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Error Free Transmission of 5 Gbps Data at 140 GHz Using Difference Frequency Generation

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Edholm's law of bandwidth states that the required data rate in the communication industry is doubled every 18 months. To meet the demand in the bandwidth for wireless communications, several experiments has been carried out using Terahertz (THz) waves (0.1 THz –10 THz). Though the THz waves are being absorbed by the atmosphere, mainly due to the water molecules, the available low loss transmission windows allows us to increase the link distance for outdoor communications. The THz communication link can be established using either electronic or photonics based approach. In this work, we have described the design and demonstration of an error free 5 Gbps transmission over the link distance of 30 cm using photonics based technologies. Two Distributed Feedback (DFB) lasers having slightly different center wavelengths operating in the telecom region is used as the source for difference frequency generation. One of the DFB lasers is intensity modulated using electro-optic modulator with the pseudo random bit sequence (PRBS) data with the pattern length of 29-1 and the data rate of 5 Gbps. The frequency of the DFB lasers is tuned in order to get the difference frequency of 140 GHz by mixing it in the photomixer. A zero bias Schottky detector (ZBD) is used at the receiver end for the detection and direct demodulation. The demodulated baseband signals are pre-amplified using a low noise amplifier and the performance is analyzed by recording the eye pattern. The amplitude of the eye opening is clear, demonstrating the error free operation of the communication link.

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