

Non-data-aided cycle slip self-correcting carrier phase estimation for QPSK modulation format of coherent wireless optical communication system

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Abstract— In this study, we propose a non-data-aided algorithm of the cycle slip self-correcting carrier phase estimation (CSSC-CPE) which mitigates the cycle slips caused by blind CPE in the coherent wireless optical communication (WOC) system. The CSSC-CPE uses the output of CPE for cumulative averaging and selects the difference between two cumulative average segments as the discriminant parameter. The location and direction of cycle slips are determined by identifying the position and sign of the peak value of . The optimal thresholds for cycle slip detection could be derived from the probability density function (PDF) of obtained by calculation and deduction. Finally, numerical simulations and indoor experiments are carried out. The results show that CSSC-CPE can effectively eliminate cycle slips under weak turbulence condition. Compared with relative non-data-aided cycle slip correction algorithms, the CSSC-CPE achieves a better performance in suppressing the phase noise generated by atmospheric turbulence and laser linewidth, which enhances the accuracy of the cycle slip identification and lowers the SNR requirement when the cycle slip is not allowed.

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