















#### **4. Conclusion**

We have proposed and experimentally demonstrated a new method to improve power margin for OFDMA-PON system using hierarchical modulation. In the experiment, signals for ONUs with 1-km and 30-km distribution fiber lengths are paired together and mapped onto the two layers of the OFDM subcarriers. Part of the power margin of the ONU with 1-km distribution fiber length is transferred to the ONU with 30-km distribution fiber length. Thus the power margin of the ONU with 30-km distribution fiber is improved, leading to the power margin improvement for the OFDMA-PON system. Compared with the conventional 16-QAM modulation, the proposed hierarchical modulation improves the power margin of the system by 2.7 dB, which can be used to support more subscribers or extend transmission distance.

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