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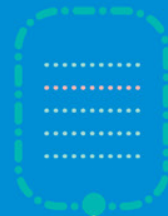
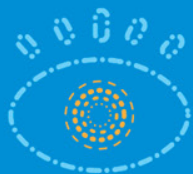
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100G-EPON:

Updates for 25G NRZ using 10G APD

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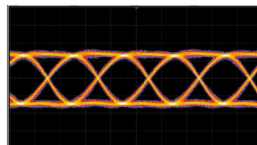
Introduction

In Atlanta meeting, we showed 10G APD test results using equalization to mitigate bandwidth limitation and dispersion loss.

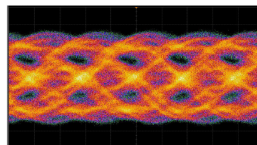
Experimental results

Experiment setup using 10G O/E components

- Wavelength: 1550nm
- 25km fiber transmission
- 25G NRZ signal generated using Keysight AWG 8195A
- Optical Tx uses 10G EML with 3dB bandwidth more than 15G
- Optical Rx uses OKI 10G PIN/TIA and Sumitomo 10G APD ROSA
- Received data are offline processed using 25GHz oscilloscope DSOX92504A with proposed PHY scheme
- Evaluated BER at 10^{-3}
- Measured sensitivity after 25km transmission
 - 10G PIN/TIA: -16dBm
 - 10G APD ROSA: -24dBm



25Gb NRZ AWG output

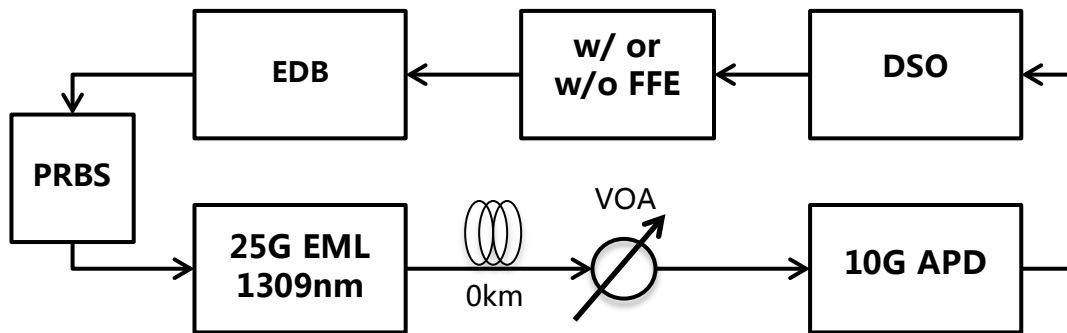


10G PIN/TIA output after 25Km

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In this presentation, we update our results for 10G APD.

Experiment of 10G APD with EDB



Experimental setup:

- 25G EML at 1309nm
- Detect by 10G commercial APD/TIA
- FFE equalization
- Decision with EDB

In this experiment, 25G EML in O band is used for better transmitter performance and minimum dispersion impact.

B2B receiver sensitivity is tested at BER of 10^{-3}

- FFE is used as EQ

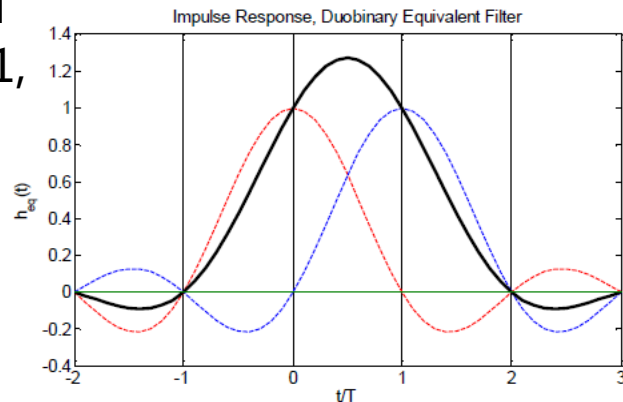
Results for EDB

In this test, FFE is used to help improve EDB detection.

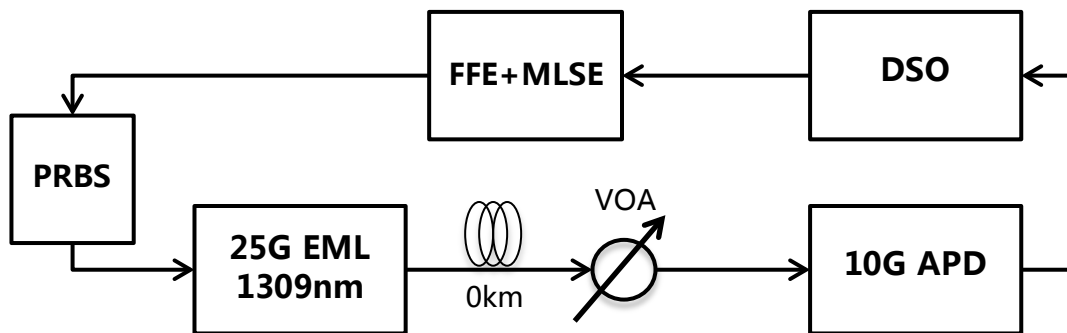
- If FFE is on, the measured receiver sensitivity is -24.5dBm, which is same with previous results in Atlanta, verifying normally 5dB loss from 10G sensitivity in theory.
- If FFE is off, the measured receiver sensitivity is -22dBm, shows about 2.5 dB degradation

In general, the equivalent impulse response of an ideal duo-binary encoder should be represented by [...0, 1, 1, 0...]

However, the actual impulse response of 10G APD is not such ideal, in our experiment, [...0.21 0.96 1 0.23...] is measured, resulting in significant ISI penalty.



Experiment of 10G APD with FFE+MLSE



Experimental setup:

- 25G EML at 1309nm
- Detect by 10G commercial APD/TIA
- FFE and MLSE

In this experiment, 25G EML in O band is used for better transmitter performance and minimum dispersion impact.

B2B receiver sensitivity is tested at BER of 10^{-3}

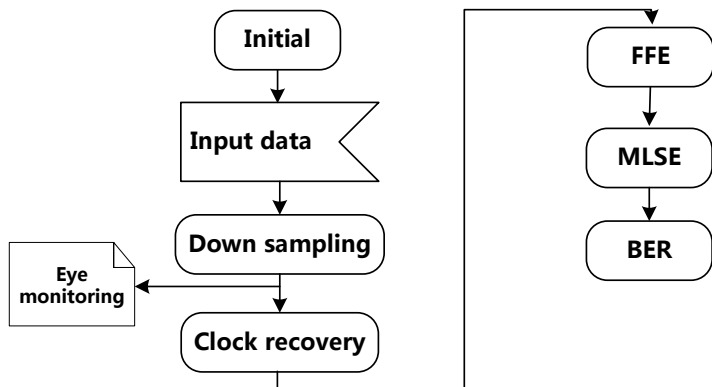
- FFE + MLSE

Results for FFE + MLSE

In this test, FFE and MLSE are employed to convert the distorted signal into NRZ signal.

Results are collected and processed offline, due to no commercial digital processors and components available for PON right now.

The measured B2B receiver sensitivity is -26dBm.



Parameters	values
Sampling rate	80G sps
NRZ bit rate	25G bps
Up/down sampling	5 pts/16 pts
Equalization	FFE+MLSE
Bit error ratio	10 ⁻³

Summary of experiment data

	10G APD (FFE+MLSE)	10G APD (EDB)	25G APD
Transmitter	25G EML	25G EML	25G EML
Rx Equalizer	FFE+MLSE	None/FFE	-
Rx electronics	ADC+DSP	FIR filters	-
Rx linearity	Linear	Linear	-
Sensitivity at BER 10^{-3}	-26dBm	-22dBm / -24.5dBm	-28.5dBm
Electronics complexity	High	Medium	Low

Conclusion

Updated experimental results using 10G APD are shown

- FFE+MLSE performs a little worse than 25G APD
- EDB without FFE shows significant degradation because of the imperfect channel response

Experimental results show that, both FFE+MLSE and EDB using 10G APD require equalizers, either in analog circuits or digital processors, which will result in increased cost more than expected.

Thank you



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