

carrier estimation (DA-ML CE) can cope with small frequency offsets. To combat larger frequency offsets, an FOE is necessary. Hence, we proposed a symbol-by-symbol receiver employing a novel complex-weighted (CW) DA-ML CE for optical channels with both carrier phase and frequency offset uncertainty. A near-ideal FOE over a complete modulo- R reduced frequency range of $\pm R/2$ (R = symbol rate) is demonstrated such that the bit-error rate performance is only limited by the carrier phase variance. CW-DA-ML CE is applicable to both M -ary phase-shift keying (MPSK) and quadrature amplitude modulation formats. The FOE for 4-PSK signals is more than 5 times faster than that of the differential FOE at signal-to-noise ratio values above 7 dB.

Acknowledgments

The financial support of the Singapore MoE AcRF Tier 2 Grant MOE2010-T2-1-101 is gratefully acknowledged.