

Bibliography

- [1] D. R. Stephens, *Phase-Locked Loops for Wireless Communications: Digital, Analog and Optical Implementations*. Boston, MA: Kluwer Academic Publishers, 2002.
- [2] F. M. Gardner, *Phaselock Techniques*. Hoboken, NJ: John Wiley and Sons, 2005.
- [3] L. H. Enloe and J. L. Rodda, “Laser phase-locked loop,” *Proc. IEEE*, vol. 53, no. 2, pp. 165–166, Feb. 1965.
- [4] T. H. Maiman, “Stimulated optical radiation in ruby,” *Nature*, vol. 187, pp. 493–494, Aug. 1960.
- [5] T. Day, A. D. Farinas, and R. L. Byer, “Demonstration of a low bandwidth 1.06 μm optical phase-locked loop for coherent homodyne communication,” *IEEE Photon. Technol. Lett.*, vol. 2, no. 4, pp. 294–296, Apr. 1990.
- [6] L. G. Kazovsky and D. A. Atlas, “A 1320-nm experimental optical phase-locked loop: performance investigation and PSK homodyne experiments at 140 Mb/s and 2 Gb/s,” *J. Lightw. Technol.*, vol. 8, no. 9, pp. 1414–1425, Sep. 1990.
- [7] M. Z. Win, C.-C. Chen, and R. A. Scholtz, “Optical phase-locked loop (OPLL) for an amplitude modulated communications link using solid-state lasers,” *IEEE J. Sel. Areas Commun.*, vol. 13, no. 3, pp. 569–576, Apr. 1995.
- [8] M. Brunel, F. Bretenaker, S. Blanc, V. Crozatier, J. Brisset, T. Merlet, and A. Poezevara, “High-spectral purity RF beat note generated by a two-frequency

- solid-state laser in a dual thermooptic and electrooptic phase-locked loop," *IEEE Photon. Technol. Lett.*, vol. 16, no. 3, pp. 870–872, Mar. 2004.
- [9] F. Herzog, K. Kudielka, D. Erni, and W. Bächtold, "Optical phase locked loop for transparent inter-satellite communications," *Opt. Express*, vol. 13, no. 10, pp. 3816–3821, May 2005.
 - [10] W. R. Leeb, H. K. Philipp, A. L. Scholtz, and E. Bonek, "Frequency synchronization and phase locking of CO₂ lasers," *Appl. Phys. Lett.*, vol. 41, pp. 592–594, Oct. 1982.
 - [11] R. C. Steele, "Optical phase-locked loop using semiconductor laser diodes," *Electron. Lett.*, vol. 19, no. 2, pp. 69–71, Jan. 1983.
 - [12] J. Harrison and A. Mooradian, "Linewidth and offset frequency locking of external cavity GaAlAs lasers," *IEEE J. Quantum Electron.*, vol. 25, no. 6, pp. 1152–1155, June 1989.
 - [13] G. Santarelli, A. Clairon, S. N. Lea, and G. M. Tino, "Heterodyne optical phase-locking of extended-cavity semiconductor lasers at 9 GHz," *Opt. Commun.*, vol. 104, no. 4-6, pp. 339–344, 1994.
 - [14] F. Z. Fan and M. Dagenais, "Optical generation of a mHz linewidth microwave signal using semiconductor lasers and a discriminator-aided phase-locked loop," *IEEE Trans. Microw. Theory Tech.*, vol. 45, no. 8, pp. 1296–1300, Aug. 1997.
 - [15] W. Imajuku and A. Takada, "Optical phase-sensitive amplification using two phase-locked light sources," *Electron. Lett.*, vol. 33, no. 16, pp. 1403–1404, July 1997.
 - [16] O. Ishida, H. Toba, and Y. Tohmori, "0.04 Hz relative optical-frequency stability in a 1.5 μm distributed-Bragg-reflector (DBR) laser," *IEEE Photon. Technol. Lett.*, vol. 1, no. 12, pp. 452–454, Dec. 1989.

- [17] J. M. Kahn, “1 Gbit/s PSK homodyne transmission system using phase-locked semiconductor lasers,” *IEEE Photon. Technol. Lett.*, vol. 1, no. 10, pp. 340–342, Oct. 1989.
- [18] J. M. Kahn, A. H. Gnauck, J. J. Veselka, S. K. Korotky, and B. L. Kasper, “4-Gb/s PSK homodyne transmission system using phase-locked semiconductor lasers,” *IEEE Photon. Technol. Lett.*, vol. 2, no. 4, pp. 285–287, Apr. 1990.
- [19] U. Gliese, T. N. Nielsen, M. Bruun, E. Lintz Christensen, K. E. Stubkjaer, S. Lindgren, and B. Broberg, “A wideband heterodyne optical phase-locked loop for generation of 3–18 GHz microwave carriers,” *IEEE Photon. Technol. Lett.*, vol. 4, no. 8, pp. 936–938, Aug. 1992.
- [20] L. N. Langley, M. D. Elkin, C. Edge, M. J. Wale, U. Gliese, X. Huang, and A. J. Seeds, “Packaged semiconductor laser optical phase-locked loop (OPLL) for photonic generation, processing and transmission of microwave signals,” *IEEE Trans. Microw. Theory Tech.*, vol. 47, no. 7, pp. 1257–1264, Jul. 1999.
- [21] S. Takasaka, Y. Ozeki, S. Namiki, and M. Sakano, “External synchronization of 160-GHz optical beat signal by optical phase-locked loop technique,” *IEEE Photon. Technol. Lett.*, vol. 18, no. 23, pp. 2457–2459, Dec. 2006.
- [22] S. Ristic, A. Bhardwaj, M. J. Rodwell, L. A. Coldren, and L. A. Johansson, “An optical phase-locked loop photonic integrated circuit,” *J. Lightw. Technol.*, vol. 28, no. 4, pp. 526–538, Feb. 2010.
- [23] R. J. Steed, L. Ponnampalam, M. J. Fice, C. C. Renaud, D. C. Rogers, D. G. Moodie, G. D. Maxwell, I. F. Lealman, M. J. Robertson, L. Pavlovic, L. Naglic, M. Vidmar, and A. J. Seeds, “Hybrid integrated optical phase-lock loops for photonic terahertz sources,” *IEEE J. Sel. Top. Quantum Electron.*, vol. PP, no. 99, pp. 1–8, 2010.

- [24] M. Kourogi, C.-H. Shin, and M. Ohtsu, “A 134 MHz bandwidth homodyne optical phase-locked-loop of semiconductor laser diodes,” *IEEE Photon. Technol. Lett.*, vol. 3, no. 3, pp. 270–272, Mar. 1991.
- [25] C. Henry, “Theory of the linewidth of semiconductor lasers,” *IEEE J. Quantum Electron.*, vol. 18, no. 2, pp. 259–264, Feb. 1982.
- [26] K. Vahala and A. Yariv, “Semiclassical theory of noise in semiconductor lasers—Part I,” *IEEE J. Quantum Electron.*, vol. 19, no. 6, pp. 1096–1101, June 1983.
- [27] ———, “Semiclassical theory of noise in semiconductor lasers—Part II,” *IEEE J. Quantum Electron.*, vol. 19, no. 6, pp. 1102–1109, June 1983.
- [28] C. Harder, K. Vahala, and A. Yariv, “Measurement of the linewidth enhancement factor alpha of semiconductor lasers,” *Appl. Phys. Lett.*, vol. 42, pp. 328–330, Feb. 1983.
- [29] R. Mears, L. Reekie, I. Jauncey, and D. Payne, “Low-noise erbium-doped fibre amplifier operating at 1.54 μm ,” *Electron. Lett.*, vol. 23, no. 19, pp. 1026–1028, 1987.
- [30] E. Desurvire, J. R. Simpson, and P. C. Becker, “High-gain erbium-doped traveling-wave fiber amplifier,” *Opt. Lett.*, vol. 12, no. 11, pp. 888–890, Nov. 1987.
- [31] H. Philipp, A. Scholtz, E. Bonek, and W. Leeb, “Costas loop experiments for a 10.6 μm communications receiver,” *IEEE T. Commun.*, vol. 31, no. 8, pp. 1000–1002, Aug. 1983.
- [32] S. Saito, O. Nilsson, and Y. Yamamoto, “Coherent FSK transmitter using a negative feedback stabilised semiconductor laser,” *Electron. Lett.*, vol. 20, no. 17, pp. 703–704, 1984.

- [33] L. Kazovsky, “Performance analysis and laser linewidth requirements for optical PSK heterodyne communications systems,” *J. Lightw. Technol.*, vol. 4, no. 4, pp. 415–425, Apr. 1986.
- [34] S. Camatel and V. Ferrero, “Homodyne coherent detection of ASK and PSK signals performed by a subcarrier optical phase-locked loop,” *IEEE Photon. Technol. Lett.*, vol. 18, no. 1, pp. 142–144, Jan. 2006.
- [35] E. Torrengo, V. Ferrero, and S. Camatel, “A 20-Gb/s quadrature phase-shift-keying real-time coherent system based on a subcarrier optical phase-locked loop,” *IEEE Photon. Technol. Lett.*, vol. 21, no. 18, pp. 1296–1298, Sep. 2009.
- [36] K. Kasai, T. Omiya, P. Guan, M. Yoshida, T. Hirooka, and M. Nakazawa, “Single-channel 400-Gb/s OTDM-32 RZ/QAM coherent transmission over 225 km using an optical phase-locked loop technique,” *IEEE Photon. Technol. Lett.*, vol. 22, no. 8, pp. 562–564, Apr. 2010.
- [37] L. A. Johansson and A. J. Seeds, “Millimeter-wave modulated optical signal generation with high spectral purity and wide-locking bandwidth using a fiber-integrated optical injection phase-lock loop,” *IEEE Photon. Technol. Lett.*, vol. 12, no. 6, pp. 690–692, June 2000.
- [38] J.-F. Cliche, B. Shillue, M. Tetu, and M. Poulin, “A 100-GHz-tunable photonic millimeter wave synthesizer for the Atacama Large Millimeter Array radiotelescope,” in *IEEE/MTT-S International Microwave Symposium, 2007*, June 2007, pp. 349–352.
- [39] S. Ayotte, A. Babin, P. Poulin, M. Poulin, A. Jeanneau, M.-J. Picard, D. Poulin, C.-A. Davidson, M. Aubé, I. Alexandre, F. Costin, F. Pelletier, J.-F. Cliche, M. Tétu, and B. Shillue, “Laser synthesizer of the ALMA telescope: Design and performance,” in *2010 IEEE Topical Meeting on Microwave Photonics (MWP)*, Oct. 2010, pp. 249–252.

- [40] T. von Lerber, S. Honkanen, A. Tervonen, H. Ludvigsen, and F. Küppers, “Optical clock recovery methods: Review (Invited),” *Opt. Fiber Technol.*, vol. 15, no. 4, pp. 363–372, 2009.
- [41] S. A. Diddams, D. J. Jones, J. Ye, S. T. Cundiff, J. L. Hall, J. K. Ranka, R. S. Windeler, R. Holzwarth, T. Udem, and T. W. Hänsch, “Direct link between microwave and optical frequencies with a 300 THz femtosecond laser comb,” *Phys. Rev. Lett.*, vol. 84, no. 22, pp. 5102–5105, May 2000.
- [42] S. A. Diddams, J. C. Bergquist, S. R. Jefferts, and C. W. Oates, “Standards of time and frequency at the outset of the 21st century,” *Science*, vol. 306, no. 5700, pp. 1318–1324, 2004.
- [43] L.-S. Ma, Z. Bi, A. Bartels, L. Robertsson, M. Zucco, R. S. Windeler, G. Wilpers, C. Oates, L. Hollberg, and S. A. Diddams, “Optical frequency synthesis and comparison with uncertainty at the 10^{-19} Level,” *Science*, vol. 303, no. 5665, pp. 1843–1845, 2004.
- [44] R. Slavík, F. Parmigiani, J. Kakande, C. Lundström, M. Sjödin, P. A. Andrekson, R. Weerasuriya, S. Sygletos, A. D. Ellis, L. Grüner-Nielsen, D. Jakobsen, S. Herstrøm, R. Phelan, J. O’Gorman, A. Bogris, D. Syvridis, S. Dasgupta, P. Petropoulos, and D. J. Richardson, “All-optical phase and amplitude regenerator for next-generation telecommunications systems,” *Nat. Photonics*, vol. 4, pp. 690–695, Oct. 2010.
- [45] M.-C. Amann, T. Bosch, M. Lescure, R. Myllyla, and M. Rioux, “Laser ranging: A critical review of usual techniques for distance measurement,” *Opt. Eng.*, vol. 40, no. 1, pp. 10–19, 2001.
- [46] G. Beheim and K. Fritsch, “Remote displacement measurements using a laser diode,” *Electron. Lett.*, vol. 21, no. 3, pp. 93–94, 1985.

- [47] E. M. Strzelecki, D. A. Cohen, and L. A. Coldren, "Investigation of tunable single frequency diode lasers for sensor applications," *J. Lightw. Technol.*, vol. 6, no. 10, pp. 1610–1618, Oct. 1988.
- [48] E. C. Burrows and K.-Y. Liou, "High resolution laser LIDAR utilising two-section distributed feedback semiconductor laser as a coherent source," *Electron. Lett.*, vol. 26, no. 9, pp. 577–579, Apr. 1990.
- [49] A. Dieckmann, "FMCW-LIDAR with tunable twin-guide laser diode," *Electron. Lett.*, vol. 30, no. 4, pp. 308–309, Feb. 1994.
- [50] S. H. Yun, G. J. Tearney, B. J. Vakoc, M. Shishkov, W. Y. Oh, A. E. Desjardins, M. J. Suter, R. C. Chan, J. A. Evans, I.-K. Jang, N. S. Nishioka, J. F. de Boer, and B. E. Bouma, "Comprehensive volumetric optical microscopy *in vivo*," *Nat. Med.*, vol. 12, pp. 1429–1433, 2007.
- [51] M. A. Choma, K. Hsu, and J. A. Izatt, "Swept source optical coherence tomography using an all-fiber 1300-nm ring laser source," *J. Biomed. Opt.*, vol. 10, no. 4, p. 044009, 2005.
- [52] C. Ndiaye, T. Hara, and H. Ito, "Profilometry using a frequency-shifted feedback laser," in *Conference on Lasers and Electro-Optics/Quantum Electronics and Laser Science and Photonic Applications Systems Technologies*. Optical Society of America, 2005, p. CThM2.
- [53] S. K. Dubey, T. Anna, C. Shakher, and D. S. Mehta, "Fingerprint detection using full-field swept-source optical coherence tomography," *Appl. Phys. Lett.*, vol. 91, no. 18, p. 181106, 2007.
- [54] W. S. Burdic, *Radar Signal Analysis*. Englewood Cliffs, NJ: Prentice-Hall, 1968.
- [55] I. V. Komarov and S. M. Smolskiy, *Fundamentals of Short-Range FM Radar*. Boston, MA: Artech House, 2003.

- [56] S. H. Yun, C. Boudoux, G. J. Tearney, and B. E. Bouma, “High-speed wavelength-swept semiconductor laser with a polygon-scanner-based wavelength filter,” *Opt. Lett.*, vol. 28, no. 20, pp. 1981–1983, Oct. 2003.
- [57] M. K. K. Leung, A. Mariampillai, B. A. Standish, K. K. C. Lee, N. R. Munce, I. A. Vitkin, and V. X. D. Yang, “High-power wavelength-swept laser in Littman telescope-less polygon filter and dual-amplifier configuration for multichannel optical coherence tomography,” *Opt. Lett.*, vol. 34, no. 18, pp. 2814–2816, Sep. 2009.
- [58] R. Huber, M. Wojtkowski, and J. G. Fujimoto, “Fourier Domain Mode Locking (FDML): A new laser operating regime and applications for optical coherence tomography,” *Opt. Express*, vol. 14, no. 8, pp. 3225–3237, Apr. 2006.
- [59] C. Chong, T. Suzuki, A. Morosawa, and T. Sakai, “Spectral narrowing effect by quasi-phase continuous tuning in high-speed wavelength-swept light source,” *Opt. Express*, vol. 16, no. 25, pp. 21 105–21 118, Dec. 2008.
- [60] C. Wiley, “Synthetic aperture radars,” *IEEE Trans. Aerosp. Electron. Syst.*, vol. AES-21, no. 3, pp. 440–443, May 1985.
- [61] N. Satyan, A. Vasilyev, W. Liang, G. Rakuljic, and A. Yariv, “Sideband locking of a single-section semiconductor distributed-feedback laser in an optical phase-lock loop,” *Opt. Lett.*, vol. 34, no. 21, pp. 3256–3258, Nov. 2009.
- [62] N. Satyan, J. Sendowski, A. Vasilyev, G. Rakuljic, and A. Yariv, “Phase noise reduction of a semiconductor laser in a composite optical phase-locked loop,” *Opt. Eng.*, vol. 49, no. 12, p. 124301, Dec. 2010.
- [63] N. Satyan, W. Liang, and A. Yariv, “Coherence cloning using semiconductor laser optical phase-lock loops,” *IEEE J. Quantum Electron.*, vol. 45, no. 7, pp. 755–761, July 2009.
- [64] N. Satyan, W. Liang, A. Kewitsch, G. Rakuljic, and A. Yariv, “Coherent power combination of semiconductor lasers Using optical phase-lock loops (Invited),”

IEEE J. Sel. Top. Quantum Electron., vol. 15, no. 2, pp. 240–247, Mar./Apr. 2009.

- [65] W. Liang, N. Satyan, A. Yariv, A. Kewitsch, G. Rakuljic, F. Aflatouni, H. Hashemi, and J. Ungar, “Coherent power combination of two Master-oscillator-power-amplifier (MOPA) semiconductor lasers using optical phase lock loops,” *Opt. Express*, vol. 15, no. 6, pp. 3201–3205, 2007.
- [66] W. Liang, N. Satyan, F. Aflatouni, A. Yariv, A. Kewitsch, G. Rakuljic, and H. Hashemi, “Coherent beam combining with multilevel optical phase-locked loops,” *J. Opt. Soc. Am. B: Opt. Phys.*, vol. 24, no. 12, pp. 2930–2939, Dec. 2007.
- [67] N. Satyan, W. Liang, F. Aflatouni, A. Yariv, A. Kewitsch, G. Rakuljic, and H. Hashemi, “Phase-controlled apertures using heterodyne optical phase-locked loops,” *IEEE Photon. Technol. Lett.*, vol. 20, no. 9-12, pp. 897–899, June 2008.
- [68] Y. Vilenchik, B. I. Erkmen, N. Satyan, A. Yariv, W. H. Farr, and J. M. Choi, “Optical phase lock loop based phased array transmitter for optical communications,” *The Interplanetary Network Progress Report*, vol. 42-184, Feb. 2011.
- [69] N. Satyan, A. Vasilyev, G. Rakuljic, V. Leyva, and A. Yariv, “Precise control of broadband frequency chirps using optoelectronic feedback,” *Opt. Express*, vol. 17, no. 18, pp. 15 991–15 999, 2009.
- [70] N. Satyan, G. Rakuljic, and A. Yariv, “Chirp multiplication by four wave mixing for wideband swept-frequency sources for high resolution imaging,” *J. Lightw. Technol.*, vol. 28, no. 14, pp. 2077–2083, July 2010.
- [71] A. Vasilyev, N. Satyan, S. Xu, G. Rakuljic, and A. Yariv, “Multiple source frequency-modulated continuous-wave optical reflectometry: Theory and experiment,” *Appl. Opt.*, vol. 49, no. 10, pp. 1932–1937, 2010.
- [72] K. Petermann, *Laser Diode Modulation and Noise*. Advances in optoelectronics (ADOP), Dordrecht: Kluwer and Tokyo: KTK Scientific Publishers, 1991.

- [73] W. Liang, "Study of optical phase lock loops and the applications in coherent beam combining and coherence cloning," PhD dissertation, California Institute of Technology, Pasadena, CA, 2008.
- [74] K. Ogata, *Modern Control Engineering (5th Edition)*. Upper Saddle River, NJ: Prentice Hall, 2009.
- [75] M. Grant, W. Michie, and M. Fletcher, "The performance of optical phase-locked loops in the presence of nonnegligible loop propagation delay," *J. Lightw. Technol.*, vol. 5, no. 4, pp. 592–597, Apr. 1987.
- [76] R. T. Ramos and A. J. Seeds, "Delay, linewidth and bandwidth limitations in optical phase-locked loop design," *Electron. Lett.*, vol. 26, no. 6, pp. 389–391, Mar. 1990.
- [77] S. Ristic, A. Bhardwaj, M. J. Rodwell, L. A. Coldren, and L. A. Johansson, "Integrated optical phase-locked loop," in *National Fiber Optic Engineers Conference*. Optical Society of America, 2009, p. PDPB3.
- [78] P. Corrc, O. Girad, and I. F. de Faria Jr., "On the thermal contribution to the FM response of DFB lasers: Theory and experiment," *IEEE J. Quantum Electron.*, vol. 30, no. 11, pp. 2485–2490, Nov. 1994.
- [79] G. S. Pandian and S. Dilwali, "On the thermal FM response of a semiconductor laser diode," *IEEE Photon. Technol. Lett.*, vol. 4, no. 2, pp. 130–133, Feb. 1992.
- [80] W. V. Sorin, K. W. Chang, G. A. Conrad, and P. R. Hernday, "Frequency domain analysis of an optical FM discriminator," *J. Lightw. Technol.*, vol. 10, no. 6, pp. 787–793, June 1992.
- [81] A. Yariv, "Dynamic analysis of the semiconductor laser as a current-controlled oscillator in the optical phased-lock loop: applications," *Opt. Lett.*, vol. 30, no. 17, pp. 2191–2193, 2005.

- [82] M. Carvalho and A. Seeds, “Simple model for frequency modulation characteristics of semiconductor lasers,” *Electron. Lett.*, vol. 24, no. 7, pp. 428–429, Mar. 1988.
- [83] L. Richter, H. Mandelberg, M. Kruger, and P. McGrath, “Linewidth determination from self-heterodyne measurements with subcoherence delay times,” *IEEE J. Quantum Electron.*, vol. 22, no. 11, pp. 2070–2074, Nov. 1986.
- [84] F. Aflatouni, O. Momeni, and H. Hashemi, “A heterodyne phase locked loop with GHz acquisition range for coherent locking of semiconductor lasers in 0.13 μ m CMOS,” *Custom Integrated Circuits Conference, 2007. CICC '07. IEEE*, pp. 463–466, Sep. 2007.
- [85] R. T. Ramos, P. Gallion, D. Erasme, A. J. Seeds, and A. Bordonalli, “Optical injection locking and phase-lock loop combined systems,” *Opt. Lett.*, vol. 19, no. 1, pp. 4–6, Jan. 1994.
- [86] A. C. Bordonalli, C. Walton, and A. J. Seeds, “High-performance homodyne optical injection phase-lock loop using wide-linewidth semiconductor lasers,” *IEEE Photon. Technol. Lett.*, vol. 8, no. 9, pp. 1217–1219, Sept. 1996.
- [87] ——, “High-performance phase locking of wide linewidth semiconductor lasers by combined use of optical injection locking and optical phase-lock loop,” *J. Lightw. Technol.*, vol. 17, no. 2, pp. 328–342, Feb. 1999.
- [88] A. Yariv, *Quantum Electronics (3rd Edition)*. New York, NY: John Wiley and Sons, 1988.
- [89] M. J. O’Mahony and I. D. Henning, “Semiconductor laser linewidth broadening due to 1/f carrier noise,” *Electron. Lett.*, vol. 19, no. 23, pp. 1000–1001, Nov. 1983.
- [90] J. Goodman, *Statistical Optics*. New York, NY: John Wiley and Sons, 2000.

- [91] L. Cutler and C. Searle, “Some aspects of the theory and measurement of frequency fluctuations in frequency standards,” *Proc. of the IEEE*, vol. 54, no. 2, pp. 136–154, Feb. 1966.
- [92] E. Eichen and P. Melman, “Semiconductor laser lineshape and parameter determination from fringe visibility measurements,” *Electron. Lett.*, vol. 20, no. 20, pp. 826–828, Sep. 1984.
- [93] E. Weisstein, “Sine Integral.” *MathWorld—A Wolfram Web Resource*.
<http://mathworld.wolfram.com/SineIntegral.html>.
- [94] D. W. Allan, “Time and frequency (time-domain) characterization, estimation, and prediction of precision clocks and oscillators,” *IEEE Trans. Ultrason., Ferroelectr., Freq. Control*, vol. 34, pp. 647–654, Nov. 1987.
- [95] F. Riehle, *Frequency Standards: Basics and Applications*. Weinheim: Wiley-VCH, 2005, ch. 3.
- [96] Y. Jeong, J. Sahu, D. Payne, and J. Nilsson, “Ytterbium-doped large-core fiber laser with 1.36 kW continuous-wave output power,” *Opt. Express*, vol. 12, no. 25, pp. 6088–6092, Dec. 2004.
- [97] V. Gapontsev, D. Gapontsev, N. Platonov, O. Shkurikhin, V. Fomin, A. Mashkin, M. Abramov, and S. Ferin, “2 kW CW ytterbium fiber laser with record diffraction-limited brightness,” in *Conference on Lasers and Electro-Optics Europe, CLEO/Europe, 2005*, June 2005, p. 508.
- [98] T. Y. Fan, “Laser beam combining for high-power, high-radiance sources,” *IEEE J. Sel. Top. Quantum Electron.*, vol. 11, no. 3, pp. 567–577, May-June 2005.
- [99] A. Shirakawa, T. Saitou, T. Sekiguchi, and K. Ueda, “Coherent addition of fiber lasers by use of a fiber coupler,” *Opt. Express*, vol. 10, no. 21, pp. 1167–1172, 2002.

- [100] L. Bartelt-Berger, U. Brauch, A. Giesen, H. Huegel, and H. Opower, “Power-scalable system of phase-locked single-mode diode lasers,” *Appl. Opt.*, vol. 38, no. 27, pp. 5752–5760, 1999.
- [101] Y. Kono, M. Takeoka, K. Uto, A. Uchida, and F. Kannari, “A coherent all-solid-state laser array using the Talbot effect in a three-mirror cavity,” *IEEE J. Quantum Electron.*, vol. 36, no. 5, pp. 607–614, May 2000.
- [102] S. J. Augst, T. Y. Fan, and A. Sanchez, “Coherent beam combining and phase noise measurements of ytterbium fiber amplifiers,” *Opt. Lett.*, vol. 29, no. 5, pp. 474–476, 2004.
- [103] C. X. Yu, J. E. Kansky, S. E. J. Shaw, D. V. Murphy, and C. Higgs, “Coherent beam combining of large number of PM fibres in 2-D fibre array,” *Electron. Lett.*, vol. 42, no. 18, pp. 1024–1025, 31 2006.
- [104] E. Desurvire, *Erbium-Doped Fiber Amplifiers: Principles and Applications*. New York, NY: John Wiley and Sons, 1994.
- [105] L. Moller, “Novel aspects of spectral broadening due to fiber amplifier phase noise,” *IEEE J. Quantum Electron.*, vol. 34, no. 9, pp. 1554–1558, Sep. 1998.
- [106] E. Rochat and R. Dandliker, “New investigations on the effect of fiber amplifier phase noise,” *IEEE J. Sel. Top. Quantum Electron.*, vol. 7, no. 1, pp. 49–54, Jan./Feb. 2001.
- [107] J. Katz, S. Margalit, and A. Yariv, “Diffraction coupled phase-locked semiconductor laser array,” *Appl. Phys. Lett.*, vol. 42, no. 7, pp. 554–556, 1983.
- [108] D. P. Resler, D. S. Hobbs, R. C. Sharp, L. J. Friedman, and T. A. Dorschner, “High-efficiency liquid-crystal optical phased-array beam steering,” *Opt. Lett.*, vol. 21, no. 9, pp. 689–691, May 1996.
- [109] J. W. Goodman, *Introduction to Fourier Optics*. Greenwood Village, CO: Roberts and Company Publishers, 2004.

- [110] C. L. Chua, R. L. Thornton, D. W. Treat, and R. M. Donaldson, “Independently addressable VCSEL arrays on 3- μm pitch,” *IEEE Photon. Technol. Lett.*, vol. 10, no. 7, pp. 917–919, July 1998.
- [111] H.-L. Chen, D. Francis, T. Nguyen, W. Yuem, G. Li, and C. Chang-Hasnian, “Collimating diode laser beams from a large-area VCSEL-array using microlens array,” *IEEE Photon. Technol. Lett.*, vol. 11, no. 5, pp. 506–508, May 1999.
- [112] K. Iiyama, L.-T. Wang, and K.-I. Hayashi, “Linearizing optical frequency-sweep of a laser diode for FMCW reflectometry,” *J. Lightw. Technol.*, vol. 14, no. 2, pp. 173–178, Feb. 1996.
- [113] P. A. Roos, R. R. Reibel, T. Berg, B. Kaylor, Z. W. Barber, and W. R. Babbsitt, “Ultrabroadband optical chirp linearization for precision metrology applications,” *Opt. Lett.*, vol. 34, no. 23, pp. 3692–3694, Dec. 2009.
- [114] F. Vollmer, D. Braun, A. Libchaber, M. Khoshima, I. Teraoka, and S. Arnold, “Protein detection by optical shift of a resonant microcavity,” *Appl. Phys. Lett.*, vol. 80, no. 21, pp. 4057–4059, 2002.
- [115] D. K. Armani, T. J. Kippenberg, S. M. Spillane, and K. J. Vahala, “Ultra-high-Q toroid microcavity on a chip,” *Nature*, vol. 421, pp. 925–928, Feb. 2003.
- [116] S. M. Spillane, T. J. Kippenberg, O. J. Painter, and K. J. Vahala, “Ideality in a fiber-taper-coupled microresonator system for application to cavity quantum electrodynamics,” *Phys. Rev. Lett.*, vol. 91, no. 4, p. 043902, July 2003.
- [117] A. M. Armani, R. P. Kulkarni, S. E. Fraser, R. C. Flagan, and K. J. Vahala, “Label-free, single-molecule detection with optical microcavities,” *Science*, vol. 317, no. 5839, pp. 783–787, 2007.
- [118] G. M. Hale and M. R. Querry, “Optical constants of water in the 200-nm to 200- μm wavelength region,” *Appl. Opt.*, vol. 12, no. 3, pp. 555–563, Mar. 1973.

- [119] R. M. Effros, M. B. Dunning, J. Biller, and R. Shaker, “The promise and perils of exhaled breath condensates,” *Am. J. Physiol.-Lung C.*, vol. 287, no. 6, pp. L1073–L1080, 2004.
- [120] I. Horvath, J. Hunt, and P. J. Barnes, “Exhaled breath condensate: Methodological recommendations and unresolved questions,” *Eur. Respir. J.*, vol. 26, no. 3, pp. 523–548, 2005.
- [121] F. S. Yang, M. E. Marhic, and L. G. Kazovsky, “CW fibre optical parametric amplifier with net gain and wavelength conversion efficiency >1 ,” *Electron. Lett.*, vol. 32, no. 25, pp. 2336–2338, Dec. 1996.
- [122] S. Ramachandran, S. Ghalmi, J. W. Nicholson, M. F. Yan, P. Wisk, E. Monberg, and F. V. Dimarcello, “Anomalous dispersion in a solid, silica-based fiber,” *Opt. Lett.*, vol. 31, no. 17, pp. 2532–2534, 2006.
- [123] S. Diez, C. Schmidt, R. Ludwig, H. G. Weber, K. Obermann, S. Kindt, I. Koltchanov, and K. Petermann, “Four-wave mixing in semiconductor optical amplifiers for frequency conversion and fast optical switching,” *IEEE J. Sel. Top. Quantum Electron.*, vol. 3, no. 5, pp. 1131–1145, Oct. 1997.
- [124] W. Mathlouthi, H. Rong, and M. Paniccia, “Characterization of efficient wavelength conversion by four-wave mixing in sub-micron silicon waveguides,” *Opt. Express*, vol. 16, no. 21, pp. 16 735–16 745, 2008.
- [125] K. O. Hill, D. C. Johnson, B. S. Kawasaki, and R. I. MacDonald, “cw three-wave mixing in single-mode optical fibers,” *J. Appl. Phys.*, vol. 49, no. 10, pp. 5098–5106, 1978.
- [126] M. E. Marhic and F. S. Yang, “High-nonlinearity fiber optical parametric amplifier with periodic dispersion compensation,” *J. Lightw. Technol.*, vol. 17, no. 2, p. 210, 1999.

- [127] J. Kim, O. Boyraz, J. H. Lim, and M. N. Islam, “Gain enhancement in cascaded fiber parametric amplifier with quasi-phase matching: Theory and experiment,” *J. Lightw. Technol.*, vol. 19, no. 2, p. 247, 2001.
- [128] O. Ishida and N. Shibata, “Laser frequency synthesis employing fiber four-wave mixing,” *IEEE Photon. Technol. Lett.*, vol. 4, no. 10, pp. 1171–1174, Oct. 1992.
- [129] K. W. Holman, D. G. Kocher, and S. Kaushik, “MIT/LL development of broadband linear frequency chirp for high resolution ladar,” in *Enabling Photonics Technologies for Defense, Security, and Aerospace Applications III*, vol. 6572, no. 1. SPIE, 2007, p. 65720J.
- [130] C. Koos, L. Jacome, C. Poulton, J. Leuthold, and W. Freude, “Nonlinear silicon-on-insulator waveguides for all-optical signal processing,” *Opt. Express*, vol. 15, no. 10, pp. 5976–5990, May 2007.
- [131] A. J. Seeds, “Microwave photonics,” *IEEE Trans. Microw. Theory Tech.*, vol. 50, no. 3, pp. 877–887, Mar. 2002.
- [132] S. Matsuura and H. Ito, “Generation of CW Terahertz Radiation with Photomixing,” in *Terahertz Optoelectronics*, series Topics in Applied Physics, K. Sakai, editor. Springer Berlin / Heidelberg, 2005, vol. 97, pp. 157–202.
- [133] D. Cotter, “Transient stimulated Brillouin scattering in long single-mode fibres,” *Electron. Lett.*, vol. 18, no. 12, pp. 504–506, June 1982.
- [134] Z. Jiang, D. E. Leaird, and A. M. Weiner, “Optical arbitrary waveform generation and characterization using spectral line-by-line control,” in *Conference on Lasers and Electro-Optics, 2006 and 2006 Quantum Electronics and Laser Science Conference. CLEO/QELS 2006.*, May 2006, pp. 1–2.
- [135] K. Inoue, “Phase-mismatching characteristic of four-wave mixing in fiber lines with multistage optical amplifiers,” *Opt. Lett.*, vol. 17, no. 11, pp. 801–803, June 1992.