Baseline Proposal for 200 Gb/s Ethernet 40 km SMF 200GBASE-ER4 in 802.3cn

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Introduction

- This presentation contains a baseline proposal to meet the cn objective “Provide a physical layer specification which supports 200 Gb/s operation over at least 40 km of SMF”
- The specification is compatible with logic layer and KP4 FEC from 802.3bs.
- This would imply a 200GBASE-ER specification to be added to ex-bs clause 122.

Background Discussion

- Jan.2018: Investigation of the technical feasibility for 200G/400G beyond 10km optical PHYs using high-power TOSA and APD-ROSA showed a -18dBm B-to-B receiver sensitivity at 2.4E-4 operating BER with 0.5dB dispersion penalty at worst case, according to this presentation, the OMA margin is 3.2dB for 200G 40km transmission. http://www.ieee802.org/3/B10K/public/18_01/yamamoto_b10k_01a_0118.pdf

- Mar. 2018: Technical Feasibility to Support 200GbE 40km Objective, presented receiver sensitivities of -17.1dBm at SECQ = 1.7dB and -16.6dBm at SECQ = 2.0dB; http://www.ieee802.org/3/B10K/public/18_03/yu_b10k_01c_0318.pdf

Background Discussion

- Sep. 2018: Single and Quad channel APD receiver performance at 25Gbaud, provided a sensitivity of -19dBm at 26.6Gbaud PAM4, with the Transmitter SECQ ranging from 1.4 to 1.7dB and extinction ratio from 6.4 to 6.9dB.

  http://www.ieee802.org/3/B10K/public/18_09/huang_b10k_01a_0918.pdf

- Sep. 2018: 200G EML Fiber Propagation Result, showed a measured B-to-B sensitivity around -17dBm with a suggestion that > 2dBm for Transmitter “minimum launch power (OMAouter) minus TDECQ” is possible.

  http://www.ieee802.org/3/B10K/public/18_09/jackson_b10k_01_0918.pdf

Transmitter Characteristics 200GBASE-ER4

Description	Proposal	Unit
Signaling rate	26.5625	GBd
Modulation format	PAM4	-
Wavelengths (range)	See slide 6	nm
Side-mode suppression ration (SMSR), (min)	30	dB
Total Average Launch Power (max)	12.63	dBm
Average launch power, each lane (max)	6.63	dBm
Average launch power, each lane (min)	0.4	dBm
Difference in launch power between any two lanes (OMAouter) (max)	4	dB
OMA_{outer}, each lane(max)	7.4	dBm
OMA_{outer}, each lane (min)	3.4	dBm
Launch power in OMA_{outer} – TDECQ, each lane (min)	2	dBm
TDECQ (max)	3.2	dB
TDECQ – $10\log_{10}(C_{eq})$ (max)	3.2	dB
Extinction ratio (ER), each lane (min)	6	dB
Transmitter transition time (max)	34	ps
RIN OMA (max)	TBD	dB
Optical return loss tolerance (max)	TBD	dB
Transmitter reflectance (max)	–26	dB

WDM Lane Assignments

WDM Lane Assignments		
Lane	**Central wavelength (nm)**	**Wavelength Range (nm)**
L0	**1295.56**	**1294.53-1296.59**
L1	**1300.05**	**1299.02-1301.09**
L2	**1304.58**	**1303.54-1305.63**
L3	**1309.14**	**1308.09-1310.19**

Receiver Characteristics 200GBASE-ER4

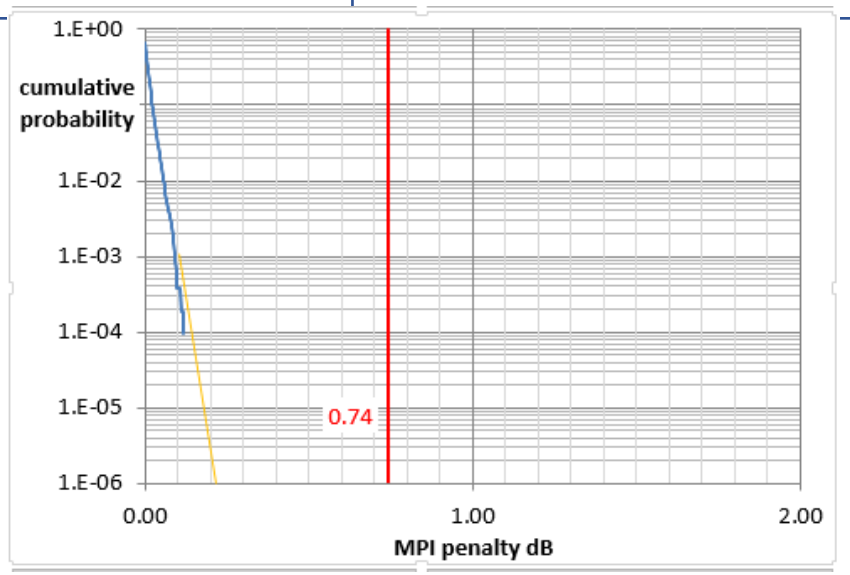
Description	Proposal	Unit
Signaling rate	26.5625	GBd
Wavelengths (range)	See slide 6	nm
Damage threshold	-2.37	dBm
Average receive power, each lane (max)	-3.37	dBm
Average receive power, each lane (min)	–17.6	dBm
Receive power (OMA_{outer}), each lane (max)	-2.6	dBm
Difference in receive power between any two lanes (OMAouter) (max)	4.6	dB
Receiver reflectance (max)	–26	dB
Receiver sensitivity (OMA_{outer}), each lane (max)	max(–15.1, SECQ – 16.5)	dBm
Stressed receiver sensitivity (OMA_{outer}), each lane (max)	–13.3	dBm
Conditions of stressed receiver sensitivity test		
Stressed eye closure for PAM4 (SECQ)	3.2	dB
SECQ – $10\log_{10}(C_{eq})$ (max)	3.2	dB
OMAouter of each aggressor lane	-8.7	dBm

Illustrative Link Power Budget 200GBASE-ER4

Description	Proposal	Unit
Power budget (for maximum TDECQ)	21.7	dB
Operating distance	40	km
Channel insertion loss (max)	18	dB
Channel insertion loss (min)	10	dB
Maximum discrete reflectance	TBD	dB
Allocation for penalties (for maximum TDECQ)	3.7	dB
Additional insertion loss allowed	0	dB

Suggested Penalty

- TDECQ 3.2dB
- MPI 0.3dB (by simulation @ 40km transmission)
- DGD 0.2dB (by simulation @ worst case)



BER:2.4E-4

Loss:18dB

ER:6dB

Connector: 6*-35dB

+4*-45dB

* Monto Carlo MPI spreadsheet model, Jonathan King, 07 Jan 2016

Recommendations

- Adopt the proposed baseline specification for 200GBASE-ER4
- The 200GBASE-ER4 will use the same FEC, PMA with 200GBASE-LR4.
- All baseline parameters and specifications are open to further analysis and ae subject to change by the Task Force.


thank you
danke
謝謝
ngiyabonga
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рахмат
Баярлалаа
спасибо
mersi
barka
welalin
tack
dank je
vinaka
blagodaram
misaotra
malondo
paldies
gracias
tapadh leat
хвала
kiitos
dankie
asante
bedankt
hvala
maururu
enkosi
dziękuję
mochchakkeram
djere dieuf
go raibh maith agat
chnorakaloutioun
gracies
sulpay
taiku
obrigado
sukriya
kop khun krap
ありがとう
arigatō
takk
dakujem
trugarez
sagolun
najis tuke
terima kasih
tanemirt
grazie
rahmet
dhanyavadagalu
shukriya
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