Comparison of delay-interferometer and time-lens-based all-optical OFDM demultiplexers - DTU Orbit (08/11/2017)

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In this paper we present the first detailed numerical comparison of two promising all-optical schemes to demultiplex orthogonal frequency-division multiplexing (OFDM) signals. The investigated schemes are the optical discrete Fourier transformation (O-DFT) and the optical spectral magnification (SM) based on time lenses. In the former scheme, cascaded delay-interferometers (DIs) are used to perform the O-DFT, with subsequent active optical gating to remove the intercarrier interference (ICI). Here a reduced-complexity partial O-DFT, realized by replacing a number of DIs with optical bandpass filters, is investigated. In the latter scheme the OFDM spectrum is magnified, allowing for simple optical bandpass filtering of the individual subcarriers with reduced ICI. Ideally only a single unit consisting of two time lenses is needed, reducing the complexity and potentially the energy consumption compared to the type of O-DFT scheme relying on many active gates. The bit-error-rate is estimated down to ~10^{-6} by Monte Carlo bit-error counting for a 32-subcarrier OFDM input signal, showing that a performance close to the ideal O-DFT is achievable for both the reduced-complexity O-DFT and the SM scheme.

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