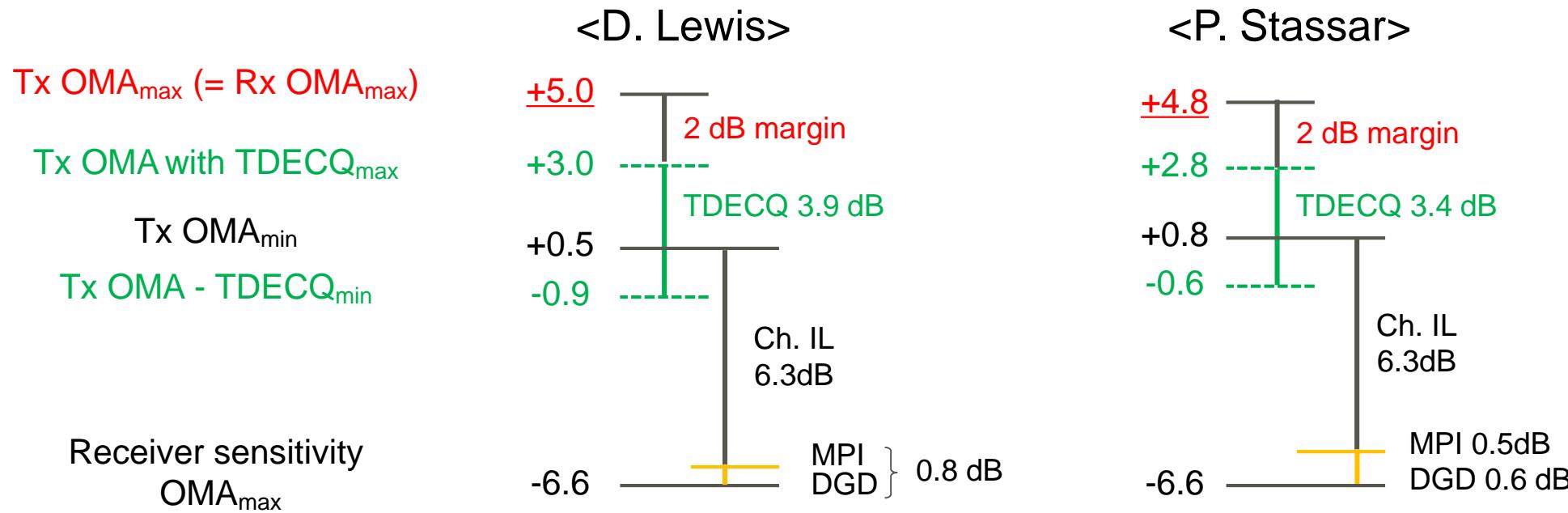# Feasibility Data for
400G LR4 Baseline Consideration

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Preliminary Remarks

■ FOC is a supportive member of CWDM-wavelength allocation for 400G LR4 baseline, outlined by D. Lewis. "lewis_3cu_01_0719"

■ This contribution will propose the refinement of the above CWDM based spec based on our experimental data.

■ In order to proceed the further discussions, FOC would like to request industry to review/confirm our proposal with actual data. Additional data from other members are expected.
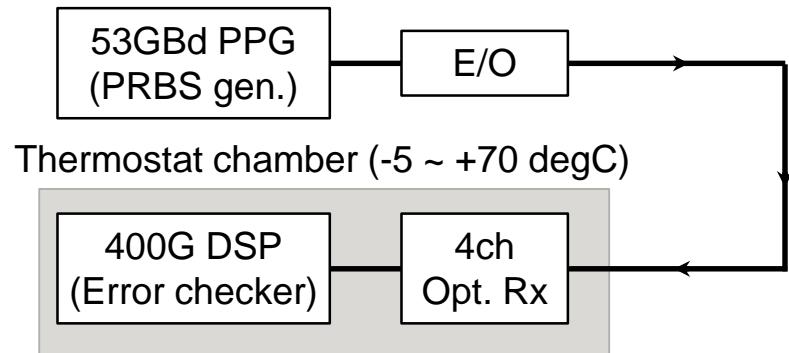
Introduction

- 400GBASE-LR4 baseline proposal are illustrated based on the contribution by D. Lewis and P. Stassar shown as below. (Reference: "lewis_3cu_01_0719.pdf", "stassar_3cu_01a_0519.pdf")

- To keep 2 dB margin for Tx OMA, Tx OMA_{max} is 5.0 & 4.8 dBm for each proposal. It requires receiver sensitivity of Rx OMA_{max} at the same value.

- In this presentation, feasibility data for 400G LR4 will be shown regarding receiver sensitivity which is marginal for the spec for Rx OMA_{max}.

Tx OMA_{max} (= Rx OMA_{max})

Tx OMA with $TDECQ_{max}$

Tx OMA_{min}

Tx OMA - $TDECQ_{min}$

Receiver sensitivity OMA_{max}

\<D. Lewis\>

+5.0
2 dB margin
+3.0
TDECQ 3.9 dB
+0.5
-0.9
Ch. IL 6.3dB
MPI DGD } 0.8 dB
-6.6

\<P. Stassar\>

+4.8
2 dB margin
+2.8
TDECQ 3.4 dB
+0.8
-0.6
Ch. IL 6.3dB
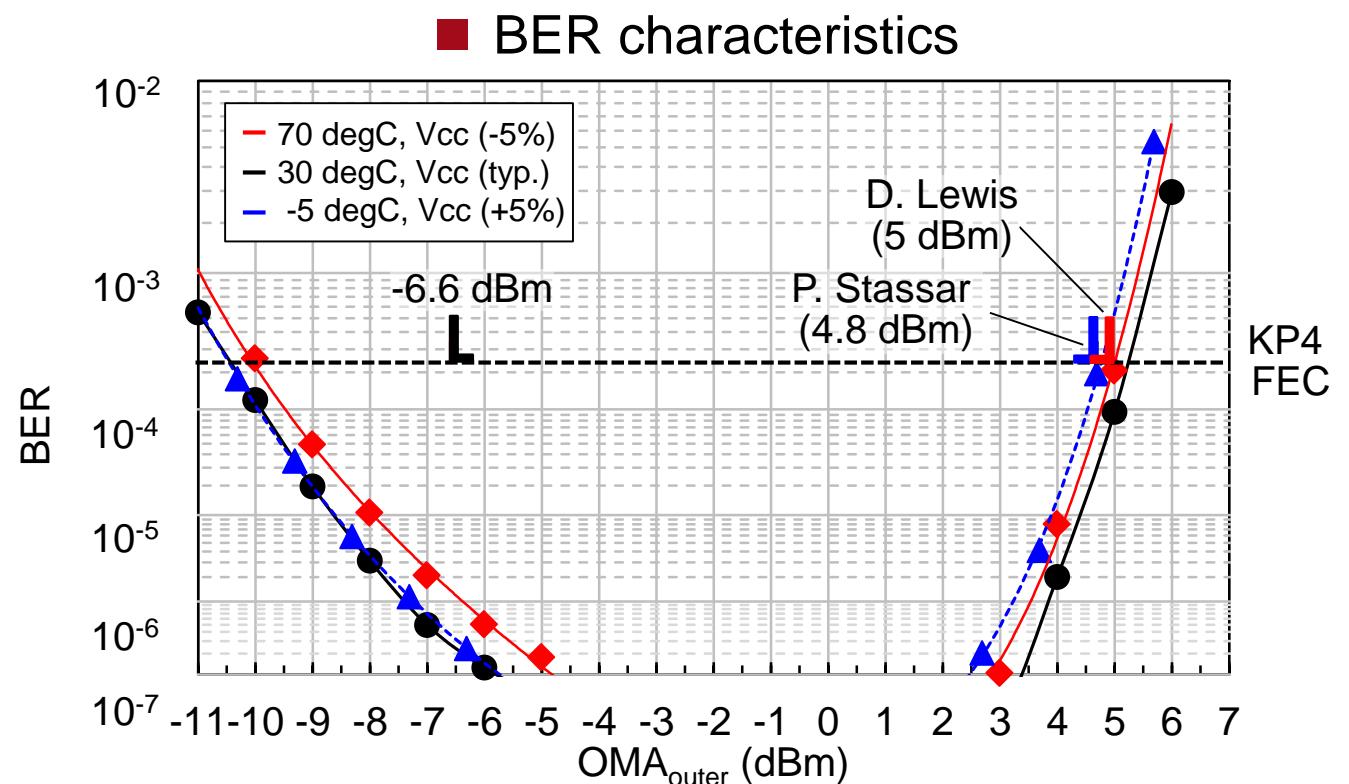MPI 0.5dB DGD 0.6 dB
-6.6

Receiver Sensitivity Measurement

- Receiver sensitivity was measured for the waveform with SECQ of 1.2 dB at the temperature range from -5 degC to 70 degC.
- Black and "red & blue" cursor show receiver sensitivity for max at -6.6 dBm (@ SECQ ≤ 1.4 dB) and Rx OMA_{max} of "D. Lewis & P. Stassar", respectively.
- Rx OMA_{max} is very marginal, on the other hand the sensitivity has ≥ 3dB margin.

- Experimental setup

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53GBd PPG          E/O
(PRBS gen.)
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Thermostat chamber (-5 ~ +70 degC)

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400G DSP    ←    4ch
(Error checker)   Opt. Rx
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Conditions
- SECQ: 1.2 dB
- Measurement without transmission fiber
- Temperature at -5, 30, 70 degC
- Sensitivity results include demux loss (r = 0.6 A/W)

- BER characteristics

Legend:
- 70 degC, Vcc (-5%)
- 30 degC, Vcc (typ.)
- -5 degC, Vcc (+5%)

-6.6 dBm

D. Lewis (5 dBm)
P. Stassar (4.8 dBm)
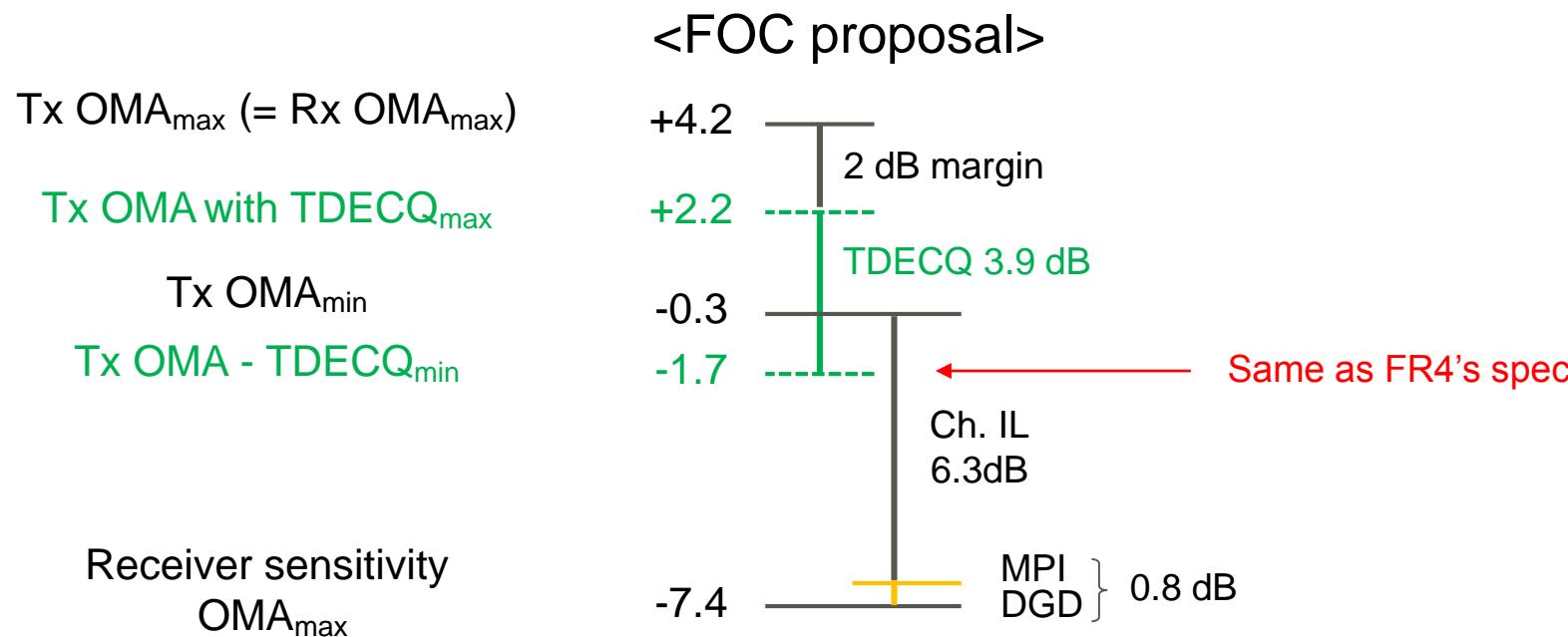KP4 FEC

BER vs OMA_{outer} (dBm)

Possible Range for 400G LR4 Baseline

- From the perspective of power saving for network equipment, it is preferable to minimize the Tx power increase as low as possible.
- According to our estimation, power consumption (P_C) can be saved ~0.5W, if we shift the baseline range by -0.8 dB.
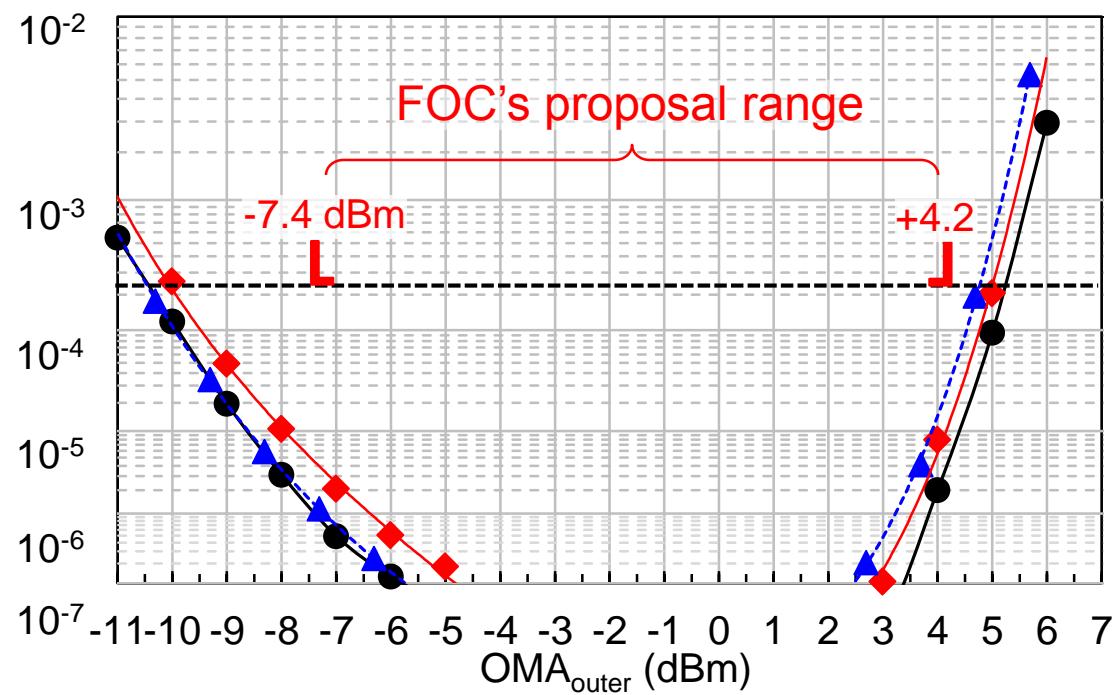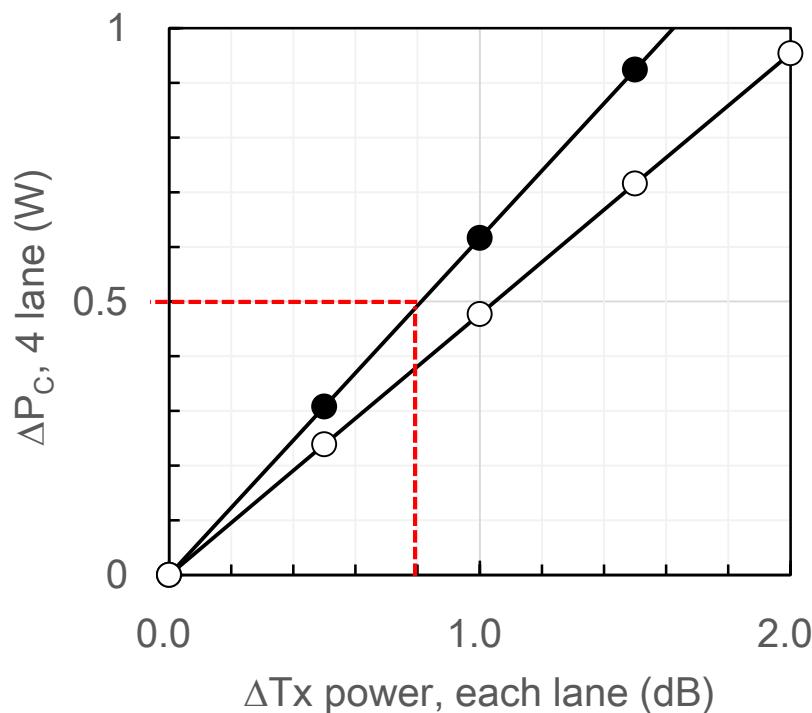
FOC's Proposal & Summary

- FOC would like to propose -0.8 dB modification with "D. Lewis" proposal from the perspective of our feasibility and power saving for 0.5W.

- Our proposal of "Tx OMA – TDECQ$_{min}$" is same as FR4's spec which would contribute the similarity to keep the Tx cost lower.

- To confirm the spec modification, more data for another condition and other vendor's data are expected.

<FOC proposal>

Tx OMA$_{max}$ (= Rx OMA$_{max}$)   +4.2

2 dB margin

Tx OMA with TDECQ$_{max}$ +2.2

TDECQ 3.9 dB

Tx OMA$_{min}$ -0.3

Tx OMA - TDECQ$_{min}$ -1.7   ← Same as FR4's spec

Ch. IL 6.3dB

Receiver sensitivity OMA$_{max}$

MPI DGD } 0.8 dB

-7.4

Thank you