

Revised parameters of 100GBASE-BR40

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Background

- At the March meeting we proposed baseline on PMD specifications for 100GBASE-BR40.
- We were pointed out a contradiction of “Damage threshold”.
- In this contribution,
 - We will discuss on value of Damage threshold and revise the value.

Value of Damage threshold in standardization

Standard	Value	Unit	Memo
ITU-T Class B _L	1.0	dBm	100 Gbps OLT/ONU
100G Lambda MSA	-2.4	dBm	Without Filter
Our previous proposal	-1.4	dBm	
Our new proposal	-1.0	dBm	

100GBASE-BR40 Transmit characteristics

Description	100GBASE-BR40	Unit
Signaling rate (Range)	53.125 ± 100 ppm	Gbd
Modulation Format	PAM4	—
100GBASE-BRx-D Center wavelength (Range)	1308.1 to 1310.1	nm
100GBASE-BRx-U Center wavelength (Range)	1303.6 to 1305.6	nm
Side-mode suppression ratio (SMSR), (min)	30	dB
Average launch power (max)	+8.5	dBm
Average launch power ^a (min) : informative	+2.7	dBm
Outer Optical Modulation Amplitude (OMA _{outer}) (max)	8.7	dBm
Outer Optical Modulation Amplitude (OMA _{outer}) (min) ^b : for TDECQ < 1.4 dB for 1.4 dB ≤ TDECQ ≤ 3.9 dB or TDECQ (max)	5.7 4.3 + TDECQ	dBm
Transmitter and dispersion eye closure for PAM4 (TDECQ) (max)	3.9	dB
TECQ (max)	3.9	dB
TDECQ – TECQ (max)	2.7	dB

100GBASE-BR40 Transmit characteristics(continued)

Description	100GBASE-BR40	Unit
Transmitter over/under -shoot (max)	22	%
Transmitter power excursion (max)	6.5	dBm
Average launch power of OFF transmitter (max)	-15	dBm
Extinction ratio (min)	5.0	dB
Transmitter transition time (max)	17	ps
RIN _x OMA (max) ^c	-136	dB/Hz
Optical return loss tolerance (max)	15.6	dB
Transmitter reflectance ^d (max)	-26	dB

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.

100GBASE-BR40 Receive characteristics

Description	100GBASE-BR40	Unit
Signaling rate (Range)	53.125 ± 100 ppm	Gbd
Modulation Format	PAM4	—
100GBASE-BRx-D Center wavelength (Range)	1308.1 to 1310.1	nm
100GBASE-BRx-U Center wavelength (Range)	1303.6 to 1305.6	nm
Damage threshold ^a	-1.0	dBm
Average receive power (max)	-1.5	dBm
Average receive power ^b (min)	-15.3	dBm
Receive power (OMA _{outer}) (max)	-1.3	dBm
Receiver reflectance (max)	-26	dB
Receiver sensitivity(OA _{outer}) ^c (max) for TECQ < 1.4 dB for 1.4 dB ≤ TECQ ≤ 3.9 dB or TDECQ (max)	-12.8 -14.2 + TECQ	dBm
Stressed receiver sensitivity (OMA _{outer}) ^d (max)	-10.3	dBm
Conditions of stressed receiver sensitivity test: ^e		
Stressed eye closure for PAM4 (SECQ)	3.9	dB
Rx Signal detect	-15	dBm

- ^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.

100GBASE-BR40 illustrative link power budgets

Description	100GBASE-BR40	Unit
Power budget (for maximum TDECQ)	22.4	dB
Operating distance	40	km
Channel insertion loss	18 ^a	dB
Maximum discrete reflectance	-35	dB
Allocation for penalties ^b (for maximum TDECQ)	4.4	dB

^a The channel insertion loss is calculated using the maximum distance specified in Table 999–5 for 100GBASE-BR10 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.

100GBASE-BR40 Fiber optic cabling (channel) characteristics

Description	100GBASE-BR40	Unit
Operating distance (max)	40	km
Channel insertion loss ^{a,b} (max)	18	dB
Channel insertion loss (min)	10	dB
Positive dispersion ^b (max)	37	ps/nm
Negative dispersion ^b (min)	-77	ps/nm
DGD_max ^c	4.9	ps
Optical return loss (min)	22	dB

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

^b Over the wavelength range 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

100GBASE-BR40 Fiber optic cabling (channel) characteristics(Continued)

Reference

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	$0.46 \times \lambda \times [1 - (1324 / \lambda)^4]$	$0.46 \times \lambda \times [1 - (1300 / \lambda)^4]$	Minimum	TBD	TBD
100GBASE-BR40	$0.92 \times \lambda \times [1 - (1324 / \lambda)^4]$	$0.92 \times \lambda \times [1 - (1300 / \lambda)^4]$	Minimum	TBD	TBD

Thank You!