Abstract

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Transmission Techniques for Ultra Dense Wavelength Division Multiplexing By Using Two Optical Amplifiers in Nonlinear Optical Networks

In the present paper, the problem amplification techniques of ultra dense wavelength division multiplexing (UDWDM) in nonlinear optical networks are investigated through five transmission techniques. The impact of tailoring of chirped pulses of different temporal waveforms is investigated in a normal dispersion fiber. The set of multiplexed signals are tailored in a different a subset to assure approximately the same output level of power to hold the signal-to-noise ratio at the same level. Moreover, three different transmission techniques, namely, soliton propagation, maximum time division multiplexing (MTDM) and ìShannonî capacity, are employed where successive section of alternating dispersion are used as a technique to manage the dispersion. Distributed ìRamanî amplifiers as well as Erbium doped fiber amplifier are engaged to maximize the repeater spacing. We have succeeded to multiplex 2400 (UDWDM) channels in the optical range 1.45 - 1.65 μm with channel spacing ranging from 0.3 up to 0.6 nm where each channel has its own characteristic parameters of loss, dispersion, and amplification. The channels are divided into sub-groups (each of 4, 5, 6, 7,....,24) where the technique of space division multiplexing (SDM) is applied. The multispan effects of ìKerrî nonlinearity and amplifier noise on "Shannon" channel capacity of dispersion-free nonlinear fiber is considered as a ceiling value for the sake of comparison. The case of soliton with modified Raman amplification via parametric gain also is investigated. Each link has special chemical structure, optical signals power, and optical Raman pumping. The cable contains {4, 5, 6, 7,... , 24} links in SDM. It has been shown that the modified Raman gain yields higher effects on the variable under consideration if compared with the conventional Raman gain. The number of links is in positive correlations with the set of effects {Repeater spacing, Soliton product, MTDM product}.In general Shannon product is the ceiling but it undergoes a maximum value at twelve links. The Chirping product also possesses a maximum at 8 links.