Photonic compressive sensing with a micro-ring-resonator-based microwave photonic filter

A novel approach to realize photonic compressive sensing (CS) with a multi-tap microwave photonic filter is proposed and demonstrated. The system takes both advantages of CS and photonics to capture wideband sparse signals with sub-Nyquist sampling rate. The low-pass filtering function required in the CS is realized in a photonic way by using a frequency comb and a dispersive element. The frequency comb is realized by shaping an amplified spontaneous emission (ASE) source with an on-chip micro-ring resonator, which is beneficial to the integration of photonic CS. A proof-of-concept experiment for a two-tone signal acquisition with frequencies of 350 MHz and 1.25 GHz is experimentally demonstrated with a compression factor up to 16.

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