











According to the OFDM bit-loading method, we could also obtain the corresponding bit number of each subcarrier in the same modulation bandwidth at the transmission distances of 0.75, 1, 1.25, 1.5, 1.75 and 2 m, respectively, as shown in Fig. 6. Here, Fig. 6 shows that the measured bit numbers are between 5 and 7, 5 and 7, 4 and 6, 3 and 6, 2 and 6, and 2 and 5 at the transmission distances of 0.75, 1, 1.25, 1.5, 1.75 and 2 m, respectively, while the two frequencies of 10 and 30 MHz are ignored. Therefore, utilizing the various observed bit numbers under different transmission links, we could retrieve the optimal signal performances of proposed VLC system.

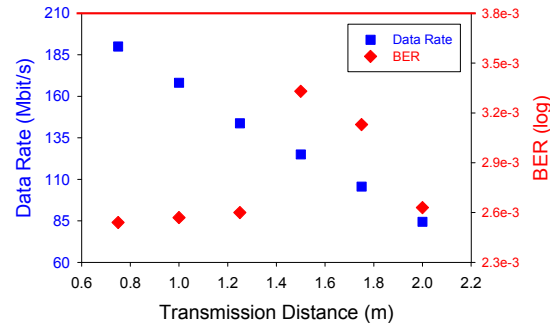


Fig. 7. Measured traffic rate and its corresponding BER of proposed phosphor-LED VLC system using 16-QAM OFDM format with bit-loading algorithm at the different transmission lengths of 0.75, 1, 1.25, 1.5, 1.75, and 2 m, respectively.

Finally, Fig. 7 shows the measured traffic rate and its corresponding BER of proposed phosphor-LED VLC system using 16-QAM OFDM format with bit-loading algorithm at the different transmission lengths of 0.75, 1, 1.25, 1.5, 1.75, and 2 m, respectively. The traffic rates were observed at 190, 168.13, 143.75, 125, 105.63, and 84.44 Mbit/s, respectively, in the different transmission distances. In addition, the corresponding BERs of  $2.54 \times 10^{-3}$ ,  $2.57 \times 10^{-3}$ ,  $2.6 \times 10^{-3}$ ,  $3.3 \times 10^{-3}$ ,  $3.1 \times 10^{-3}$ ,  $2.6 \times 10^{-3}$  were also obtained, as illustrated in Fig. 5. The entire measured BER values were below the forward error correction (FEC) threshold (BER =  $3.8 \times 10^{-3}$ ) [16], as seen in Fig. 7. As a result, the maximum and minimum traffic rates of 190 and 84.44 Mbit/s could be obtained at the free space transmission lengths of 0.75 and 2 m, respectively.

#### 4. Conclusion

In summary, we have proposed and investigated a white-light phosphor-LED VLC system with the adaptive traffic rate of 84.44 to 190 Mbit/s by using 16-QAM OFDM modulation format with bit-loading method under the free space transmission lengths of 0.75 to 2 m. Here, we also designed an optimal analogy pre-equalization circuit design at LED-Tx side and employed no blue filter at Rx side to increase the modulation bandwidth of phosphor-LED from 1 MHz to 30 MHz. In addition, the whole obtained BERs could be less than the FEC threshold at the different transmission lengths of 0.75, 1, 1.25, 1.5, 1.75, and 2 m, respectively. In addition, we could adjust the traffic data rate of proposed VLC system adaptively, according to the different transmission lengths and received sensitivities at the Rx side.