Direct Detection Optical OFDM (DDO-OFDM)

6 Patents in Pictures

Please refer to the patent documents for full disclosures and inventors.
Basic DDO-OFDM


Advances: Virtual Carrier

Provides the highest data rate for a given DAC sample rate. This is because the DAC is not used to generate the carrier (or the gap). The frequency and amplitude of the carrier are also easy to control.

Advances: Carrier Boost

Carrier Boost: Improves the sensitivity of the system (receiver signal quality versus OSNR), and possibly reduces the frequency gap to increase the spectral efficiency.

A. J. Lowery, "Improving sensitivity and spectral efficiency in direct-detection OFDM lightwave systems," Optical Fiber Telecommunications (OFC 2008), San Diego, paper OMM4
Advances: Cyclic Prefix Reduction

The idea is to stagger the transmission of bands of OFDM subcarriers so that, after the fiber’s differential group delay (DGD), they arrive in synchronism at the receiver. This means that a shorter Cyclic Prefix (CP) may be used, which reduces the CP overhead (i.e. allows more time for data transmission).

A. J. Lowery, "Reducing Cyclic Prefix Overhead in Optical OFDM Systems," European Conference on Optical Communications, (ECOC 2009), Vienna, Austria, paper 1.3.4
Advances: Nonlinearity Compensation (NLC)

US Patent 8,112,001

The idea is to use a self-coherent receiver with DDO-OFDM, where the carrier is used as the local oscillator in a coherent receiver. This has an advantage that the \( signal \times signal \) beat noise is cancelled, so the frequency gap can be reduced. Polarization multiplexing is also supported. A smaller gap is required to enable the carrier to be isolated.
