



# High Spectral Density Optical Communication Technologies (Optical and Fiber Communications Reports)

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The growth of Internet traffic in recent years surpassed the prediction of one decade ago. Data stream in individual countries already reached terabit/s level. To cope with the petabit class demands of traffic in coming years the communication engineers are required to go beyond the incremental improvement of today's technology. A most promising breakthrough would be the introduction of modulation formats enabling higher spectral efficiency than that of binary on-off keying scheme, virtually the global standard of fiber-optic communication systems. In wireless communication systems, techniques of high spectral density modulation have been well developed, but the required techniques in optical frequency domain are much more complicated because of the heavier fluctuation levels. Therefore the past trials of coherent optical modulation/detection schemes were not successful. However, the addition of high-speed digital signal processing technology is the fundamental difference between now and two decades ago, when trials of optical coherent communication systems were investigated very seriously. This approach of digital coherent technology has attracted keen interest among communication specialists, as indicated by the rapid increase in the pioneering presentations at the post-deadline sessions of major international conferences. For example, 32 terabit/s transmission in a fiber experiment based on this technology was reported in post-deadline session of Optical Fiber Communication Conference (OFC) 2009. The advancement of the digital coherent technologies will inevitably affect the network architecture in terms of the network resource management for the new generation photonic networks, rather than will simply provide with huge transmission capacity.

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