Optical Baseline for 800GBASE-LR1

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Overview

This contribution focuses on an optical baseline for the following 800Gb/s 802.3dj objective:

- over 1 wavelength over a single SMF in each direction with lengths up to at least 10 km

A logical specification based on coherent modulation and BCH coding has been adopted for the 10km objective

- https://www.ieee802.org/3/dj/public/23_07/kota_3dj_01b_2307.pdf

Previously, optical solutions based on both C band and O band wavelengths were presented:

- C Band: https://www.ieee802.org/3/dj/public/23_11/maniloff_3dj_01_2311.pdf
- O Band: https://www.ieee802.org/3/dj/public/23_11/kota_3dj_01a_2311.pdf

This contribution presents an optical baseline based on O band transmission for this objective

November Straw Poll

A straw poll at the November 802.3dj meeting showed support leaning towards an O band solution

- https://www.ieee802.org/3/dj/public/23_11/motions_3cwdfdj_2311.pdf

O band has advantages in potential DSP power savings and alignment with 800LR development in OIF

Straw Poll #11

For the 800GBASE-LR1 (10km SMF single wavelength) I would support basing the specification on:

A. O Band
B. C Band
C. Need more information
D. Abstain

Results (all): A: 34, B: 20, C: 22,   D: 33

Transmit Quality Metric

802.3cw uses EVM as a transmitter quality metric (TQM)

- Parametric specifications are used for the transmitter
- EVM is used as an overall quality metric

Proposals have been introduced to revisit the TQM

- https://www.ieee802.org/3/dj/public/23_11/kota_3dj_01a_2311.pdf
- https://www.oiforum.com/get/54090

Significant work is required to finalize the TQM selection, and determine which parameters it covers

Frequency Accuracy

Relaxing the laser frequency accuracy beyond the ± 1.8GHz typically used in DWDM optics opens the door to additional laser options

- Unlocked lasers with ~ ±12.5 GHz frequency accuracies can be selected for this application
- If this solution is adopted Laser tracking and acquisition will need to be discussed and documented
- See: https://www.ieee802.org/3/df/public/22_11/maniloff_3df_01_2211.pdf

Frequency accuracy is currently listed as TBD in the initial baseline to allow discussions

800GBASE-LR1 Link parameters

	800GBASE-LR1	Unit
Operating Distance	10	km
Channel Insertion Loss	6.3	dB [1]
Chromatic Dispersion Max	10.1	ps/nm [2]
Chromatic Dispersion Min	-12.3	ps/nm [2]
Polarization Mode Dispersion	5	ps

Note 1: The channel insertion loss for 800GBASE-LR1 is calculated using the maximum distance and fiber attenuation of 0.43 dB/km plus an allocation for connection and splice loss

Note 2: CD Min/Max based on G.652, values consistent with 802.3-2022, (ex: Table 122-16) for a wavelength of 1311nm.

800GBASE-LR1 Tx Parameters

	800GBASE-LR1	Unit
Signalling rate	123.6364±50 ppm	Gbaud
Modulation Format	DP-16QAM	
Optical Frequency	228.675	THz [1]
FEC	RS(544,514,10) +BCH(126,110)	
Average Launch Power (Max)	TBD	dBm
Average Launch Power (Min)	TBD	dBm
Optical Frequency Accuracy	TBD	GHz
Laser Linewidth	1	MHz
In Band OSNR	35	dB/12.5 GHz
Power difference between X and Y polarizations (max)	1.5	dB
Skew between X and Y polarizations (max)	TBD	ps
EVMmax (max)	TBD	%
Instantaneous I-Q offset per polarization (max)	-20	dB
Mean I-Q offset per polarization (max)	-26	dB
I-Q amplitude imbalance (mean)	1	dB
I-Q phase error magnitude (max)	5	deg
I-Q quadrature skew (max)	0.75	ps
Average launch power of OFF transmitter (max)	-20	dBm
Transmitter reflectance (max)	-20	dB
RIN average (max)	-145	dB/Hz
RIN peak (max)	-140	dB/Hz

Note 1: Operating frequency is based on a center frequency of 1311 nm

800GBASE-LR1 Rx Parameters

	800GBASE-LR1	Gbaud
Signalling rate	123.6364±50 ppm	GHz
Modulation Format	DP-16QAM	
Optical Frequency	228.675	GHz
Optical Frequency Tolerance	TBD	dBm
Damage Threshold	TBD	dBm
Average receive power (min)	TBD	dBm
Average receive power (max)	-6	dBm
Receiver reflectance (max)	20	dB
Allocation for Penalties	0.5	dB

Summary

This contribution provides baseline optical specifications for 800GBASE-LR1

Using an O band wavelength provides pathways to reduced DSP power and aligns with OIF 800LR IA

Work items on identifying the TQM methodology and wavelength specifications remain to close TBD items

The specification is developed to allow TBDs to be addressed in Task Force review

Thanks!