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Polarization mode dispersion tolerance of Miller and Manchester signals

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Abstract Polarization mode dispersion (PMD) which is the time space varying nature of two parallel splitting rays polarized perpendicularly in single mode fiber, causes a serious problem in high bit rate transmission. We evaluated the PMD induced system penalty by means of simulations for Miller and Manchester signals under similar conditions and found that Miller is more tolerant to PMD than Manchester.

Keywords Data formats · High bit rate · Manchester code · Miller code · Polarization-mode dispersion (PMD)

1 Introduction

Single mode fibers support two modes of polarization, due to imperfect circular geometry or stress on the cable (Sakai and Kimura 1981). As a result of construction methods, installation, environmental conditions, etc., the effective area of the core varies along the axis of the fiber. Thus the effective area causes subtle differences in propagation speed of the light wave (differential transit time) based upon the polarization of the component photons (Poole and Wagner 1986). Thus in a single-mode fiber two phenomenon occur, first the input data pulses are being split and then differentially delayed. The transmission performance degrades greatly in the form of intersymbol interference when the broadened output pulse becomes equivalent to the bit time period due to PMD (Poole et al. 1991). The penalties induced by PMD fluctuate randomly with time as the polarization dispersion at any wavelength is dependent on the details of the time-varying mode coupling of the fiber (Curti et al. 1990).

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