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TDP Estimation for 100GBASE-LR4

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Background

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- 100GBASE-LR4 baseline (cole_01_0508) was decided in the last meeting at Munich.
- Now is the stage for the detail specifications discussion.
  - 10GBASE-L specification has been specified introducing the value of ‘Launch power (min) in OMA minus TDP(Transmitter and Dispersion Penalty)’ in order to relax requirements for Tx.
  - 100GBASE-LR4 also should be specified using the same methodology as 10GBASE-L.
- TDP is estimated using DML measurement results.
  - Generally, TDP of EML is less than that of DML.
  - TDP of DML estimation is important in case considering the worst case of link power budget.

Link Power Budget Model

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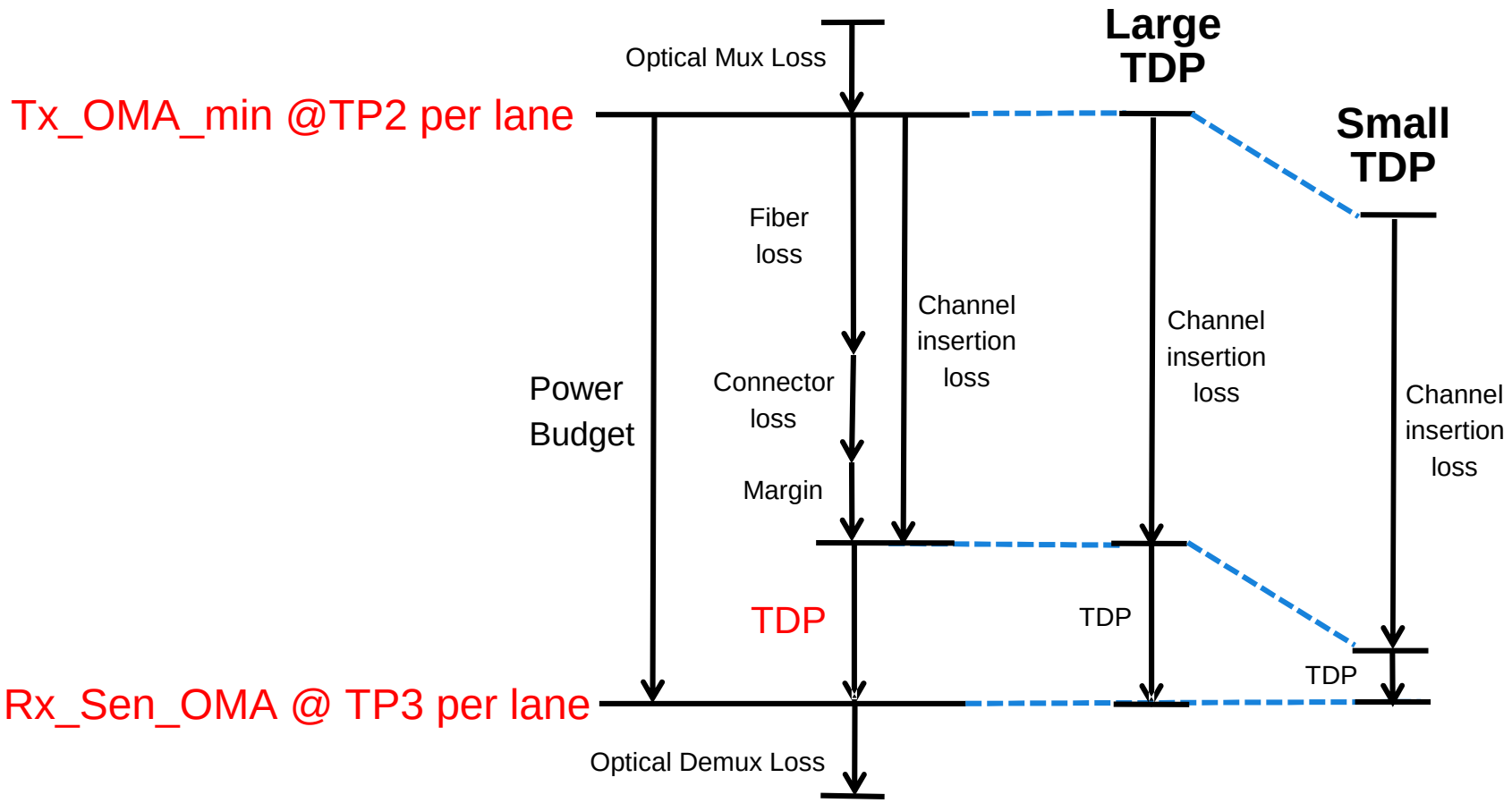

Tx_OMA_min={Launch power(min) in OMA minus TDP} + TDP

TDP Measurement Setup

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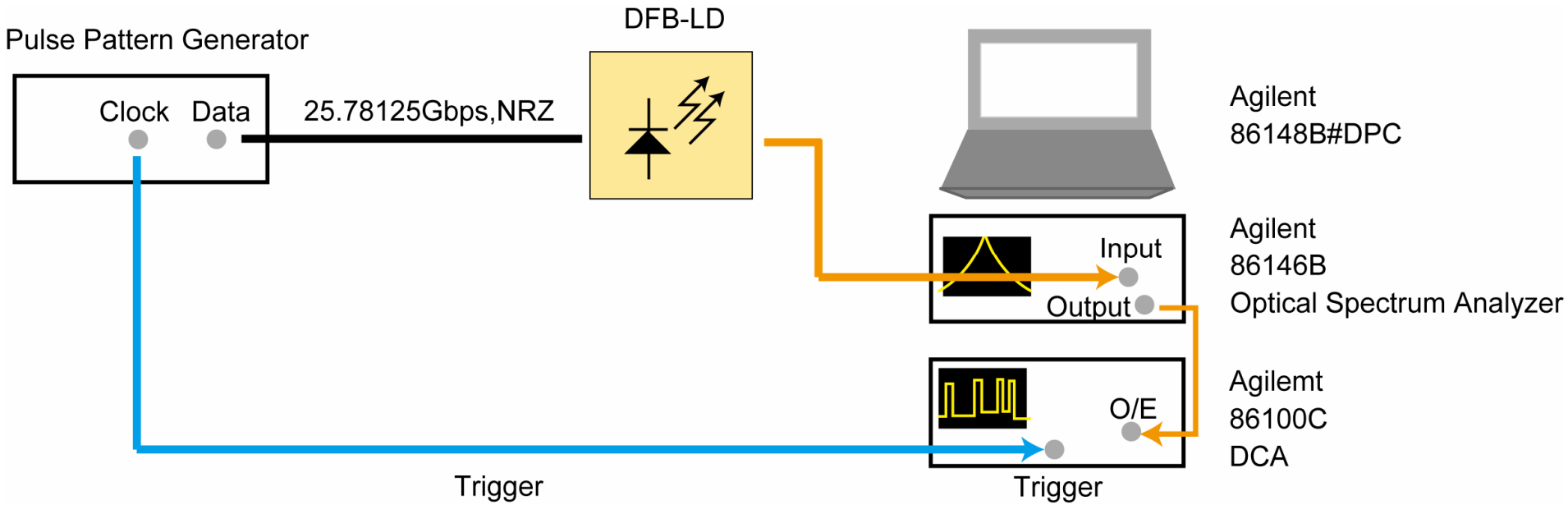
Using TRC (Time Resolved Chirp) method, the LD chirp and waveform is measured directly, and TDP is calculated.



Reference: IEC61280-2-10

http://cp.literature.agilent.com/litweb/pdf/5988-5614EN.pdf

http://cp.literature.agilent.com/litweb/pdf/5988-7825EN.pdf

Eye Mask

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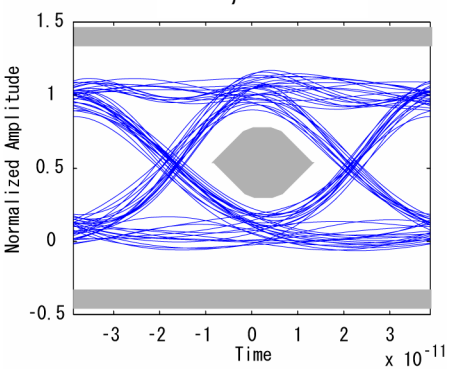
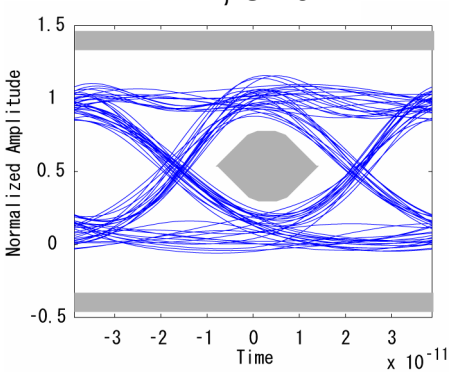
Sample A (1315nm)

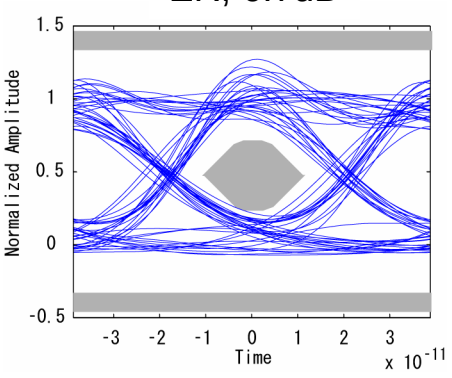
ER; 5.1dB



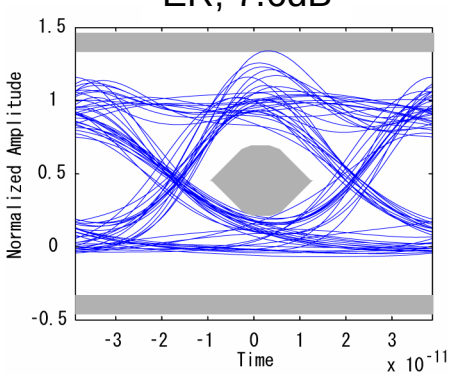
ER; 5.4dB



ER; 6.7dB

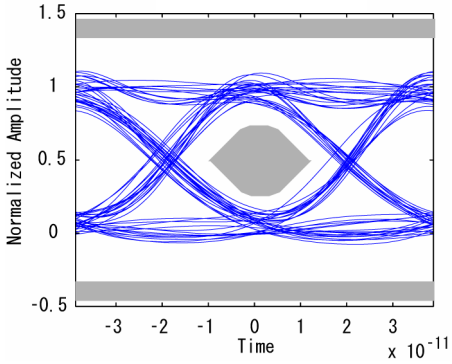


ER; 7.6dB

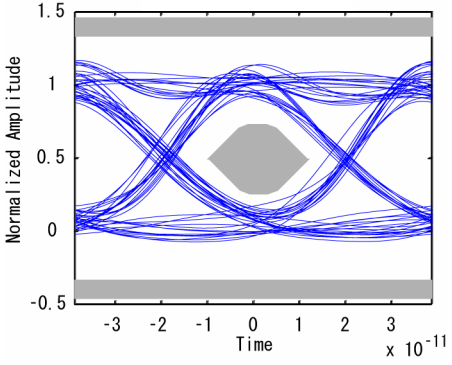


Sample B (1294nm)

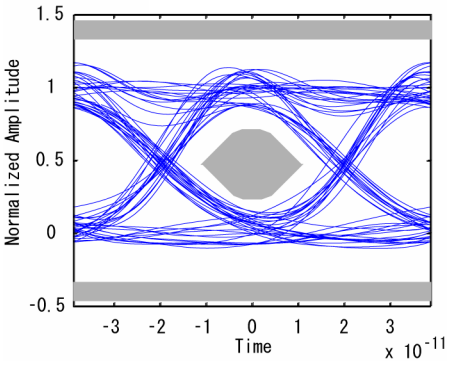
ER; 5.6dB



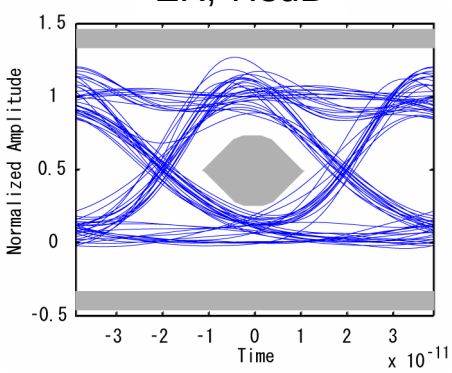
ER; 6.1dB



ER; 6.5dB

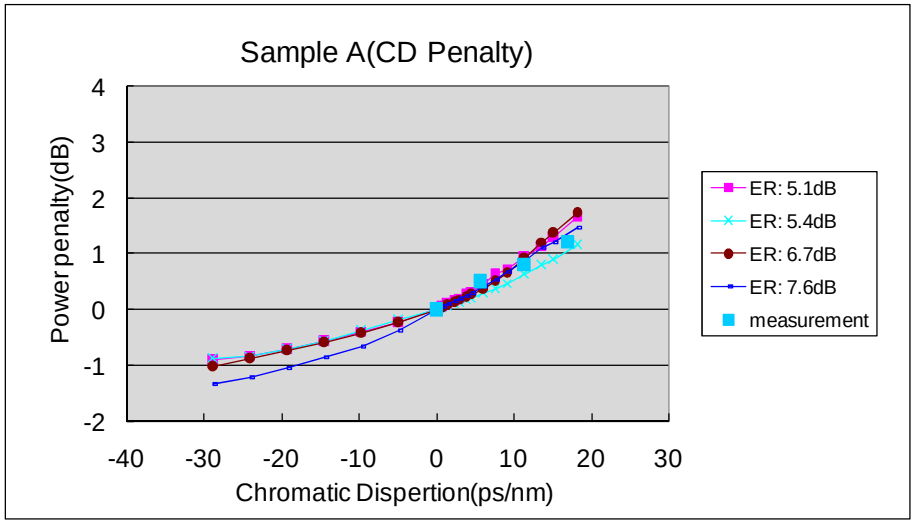


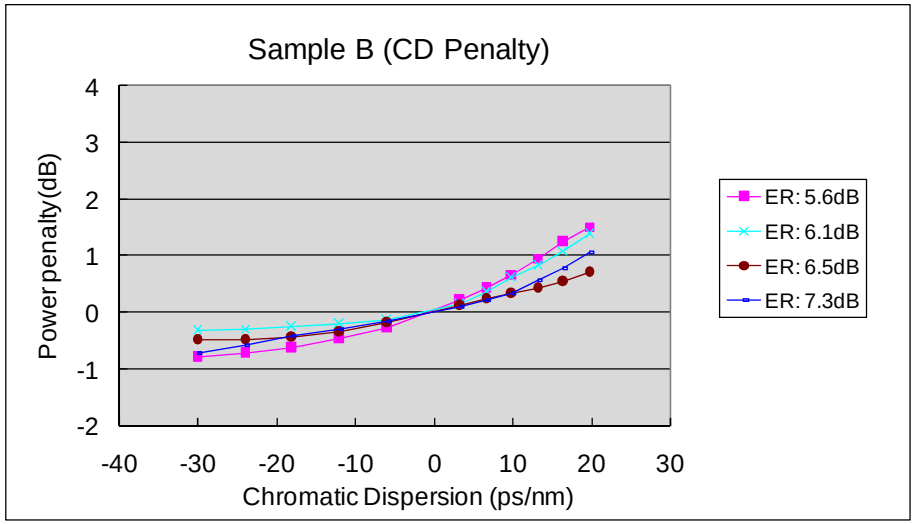
ER; 7.3dB



Extinction Ratio < 6.5dB

Chromatic Dispersion Penalty





Worst Case; 9.5ps/nm@1310.28nm(*1)

CD Penalty < 1dB

(*1) cole_01_0608

Transmitter & Dispersion Penalty

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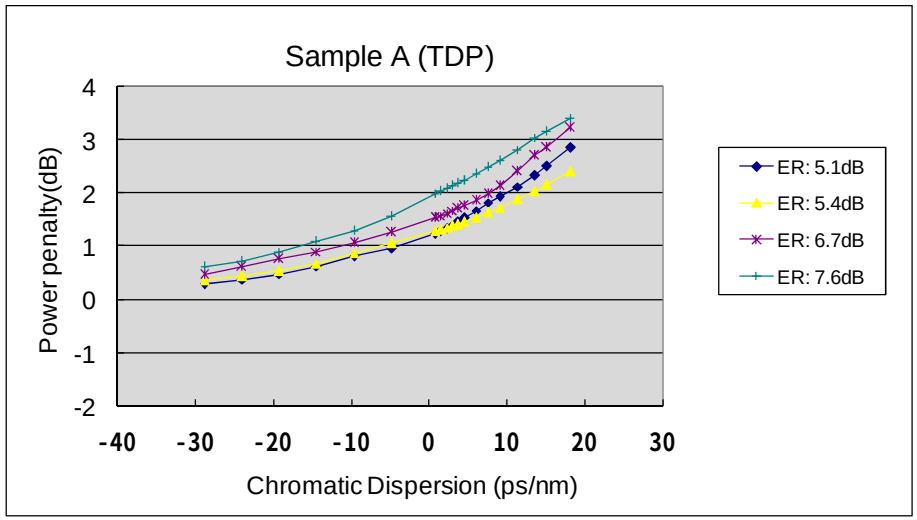

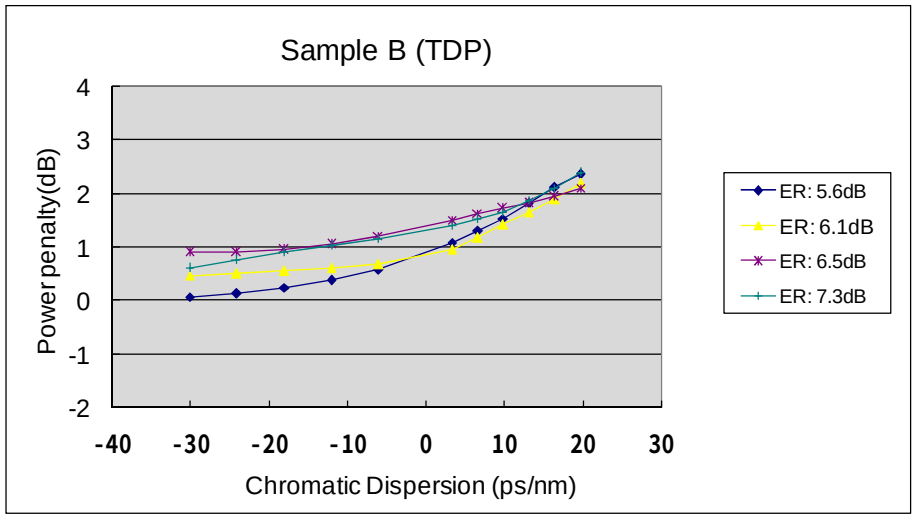

Worst Case; 9.5ps/nm@1310.28nm

TDP < 2.0dB (ER<6.5dB)

➡ TDP 2.0dB for DML at least

Basic Characteristics of 100GBASE-LR4

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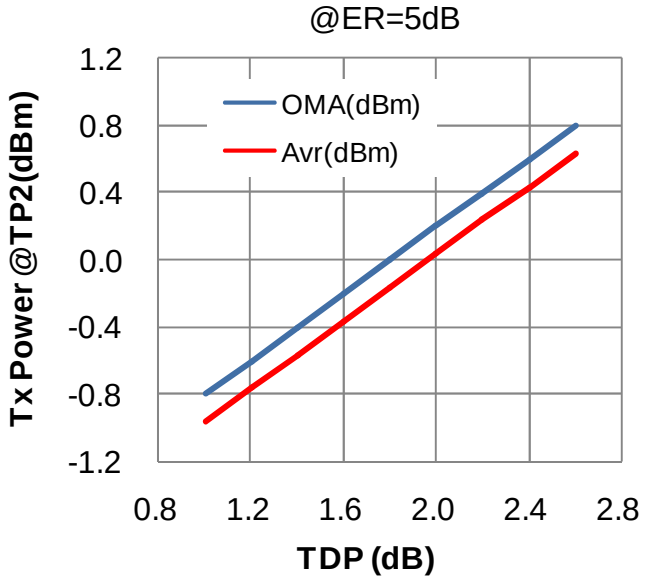
Transmitter and receiver characteristics

Description	100GBASE-LR4	Units
Signaling speed per lane	25.78125±100ppm	GBd
Lane wavelengths (range)	1294.44-1296.68 *1 1298.93-1301.18 1303.45-1305.72 1308.00-1310.28	nm
Launch power (min) in OMA minus TDP, per lane	-1.8	dBm
Transmitter & dispersion penalty (max)	2.0 - 2.5	dB
Extinction Ratio (min)	4.0 *1	dB
Receiver sensitivity (max) in OMA, per lane	-8.1 *1	dBm

(*1) cole_01_0608



Link power budget

Parameter	100GBASE-LR4	Units
Operating distance	10	km
Power budget	8.3 - 8.8	dB
Channel insertion loss	6.3 *1	dB
Allocation for penalties	2.0 - 2.5	dB
Additional insertion loss allowed	0.0 *1	dB

(*1) cole_01_0608

Summary

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- 100GBASE-LR4 should be specified using the same methodology as 10GBASE-L, such as introducing the parameter of ‘Launch power (min) in OMA minus TDP’ in order to relax Tx requirements.

- The value of 2.0-2.5dB TDP is necessary at least for 100GBASE-LR4 from the result of TRC measurements using 25Gb/s DML.

- Need more discussion about TDP.

Thank you !