Signature Core™ Fiber Optic Cabling System and Cisco's 40G BiDi Optical Modules

Mixing Signature Core™ Multimode Fiber with OM3 and OM4

PANDUIT®

building a smarter, unified business foundation

Connect. Manage. Automate.

Mixing Signature Core™ Multimode Fiber with OM3 and OM4

To obtain the best performance with Cisco's 40G BiDi optical modules (40GBASE-SR-BD), one should use Panduit's Signature Core™ Fiber Optic Cabling System from end-to-end. This ensures that the standard, un-engineered link will be able to attain a reach of 150m: the longest distance possible with 40G BiDi optical modules.

When erecting a brand new data center, deploying Signature Core™ end-to-end is easy and straight forward. However, for some applications, one may need to use Signature Core™ Multimode Fiber (MMF) in conjunction with existing OM3 or OM4 MMFs. If that is the case, the question that needs to be answered is: How does mixing Signature Core™ MMF with either OM3 or OM4 MMF affect the link's performance?

Signature Core™, OM3, and OM4, MMFs are all intermateable. They all use the same fiber geometries: a 50µm core diameter and a 125µm outer diameter including the fiber's cladding.

The question of mixing Signature Core™ MMF with OM3 and OM4 MMFs is one of reach: how far can one deploy a link comprised of two different fiber types?

There are two main differences between the three fiber types: compensation for chromatic dispersion; and, their available bandwidth, or information carrying capacity of the fiber.

Signature Core™ MMF and Chromatic Dispersion

Dispersion is the spreading out of light pulses as they travel down the length of the MMF. This degrades the original transmitted signal and may cause receive errors. Two types of dispersion exist: modal and chromatic. Traditional laser-optimized OM3 and OM4 MMF are designed to minimize modal dispersion but not chromatic dispersion. It is chromatic dispersion that affects performance at higher data rates.

Chromatic dispersion is caused by the spreading out of light due to the slightly different colors or wavelengths of light that make up the optical signal. Laser light generated from typical VCSELs is actually not a single wavelength but is in fact made up of several closely spaced discrete wavelengths around 850 nm. The speed at which the light travels through the fiber depends on the wavelength, therefore the individual wavelength components of the light pulse travel at slightly different speeds with the shorter wavelengths traveling at slower speeds compared to the longer wavelengths.

This slight difference in the speed of the various wavelengths as they travel through the fiber results in unequal transit times, which results in signal distortion. The wavelengths cause the laser pulse to spread out which makes it harder to interpret the data stream at the receiving end and limits reach while increasing the Bit Error Rate (BER). The negative impact of chromatic dispersion increases as the data rate increases.

The Signature Core™ Fiber Optic Cabling System was designed to minimize the effects of chromatic dispersion. OM3 and OM4 MMFs do not compensate for chromatic dispersion. Therefore, the more OM3 or OM4 MMF used to deploy a 40G BiDi link, the shorter that link must become in order to meet BER requirements.

Signature Core™ MMF and Bandwidth

In addition to correcting for chromatic dispersion to improve performance, MMF is also available with different bandwidths. A fiber's bandwidth is a measure of its information carrying capacity over a distance; the higher the fiber's bandwidth, the faster the data rate it can support and/or the farther it can send that data.

	OM3	OM4	Signature Core™
Bandwidth	2,000	4,700	5,500 (Min.)[1] MHz·km

Table 1 – Bandwidth of multimode optical fibers

As with chromatic dispersion, mixing the various fiber types can have a negative impact on the link's performance due to the inclusion of lower BW MMF.

Mixing Signature Core™ with OM3 or OM4 Multimode Optical Fibers

Mixing Signature Core™ MMF with OM3 or OM4 will limit the reach of the link to a total length shorter than 150m because OM3 and OM4 have lower bandwidth specifications and they do not correct for chromatic dispersion. The more OM3 and OM4 that is used with Signature Core™ MMF, the shorter the link.

The chart below shows the relationship between Signature Core™ and OM3 or OM4. The graph can be used to determine the length of Signature that can be used with a given length of OM3, or OM4, and vice-a-versa, and still have the link support 40G BiDi optical modules. For example, if one has a trunk of Signature Core™ with a length of 120m, one can add a maximum of 18m of OM3 or a maximum of 20m of OM4, and 30m of OM4 but with a total connector insertion loss of 1.0db.

This graph also shows the reach when taking the total connector insertion loss for the link into account for OM4 MMF. Two cases are shown: 1.5db of total connector loss and 1.0db of total connector loss, which would be considered an engineered link.

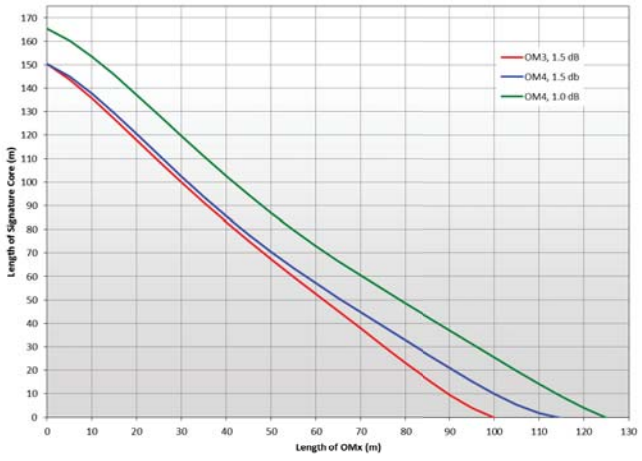

Figure 1 - Length of Signature Core vs. length of OM3/OM4

[1]Specifications are subject to change without notice.

Real-World Solutions

With a proven reputation for excellence and innovation, Panduit and our partners work with you to overcome challenges and implement real-world solutions that create a competitive business advantage. Panduit offers the broadest range of solutions, from data centers and intelligent buildings to manufacturing operations, to help you build a ***smarter, unified business foundation.***

Technology Leadership

Panduit develops innovative physical infrastructure solutions that meet the rapidly changing needs of our clients, from hardware and software to advisory services. This commitment is supported by investment in advanced research, solutions-focused product development, world-class manufacturing, and collaboration with customers at the forefront of technology.

Partner Ecosystem

Our best-in-class partner ecosystem offers a comprehensive portfolio of services that span the project lifecycle, from planning and design to delivery, deployment, maintenance, and operation. Panduit business partners – distributors, and certified architects, consultants, engineers, designers, system integrators, and contractors – are qualified to help you achieve your objectives and realize predictable and measurable results.

Strategic Alliances

Panduit cultivates long-term strategic alliances with industry leaders, including Cisco Systems, EMC, IBM, and Rockwell Automation, to develop, optimize, and validate solutions for our customers. This investment in people and resources helps solve our customers' greatest business challenges.

Global Business Commitment

Panduit is committed to delivering a consistently high level of quality and service the world over. With a presence in more than 100 countries, local Panduit sales representatives and technical specialists offer guidance and support that bring value to your business. Our global supply chain, which includes manufacturing, customer service, logistics, and distribution partners, provides prompt response to your inquiries and streamlines delivery to any worldwide destination.

Sustainability

With a commitment to environmental sustainability, Panduit develops and implements solutions that protect, replenish, and restore the world in which we live. This commitment is demonstrated by Panduit's LEED Gold certified World Headquarters, leveraging the Unified Physical Infrastructure℠ approach to enable convergence of critical building systems to drive energy efficiency and ongoing operational improvement.

Panduit Corp.
World Headquarters
Tinley Park, IL 60487

cs@panduit.com
US and Canada: 800.777.3300
Europe, Middle East, and Africa: 44.20.8601.7200
Latin America: 52.33.3777.6000
Asia Pacific: 65.6305.7575

www.panduit.com

PANDUIT®