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Invited paper

Frequency Division Multiplexed 1 Gsymbol/s, 64 QAM Coherent Optical Transmission with a Spectral Efficiency of 8.6 bit/s/Hz

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Abstract

We have successfully transmitted a three-channel frequency division multiplexed 1-Gsymbol/s, 64 QAM coherent optical signal over 160-km with a 1.4-GHz spacing. The spectral efficiency reaches as high as 8.6-bit/s/Hz.

Extended Abstract

Improving the spectral efficiency of optical transmission systems is becoming more important as the demand for capacity rapidly increases. Recently coherent optical transmission systems with a spectral efficiency of more than 2 bit/s/Hz have been demonstrated by several groups using QPSK, 8PSK, and OFDM. The highest spectral efficiency demonstrated in a DWDM transmission experiment was 4.2 bit/s/Hz, reported by X. Zhou et al in 2008 by using a polarization-multiplexed RZ-8PSK format. Of the many available modulation formats, coherent QAM is a very interesting way of increasing the spectral efficiency because 2N QAM has N times the spectral efficiency of BPSK. We have already reported polarization-multiplexed 1 Gsymbol/s, 64 and 128 QAM coherent signal transmissions over 150 km with a single channel.

In this paper, we describe a three-channel frequency division multiplexed (FDM) and polarisation-multiplexed 1 Gsymbol/s, 64 QAM coherent transmission over a 160 km SMF with a 1.4 GHz spacing. The total capacity for each channel reaches 12 Gbit/s in an optical bandwidth of 1.4 GHz, resulting in a spectral efficiency of 8.6 bit/s/Hz. In other words, 36 Gbit/s transmission is successfully achieved with an FDM bandwidth of 4.2 GHz.

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Masato Yoshida was born in Toyama, Japan, on January 25, 1975. He was awarded a Ph.D. degree by Tohoku University, Sendai, Japan in 2001. In 2001, he joined the Research Institute of Electrical Communication, Tohoku University, Sendai, Japan. His research interests include mode-locked fiber lasers, coherent optical communication, and photonic crystal fibers.
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