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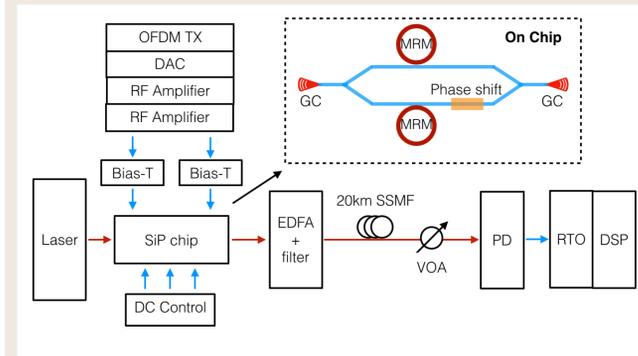
## ABSTRACT

We experimentally demonstrate SSB-OFDM signal generation with over 18-dB sideband suppression ratio using a silicon microring IQ modulator. Transmission of 31.4 Gb/s over 20-km SSMF is achieved well below the FEC threshold.

## INTRODUCTION

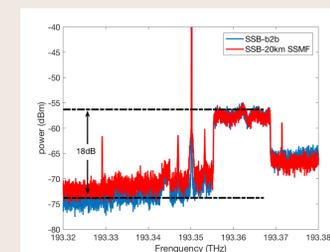
- OFDM for next generation PON:
  - Single sideband
    - Avoid frequency selective fading
    - Power conservation
    - Bandwidth conservation
  - Direct detection
    - Low cost and low complexity
- Current single sideband direct detection solution on silicon photonics chip:
  - Dual-drive MZM (DD-MZM)
    - Large device size and high power consumption
  - In-phase and quadrature Mach-Zehnder modulator (IQ-MZM)
    - Complex driving scheme (four driving signals)

## EXPERIMENT SET-UP

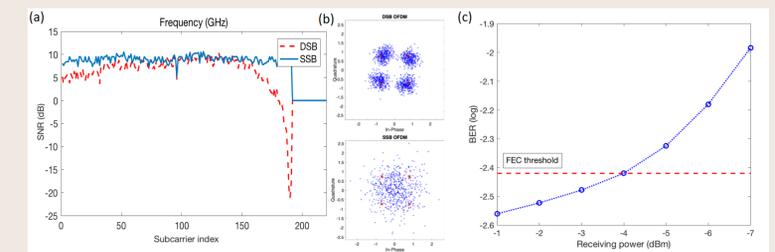


- 8-bit DAC with 16 GHz bandwidth running at 84 Gsa/s
- Driving signals are amplified to 5V<sub>pp</sub> by two 50 GHz RF amplifiers, and are sent to the chip via a GSGSG configured, 50 Ω RF probe
- RTO captures the signal at 80 Gsa/s with 30 GHz bandwidth

## EXPERIMENTAL RESULT

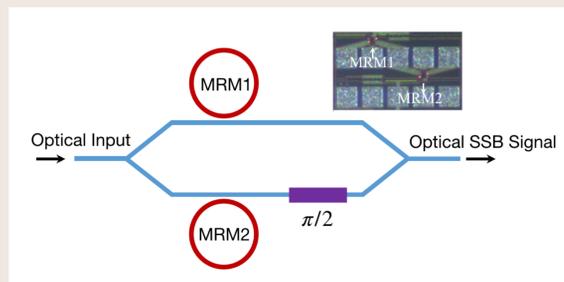


Optical Spectrum for generated SSB-OFDM signal

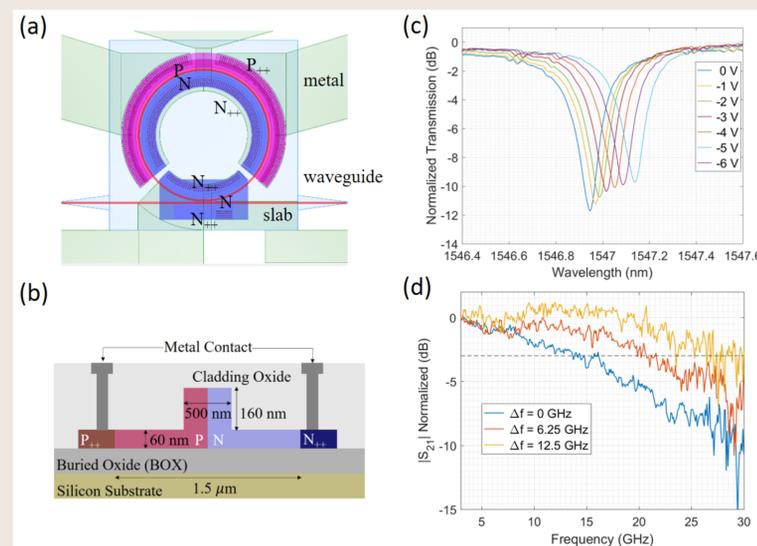


(a) Estimated SNR per subcarrier for DSB and SSB signals. (b) Constellations of received DSB and SSB signals. (c) BER of detected SSB OFDM signal with varied received power.

## IQ MRM MODULATOR BASED OPTICAL SSB TRANSMITTER



Schematic and microscope image of an optical SSB transmitter based on silicon microring IQ modulator

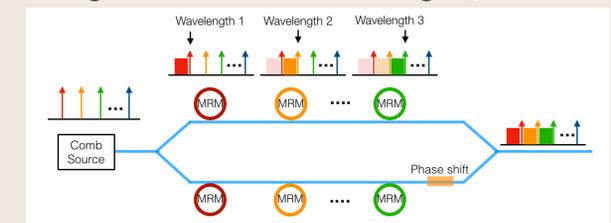


(a) Partial mask layout for MRM1/MRM2, (b) cross section of the p-n junction of MRM1/MRM2 showing relevant dimensions, for MRM1 measured (c) power transmission spectra at different bias voltages, and (d) electro-optic frequency response (S21) at different frequency detunings.

- CMOS-compatible and cheap (SiP solution)
- Compact device size (20μm radius MRM)
- Power efficient (milliwatts level)
- Simple driving scheme (two driving signals)

## CONCLUSION

- We demonstrate the 20 km SMF transmission of wide-band optical SSB OFDM (15.7-GHz bandwidth with a 2.7 GHz guard band) using an integrated silicon microring IQ modulator.
- 18 dB side-band suppression ratio
- Robustness against chromatic dispersion
- Provides a low-cost integrated solution for SSB signal transmitter and has a great potential for WDM-PON applications.



## ACKNOWLEDGEMENT

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## REFERENCE

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- [2] Ruan, Xiaoke, et al. "Experimental comparison of direct detection Nyquist SSB transmission based on silicon dual-drive and IQ Mach-Zehnder modulators with electrical packaging." *Optics express* 25.16 (2017): 19332-19342.
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