# Demonstration of 200-Gb/s DMT Signal Using Entropy Loading


Qun Liu[1], Jing Zhang[1], Shaohua Hu[1], Taowei Jin[1], Mingyue Zhu[1], Xingwen Yi[2] and Kun Qiu[1]

[1]*Key Lab. of Optical Fiber Sensing and Communications, University of Electronic Science and Technology of China, Chengdu, 611731, China*

[2]*School of Electronics and Information Technology, Sun Yat-Sen University, Guangzhou, 510275, China*


## Introduction

We have experimentally demonstrated a 200-Gb/s DMT signal transmission over 2-km or 10-km SSMF with bit loading (BL) or entropy loading (EL) using a 23-GHz MZM, respectively. When the equalizer memory length is (150, 5), entropy loading can improve AIR by 8.9%-23% compared with bit loading.

## 1. Experimental setup

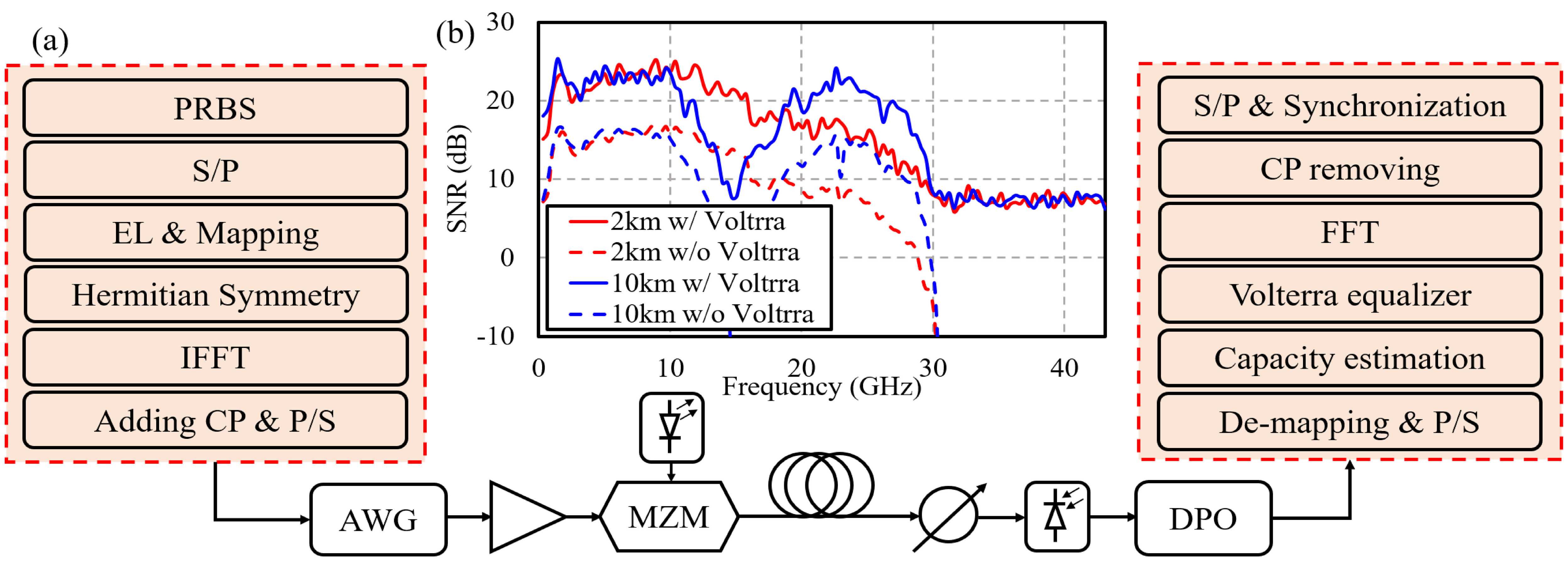


Fig. 1. DMT experimental. (b) SNR versus subcarrier frequency with or without VF.

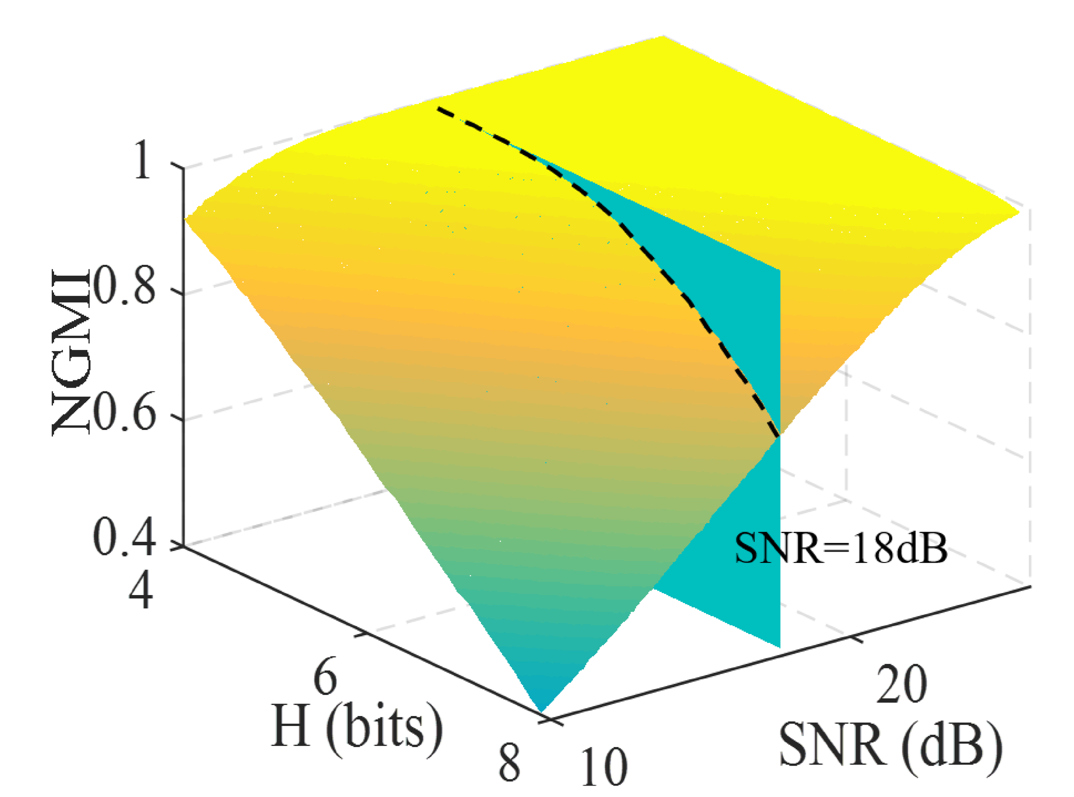


Fig. 2. The look-up table of PS 256-QAM.

Fig. 1(a) shows the experimental setup of the IM-DD transmission system. The bandwidth of the MZM is 23 GHz, so the transmission system is band limited for the 43.125-GHz DMT signal. Fig. 1 (b) shows the SNR with or without Volterra filter (VF) after 2-km and 10-km SSMF. The memory length is set at (150, 5). As shown in Fig. 1 (b), the SNR in high-frequency region after 25-GHz drops sharply due to the severe band-limiting effect that limit the transmission capacity. Besides, some power fading points are distributed across the whole frequency band. Even with the VF, the power fading effects are still existed. We choosing the 2nd-order VF to mitigate the ISI and restrict the complexity. Then execute the EL and BL algorithms.

The EL algorithm based on the look-up table with NGMI as the constraint and the format is specified by the squared-QAM level *M* and the source entropy *H* after PS. Fig. 2 shows the look-up table on the PS 256-QAM. While for BL, the format is chosen from 4-QAM up to 1024-QAM. Each sub-carrier is integer entropy.

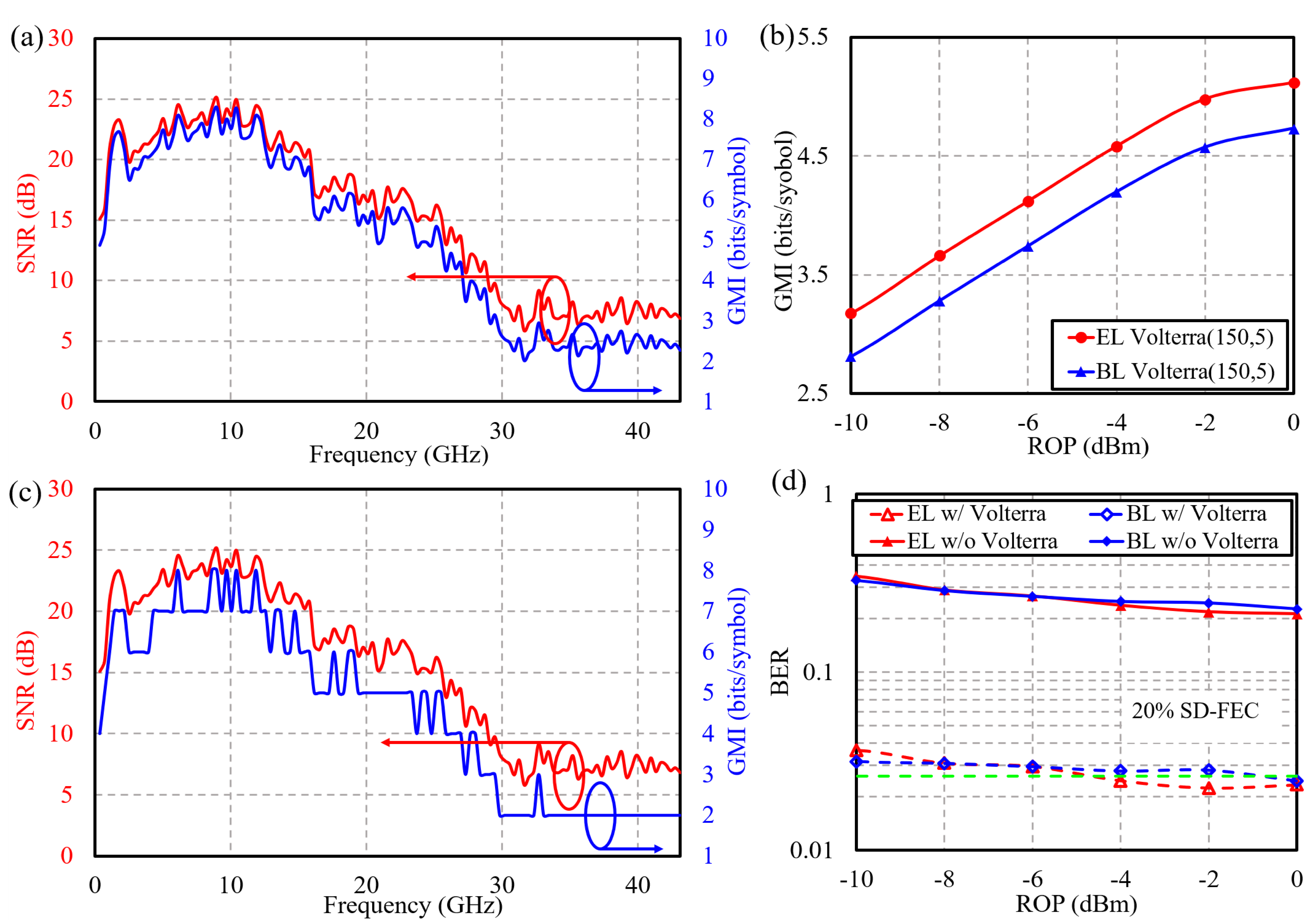


Fig. 2. (a) BL and (c) EL scheme. The GMI (b) and BER (d) versus ROP over 10-km SSMF.

Fig. 2(a) and 2(c) show the detailed BL and EL schemes of 200-Gbit/s DMT signal after 2-km SSMF, respectively. The memory lengths of the VF is set at (150, 5). We can see that the GMI and channel capacity have the same trend for EL, but the entropy is staircase shape foe BL due to its coarse entropy granularity. In Fig. 2(b), the average GMI of the DMT signal is 4.57 bits/symbol for BL and 4.98 bits/symbol for EL after 10-km SSMF when the ROP is -2dBm, corresponding to 8.9% AIR increment. And the corresponding transmission rate is about 197 Gb/s for BL and 214 Gb/s for EL. Fig. 2(d) depict the BER performance of 10-km SSMF with or without Volterra equalizer. We can see that with the Volterra equalizer, the BER is reduced by an order of magnitude. The BER after 10-km SSFM can be below the 20% SD-FEC threshold.

## 2.Conclusion

We experimentally demonstrate a joint EL or BL and simplified Volterra equalizer to support 200-Gb/s DMT signal transmission over 2-km for BL and 10-km for EL SSMF using a 23-GHz MZM below 20% SD-FEC threshold.