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Subspace tracking: a novel measurement method to test the standard phase noise model of optical frequency combs

Abstract
The introduction of digital signal processing (DSP) assisted coherent detection has been a cornerstone of modern fiber-optic communication systems. The ability to digitally, after analogue-to-digital converter, compensate for chromatic dispersion, polarization mode dispersion, and phase noise has rendered traditional analog feedback loops largely obsolete. While analog techniques remain prevalent for phase noise characterization of single-frequency lasers, the phase noise characterization of optical frequency combs presents a greater challenge. This complexity arises from different number of phase noise sources affecting an optical frequency comb. We show how a phase noise measurement techniques method based on multi-heterodyne coherent detection and DSP based subspace tracking can be used to identify, measure and quantify various phase noise sources associated with an optical frequency comb.

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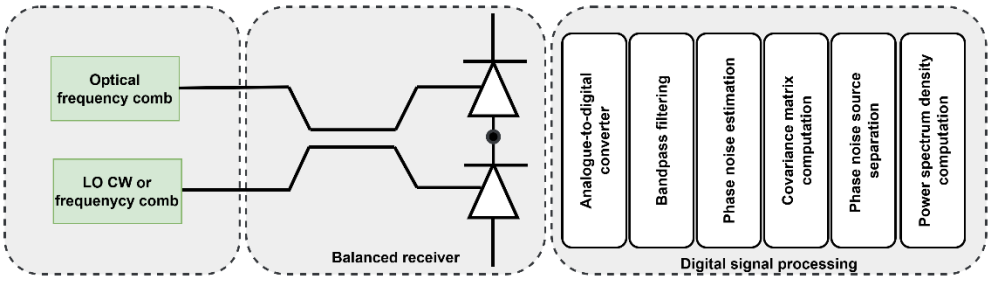

Fig. 1: Measurement set-up based on subspace tracking for optical frequency comb noise characterization