

Abstract

In this project we have designed and constructed an optical communication system to transmit two-voice channel full duplex technique with line of sight, which uses a laser beam as a carrier wave in free space.

The constructed full-duplex optical communication system consists of a transceiver (transmitter and receiver) for both sides. The transmitter part includes a laser source and other transmitter accessories as well as a receiver component.

The pulse code modulation (PCM) technique has been used to transmit voice signal of a frequency range (0.3-4) kHz bandwidth with the transmission bit rate 100kb/s with non-return to zero (NRZ) line coding.

The sound wave will be entered by a microphone, this signal will be amplified and converted to a digital signal by using analog to digital converter (ADC) with sample resolution of 8 bits per sample.

These digital signals are carried on the laser beam in free space, then sent to the receiver, the laser power is converted to a weak electrical signal by the detector, the signal will be amplified, and then converted back to analog signal by using digital to analog converters (DAC) to produce the original transmitted signal.

A high quality sound communication link for a distance reaching about 1300m is achieved with signal to noise ratio (S/N) equal to 21.1 dB, the system calculation shows that the bit error rate BER (Bit error rate) is (5×10^{-8}) and the system power budget is 47.4 dB.