Compressive sensing with a microwave photonic filter

In this letter, we present a novel approach to realizing photonics-assisted compressive sensing (CS) with the technique of microwave photonic filtering. In the proposed system, an input spectrally sparse signal to be captured and a random sequence are modulated on an optical carrier via two Mach–Zehnder modulators (MZMs). Therefore, the mixing process (the signal to be captured mixing with the random sequence) is realized in the optical domain. The mixed optical signal then propagates through a length of dispersive fiber. As the double-sideband modulation in a dispersive optical link leads to a frequency-dependent power fading, low-pass filtering required in the CS is then realized. A proof-of-concept experiment for compressive sampling and recovery of a signal containing three tones at 310 MHz, 1 GHz and 2 GHz with a compression factor up to 10 is successfully demonstrated. More simulation results are also presented to recover signals within wider bandwidth and with more frequency components.
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