

Optical Fiber Transmission of Audio and Video Signals Employing Pulse Frequency Modulation Scheme

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This thesis is about the optical transmission of audio and video signals employing pulse frequency modulation (PFM) scheme. First, an investigation was made on several kinds of pulse modulation schemes which were proposed for transmitting video signal. It was made clear that PFM (Pulse Frequency Modulation waveform with a constant pulse width) is most advantageous. Then, a theoretical analysis on PFM and SWFM whose duty ratio is 0.5 was carried out by using Fourier Series. From the results of the analysis, it was made clear that how to decide the parameter such as carrier frequency, its deviation modulation index, and pulse width in the modulator and demodulator.

An optical fiber transmission system employing PFM was established for transmitting audio and video signals. The result of the analysis made above was verified, and a new method for measuring the modulation index which is very important to the performances such as the SNR and distortion of demodulated signal in PFM scheme. In order to achieve the baseband modulation signal from SWFM signal, two types of demodulator. i.e., delay line FM demodulator and DPFM demodulator(which multiplex the delayed SWFM signal onto the original SWFM signal) were discussed and the DPFM demodulator was verified to be better because of the better SNR.

By using the modulation and demodulation circuits discussed above, several kinds of transmission systems were carried out such as the system for transmitting baseband video signal which is frequency division multiplexed with FM audio signal, PCM audio FSK signal or narrow band PSK signal. Furthermore, the optical multiplexer/demultiplexer and distributor were added to the above systems to increase the transmission capability, to bidirectionally transmit the optical signal, and to distribute the optical signal to several different receivers.

Upon the study of above, two prototypes of applicative audio and video signals transmission systems for using in hospital and high power medium-wave broadcast station were accomplished.