

Security Level:

Symmetric 50G PON using NRZ

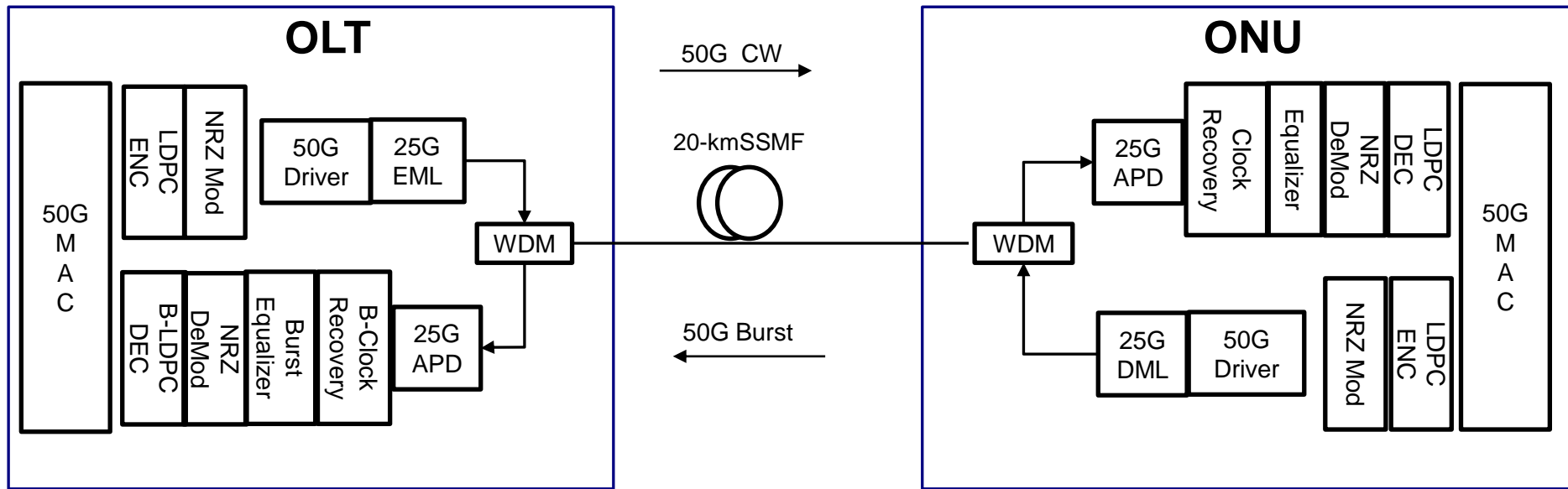
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Background

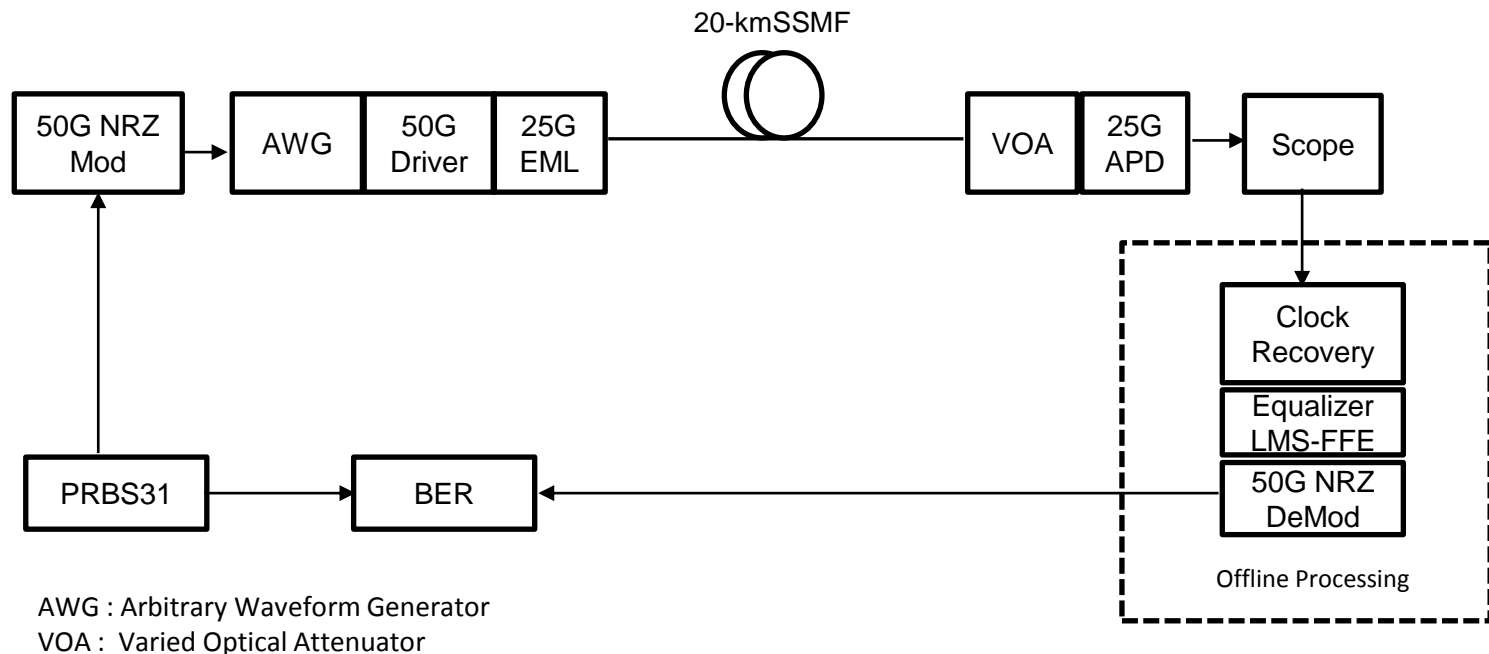
- The optical power budget is an important subject for 50G EPON
- This contribution analyzes 50G NRZ Modulation with 25G optics using equalizer to get the required optical power budget.

Symmetric 50G PON system using NRZ



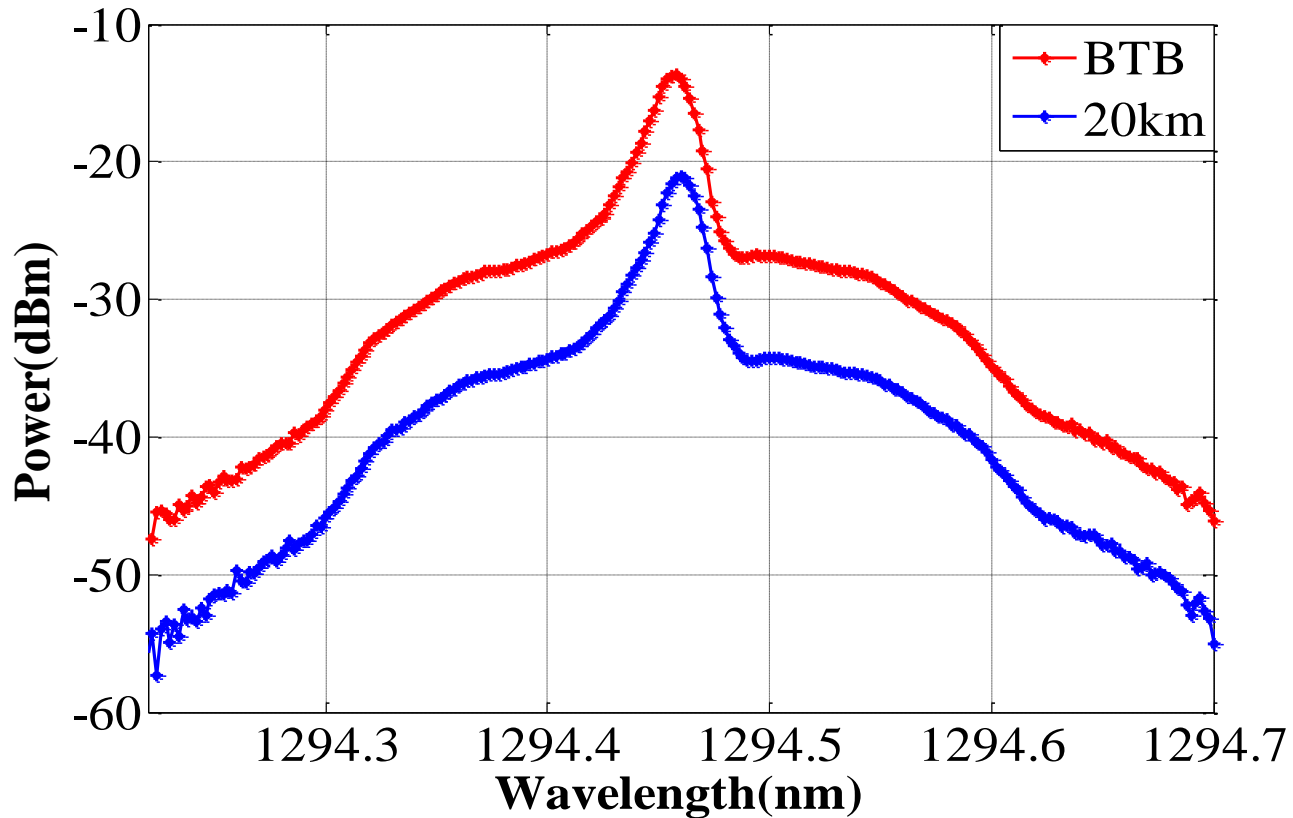
- 50Gb/s NRZ is used both continuous downstream and burst mode upstream
- Equalizer is used to mitigate the bandwidth inefficiency and dispersion penalty
- LDPC is used to get more margin

50G NRZ Downstream Experimental Setup



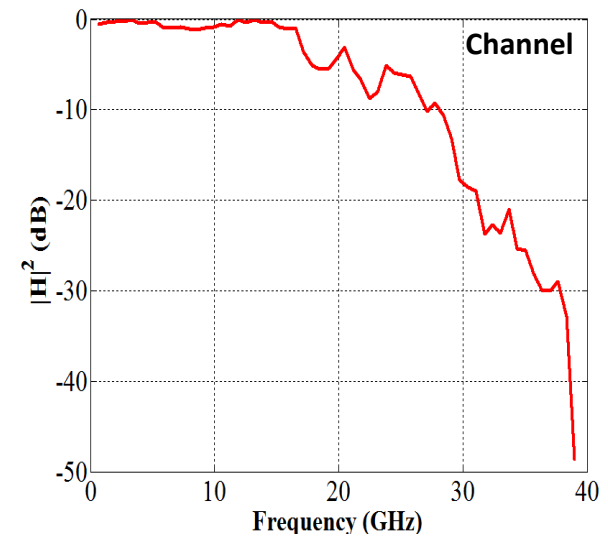
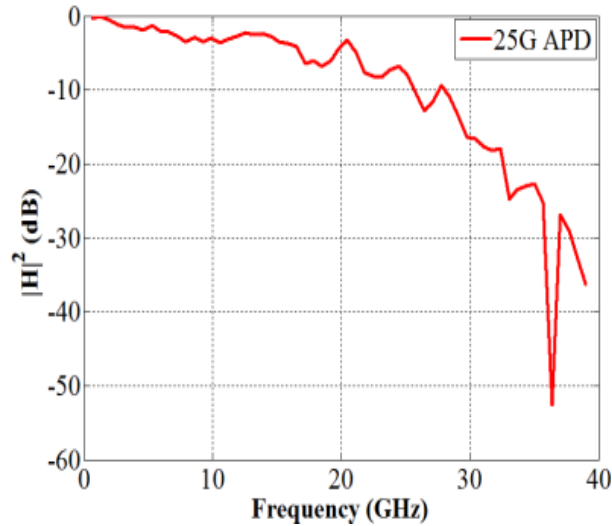
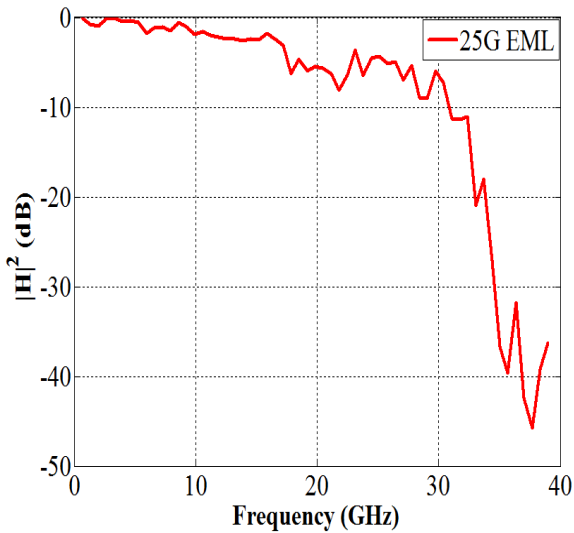
- 25G EML @ TX and 25G APD @ RX
- 50G NRZ is generated by the AWG
- Equalizer(LMS-FFE)is performed offline after the received data is sampled by the oscilloscope

Measured optical spectrum



1294nm is used, no obvious optical spectrum broaden is observed

Measured 25G Optics and Channel Frequency Response

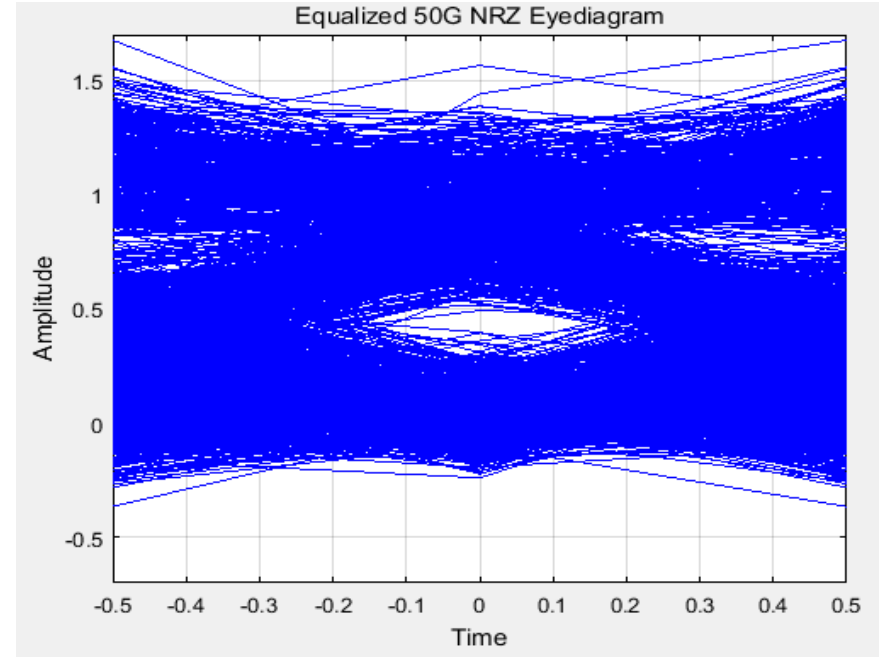
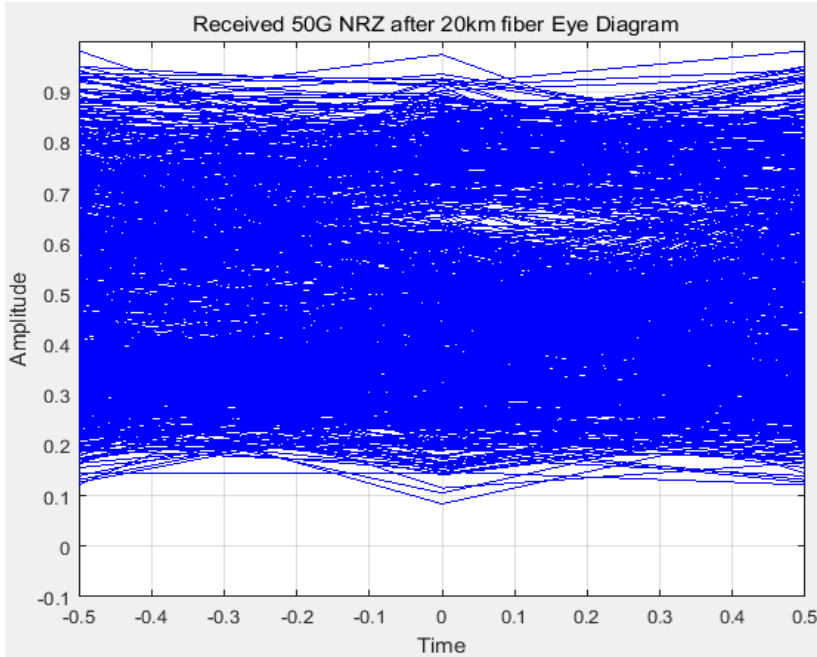


Parameters	3dB Bandwidth	10dB Bandwidth	Unit
25G EML	17	30	GHz
25G APD	17	25	GHz
Channel	16	25	GHz

- Channel Bandwidth is very limited to transmit 50G NRZ.
- Equalizer is needed.

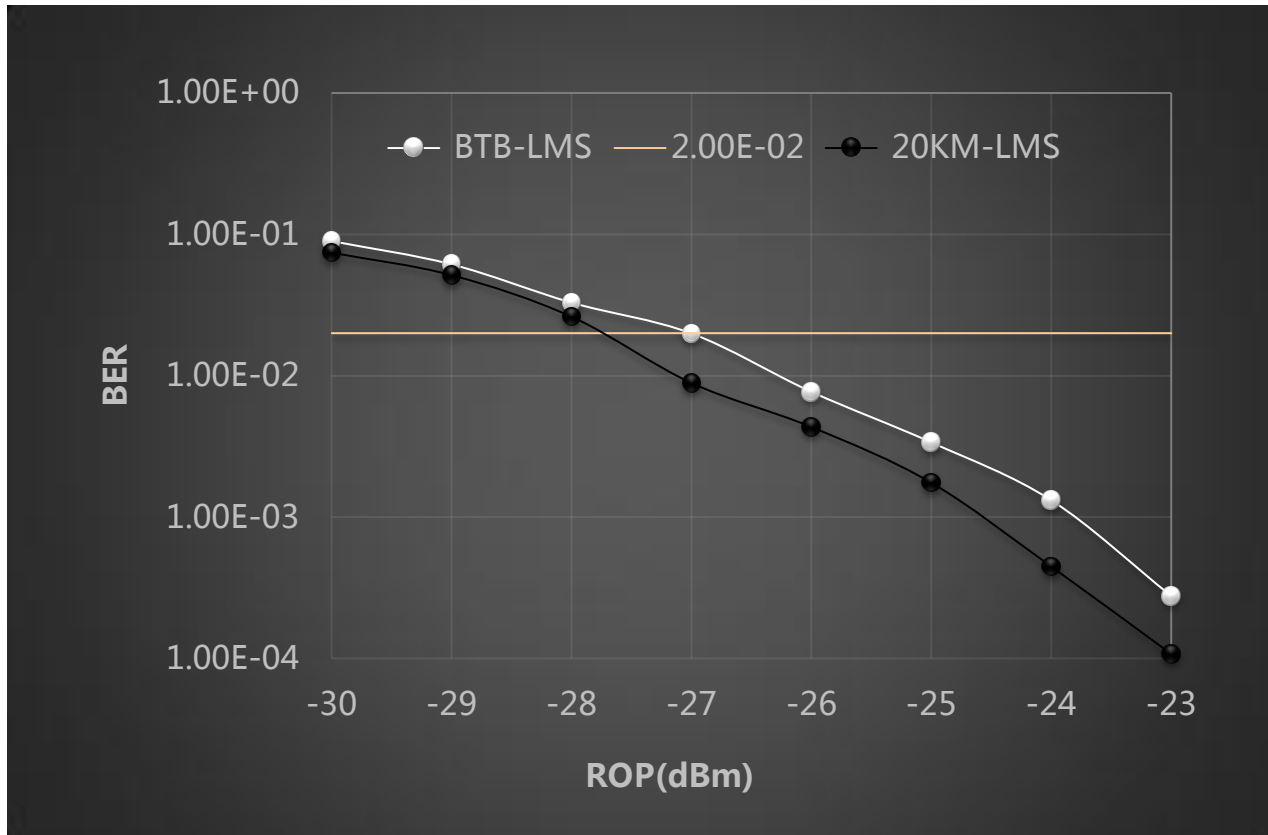
Received and Equalized 50G NRZ Eyediagram

ROP = -24dBm



FFE (using LMS tap update) equalizer can mitigate the bandwidth insufficiency and dispersion introduced ISI(inter symbol interference)

50G NRZ Downstream Experimental Performance



Parameters	Hard LDPC (1E-2 BER)	Soft LDPC (2E-2 BER)	Unit
Receiver Sensitivity @ 20km fiber	-27	-27.7	dBm
Receiver Sensitivity @ OBTB	-26.3	- 27	dBm
DP	-0.7	-0.7	dB

50G NRZ Optical Power Budget Analysis

TX Optical Power (dBm)		RX Sensitivity (dBm)		Engineering Margin (dB)	Optical Power Budget (dB)
50G NRZ Downstream (DS)					
25G EML	4.5	25G APD	-27 (worst case)	2	29.5
25G EML + SOA	8	25G APD	-27 (worst case)	2	33
50G NRZ Upstream(US)					
25G DML	6	25G APD	-26 Assuming 1dB penalty compared to DS	2	30
25G DML	6	SOA + Filter + 25G PIN	-29	2	33

Summary

- 50G NRZ + 25G Optics can provide the 50G PON required optical power budget (up to 33dB)
- Equalizer can mitigate the bandwidth insufficiency and dispersion penalty effectively in 50G.
- Experimental analyze on 50G NRZ upstream performance can be shown in future meetings.

Thank you
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