Dependency of Transmission Parameters for 400GbE DMT 10km Transceiver

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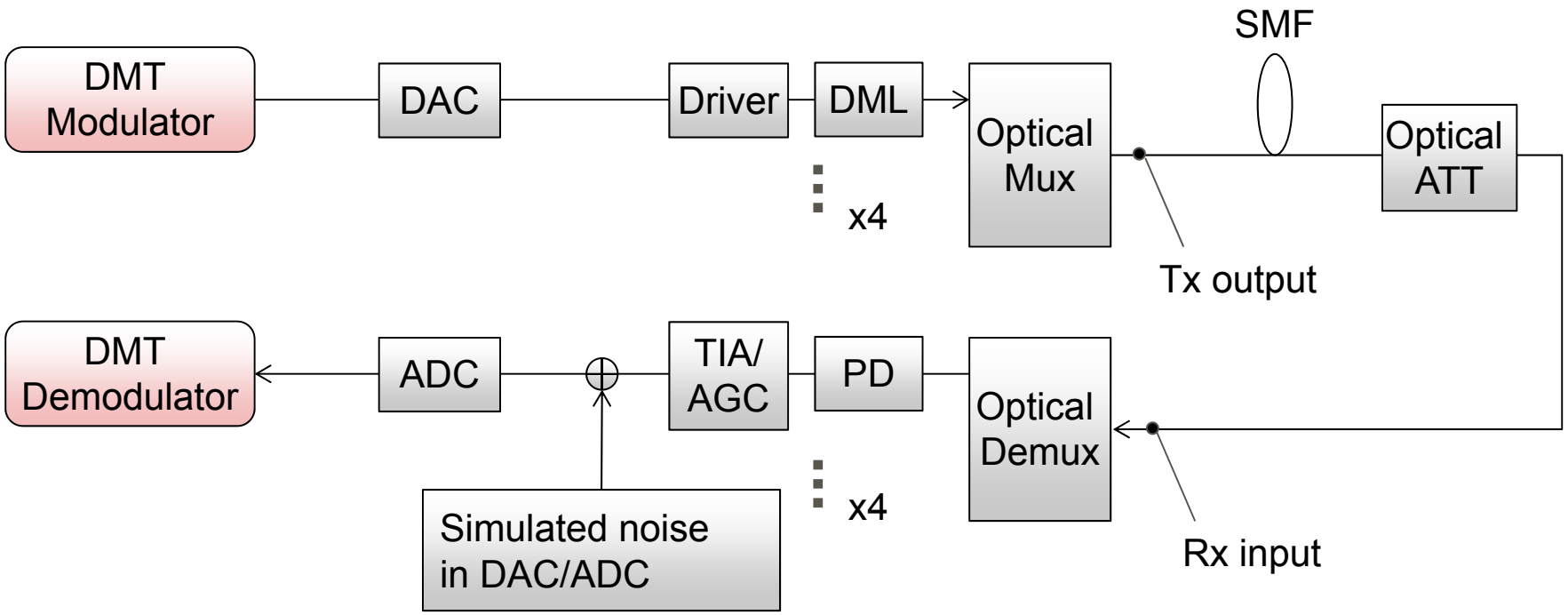
Simulation Platform



DMT Parameter	Value
Number of subcarriers	256
Cyclic prefix	32
DMT probing signal	2 bit
Bit-loading algorithm	Chow*1

Bitrate = 4 x 116Gbps (100GbE+12.5% FEC OH)

*1: ref.: P.S.Chow, et. al., "A practical discrete multitone transceiver loading algorithm for data transmission over spectrally shaped channels," IEEE Trans. Commun., vol.43, no.2, pp.773-775, (1995).

Parameter of Optical 400Gbps DMT

	Parameter	Value	Note
Transmitter	Cascaded Tx bandwidth	12~18 GHz	
	Laser RIN	-150~-138 dB/Hz	
	Output power	< +4 dBm	
Transmission link	Link loss	6.3 dB	SMF 10 km
	Fiber Dispersion	-40~+20 ps/nm	Ref.: *1
Receiver	Responsivity	0.5 A/W	Incl. demux loss
	PD/TIA-noise	15 pA/√Hz	
	Cascaded Rx bandwidth	12~18 GHz	

*1: Channel specification for dispersion (from IEEE802.3ba)

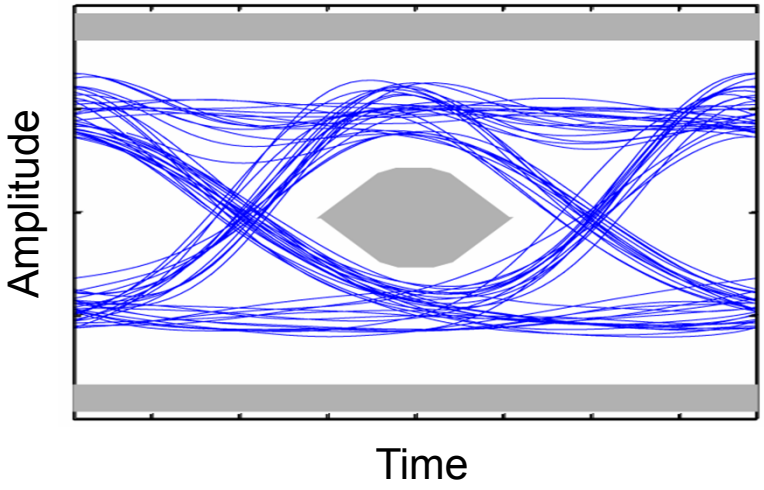
PMD type	Dispersion[a] (ps/nm)		Insertion loss[b]	Optical return loss[c]	Max mean DGD
	Minimum	Maximum			
100GBASE–LR4	$0.2325 \cdot \lambda \cdot [1 - (1324 / \lambda)^4]$	$0.2325 \cdot \lambda \cdot [1 - (1300 / \lambda)^4]$	Minimum	20 dB	0.8 ps
100GBASE–ER4	$0.93 \cdot \lambda \cdot [1 - (1324 / \lambda)^4]$	$0.93 \cdot \lambda \cdot [1 - (1300 / \lambda)^4]$	Minimum	20 dB	0.8 ps

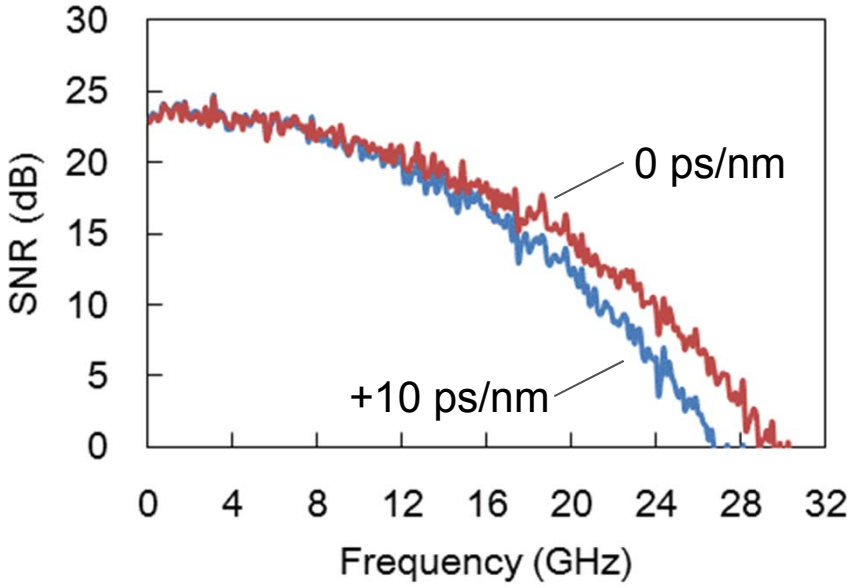
(RIN: Relative intensity noise)

Power Penalty due to Fiber Dispersion

- NRZ format
  - Eye mask
    - Eye closure
- DMT format
  - Frequency characteristics
    - Bandwidth narrowing

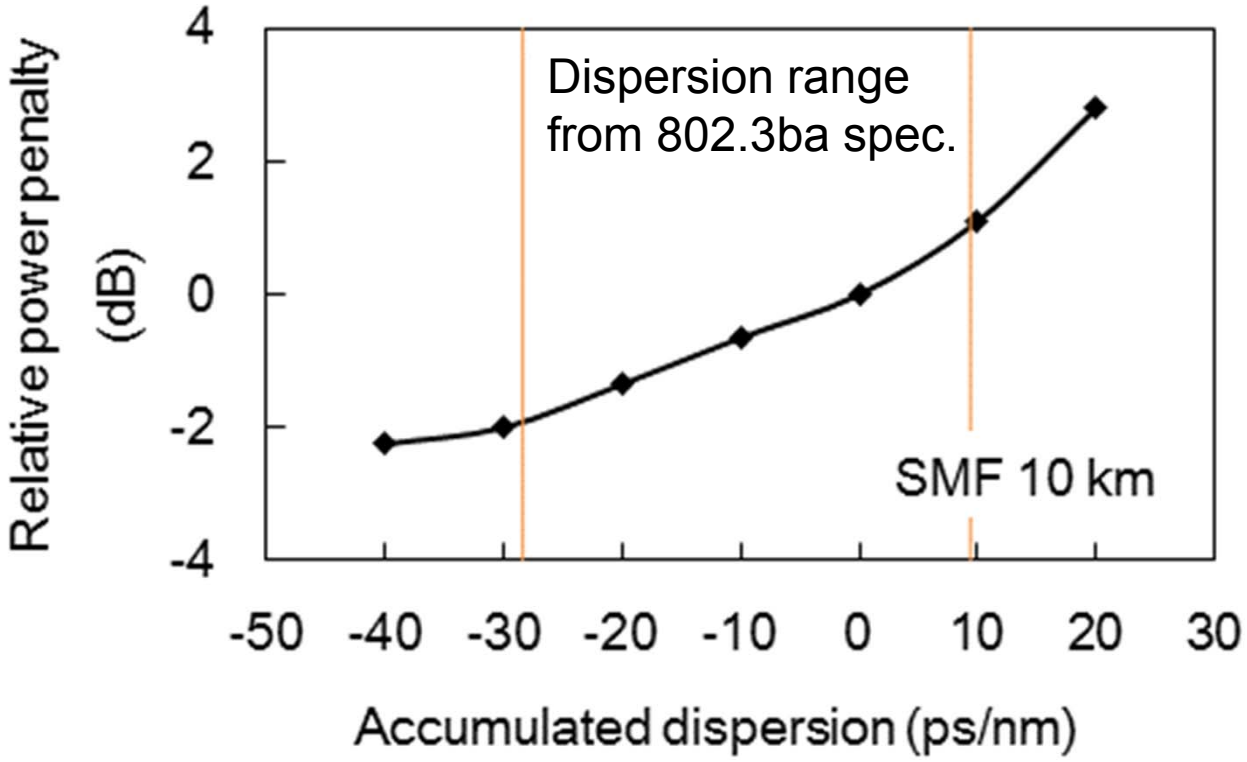
→ Including to adaptive bit loading





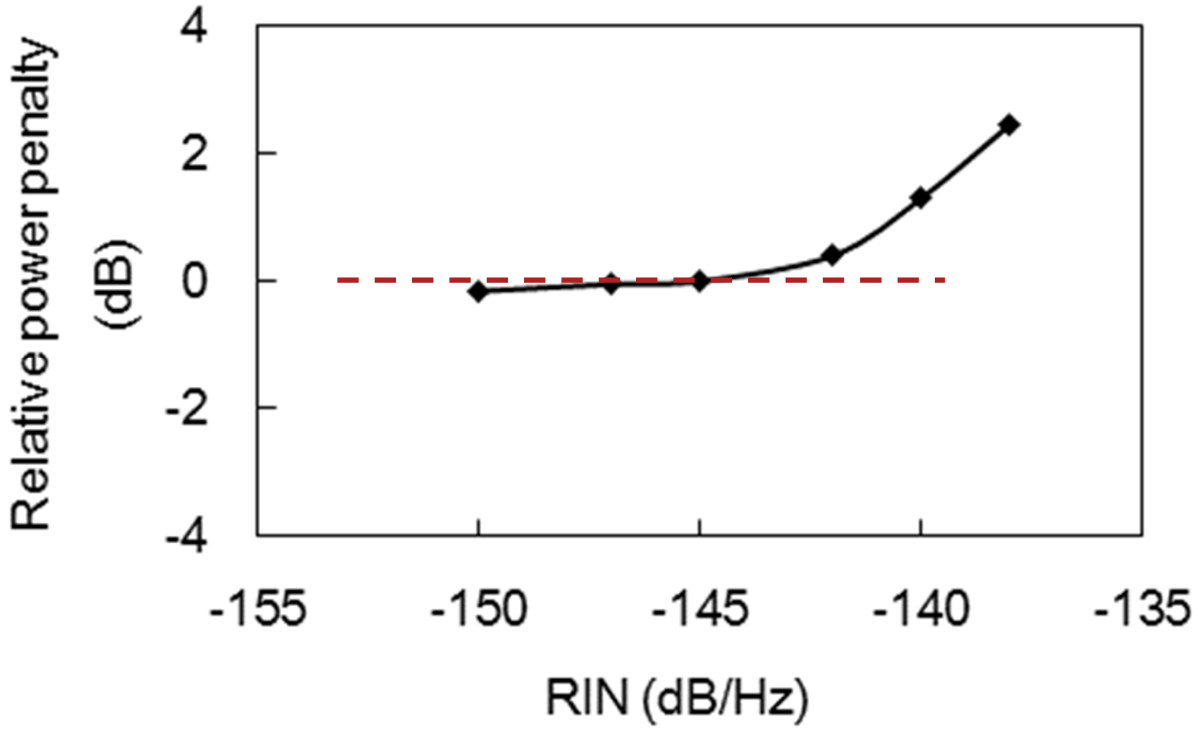
Dispersion Penalty

- Dispersion penalty: about 1 dB
  - Channel specification for dispersion from IEEE802.3ba
  - After 10-km SMF
  - 4ch. LAN-WDM configuration



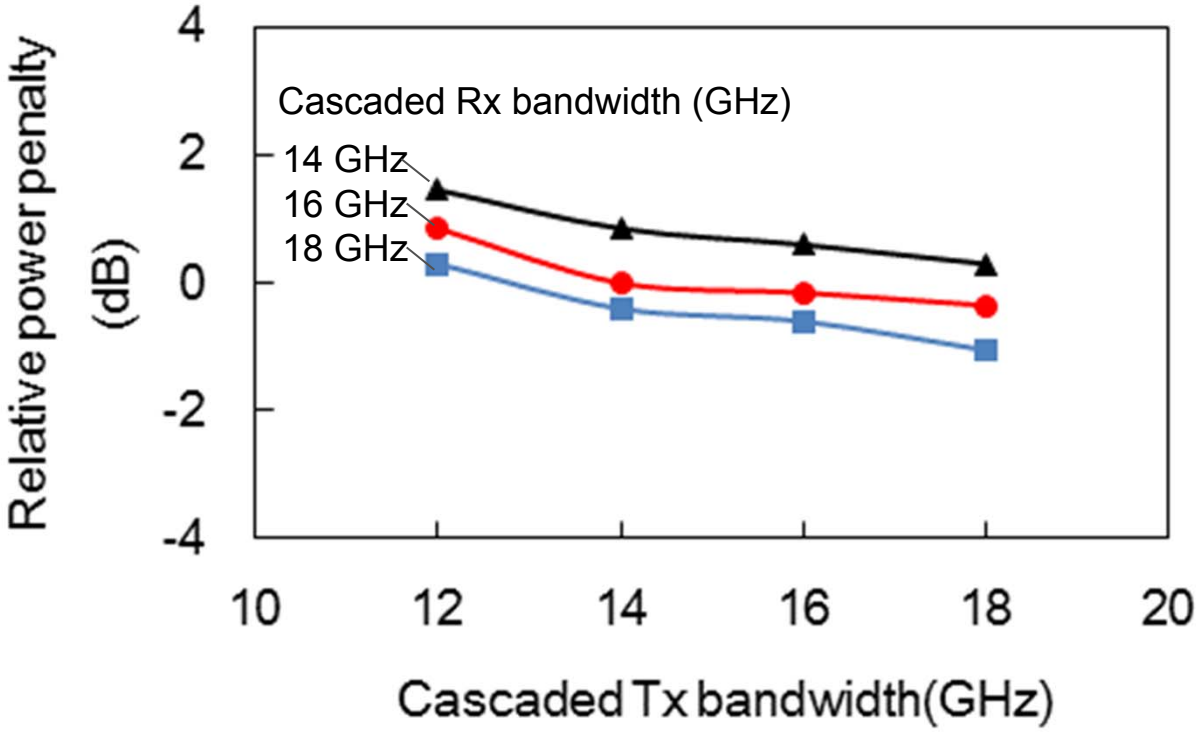
Laser RIN Penalty

- Laser RIN penalty: about 1 dB at RIN=-140 dB/Hz
  - By decrease of RIN, the performance is rapidly improved.
    - Less than -145 ~ -142 dB/Hz will be preferred.



Bandwidth Dependency

- Bandwidth enhancement decreased the power penalty.
  - The impact is smaller than penalty due to dispersion and RIN.



Summary

- Simulation results for optical 400GbE DMT after 10-km SMF
  - Dispersion penalty was about 1 dB for the worst channel in Channel specification for dispersion from IEEE802.3ba.
  - Laser RIN penalty was about 1 dB at RIN=-140 dB/Hz.
    - Reduction of RIN to -145 ~ -142 dB/Hz is preferred.
  - Bandwidth dependency
    - The impact is smaller than penalty due to dispersion and RIN.

Thank you