MSc Thesis Project

Phase noise recovery for multi-carrier optical systems

Introduction: A popular method for reducing the nonlinear effects and thereby increasing the data rate of optical communication systems is the multi-carrier modulation (MCM) scheme [1]. In MCM, the serial data stream is parallelized into independent sub-channels of smaller bandwidth, which results in increased tolerance to nonlinearities (see Fig. 1). However, low-cost optical transceivers require non-ideal lasers for local oscillators. Such oscillators typically have a large linewidth and thus produce significant phase noise, which is particularly problematic for narrow-bandwidth communications. Standard phase noise recovery algorithms result in excess of 2 dB loss when operating at high spectral efficiency and data rate, which masks the potential gains from the nonlinear tolerance of MCM.

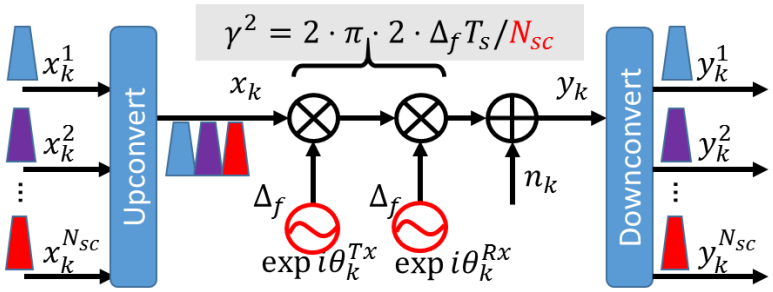

Figure 1 Multi-carrier system with non-ideal local oscilalors

Contents: In this project, new methods will be investigated for phase noise recovery in MCM systems. The student will learn about high-spectral efficiency optical communications, the nonlinear noise problem of such systems, and the potential gains of MCM. The general problem of phase noise in non-ideal transceivers will be then studied, and novel solution for mitigating phase noise in MCM system will be investigated.

Prerequisites:

- Linear and/or nonlinear digital signal processing, e.g. 02457, 02459, 02451
- Programming experience in Matlab and/or C
- General digital communications, e.g. 34230

Additional information:

[1] P. Poggiolini, et. al., "Analytical and Experimental Results on System Maximum Reach Increase Through Symbol Rate Optimization", Journal of Lightwave Technology, vol.34, no.8, 2016

Practical details: The project is intended for 1 or 2 students with 30 ECTS-points per student.

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