

Baseline proposal for 20km objective and update to the baseline for 40km objective

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Background

- At the interim meeting in January, the coherent proposal for 800G 20km objective has been adopted (lusted_nowell_3dj_01_2401 page 2) by the Task Force. (Working Group approval targeted for this week)
- 800G 20km coherent objective was primarily justified to orient to the higher link budget requirements of telecommunications scenarios
 - also supports interoperability with 40km objective (cheng_3dj_01b_2401 page 5)
- The logic and optical baseline proposal for the 40km 800GBASE-ER1 has also been adopted (nicholl_3dj_02_2307 & williams_3dj_01a_2305 pgs 7-10), which makes a good starting point to determine the 20km optical and logic baseline under the consideration of interoperability.

Refresh: Motivation for 20km Objective

- Justification for the new 20km objective was reviewed in cheng_3dj_01b_2401:
- Support telecom applications with > 10 km or older fiber
- Support interoperation with 40 km PMD

Considerations on optical and logic baselines for 20km objective

- For clarity the following nomenclature will be used in this presentation:
 - 800GBASE-ER1-20 for the 20km objective
 - 800GBASE-ER1-40 for the 40km objective
- Optical baseline for 20km objective should be aligned with the adopted optical baseline for 800GBASE-ER1-40
 - appropriately relaxing parameters such as launch power to lower the requirements on optoelectronic components.
 - C-band is proposed for 20km, aligning with optical PMD of 800GBASE-ER1
- Optical amplification
 - Need for optical amplifiers should be avoided to reduce the Capex and Opex of network infrastructure for operators, taking into account the amount of optical interfaces in interconnected nodes
- Logic baseline for 800GBASE-ER1-20 should be identical to 800GBASE-ER1-40
 - defined in nicholl_3dj_02_2307

Channel Loss Assumptions

- C-band fiber loss assumptions have varied some across standardization efforts
 - A more detailed review of channel loss assumptions are provided in [stassar_3dj_01_2403](#)
- The two methodologies shown below are considered equivalent assumptions that support the same channel loss values for 20km and 40km

Methodology 1

$$\begin{aligned} 20\text{km} &= 0.25 \text{ dB/km} \times 20\text{km} + 1.5\text{dB} \\ &= \mathbf{6.5\text{dB}} \end{aligned}$$

$$\begin{aligned} 40\text{km} &= 0.25 \text{ dB/km} \times 40\text{km} + 2\text{dB} \\ &= \mathbf{12.0\text{dB}} \end{aligned}$$

Methodology 2

$$\begin{aligned} 20\text{km} &= 0.275 \text{ dB/km} \times 20\text{km} + 1.0\text{dB} \\ &= \mathbf{6.5\text{dB}} \end{aligned}$$

$$\begin{aligned} 40\text{km} &= 0.275 \text{ dB/km} \times 40\text{km} + 1.0\text{dB} \\ &= \mathbf{12.0\text{dB}} \end{aligned}$$

Transmitter Specifications

Description	800GBASE-ER1-20	800GBASE-ER1-40	Unit
Signaling rate	118.2	118.2	Gbd
Modulation format	DP-16QAM	DP-16QAM	
Channel frequency (Nominal)	193.7	193.7	THz
Channel frequency accuracy (+/-)	+/- 1.8	+/- 1.8	GHz
Average launch power (min)	-11	-5	dBm
Average launch power (max)	-7	-1	dBm
Average launch power of OFF transmitter (max)	-20	-20	dBm
Laser linewidth (max)	1.0	1.0	MHz
I/Q phase error (+/-)	5	5	Deg
I/Q quadrature skew (max)	0.75	0.75	ps
I/Q amplitude imbalance (mean)	1	1	dB
Transmitter TQM	TBD	TBD	%

Parameters in blue represent spec relaxations compared to OIF 800ZR optics

Transmitter Specifications (cont.)

Description	800GBASE-ER1-20	800GBASE-ER1-40	Unit
Transmitter OSNR	35	35	dB
Power difference between X and Y polarizations (max)	1.0	1.0	dB
Skew between X and Y polarizations (max)	5	5	ps
Transmitter reflectance (max)	-20	-20	dB
RIN average	-145	-145	dBc/Hz
RIN peak	-140	-140	dBc/Hz

Receiver Specifications

Description	800GBASE-ER1-20	800GBASE-ER1-40	Unit
Modulation format	PM-16QAM	PM-16QAM	
Frequency offset between received carrier and local oscillator	+/-3.6	+/-3.6	GHz
Receive sensitivity	-18	-18	dBm
Average receive input power (max)	+3	+3	dBm
CD tolerance (max)	400	800	ps/nm
Peak PDL tolerance	1.5	1.5	dB
DGD	TBD	TBD	ps
SOP tolerance	50	50	krad/s

Illustrative Link Budgets

Parameter	800GBASE-ER1-20	800GBASE-ER1-40	Unit
Power budget	7.0	13	dB
Operating distance	20	40	Km
Channel insertion loss	6.5	12	dB
Allocation for penalties	0.5	1.0	dB
Additional insertion loss allowed	0	0	dB

Summary

- Optical and logic baseline proposals for 800GBASE-ER1-20 have been presented
- Optical baseline for 20km coherent objective should be aligned with that of the 40km objective to satisfy the interoperability target
- The optical parameters for 800GBASE-ER1-20 transmitter and receiver specifications can be correspondingly lightened to reduce costs for vendors or manufacturers.
- With this proposal, the 800GBASE-ER1-20 can be implemented without in-module amplification, which reduces the power and cost of the module, fulfilling the requirement of reducing Capex and Opex

Recommendation

- Adopt pages 7-11 of this presentation (wang_3dj_01a_2403) as the optical baseline for the 800GBASE-ER1-20 objective
- Adopt nicholl_3dj_02_2307 as the logic baseline for the 800GBASE-ER1-20 objective
- Update nomenclature for what was formerly known as 800GBASE-ER1 to 800GBASE-ER1-40
- Update the 800GBASE-ER1-40 optical specs with the values in pages 7-11 of this presentation to have consistent link specification methodologies between the ER1-40 and ER1-20