Eds., Plenum, New York, 1981), pp. 267-296.
- “Stabilized Lasers,” in *Solar Instrumentation—What’s Next?* (R. B. Dunn, Ed., SAC Peak National Observatory, Sunspot, NM, 1981), pp. 142-149, with T. Baer.
- “Optical heterodyne saturation spectroscopy,” *Appl. Phys. Lett.* 39, 680-683 (1981), with L. Hollberg, T. Baer and H. G. Robinson.
- “Precision spectroscopy and laser frequency control using FM sideband optical heterodyne techniques,” in *Laser Spectroscopy*, Proceedings, Fifth International Conference on Laser Spectroscopy (A. R. W. McKellar, T. Oka and B. P. Stoicheff, Eds., Springer-Verlag, Heiderberg, 1981), pp. 15-24, with T. Baer, L. Hollberg and H. G. Robinson.
- “Progress toward phase-stable optical frequency standards,” Proceedings, Third Symposium on Frequency Standards and Metrology, *J. Physique-Colloque* 42,

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Suppl. 12, C8 59-71 (1981), with L. Hollberg, L.-S. Ma, T. Baer and H. G. Robinson.

“Lambda meter resolution enhancement using a novel frequency meter,” in CLEO Laser Conference, 1981, with J. J. Snyder, T. Baer and L. Hollberg.

“Dye laser spectrometer for ultrahigh spectral resolution: Design and performance,” Appl. Opt. 21, 1686-1694 (1982), with J. Helmcke and S. A. Lee.

“Laser phase and frequency stabilization using an optical resonator,” Appl. Phys. B 31, 97-105 (1983), with R. W. P. Drever, F. V. Kowalski, J. Hough, G. M. Ford, A. J. Munley and H. Ward.

“Direct frequency measurement of the I₂-stabilized He-Ne 473-THz (633 nm) laser,” Opt. Lett. 8, 136 (1983), with D. A. Jennings, C. R. Pollock, F. R. Petersen, R. E. Drullinger, K. M. Evenson, J. S. Well and H. P. Layer.

“Tunable laser stabilization techniques for ultrahigh resolution spectroscopy,” in Beijing/Shanghai Proceedings of an International Conference on Lasers, May 1980 (China Academic Publishers, Wiley, 1983), pp. 15-33.

“Some remarks on the interaction between precision physical measurement and fundamental physical theories,” in Quantum Optics, Experimental Gravity, and Measurement Theory (P. Meystre and M. O. Scully, Eds., Plenum, New York, 1983), pp. 347-361.

“The line shapes of sub-Doppler resonances observable with FM side-band (optical heterodyne) laser techniques,” in Advances in Laser Spectroscopy, NATO ASI Series B, Vol. 95 (F. T. Arecchi, F. Strumia and H. Walther, Eds., Plenum, 1983), pp. 99-126, with H. G. Robinson, T. Baer and L. Hollberg.

“Laser gravitational wave experiment in space,” in 10th International Conference on General Relativity and Gravitation, Padova, Italy, July 1983, Contributed Papers Vol. 2 (B. Bertotti, F. de Felice and A. Pascolini, Eds., Consiglio Nazionale delle Ricerche, Rome, 1983), pp. 960-962, with J. E. Faller, P. L. Bender, Y. M. Chan, D. Hils and J. Hough.

“Cooling of an atomic beam with frequency-sweep techniques,” in Laser-Cooled and Trapped Atoms, Proceedings, Workshop on Spectroscopic Applications of Slow Atomic Beams, NBS, Gaithersburg, MD, April 1983 (W. D. Phillips, Ed.) NBS Spec. Publ. 653 (1983), pp. 142-153, with R. Blatt and W. Ertmer.

“Some candidate atoms and ions for frequency standards research using laser radiative cooling techniques,” in Laser-Cooled and Trapped Atoms, Proceedings, Workshop on Spectroscopic Applications of Slow Atomic Beams, held at NBS, Gaithersburg, MD, April 1983 (W. D. Phillips, Ed.) NBS Spec. Publ. 653 (1983),

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Publications: (continued)

pp. 154-161, with W. Ertmer and R. Blatt.

“Measurement of the positronium $1^3S_1 \leftrightarrow 2^3S_1$ two-photon transition,” in Laser Spectroscopy VI, Proceedings, Sixth International Conference, Interlaken, Switzerland, June 27-July 1, 1983 (H. P. Weber and W. Luthy, Eds., Springer-Verlag, 1983), pp. 28-33, with S. Chu and A. P. Mills, Jr.

“State-dependent hyperfine coupling of HF studied with a frequency-controlled color-center laser spectrometer,” in Laser Spectroscopy VI, Proceedings, Sixth International Conference, Interlaken, Switzerland, June 27-July 1, 1983 (H. P. Weber and W. Luthy, Eds., Springer-Verlag, 1983), pp. 138-143, with Ch. Breant, T. Baer and D. Nesbitt.

“Observation of energy level shifts of Rydberg atoms due to thermal fields,” in Laser Spectroscopy VI, Proceedings, Sixth International Conference, Interlaken, Switzerland, June 27-July 1, 1983 (H. P. Weber and W. Luthy, Eds., Springer-Verlag, 1983), pp. 229-232, with L. Hollberg.

“Dye-laser frequency stabilization using optical resonators,” Appl. Phys. B **33**, 179-185 (1984), with J. Hough, D. Hils, M. D. Rayman, L.-S. Ma and L. Hollberg.

“Measurement of the positronium $1^3S_1 \leftrightarrow 2^3S_1$ interval by Doppler-free two-photon spectroscopy,” Phys. Rev. Lett. **52**, 1689-1692 (1984), with S. Chu and A. P. Mills, Jr.

“Relativistic time dilation: A latter-day Ives-Stillwell experiment,” in Precision Measurement and Fundamental Constants II (B. N. Taylor and W. D. Phillips, Eds., NBS Spec. Publ. 617, 1984) pp. 671-673, with P. Nachman and M. D. Rayman.

“Optical frequency standards: Progress and applications,” in Precision Measurement and Fundamental Constants II (B. N. Taylor and W. D. Phillips, Eds., NBS Spec. Publ. 617, 1984) pp. 43-44.

“Precision measurements by optical heterodyne techniques,” in Laser-Based Ultrasensitive Spectroscopy and Detection V (SPIE, San Diego, CA, 1983), Vol. 426, pp. 91-98, with L. Hollberg, L.-S. Ma and M. Hohenstatt.

“Measurement of the shift of Rydberg energy levels induced by blackbody radiation,” Phys. Rev. Lett. **53**, 230-233 (1984), with L. Hollberg.

“External dye laser frequency stabilizer,” Opt. Lett. **9**, 502-504 (1984), with T. Hansch.

“Laser manipulation of atomic beam velocities: Demonstration of stopped atoms and velocity reversal,” Phys. Rev. Lett. **54**, 996-999 (1985), with W. Ertmer, R. Blatt and M. Zhu.

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Publications: (continued)

- “Space antenna for gravitational wave astronomy,” Proceedings, Colloquium on Kilometric Optical Arrays in Space, October 1984, Corgese, Corsica, France (ESA SP-226, April 1985), pp. 157-163, with J. E. Faller, P. L. Bender, D. Hils and M. A. Vincent.
- “Servo control of amplitude modulation in FM spectroscopy: Demonstration of shot-noise limited detection,” *J. Opt. Soc. Am. B* 2, 1527-1533 (1985), with N. C. Wong.
- “Servo control of amplitude modulation in FM spectroscopy: Shot-noise limited measurement of water vapor pressure broadening,” in Laser Spectroscopy VII, Proceedings of the Seventh International Conference, Hawaii, 24-28 June 1985 (T. W. Hansch and Y. R. Shen, Eds., Springer-Verlag, 1985), pp. 393-394.
- “Intracavity frequency doubling for the generation of squeezed states of light,” in Quantum Optics IV, Proceedings, Fourth International Symposium, Hamilton, New Zealand, February 1986 (J. D. Harvey and D. F. Walls, Eds., Springer, 1986), pp. 58-69, with H. J. Kimble.
- “Stabilizing lasers, for applications in quantum optics,” in Quantum Optics IV, Proceedings, Fourth International Symposium, Hamilton, New Zealand, February 1986 (J. D. Harvey and D. F. Walls, Eds., Springer, 1986), pp. 273-284.
- “Practical sound-reducing enclosure for laboratory use,” *Rev. Sci. Instrum.* 57, 2532-2534 (1986), with D. Hils and J. E. Faller.
- “Atomic beam cooling: A simulation approach,” *Phys. Rev. A* 34, 3022-3033 (1986), with R. Blatt, W. Ertmer and P. Zoller.
- “Generation of squeezed states by parametric down conversion,” *Phys. Rev. Lett.* 57, 2520-2523 (1986), with L.-A. Wu, H. J. Kimble and H. Wu.
- “Principles of optical phase locking: Application to internal mirror He-Ne lasers phased locked via fast control of the discharge current,” *IEEE J. Quant. Electron.* QE-23, 427-437 (1987), with L.-S. Ma and G. Kramer.
- “Response of a Fabry-Perot cavity to phase modulated light,” *Rev. Sci. Instrum.* 58, 1406-1412 (1987), with D. Hils.
- “Towards the ultimate laser resolution,” in Laser Spectroscopy 8 (W. Persson and S. Svanberg, Eds., Springer-Verlag, Heidelberg, 1987), pp. 376-380, with D. Hils, C. Salomon and J.-M. Chartier.
- “Fundamental tests of special relativity and the isotropy of space,” in Laser Spectroscopy 8 (W. Persson and S. Svanberg, Eds., Springer-Verlag, Heidelberg, 1987), pp. 52-55, with S. A. Lee, L.-U. A. Andersen, N. Bjerre, O. Poulsen and E. Riis.

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- “High resolution optical multiplex spectroscopy,” in Laser Spectroscopy 8 (W. Persson and S. Svanberg, Eds., Springer-Verlag, Heidelberg, 1987), pp. 388-389, with K. P. Dinse and M. P. Winters.
- “Test of the isotropy of the speed of light using fast-beam laser spectroscopy,” Phys. Rev. Lett. 60, 81-84 (1988), with E. Riis, L.-U. A. Andersen, N. Bjerre, O. Poulsen and S. A. Lee.
- “Frequency stability measurement on polarization-stabilized He-Ne lasers,” Appl. Opt. 27, 1285-1289 (1988), with T. M. Niebauer, J. E. Faller, H. M. Godwin and R. L. Barger.
- “Laser stabilization at the millihertz level,” J. Opt. Soc. Am. B 5, 1576-1587 (1988), with Ch. Salomon and D. Hils.
- “Doppler-free optical multiplex spectroscopy with stochastic excitation,” J. Opt. Soc. Am. B 5, 1825-1831 (1988), with K. P. Dinse and M. P. Winters.
- “Generation of squeezed light by intracavity frequency doubling,” Phys. Rev. A 38, 4931-4934 (1988), with S. F. Pereira, M. Xiao and H. J. Kimble.
- “Toward the ultimate laser spectroscopic resolution,” in XVI International Conference on Quantum Electronics Technical Digest (Japan Society of Applied Physics, Tokyo, 1988), pp. 4-5.
- “External frequency stabilization of a commercial dye laser at the sub-Hertz level,” in XVI International Conference on Quantum Electronics Technical Digest (Japan Society of Applied Physics, Tokyo, 1988), pp. 374-375, with M. Zhu, F. Shimizu and K. Shimizu.
- “Precise laser frequency scanning using frequency-synthesized optical frequency sidebands: Application to isotope shifts and hyperfine structure of mercury,” J. Opt. Soc. Am. B 6, 539-549 (1989), with M. D. Rayman and C. G. Aminoff.
- “Ultrastable cavity-stabilized lasers with sub-Hertz line width,” Proceedings, Fourth International Symposium on Frequency Standards and Metrology (A. De Marchi, Ed., Springer-Verlag, Heidelberg, 1989), pp. 162-173, with D. Hils.
- “Fundamental tests of the isotropy of space using fast-beam laser spectroscopy,” in Atomic Physics 11 (S. Haroche, J. C. Gay and G. Grynberg, Eds., World Scientific, Singapore, 1989), pp. 589-611, with O. Poulsen, N. Bjerre, E. Riis and S. A. Lee.
- “Riis et al. reply to Comment on ‘Test of the isotropy of the speed of light using fast-beam laser spectroscopy’,” Phys. Rev. Lett. 62, 842 (1989), with E. Riis, L.-U. Andersen, N. Bjerre, O. Poulsen and S. A. Lee.

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- “A laser interferometer for gravitational wave astronomy in space,” Proceedings, Fifth Marcel Grossman Conference on General Relativity (World Scientific, Singapore, 1989), pp. 1759-1767, with R. T. Stebbins, P. L. Bender, J. E. Faller, D. Hils and M. A. Vincent.
- “Optical interferometer in space,” in Relativistic Gravitation Experiments in Space (R. W. Hellings, Ed., NASA Conf. Publ. 3046, 1989), pp. 80-88, with P. L. Bender, J. E. Faller, D. Hils, R. T. Stebbins and M. A. Vincent.
- “An antenna for laser gravitational-wave observations in space,” Proceedings, XXVII COSPAR Symp. 15 on Relativistic Gravitation, *Adv. Space Res.* 9, 107-111 (1989), with J. E. Faller, P. L. Bender, D. Hils, R. T. Stebbins and M. A. Vincent.
- “Prospects for using laser-prepared atomic fountains for optical frequency standards applications,” *J. Opt. Soc. Am. B* 6, 2194-2205 (1989), with M. Zhu and P. Buch.
- “Improved Kennedy-Thorndike experiment—a preliminary report,” in Laser Spectroscopy IX, (M. S. Feld and J. E. Thomas, Eds., Academic, 1989), pp. 376-381, with D. Hils.
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