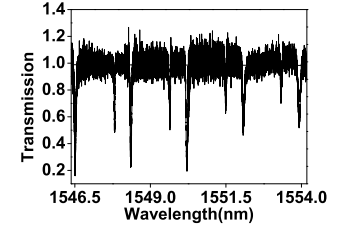


# DUAL-COMB SPECTROSCOPY USING A DUAL-COMB FIBER LASER BASED ON HYBRID PULSE FORMATION MECHANISMS

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Single-cavity dual-comb fiber laser can generate two ultra-short pulse trains from the same cavity, which could have relatively low common-mode noises and good mutual coherence. They had been demonstrated to be applicable to various dual-comb metrology applications including optical spectroscopy<sup>a</sup>, absolute distance measurement<sup>b</sup> and so on. Here, broadband dual-comb spectroscopy measurement using a broadband mode-locked dual-comb fiber laser based on hybrid pulse formation mechanisms is demonstrated. Through the dispersion management in the cavity, the bandwidths of both pulses are greatly increased. Dual-comb pulse with broader spectra can be generated when the pump power is above the threshold power. After jointly being amplified by an Erbium-doped fiber amplifier, the 3-*dB* spectral bandwidths, at the center wavelength of 1550nm and 1555nm, have been broadened from 4.4nm and 1.3nm<sup>c</sup> to 58.8nm and 8.5nm, respectively. Also, the 10-*dB* width of the overlapped spectra is over 16nm, covering 1546nm to 1562nm. The repetition rate difference of two pulse trains is 37Hz, because of the small difference in their center wavelengths and the low cavity dispersion. Then, typical asynchronous experimental setup is used to measure transmission spectrum of an on-chip microring resonator by averaging over 30 interferograms. All the resonance spectral features are clearly resolved. This kind of dual-comb fiber lasers could offer extra options for low-complexity, dual-comb metrology applications.



<sup>a</sup>X. Zhao, et al., Optics Express, vol. 24, 21833, 2016.

<sup>b</sup>B. Lin, et al., IEEE Photonics Journal, 99, 2017.

<sup>c</sup>Y. Liu, et al., Optics Express, vol. 24, 21392, 2016.