

100GBASE-BR10: Updates to Tables

K.P. Jackson & James Kannan (Sumitomo Electric)
Takuya Kanai, Hirotaka Nakamura (NTT Innovative Devices)

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Supporters

- Tomoo Takahara, Fujitsu

Overview

- This presentation includes *minor* updates to table entries for the 100GBASE-BR10, Draft 0.4 specification.
- Includes changes taken from other relevant standards (P802.3cu, 100Gb/s per lane & P802.3cp, 50Gb/s BiDi) to promote consistency and enhance readability. *{P802.3dj accepted comments on D1.0 to be incorporated when editor's have completed their wording "with editorial license".}*

***Note:** This presentation is covering 100GBASE-BR10. 100GBASE-BR20/BR40 specification values are addressed in separate presentations.*

Table 999-4 Signal Detect value definition (page 6244)

Receive conditions	SIGNAL_DETECT value
Average optical power at TP3 \leq TBD dBm -20	FAIL
[(Optical power at TP3 average receive power (min) Table 999-7) AND (compliant 100GBASE-BRx signal input)]	OK
All other conditions	Unspecified

Justification

Value must be lower than Rx avg power at TP3. P802.3cu, 100GBASE-LR1 has -15dBm. This table applies to BR10, BR20 & BR40. Prefer a common number for all---- **-20 dBm**

Table 999-6—100GBASE-BRx transmit characteristics (Page 6246)

Description	100GBASE-BR10	100GBASE-BR20	100GBASE-BR40	Unit
Signaling rate (range)	53.125 ± 100 ppm			GBd
Modulation format	PAM4			—
100GBASE-BRx-D center wavelengths (range)	1308.1 to 1310.1			nm
100GBASE-BRx-U center wavelengths (range)	1303.6 to 1305.6			nm
Side-mode suppression ratio (SMSR), (min)	30			dB
Average launch power (max)	4.8			dBm
Average launch power ^a (min)	-1.9			dBm
Outer Optical Modulation Amplitude (OMA _{outer}) (max)	5			dBm
Outer Optical Modulation Amplitude (min) ^b : for TDECQ < 1.4 dB for 1.4 dB ≤ TDECQ ≤ 3.4 dB	1.1 -0.3 + TDECQ			dBm dBm
Transmitter and dispersion eye closure for PAM4 (TDECQ) (max)	3.4			dB
TECQ (max)	3.4			dB
TDECQ – TECQ (max)	2.5			dB
Transmitter over/under -shoot (max)	22			%
Transmitter power excursion (max)	2.8			dBm
Average launch power of OFF transmitter (max)	-15 -20			dBm
Extinction ratio (min)	3.5			dB

Recommend format shown at right (highlighted yellow)

BR 10 Justification	
Consistent with other IEEE standards	
Same as P802.3cu, 100Gb/s per wavelength. 100GBASE-LR1	
Assumes ER=∞	
Same as P802.3cu, 100Gb/s per wavelength. 100GBASE-LR1	
Outer Optical Modulation Amplitude (OMA _{outer}), each lane (min) for max(TECQ, TDECQ) < 1.4 dB for 1.4 dB ≤ max(TECQ, TDECQ) ≤ TDECQ (max)	1.1 -0.3 + max(TECQ, TDECQ)
Same as P802.3cu, 100Gb/s per wavelength. 100GBASE-LR1	
Same as P802.3cu, 100Gb/s per wavelength. 100GBASE-LR1	
Same as P802.3cu, 100Gb/s per wavelength. 100GBASE-LR1	
Same as P802.3cu, 100Gb/s per wavelength. 100GBASE-LR1	
Same as P802.3cu, 100Gb/s per wavelength. 100GBASE-LR1	
P802.3cu uses -15. With IL(min) = 0dB, then Tx(avg, off) = -20 dBm (to match previous table)	
Same as P802.3cu, 100Gb/s per wavelength. 100GBASE-LR1	

Table 999-6—100GBASE-BRx transmit characteristics (continued)

Description	100GBASE-BR10	100GBASE-BR20	100GBASE-BR40	Unit	BR10 Justification
Transmitter transition time (max)	17			ps	Same as P802.3cu, 100Gb/s per wavelength. 100GBASE-LR1
RIN _x OMA (max) ^c	-136			dB/Hz	Same as P802.3cu, 100Gb/s per wavelength. 100GBASE-LR1
Optical return loss tolerance (max)	15.6			dB	Same as P802.3cu, 100Gb/s per wavelength. 100GBASE-LR1
Transmitter reflectance ^d (max)	-26			dB	Same as P802.3cu, 100Gb/s per wavelength. 100GBASE-LR1

^a Average launch power (min) is not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.

^b The OMA_{outer} (min) requirement holds even if the TDECQ < 1.4 dB. Even though the representation of the OMA_{outer} requirement is different from that in Clause 139, they are consistent.

^c In RIN_xOMA, “x” is the optical return loss tolerance (max) for the PHY under test.

^d Transmitter reflectance is defined looking into the transmitter.

No change to D0.4

Table 999-7—100GBASE-BRx receive characteristics (page 6248)

Description	100GBASE-BR10	100GBASE-BR20	100GBASE-BR40	Unit
Signaling rate (range)	53.125 ± 100 ppm			GBd
Modulation format	PAM4			—
100GBASE-BRx-D center wavelengths (range)	1303.6 to 1305.6			nm
100GBASE-BRx-U center wavelengths (range)	1308.1 to 1310.1			nm
Damage threshold ^a	5.8			dBm
Average receive power (max)	4.8			dBm
Average receive power ^b (min)	-8.2			dBm
Receive power (OMA _{outer}) (max)	5			dBm
Receiver reflectance (max)	-26			dB
Receiver sensitivity (OMA _{outer}) ^c for TECQ < 1.4 dB for 1.4 dB ≤ TECQ ≤ 3.4 dB	-6.1 -7.5 + TECQ			dBm dBm
Stressed receiver sensitivity (OMA _{outer}) ^d (max)	-4.1			dBm
Conditions of stressed receiver sensitivity test: ^e				
Stressed eye closure for PAM4 (SECQ)	3.4			dB

Accommodate 3.4 & 3.9 values Use SECQ

BR10 Justification	
	Align with ITU-T G9608 Am 3, 100G BiDi wavelength plan (downstream)
	Align with ITU-T G9608 Am 3, 100G BiDi wavelength plan (upstream)
	+1 dB higher than max avg Rx power, Same as P802.3cu, 100GBASE-LR1.
	Same as P802.3cu, 100Gb/s per wavelength. 100GBASE-LR1
	Same as P802.3cu, 100Gb/s per wavelength. 100GBASE-LR1
	Same as P802.3cu, 100Gb/s per wavelength. 100GBASE-LR1
	Consistent with P802.3cu, 100Gb/s per wavelength & P802.3cp, 50GBASE-BR40
Same as P802.3dj	Receiver sensitivity (OMA _{outer}), each lane (max) for TECQ < 1.4 dB for 1.4 dB ≤ TECQ ≤ SECQ
	Same as P802.3cu, 100Gb/s per wavelength. 100GBASE-LR1
	SECQ = TECQ

^a The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level.
^b Average receive power (min) is not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.
^c Receiver sensitivity (OMA_{outer}) (max) is optional and is defined for a transmitter with a value of SECQ up to 3 dB for 100GBASE-BR10 and 3.2 dB for 100GBASE-BR20, and 100GBASE-BR40.
^d Measured with conformance test signal at TP3 (see 999.7) for the BER specified in 999.1.1.
^e These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

Table 999–8—100GBASE-BRx illustrative link power budgets (page 6249)

Parameter	100GBASE-BR10	100GBASE-BR20	100GBASE-BR40	Unit	BR10 Justification
Power budget (for maximum TDECQ)	10.6	<i>(see other presentations)</i>		dB	Same as P802.3cu, 100Gb/s per wavelength. 100GBASE-LR1
Operating distance	10			km	
Channel insertion loss	6.3 ^a			dB	
Maximum discrete reflectance Footnote c	-35			dB	Same as P802.3cu, 100Gb/s per wavelength. 100GBASE-LR1
Allocation for penalties ^b (for maximum TDECQ) Footnote d	4.3			dB	Same as P802.3cu, 100Gb/s per wavelength. 100GBASE-LR1

^a The channel insertion loss is calculated using the maximum distance specified in Table 999–5 for 100GBASE-BR10, 100GBASE-BR20 and 100GBASE-BR40 and fiber attenuation of 0.4 dB/km plus an allocation for connection and splice loss given in 999.10.2.1.

^b Link penalties are used for link budget calculations. They are not requirements and are not meant to be tested.

Table 999-13

Number of discrete reflectances above -55 dB	Maximum value for each discrete reflectance			Unit
	100GBASE-BR10	100GBASE-BR20	100GBASE-BR40	
1	-22	TBD	TBD	dB
2	-29	TBD	TBD	dB
4	-33	TBD	TBD	dB
6	-35	TBD	TBD	dB
8	-37	TBD	TBD	dB
10	-39	TBD	TBD	dB

No change to D0.4

Add footnote to illustrative link power budgets Table

^c See 999.10.2.2 for details and specifications as a function of the number of discrete reflectances within the channel.

^d Maximum value for each discrete reflectance with 6 discrete reflectances above -55 dB within the channel.

Table 999-11—Transmitter compliance channel specifications (page 6252)

PMD type	Dispersion ^a (ps/nm)		Insertion loss ^b	Optical return loss ^c	Max mean DGD
	Minimum	Maximum			
100GBASE-BR10	$0.23 \times \lambda \times [1 - (1324 / \lambda)^4]$	$0.23 \times \lambda \times [1 - (1300 / \lambda)^4]$	Minimum	15.6	5
100GBASE-BR20	<i>(see other presentations)</i>				
100GBASE-BR40					

BR10 Justification

Update Dispersion (min, max) per progress in P802.3dj (?). Max DGD consistent with P802.3cu, 100GBASE-LR1.

0.8 ps

^a The dispersion is measured for the wavelength of the device under test (λ in nm). The coefficient assumes 10 km for 100GBASE-BR10, 20 km for 100GBASE-BR20, and 40 km for 100GBASE-BR40. The link may be as short as 2 m, and the minimum or maximum dispersion may be 0.

^b There is no intent to stress the sensitivity of the O/E converter associated with the oscilloscope.

^c The optical return loss is applied at TP2.

Table 999-12—Fiber optic cabling (channel) characteristics (page 6259)

Description	100GBASE-BR10	100GBASE-BR20	100GBASE-BR40	Unit	BR10 Justification
Operating distance (max)	10	<i>(see other presentations)</i>		km	
Channel insertion loss ^{a, b} (max)	6.3			dB	
Channel insertion loss (min)	0			dB	
Positive dispersion ^b (max)	9.3 9.2			ps/nm	Update per progress in P802.3dj(?)
Negative dispersion ^b (min)	-19.4 -19.2			ps/nm	Update per progress in P802.3dj(?)
DGD_max ^c	5			ps	P802.3cp, 50GBASE-BR10 has 8 psec, but this is inconsistent with 100GBASE-LR1 (P802.3cu)
Optical return loss (min)	22			dB	P802.3cp, 50G BiDi has 21 dB. P802.3cu, 100GBASE-LR1 has 22 dB. Propose 22 dB. Also, first row of Table 999-13.

^a These channel insertion loss values include cable, connectors, and splices.

^b Over the wavelength range ~~1260 nm to 1340 nm for 100GBASE-BR10 and 1281 nm to 1322 nm for 100GBASE-BR20 and 100GBASE-BR40~~ 1303.6 nm to 1310.1 nm.

^c Differential Group Delay (DGD) is the time difference at reception between the fractions of a pulse that were transmitted in the two principal states of polarization of an optical signal. DGD_max is the maximum differential group delay that the system is required to tolerate.

No change to D0.4

Add Table and update Section 999.10.1 Optical fiber cable

999.10.1 Optical fiber cable

The optical fiber cable requirements are satisfied by cables containing ITU-T ~~G.652.B (dispersion unshifted)~~, type G.652.D (low water peak, dispersion unshifted), or type G.657.A1, or type G.657.A2 (bend insensitive) fibers, or the requirements in Table 182–11 where they differ.

Are these references correct?

Table 139–13—Optical fiber and cable characteristics

{from P802.3cn, 50GBASE-ER}

Description	Value	Unit
Nominal fiber specification wavelength	1310	nm
Cabled optical fiber attenuation (max)	0.43 ^a or 0.5 ^b	dB/km
Zero dispersion wavelength (λ_0)	$1300 \leq \lambda_0 \leq 1324$	nm
Dispersion slope (max) (S_0)	-0.093 0.092	ps/nm ² km

^a The 0.43 dB/km at 1304.5 nm attenuation for optical fiber cables is derived from Appendix I of ITU-T G.695.

^b The 0.5 dB/km attenuation is provided for Outside Plant cable as defined in ANSI/TIA 568-C.3. Using 0.5 dB/km may not support operation 10 km for 100GBASE-BR10, 20km for 100GBASE-BR20 or 40km for 100GBASE-BR40.

Thanks!