

Abstract**Multi-Wavelength Coherent Receiver With A Shared Optical Hybrid And A Multi-Wavelength Local Oscillator**

An exemplary apparatus for digital coherent detection of a multi -wavelength signal includes a polarization-diversity optical hybrid, at least four Wavelength De-Multiplexing (W-DMUX) filters, $4M$ detectors, and $4M$ analog-to-digital converters (ADCs), with M an integer greater than one. The hybrid has a first input for receiving a multi -wavelength signal including M sub-channels at different wavelengths, and a second input for receiving a reference light source including M continuous-wave references at different wavelengths that approximates center wavelengths of the M sub-channels. The hybrid has at least four outputs. A W-DMUX input for each W-DMUX filter is provided a corresponding one of the hybrid outputs, and each W-DMUX filter provides M filtered optical channel outputs. Each detector converts at least one of the filtered channel outputs into a corresponding electrical signal. Each ADC converts one of the electrical signals into a corresponding digital signal. The corresponding digital signals represent the M sub-channels.

Fig. 3