Table 91-10-10/1GBASE-PRX-U3 transmitter spectral limits

Center wavelength	RMS spectral width (max)[a]	RMS spectral width to achieve epsilon $\varepsilon = 0.08$ (informative)
nm	nm	nm
1260	0.59	0.5
1270	0.7	0.59
1280	0.87	0.74
1290	1.14	0.97
1300	1.64	1.39
1304	1.98	1.67
1305	2.09	1.77
1308	2.4	2
1317	2.4	2
1320	2.07	1.75
1321	1.98	1.67
1330	1.4	1.18
1340	1.06	0.89
1350	0.86	0.72
1360	0.72	0.61

[a] These limits for the 10/1GBASE-PRX-U3 transmitter are illustrated in Figure 91-6. The equation used to calculate these values is detailed in Subclause 60.7.2. Limits at intermediate wavelengths may be found by interpolation.

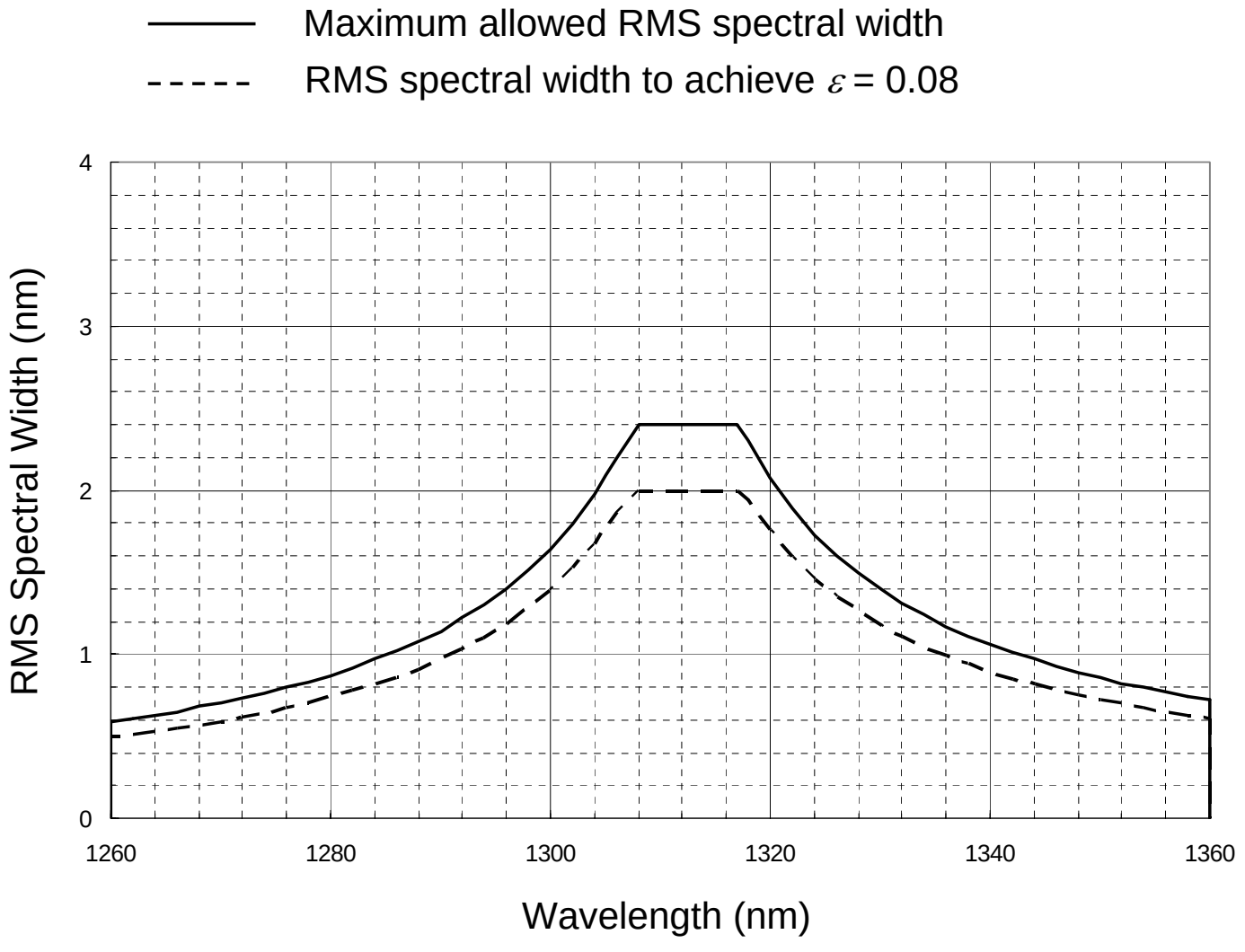


Figure 91-6-10/1GBASE-PRX-U3 transmitter spectral limits

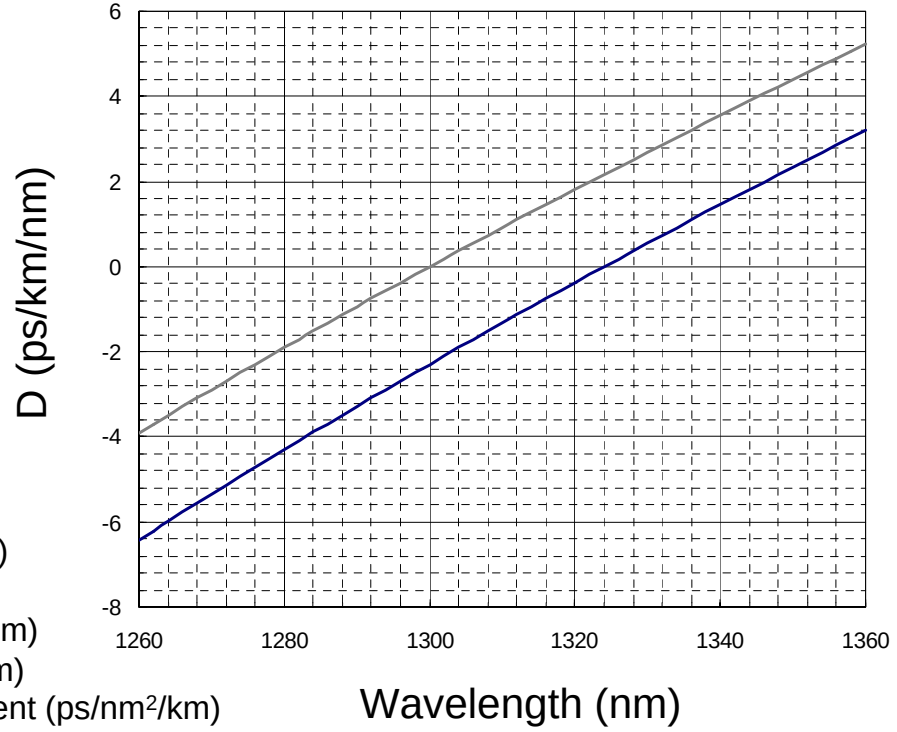
Appendix

Dispersion characteristics of SM fiber

We can calculate dispersion values using the following equation .

$$\frac{\lambda S_{0\max}}{4}\left[1-\left(\frac{\lambda_{0\max}}{\lambda}\right)^4\right] \le D(\lambda) \le \frac{\lambda S_{0\max}}{4}\left[1-\left(\frac{\lambda_{0\min}}{\lambda}\right)^4\right]$$

λ_{0max} =1324 nm
λ_{0min} =1300 nm
S_{0max} = 0.093 ps/nm^2/km



D: The chromatic dispersion coefficient (ps/km/nm)
λ: Wavelength (nm)
λ_{0max}: the maximum zero-dispersion wavelength (nm)
λ_{0min}: the minimum zero-dispersion wavelength (nm)
S_{0max}: the maximum zero-dispersion slope coefficient (ps/nm^2/km)

Power penalty due to the mode-partition noise (MPN)

We can calculate power penalty δ_{mpn} due to the mode-partition noise (MPN) using the following equation.

$$\delta_{mpn} = -5 \cdot Log_{10}\left(1 - Q^2 r_{mpn}^2\right)$$

$$r_{mpn} = \left(k / \sqrt{2}\right)\left(1 - \exp\left(-\left(\pi B L D \Delta\lambda\right)^2\right)\right)$$

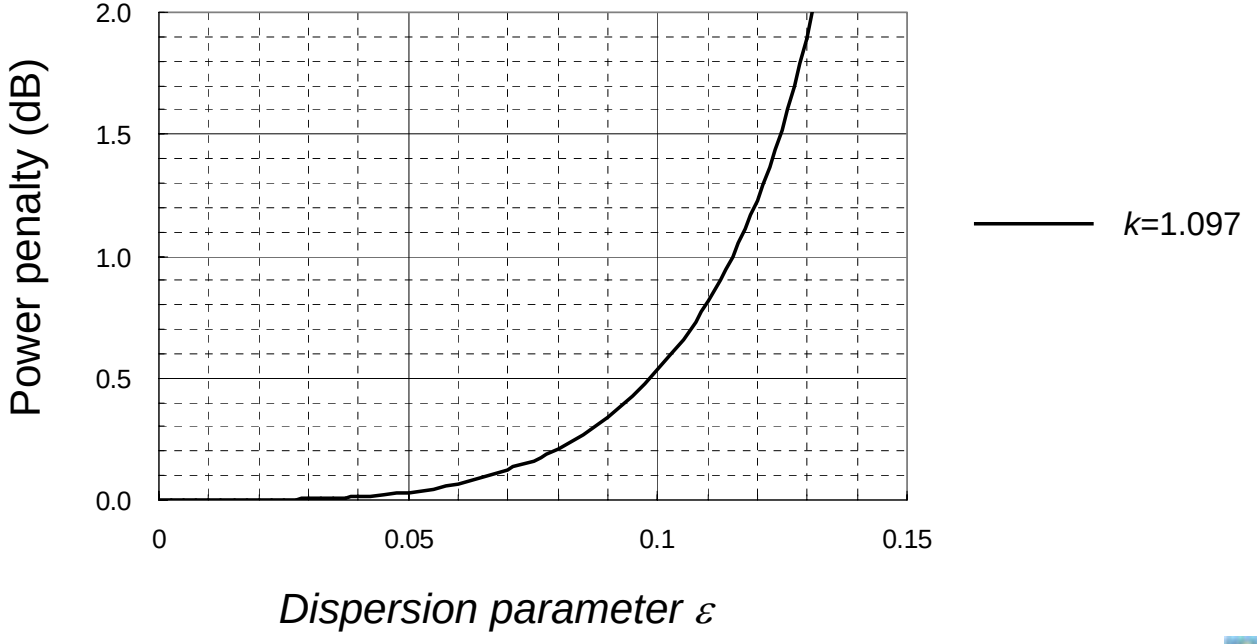
δ_{mpn}: Power penalty due to the mode-partition noise (MPN)
Q : Q factor
r_{mpn} : The relative noise level of the received power in the presence of MPN
k : Mode-partition coefficient
B : Bit rate (Gbit/s)
L : Transmission length (km)
D : The chromatic dispersion coefficient (ps/km/nm)
$\Delta\lambda$: RMS spectral width (nm)

$$\varepsilon = \left|D(\lambda)\right| \times L \times \Delta\lambda \times B \times 10^{-3}$$

ε : Dispersion parameter

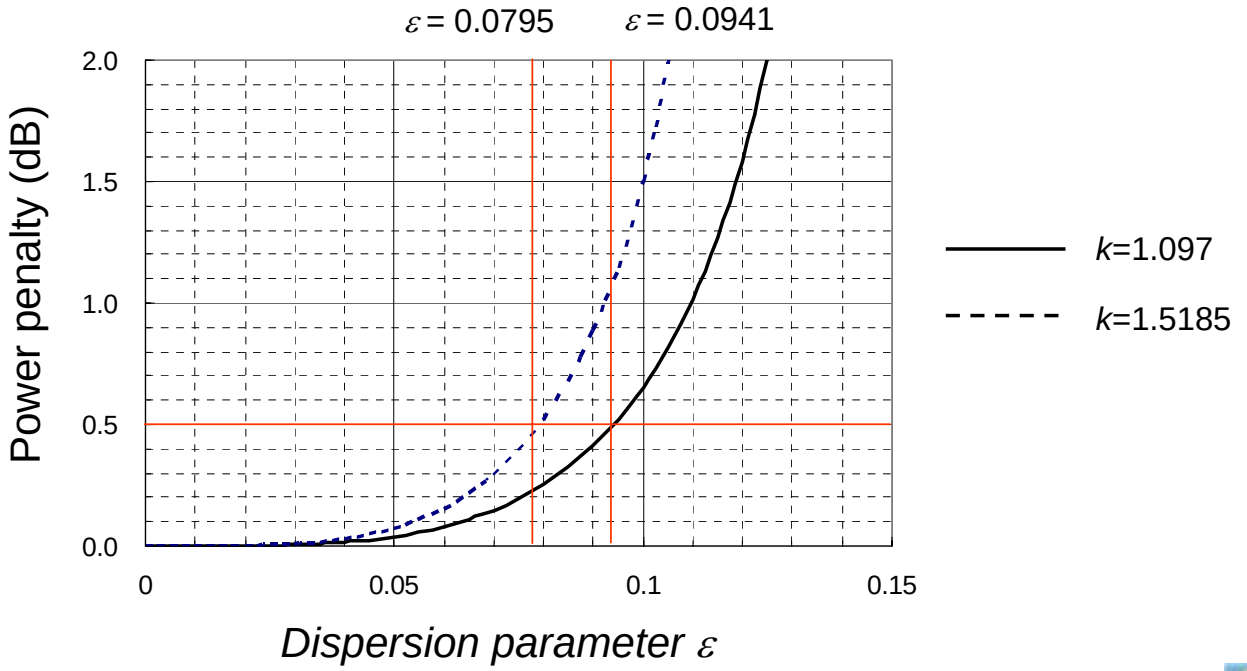
Power penalty due to MPN @BER=10^{-10}

In ITU-T Recommendation G.984.2, the maximum RMS width of the MLM type 1 for 622.08 Mbit/s upstream signals is specified as 1.4 nm during the wavelength range from 1260 to 1360 nm. It is determined on the condition of BER=10^{-10}, the absolute value of D_{max}=6.4 ps/km/nm@1260nm, and L=20 km, so ε is estimated as around 0.115. To satisfy 1dB path penalty at ε=0.115, k is estimated as around 1.097.



Power penalty due to MPN @BER=10^{-12}

In Sub-clause 60.7.2, the power penalty is specified as 1.5 dB at ε =0.1 (and BER=10^{-12}) for PX20. In this condition, *k* is estimated as around 1.5185. So we can obtain the power penalty curve for informative specifications of RMS spectral widths.
Calculating the power penalty at BER=10^{-12} with *k* from the slide 6, we can obtain the power penalty curve for specifications of maximum RMS spectral widths.
Using both curves, we can estimate each ε value at 0.5 dB power penalty for PRX-U3.



10/1GBASE-PRX-U3 transmitter spectral limits @BER=10^{-12}

We can calculate RMS spectral widths $\Delta\lambda$ using following equation with each MPN parameter ε from the slide 7.

$$\varepsilon = \left|D(\lambda)\right| \times L \times \Delta\lambda \times B \times 10^{-3}$$

D : The chromatic dispersion coefficient (ps/km/nm)
L : Transmission length (km)
$\Delta\lambda$: RMS spectral width (nm)
ε : Dispersion parameter
B : Bit rate (=1.25 Gbit/s)

——— ε = 0.0941@*k*=1.097,PP=0.5dB

- - - - - ε = 0.0795@*k*=1.5185,PP=0.5dB