

86. Physical Medium Dependent (PMD) sublayer and medium, type 40GBASE-SR4 and 100GBASE-SR10

86.1 Overview

The 40GBASE-SR4 and 100GBASE-SR10 PMD sublayers provide point-to-point 40 Gb/s and 100 Gb/s Ethernet links over four or ten pairs of multimode fiber, up to at least 100 m. Table 86–1 shows the primary attributes of each PMD type.

Table 86–1—Summary of 40GBASE-SR4 and 100GBASE-SR10

PMD Type	40GBASE-SR4	100GBASE-SR10	Unit
Fiber type	50/125 μm multimode, type A1a.2 ^a (OM3) or OM4 ^b		
Number of fiber pairs	4	10	
Nominal wavelength	850		nm
Required operating range	0.5 to 100 for OM3		m
	0.5 to 150 for OM4^c		
Signaling rate, each lane	10.3125 ±100 ppm		GBd

^a Type A1a.2 (OM3) specified in IEC 60793-2-10. See 86.10.2.1.

^b OM4 specified in TIA-492AAAD. See 86.10.2.1.

^c [This is an engineered link with maximum 1 dB connection and splice loss.](#)

86.7.4 40GBASE-SR4 and 100GBASE-SR10 illustrative link power budget

Annex I Illustrative power budgets and penalties for a 40GBASE-SR4 or 100GBASE-SR10 optical channel are shown in Table 86–9.

Table 86–9—40GBASE-SR4 and 100GBASE-SR10 illustrative link power budgets

Parameter	OM3	OM4	Unit
Effective modal bandwidth at 850 nm	2000 ^a	4700 ^b	MHz•km
Power budget (for maximum TDP)	8.3		dB
Operating distance	0.5 to 100	0.5 to 150	m
Channel insertion loss ^c	1.9	1.5	dB
Allocation for penalties (for maximum TDP) ^d	6.4	6.5	dB
Unallocated margin	0	0.3^e	dB
Additional insertion loss allowed	0		dB

^a Per IEC 60793-2-10

^b Per TIA-492AAAD

^c The channel insertion loss is calculated using the maximum distances specified in Table 86–1 and cabled optical fiber attenuation of 3.5 dB/km at 850 nm plus an allocation for connection and splice loss given in 86.10.2.2.1.

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

^e[This unallocated margin is not available for use.](#)

86.10 Optical channel

86.10.1 Fiber optic cabling model

The fiber optic cabling model is shown in Figure 86–5

The channel insertion loss is given in Table 86–13. A channel may contain additional connectors as long as

Table 86–13—Fiber optic cabling (channel) characteristics at 850 nm

Description	Type	OM3	OM4	Unit
Operating distance	Max	100	150	m
Cabling Skew	Max	79		ns
Cabling Skew Variation ^a	Max	2.6 2.5		ns
Channel insertion loss	Min	0		dB
Channel insertion loss ^b	Max	1.9^c	1.5^d	dB

^a An additional ~~200~~ [300](#) ps of Skew Variation could be caused by wavelength changes, which are attributable to the transmitter not the channel

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

^c[1.5 dB allocated for connection and splice loss](#)

^d[1 dB allocated for connection and splice loss](#)

the optical characteristics of the channel, such as attenuation, modal dispersion, reflections and losses of all connectors and splices meet the specifications. Insertion loss measurements of installed fiber cables are made in accordance with IEC 61280-4-1/Method 2 or IEC 61280-4-1/Method 3. The fiber optic cabling (channel) contains 4 or 10 optical fibers for each direction to support 40GBASE-SR4 or 100GBASE-SR10, respectively. The fiber optic cabling interconnects the transmitters at the MDI on one end of the channel to the receivers at the MDI on the other end of the channel. As defined in clause 86.10.3, the optical lanes appear in defined locations at the MDI but the locations are not assigned specific lane numbers within this standard because any transmitter lane may be connected to any receiver lane.

86.10.2.2.1 Connection insertion loss

The maximum ~~link operating~~ distances ~~are is~~ based on an allocation of 1.5 dB ~~or 1 dB~~ total connection and splice loss. For example, ~~this~~ [these](#) allocation~~s~~ supports ~~two~~ connections, each with an insertion loss of 0.75 dB ~~or 0.5 dB, respectively~~. Connections with lower loss characteristics may be used provided the requirements of Table 86–13 ~~and~~ are met. However, the loss of a single connection shall not exceed 0.75 dB.