Application Engineering Note - 50 µm and 62.5 µm Multimode Fiber Compatibility

Application Note

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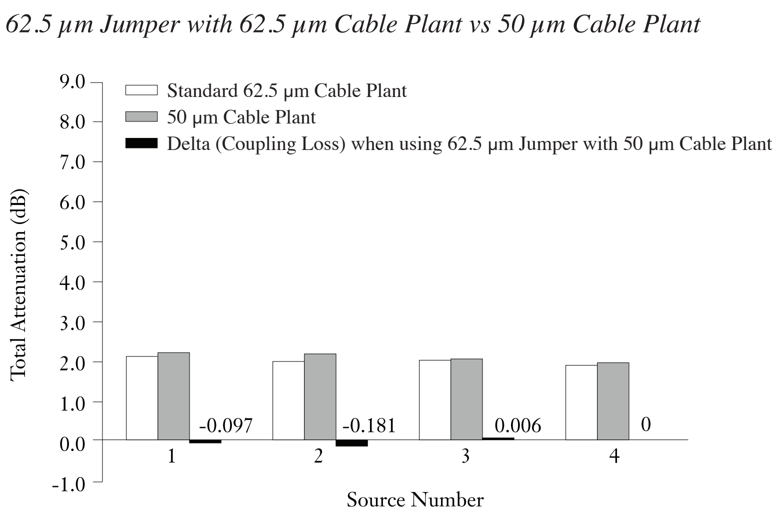
Fiber Compatibility – 50 µm and 62.5 µm Fibers

It is important to understand fiber compatibility, especially if different fiber types will be used in a given location. According to standards, multimode cable plants should maintain uniform fiber types in each link, including jumpers and patchcords. Corning recommends compliance with standards by maintaining consistent core sizes within a MMF cable plant. In a situation where mixing core sizes is unavoidable, it is technically feasible to combine 50 µm and 62.5 µm fibers in a single link using either LED or laser sources. Single-mode fiber is not compatible with either 50 µm or 62.5 µm multimode fibers.

Corning performed extensive physical tests and computer simulations on combining 50 µm and 62.5 µm fiber. Initially, laser sources were tested for mixing fiber coupling losses (62.5 µm into 50 µm, and vice versa). Tests found no significant coupling losses, which indicate that 50 µm and 62.5 µm fibers are fully compatible with laser sources as shown in Figure 1. This result was no surprise since lasers have a relatively small spot size that launches light into the center of the fiber.

Laser Coupling Losses

Figure 1



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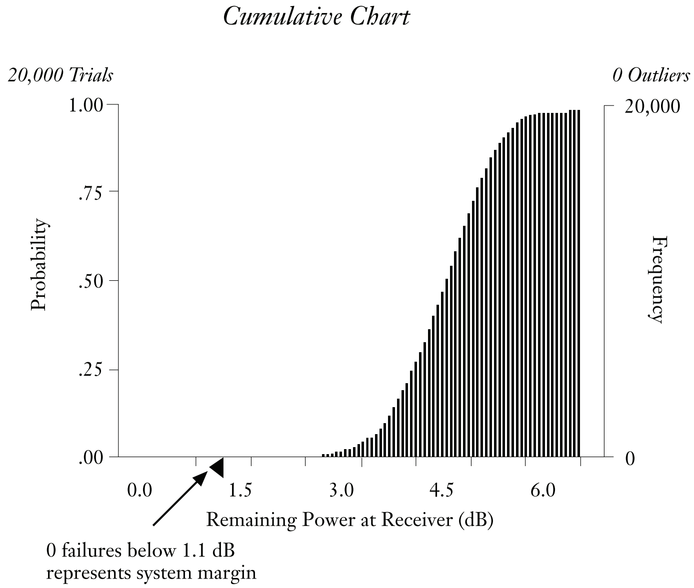
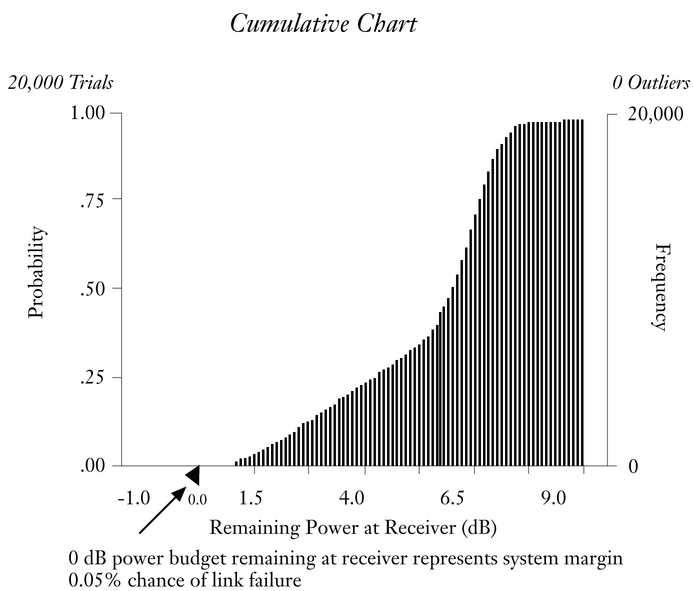
Next, LED sources were tested with 50 μm and 62.5 μm mixed media cable plants. As illustrated in Figure 2, no failures (systems with no remaining power margin) were found in 1300 nm LED systems after 20,000 trials were simulated.

1300 nm LED Systems – Remaining Power in a Mixed 50/62.5 μm System
Figure 2



In addition, 20,000 trials of 850 nm LEDs showed similar results, as illustrated in Figure 3.

850 nm LED Systems – Remaining Power in a Mixed 50/62.5 μm System
Figure 3



Intuitively this is less obvious, since the theoretical mismatch of core size and numerical aperture between the fiber types should lead to approximately a 4 dB coupling loss. However, a one-time attenuation loss of approximately 2 dB is experienced when coupling 62.5 μm fiber into 50 μm fiber with LEDs, because the mode power distribution of LEDs is not always uniformly overfilled. In simulations this smaller loss was covered by the excess power budget of the system, and was independent of the number of connectors and fiber type changes that occur in a cable run.

Summary

Corning recommends standards-compliant MMF deployments by maintaining consistent core sizes throughout the cable plant. However, it is technically feasible to combine 62.5 µm and 50 µm multimode fiber in a single link using current LED and laser sources.

Additional Resources

Fiber Selection and Standards Guide for Premises Networks (WP1160) -
http://www.corning.com/assets/0/433/573/637/645/4927DD2D-CF13-4D9D-8159-D30A5B90EA59.pdf

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