# TBD specs of 100G BR20

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# 999.5.4 PMD global signal detect function

**Table 999–4—SIGNAL_DETECT value definition**

| Receive conditions | SIGNAL_DETECT value |
|---|---|
| Average optical power at TP3 ≤ 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 |

References:

| | Value (dBm) | Average receive power (min) |
|---|---|---|
| Clause 140 | -15 | -5.9(100G DR)<br>-7.1(100G FR1)<br>-8.2(100G LR1) |
| Clause 160 | -20 | -10.8(50G BR10)<br>-17.6(50G BR20/40) |
| Clause 999 | TBD | -8.2(100G BR10)<br>-15.3(100G BR40) |
| 3dk_takahara_2404_1a | -15 | / |
| 3dk_jackson_2406_1 | -20 | / |

# 999.6 PMD to MDI optical specifications for 100GBASE-BRx

**Table 999–6—100GBASE-BRx transmit characteristics**

| Description | 100GBASE-BR10 | 100GBASE-BR20 | 100GBASE-BR40 | Unit | BR20 justification |
|---|---|---|---|---|---|
| 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 | 30 | 30 | dB | Consistent with other IEEE standards (802.3cu, 802.3cp) |
| Average launch power (max) | 4.8 | -0.2 | 8.5 | dBm | From 3dk_effenberger_2401_1, 3dk_effenberger_2403_1 |
| Average launch power[a] (min) | –1.9 | -5.3 | 2.7 | dBm | From 3dk_effenberger_2401_1, 3dk_effenberger_2403_1 |
| Outer Optical Modulation Amplitude ($OMA_{outer}$) (max) | 5 | 0 | 8.7 | dBm | From 3dk_effenberger_2401_1, 3dk_effenberger_2403_1 |
| Outer Optical Modulation Amplitude ($OMA_{outer}$) (min)[b]:<br>for TDECQ < 1.4 dB<br>for 1.4 dB ≤ TDECQ ≤ 3.4 dB | <br>1.1<br>–0.3 + TDECQ | <br>-2.3<br>-3.7+TDECQ | <br>5.7<br>4.3 + TDECQ | <br>dBm<br>dBm | From 3dk_effenberger_2401_1, 3dk_effenberger_2403_1 |
| Transmitter and dispersion eye closure for PAM4 (TDECQ) (max) | 3.4 | 3.4 | 3.9 | dB | From G.9806 Amd.3 (Class $S_L$ 0~10dB) |
| TECQ (max) | 3.4 | 3.4 | 3.9 | dB | TECQ max= TDECQ max |
| \| TDECQ – TECQ \| (max) | 2.5 | 2.5 | 2.7 | dB | From G.9806 Amd.3 (Class $S_L$ 0~10dB) |
| Transmitter over/under -shoot (max) | 22 | 22 | 22 | % | Same as P802.3cu, 100Gb/s per wavelength |
| Transmitter power excursion (max) | 2.8 | 3.9 | TBD | dBm | From 3dk_Effenberger_2309_1 |
| Average launch power of OFF transmitter (max) | –15 | -20 | -15 | dBm | Consistent with 802.3cp (50G BR20), G.9806 Amd.3 (Class $S_L$ 0~10dB) |
| Extinction ratio (min) | 3.5 | 5.0 | 5.0 | dB | From 3dk_Effenberger_2309_1, G.9806 Amd.3 (Class $S_L$ 0~10dB) |

# 999.6 PMD to MDI optical specifications for 100GBASE-BRx

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

| Description | 100GBASE-BR10 | 100GBASE-BR20 | 100GBASE-BR40 | Unit |
|---|---|---|---|---|
| Transmitter transition time (max) | 17 | 17 | 17 | ps |
| $RIN_x OMA$ (max)[c] | -136 | -136 | -136 | dB/Hz |
| Optical return loss tolerance (max) | 15.6 | 15 | 15.6 | dB |
| Transmitter reflectance[d] (max) | -26 | -26 | -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 $RIN_x OMA$, "*x*" is the optical return loss tolerance (max) for the PHY under test.
[d] Transmitter reflectance is defined looking into the transmitter.

| BR20 justification |
|---|
| Consistent with IEEE 802.3cu |
| Consistent with IEEE 802.3cu |
| Consistent with IEEE 802.3cp (50G BR20) |
| Consistent with other IEEE standards (802.3cu, 802.3cp) |

# 999.6 PMD to MDI optical specifications for 100GBASE-BRx

**Table 999–7—100GBASE-BRx receive characteristics**

| Description | 100GBASE-BR10 | 100GBASE-BR20 | 100GBASE-BR40 | Unit | BR20 justification |
|---|---|---|---|---|---|
| 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 | 1.0 | TBD | dBm | From 3dk_effenberger_2401_1, 3dk_effenberger_2403_1 |
| Average receive power (max) | 4.8 | -0.2 | TBD | dBm | From 3dk_effenberger_2401_1, 3dk_effenberger_2403_1 |
| Average receive power[b] (min) | –8.2 | -15.3 | -15.3 | dBm | From 3dk_effenberger_2401_1, 3dk_effenberger_2403_1 |
| Receive power ($OMA_{outer}$) (max) | 5 | 0 | TBD | dBm | From 3dk_effenberger_2401_1, 3dk_effenberger_2403_1 |
| Receiver reflectance (max) | -26 | -26 | -26 | dB | Consistent with other IEEE standards (802.3cu, 802.3cp) |
| Receiver sensitivity ($OMA_{outer}$)[c] (max)<br>for TECQ < 1.4 dB<br>for 1.4 dB ≤ TECQ ≤ 3.4 dB | <br>–6.1<br>–7.5 + TECQ | -12.8<br>-14.2+TECQ | <br>-12.8<br>-14.2 + TECQ | <br>dBm<br>dBm | To be aligned with BR40 |
| Stressed receiver sensitivity ($OMA_{outer}$)[d] (max) | –4.1 | -10.8 | TBD | dBm | To be aligned with BR40 |
| Conditions of stressed receiver sensitivity test:[e] | | | | | |
| Stressed eye closure for PAM4 (SECQ) | 3.4 | 3.4 | 3.9 | dB | SECQ=TECQ |

# 999.6 PMD to MDI optical specifications for 100GBASE-BRx

**Table 999–8—100GBASE-BRx illustrative link power budgets**

| Parameter | 100GBASE-BR10 | 100GBASE-BR20 | 100GBASE-BR40 | Unit |
|---|---|---|---|---|
| Power budget (for maximum TDECQ) | 10.6 | 13.9 | 22.4 | dB |
| Operating distance | 10 | 20 | 40 | km |
| Channel insertion loss | 6.3[a] | 10[a] | 18[a] | dB |
| Maximum discrete reflectance | –35 | -35 | -35 | dB |
| Allocation for penalties[b] (for maximum TDECQ) | 4.3 | 3.9 | 4.4 | dB |

[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.

| BR20 justification |
|---|
| = IL + TDECQ + (MPI+DGD) = 10+3.4+0.5=13.9 |
| |
| |
| Consistent with IEEE 802.3cu |
| = TDECQ + (MPI+DGD) = 3.4+0.5 |

# 999.7.5.2 Channel requirements

**Table 999–11—Transmitter compliance channel specifications**

| 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 15 | TBD 0.8 |
| 100GBASE-BR40 | $0.92 \times \lambda \times [1 - (1324 / \lambda)^4]$ | $0.92 \times \lambda \times [1 - (1300 / \lambda)^4]$ | Minimum | TBD | TBD |

= Tx optical return loss tolerance

Consistent with other IEEE standards

Definitions in other IEEE 802.3 clauses:

| Clause No. | PMD type | Optical return loss | Max mean DGD |
|---|---|---|---|
| 140 | 100GBASE-LR1 | 15.6 dB | 0.8 ps |
| 160 | 50GBASE-BR10<br>50GBASE-BR20<br>50GBASE-BR40 | 15.6 dB<br>15 dB<br>15 dB | 0.8 ps<br>0.8 ps<br>0.8 ps |

# 999.9 Fiber optic cabling model

**Table 999–12—Fiber optic cabling (channel) characteristics**

| Description | 100GBASE-BR10 | 100GBASE-BR20 | 100GBASE-BR40 | Unit | BR20 justification |
|---|---|---|---|---|---|
| Operating distance (max) | 10 | 20 | 40 | km | |
| Channel insertion loss[a, b] (max) | 6.3 | 10 | 18 | dB | |
| Channel insertion loss (min) | 0 | 0 | 10 | dB | |
| Positive dispersion[b] (max) | TBD/3.3 | 18.4 | 37 | ps/nm | To be determined by updates in 802.3dj |
| Negative dispersion[b] (min) | TBD/-12.1 | -38.4 | -77 | ps/nm | To be determined by updates in 802.3dj |
| DGD_max[c] | 5 | TBD | TBD | ps | Consistent with IEEE 802.3cp (50G BR20) |
| Optical return loss (min) | 22 | 22 | 22 | dB | Aligned with 100G BR10 |

# 999.10.2.2 Maximum discrete reflectance

**Table 999–13—Maximum value of each discrete reflectance**

| Number of discrete reflectances above –55 dB | Maximum value for each discrete reflectance | | | Unit |
|---|---|---|---|---|
| | 100GBASE-BR10 | 100GBASE-BR20 | 100GBASE-BR40 | |
| 1 | -22 | TBD -22 | TBD -19 | dB |
| 2 | -29 | TBD -29 | TBD -27 | dB |
| 4 | -33 | TBD -33 | TBD -32 | dB |
| 6 | -35 | TBD -35 | TBD -35 | dB |
| 8 | -37 | TBD -37 | TBD -37 | dB |
| 10 | -39 | TBD -39 | TBD -39 | dB |

802.3 cu 100G-LR1

3dk_jackson_2406_1
400G-ER4-30 MSA

# Thank you

Any questions?