

Significant Publications:

- 1) Lau, K. Y., Bar-Chaim, N., Ury, I., Harder, C., & Yariv, A. "Direct amplitude modulation of short-cavity GaAs lasers up to X-band frequencies," Applied Physics Letters, 43 (1), 1-3, 1983. *First identification of fundamental laser parameters responsible for direct modulation bandwidth.* [View PDF](#)
- 2) "Intermodulation distortion in a directly modulated semiconductor injection laser," Lau, K. Y.; Yariv, A.; Applied Physics Letters, vol. 45, Nov. 15, 1984, p. 1034-1036. - *First experimental and analytic studies of third order intermodulation distortion in directly modulated laser diodes* [View PDF](#)
- 3) Lau, K. Yariv, A., "Ultra-high speed semiconductor lasers,," IEEE Journal of Quantum Electronics, Volume: 21 Issue: 2, Feb. 1985, Page(s): 121 –138 – *An invited review of basic principles of high speed laser diodes.* [View PDF](#)
- 4) Lau, K. Y.; Yariv, A., "Nonlinear distortions in the current modulation of non-self-pulsing and weakly self-pulsing GaAs/GaAlAs injection lasers," Optics Communications, vol. 34, Sept. 1980, p. 424-428. - *First introduction of perturbation analytic approach to prediction of fundamental third order intermodulation distortions in directly modulated laser diode, critical for CATV fiber transport designs.* [View PDF](#)
- 5) D.M.; Lau, K.Y., "Ultralow power optical interconnect with zero-biased, ultralow threshold laser-how low a threshold is low enough?," Cutrer,; IEEE Photonics Technology Letters, Volume: 7 Issue: 1, Jan 1995, Page(s): 4 –6 [View PDF](#)
- 6) "Signal-induced noise in fiber-optic links using directly modulated Fabry-Perot and distributed-feedback laser diodes," Lau, K.Y.; Gee, C.M.; Chen, T.R.; Bar-Chaim, N.; Ury, I.; IEEE Journal of Lightwave Technology, , Volume: 11 Issue: 7, July 1993, Page(s): 1216 –1225 [View PDF](#)
- 7) "Interferometric noise reduction in fiber-optic links by superposition of high frequency modulation," Pepeljugoski, P.K.; Lau, K.Y.; IEEE Journal of Lightwave Technology, Volume: 10 Issue: 7, July 1992, Page(s): 957 –963 [View PDF](#)
- 8) "11-GHz direct modulation bandwidth GaAlAs window laser on semi-insulating substrate operating at room temperature," Lau, K. Y.; Bar-Chaim, N.; Ury, I.; Yariv, A.; Applied Physics Letters), vol. 45, Aug. 15, 1984, p. 316-318. [View PDF](#)
- 9) "Recent developments in very-high-speed semiconductor laser diodes (A)," Lau, Kam Y.; Yariv, Amnon; J. Opt. Soc. Am. B, vol. 1, page 460, Jan. 1984 [View PDF](#)

Implications of above work:

Most high speed semiconductor laser transmitters deployed in fiber optic networks today are directly intensity modulated;

Prof. Lau provided, over a period of more than two decades:

- A *fundamental* understanding of dynamics and bandwidth limitations of directly modulated laser diodes by reducing the hitherto complex relationship between laser modulation bandwidth to numerous device and operational parameters, to just three (3) *fundamental irreducible* device and material parameters^{[1,8,9]^{above}}, namely, i) differential optical gain of the laser medium, ii) photon density in the laser cavity, iii) photon lifetime. In deriving this simple relationship, Prof. Lau provides insight for the understanding of superior direct modulation properties of advanced laser diodes, namely, those which can be attained through a high differential optical gain, - achievable with quantum well or strained layer materials. *Most, if not all* high speed semiconductor laser transmitters deployed today are constructed from these advanced materials.
- Prof. Lau performed *first* experimental investigation and development of an analytic approach for predicting *fundamental* limits in analog distortion characteristics of subcarrier directly modulated laser diodes ^{[2,4]^{above}}, paving the way for further developments in the now-widely employed pre-distortion linearization techniques,

system-level designs, and subsequent industrial deployment of Hybrid Fiber Coax (HFC) video (CATV) and internet distribution (cable modem access).

- Prof. Lau assumed the role of chief scientist at Ortel Corp., during the period when the company developed the CATV fiber optic transmission subsystem products which dominated the industry, thus paving the way for large scale deployment of Hybrid Fiber Coax (HFC) infrastructure, on which present day superior and popular CATV services and cable modem internet access depends.