800GBASE-LR1 PMD specification proposals
(Supporting contribution for comments #550 thru #558)

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Agenda

- Address 800GBASE-LR1 PMD (Clause 185) TBDs
  - PMD Performance (Comment #550)
  - Laser Specifications (Comment #555, #556)
  - Receiver Specifications (Comment #551, #558)
  - Transmit Specifications (Comment #552, #554, #553, #557)

Clause 185 PMD Reliability Requirements

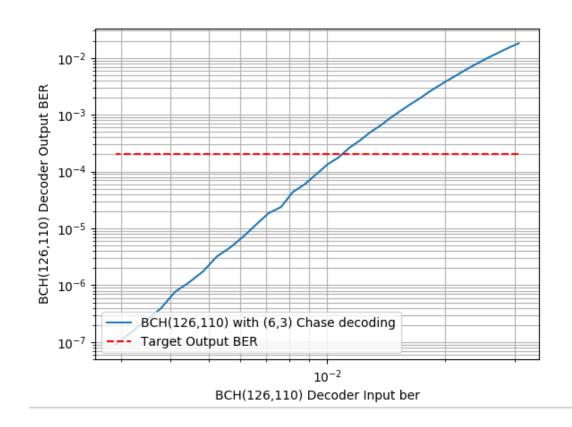- Proposed resolution for Comment #550:

Replace

"A PMD is expected to meet <metric TBD>."

with following text:

"A PMD is expected to meet the FEC codeword error ratio requirement of less than 1.45×10^{-11} in 174A.5 with a BER of 1×10^{-2} at the output of the DP-16QAM demapper in the inner FEC sublayer."

From Slide 6 of kota_3dj_01a_2311

Laser Frequency Specifications

- Comment #556: In Table 185-5 (800GBASE-LR1 receive characteristics), "Frequency offset between received carrier and local oscillator (max)" is TBD

- Comment #555: In Table 185-4 (800GBASE-LR1 transmit characteristics), "Carrier frequency (range)" and "Laser relative frequency tracking accuracy" are TBD

- Laser frequency accuracy considerations were discussed in kota_3dj_01a_2311, kota_3dj_01a_2403 and maniloff_3dj_01_2405

- Absolute frequency accuracy of ±10GHz and ±12.5GHz were discussed in the prior presentations.
  - The max frequency offset between received carrier and local oscillator would be ±20GHz (or ±25GHz) when the laser is shared between TX and RX.

- A relative frequency accuracy of ±900MHz after frequency acquisition using the procedure described in prior contributions seems reasonable.

Proposed Resolution for comments #555 and #556

In Table 185-4

Description	Value	Unit
Carrier frequency (range)	228.675±10 GHz	THz
Laser relative frequency tracking accuracy	0.9	GHz

In Table 185-5

Description	Value	Unit
Frequency offset between received carrier and local oscillator (max)	20	GHz

Receive Power Specification

- In Table 185-5: "Average receive power (min)" is TBD

- Prior contributions ([kota_3dj_01a_2311](), [kota_3dj_03a_2407]()) discussed the benefits of an IMDD style specification where the receive sensitivity is a function of the TQM

- Proposed resolution of comment #551 (from [kota_3dj_03a_2407]()):

Description	Value	Unit
Average receive power (min) for TQM<1.4dB	-18	dBm
for 1.4dB<TQM<3.4dB	-19.4 + TQM	dBm

Transmit Power Specification (Option 1)

- Comments #552, #553, #557, #554 related to transmit power and imbalance specifications

- Prior contributions (kota_3dj_01a_2311 , kota_3dj_03a_2407) discussed the benefits of an IMDD style specification where the transmit power is a function of the TQM

- Option 1 to resolve comments #552 and #553. Note that this approach does not provide any way to relax imbalance specifications

Description	Value	Unit
Average channel output power (min) for TQM<1.4dB	-11.7	dBm
for 1.4dB<TQM<3.4dB	-13.1 + TQM	dBm
Average channel output power (max)	-7	dBm
I-Q amplitude imbalance (mean)	1	dB
Power difference between X and Y polarizations (max)	1.5	dB

Transmit Power Specification (Option 2)

- Comments #552, #553, #557, #554 related to transmit power and imbalance specifications
- Prior contributions (kota_3dj_01a_2311 , kota_3dj_03a_2407) discussed the benefits of an IMDD style specification where the transmit power is a function of the TQM
- Option 2 to resolve above comments: It was proposed in prior contributions (see e.g kota_3dj_03a_2407) to specify the transmit power on a per-lane basis (i.e. XI/XQ/YI/YQ) and combine the imbalance specifications into a single lane-to-lane amplitude mismatch specification

Description	Value	Unit
Average ~~channel~~ output power, each lane (min)		
for TQM<1.4dB	-17.7	dBm
for 1.4dB<TQM<3.4dB	-19.1 + TQM	dBm
Average ~~channel~~ output power, each lane (max)	-13	dBm
Difference in average launch power between lanes (max)	3	dB
~~I-Q amplitude imbalance (mean)~~	~~1~~	~~dB~~
~~Power difference between X and Y polarizations (max)~~	~~1.5~~	~~dB~~

State of Polarization (SOP)

- SOP requirements were discussed in [kota_3dj_01a_2311](#)
  - A specification of 50krad/s has traditionally been used in coherent specifications targeted at DWDM (see e.g. OIF 400ZR) and carried over from specification to the next. This number is driven by typical DSP capability instead of an application requirement.
  - This specification adds to the power dissipation of typical designs of coherent DSPs.
  - Most measurements of SOP show changes withi are either much slower than this traditional number or much larger (see the references discussed in [kota_3dj_01a_2311](#))
  - It is proposed to reduce this spec to 5krad/s to allow more power efficient designs for point-to-point applications such as 800GBASE-LR1

- Proposed resolution for comment #558:

In Table 185-5

Description	Value	Unit
State of polarization (max)	5	Krad/s

Thank you!