TRANSMITTING AND RECEIVING IN DIGITAL OPTICAL TRANSMISSION SYSTEMS

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Design methods of transmitters/receivers and repeaters are described both for high speed digital transmission systems with bit rates of 100 Mb/s or more, and for star configured optical local area networks.

The experiments on transmitting high speed signals at 100 Mb/s and above at long wavelengths are presented in order to verify the research on repeater spacing. By using a 1.3 μm wavelength. which is the zero dispersion wavelength of a single-mode fiber, more than 20 km repeater spacing is experimentally achieved at 400 Mb/s. How to adjust the APD multiplication factor and the decision circuit threshold level is studied and the results show that the repeater can operate properly at degraded levels of intersymbol interference, APD dark current, and LD extinction ratio. The design and the measured transmission characteristics of a 400 Mb/s repeater using a single-mode fiber in the 1.3 μm wavelength are described.

In order to use the CSMA/CD protocol in star configured optical local area networks, an efficient collision detection method needs to be devised. A Code Rule Violation (CRV) collision detection method, using a dipulse line code and a partial response system, is proposed and analyzed. A method for designing transmitters/receivers utilizing the CRV method is given. To connect the star configured passive optical local area networks to each other, repeaters implemented with the CRV method are studied. A unique repeater using wavelength division multiplexing and a gate control is proposed and the design method for the repeater is established.