

# Wavelength Division Multiplexing in Long-Haul Transmission Systems

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## ***Course Description:***

Wavelength division multiplexing (WDM) technology used in long-haul transmission systems has steadily progressed over the past few years. Newly installed state-of-the-art transoceanic systems now have terabit/s maximum capacity, while being flexible enough to have an initial deployed capacity at a fraction of the maximum. The steady capacity growth of these long-haul fiber-optic cable systems has resulted from many improvements in WDM transmission techniques and an increased understanding of WDM optical propagation. Important strides have been made in areas of dispersion management, gain equalization, modulation formats, and error correcting codes that have made possible the demonstration of multi-terabit capacities over transoceanic distances in laboratory experiments. Next-generation systems and future upgrades of existing systems will benefit from these new concepts emerging from system research.

This short course will review the important issues regarding the use of WDM in long-haul transmission systems. Included will be an introduction to long-haul undersea transmission systems, the amplified transmission line, dispersion/nonlinear management, transmission formats, measures of system performance, forward error correction, the importance of polarization effects, experimental techniques and results, a transmission line design example and future trends.



**Neal S. Bergano** is Managing Director of System Research & Network Development at Tyco Telecommunications. In 1981 he received a BS degree in Electrical Engineering from the Polytechnic Institute of New York and in 1983 received an MS degree in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology. In 1981 he joined the technical staff of Bell Labs' undersea systems division. In 1992 he was named a distinguished member of the technical staff of AT&T Bell Labs. In 1996 he was promoted to AT&T Technology Consultant. In 1997 he was promoted to AT&T Technology Leader. He holds 27 US patents in the area of lightwave transmission systems. He is a Fellow of the OSA, the IEEE, and AT&T. Neal S. Bergano is the recipient of the 2002 John Tyndall Award “for outstanding technical contributions to and technical leadership in the advancement of global undersea fiber optic communication systems.”

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