

# **Technical considerations towards the baseline of 100GBASE-BR10 and 100GBASE-BR20**

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# Overview

- In 2023.07 plenary meeting, 3dk\_tan\_2307\_1 proposed considerations of the baseline of optical specifications of 100GBASE-BR10, 100GBASE-BR20 based on 50GBASE-BR10 and 50GBASE-BR20 (clause 160, IEEE 802.3cp-2021), and 100GBASE-LR1 (clause 140, IEEE 802.3cu-2021)
- ITU-T G.9806 Amd.3 is recommended to be added as one of the baseline references.

# Table for 100GBASE-BR10,100GBASE-BR20 Transmitter Spec

	IEEE Std 802.3cu-2021, clause 140.6	G.9806 Amd.3 100G line rate		IEEE Std 802.3dk, new clause		
Description	100GBASE-LR1	Class S <sub>L</sub> (0~10dB)	Class S <sub>U</sub> (5~15dB)	100GBASE-BR10	100GBASE-BR20	Unit
Signaling rate (range)	53.125 ± 100 ppm	53.125		53.125 ± 100 ppm		GBd
Modulation format	PAM4	PAM4		PAM4		-
Downstream center wavelength (range)	N/A	1309.1 ± 1 nm		1308.1 to 1310.1		nm
Upstream center wavelength (range)		1304.6 ± 1 nm		1303.5 to 1305.5		nm
Wavelength	1304.5 to 1317.5	NA		N/A		nm
Side-mode suppression ratio (SMSR), (min)	30	30		30	30	dB
Average launch power (max)	4.8	-0.2	4.8	4.8		dBm
Average launch power (min) [1]	-1.9			-1.9		dBm
Outer Optical Modulation Amplitude (OMA <sub>outer</sub> ) (max)	5			5		dBm
Transmitter and dispersion eye closure for PAM4 (TDECQ) (max))	3.4	3.4	3.4	3.4	3.4	dB
TECQ(max)	3.4			3.4		dB
TDECQ-TECQ (max)	2.5	2.5	2.5	2.5	2.5	dB
Transmitter over/under-shoot (max)	22			22		%

Note 1: Average launch power (min)= Average receive power (min) + Channel insertion loss

# Table for 100GBASE-BR10,100GBASE-BR20 Transmitter Spec

	IEEE Std 802.3cu-2021, clause 140.6	G.9806 Amd.3 100G line rate		IEEE Std 802.3dk, new clause		
Description	100GBASE-LR1	Class S <sub>L</sub> (0~10dB)	Class S <sub>U</sub> (5~15dB)	100GBASE-BR10	100GBASE-BR20	Unit
Outer Optical Modulation Amplitude(OMA <sub>outer</sub> ) (min) <sup>b</sup> : for TDECQ < 1.4 dB for 1.4 dB ≤ TDECQ ≤ 3.2 dB	N/A	N/A		N/A		dBm dBm
Outer Optical Modulation Amplitude(OMA <sub>outer</sub> ) (min): for TDECQ < 1.4 dB for 1.4 dB ≤ TDECQ ≤ 3.4 dB	1.1 -0.3+TDECQ	N/A		1.1 -0.3+TDECQ		dBm dBm
Outer Optical Modulation Amplitude(OMA <sub>outer</sub> ) (min): for TDECQ < 1.6 dB for 1.6 dB ≤ TDECQ ≤ 3.4 dB	N/A	-2.3 -3.9 + TDECQ	-2.3 -3.9 + TDECQ	N/A		dBm dBm
Transmitter power excursion (max)	2.8			2.8		dBm
Average launch power of OFF transmitter (max)	-15	-20	-20	-15		dBm
Extinction ratio (min)	3.5	5	5	3.5		dB
Transmitter transition time (max)	17			17		ps
RIN <sub>x</sub> OMA (max) <sup>d</sup>	-136			-136		dB/Hz
Optical return loss tolerance (max)	15.6			15.6		dB
Transmitter reflectance <sup>e</sup> (max)	-26	-26		-26	-26	dB

# Table for 100GBASE-BR10,100GBASE-BR20 Receiver Spec

	IEEE Std 802.3cu-2021, clause 140.6	G.9806 Amd.3 100G line rate		IEEE Std 802.3dk, new clause		
Description	100GBASE-LR1	Class S <sub>L</sub> (0~10dB)	Class S <sub>U</sub> (5~15dB)	100GBASE-BR10	100GBASE-BR20	unit
Signaling rate (range)	53.125±100ppm	53.125		53.125 ± 100 ppm		GBd
Modulation format	PAM4	PAM4		PAM4		-
Downstream center wavelength (range)	N/A	1304.6 ± 1 nm		1303.5 to 1305.5		nm
Upstream center wavelength (range)	N/A	1309.1 ± 1 nm		1308.1 to 1310.1		nm
Wavelength (range)	1304.5 to 1317.5	N/A		N/A		nm
Damage threshold	5.8	1.0	1.0	5.8		dBm
Average receive power (max)	4.8			4.8		dBm
Average receive power (min)	-8.2			-8.2		dBm
Receive power (OMA <sub>outer</sub> ) (max)	5			5		dBm
Receiver reflectance (max)	-26			-26	-26	dB
Receiver sensitivity (OMA <sub>outer</sub> ) (max) for TECQ < 1.4 dB for 1.4 dB ≤ TECQ ≤ 3.2 dB	N/A	N/A		N/A		dBm dBm
Receiver sensitivity (OMA <sub>outer</sub> ), (max) for TECQ < 1.4 dB for 1.4 dB ≤ TECQ ≤ 3.4 dB	-6.1 -7.5+TECQ	N/A		-6.1 -7.5+TECQ		dBm dBm
Receiver sensitivity (OMA <sub>outer</sub> ), (max) for TECQ < 1.6 dB for 1.6 dB ≤ TECQ ≤ 3.6 dB	N/A	-12.8 -14.4 + TECQ	-12.8 -14.4 + TECQ	N/A		
Stressed receiver sensitivity (OMA <sub>outer</sub> ) (max)	-4.1			-4.1		dBm
Conditions of stressed receiver sensitivity test:						
Stressed eye closure for PAM4 (SECQ)	3.4			3.4		dB

# Table for 100GBASE-BR10,100GBASE-BR20 illustrative link power budgets

Description	IEEE Std 802.3cu-2021, clause 140.6	G.9806 Amd.3 100G line rate	IEEE Std 802.3dk, new clause		unit
	100GBASE-LR1		100GBASE-BR10	100GBASE-BR20	
Power budget (for maximum TDECQ)	10.6		10.6		dB
Operating distance	10	10, 20, 40	10	20	km
Channel insertion loss	6.3	Note1	6.3		dB
Maximum discrete reflectance	-35		-35		dB
Allocation for penalties (for maximum TDECQ)	4.3		4.3		dB

Note1: Classes for optical path loss in G.9806 Amd.3

	Class S	Class S <sub>L</sub>	Class S <sub>U</sub>	Class A	Class B-	Class B
Minimum loss	0 dB	0 dB	5 dB	5 dB	10 dB	10 dB
Maximum loss	15 dB	10 dB	15 dB	20 dB	23 dB	25 dB

Channel insertion loss in 802.3cp:

- BR10 = 6.3dB
  - BR20 = 15dB
- (From 802.3cp-2021, table 160-8)

Class S: Optical path loss 0-15 dB is intended to cover distances from 0 to 20 km.

Two optical budget sub-classes are defined, each with a dynamic range of 10 dB:

- Class S<sub>L</sub>: 0 – 10 dB (where L stands for lower segment of the S class)
- Class S<sub>U</sub>: 5 – 15 dB (where U stands for upper segment of the S class)
- Class A: Optical path loss 5-20 dB.
- Class B-: 10-23 dB: Introduced to relax the transceiver performances to cover distance up to 40 km.
- Class B: Optical path loss 10-25 dB is intended to cover distances from 20 to 40 km.

# Conclusions for 100G BR10/20 optical specifications

- Two baseline references for 100GBASE-BR10/20 optical specifications are listed: IEEE Std 802.3cu-2021 and ITU-T G.9806 Amd.3.
- We propose to consider Table 140-6 and 140-7 (IEEE Std 802.3cu-2021) as the baseline in this contribution.
- The group is encouraged to further discuss about the link power budget and related specifications of 100GBASE-BR10/20.

# Thank you

Any questions?