

### **How is the implementation of multimode fiber optics-based 40/100G Ethernet different from 10G Ethernet?**

The biggest difference between 10G and 40/100G is that 40/100G uses parallel optics. Rather than develop new components capable of sending data four or ten times faster than 10G (for 40G and 100G respectively), the IEEE determined that it would be more cost effective to simply have multiple lanes of 10G for 40G and 100G.

Another significant difference applies to the lasers used in the transceivers. One characteristic of the light that exits the transceiver is called spectral width. This is a measure of the range of wavelengths emitted by the vertical cavity surface emitting lasers (VCSELs) used in modern multimode fiber systems. The maximum spectral width increased from 0.45nm to 0.65nm from 10G to 40/100G.

### **How do these changes impact my data center?**

The use of parallel optics increases the number of fiber strands needed for each link, however, the reuse of existing 10G technology in the transceivers provides a flexible, lower-cost solution compared to competing technologies, such as those based on single-mode optics. Berk-Tek's patented Micro Data Center Plenum (MDP) cable offers the highest density cabling solution in the industry.

The link lengths defined by the 40/100G standard are significantly shorter than the 10G distance limitations. At 10G, the maximum link lengths for OM3 and OM4 are 300m and 400m respectively. For 40/100G, those lengths are 100m & 150m. This reduction is largely due to the increased spectral width allowance. Some equipment manufacturers also sell 40G transceivers that exceed the 40G IEEE specifications and meet the 10GBASE-SR specification. This allows for 40G link lengths of 300m and 400m for OM3 and OM4.

### **How does using the Berk-Tek Link Loss Tool help me?**

While achieving maximum link length is important, using shorter lengths with a higher number of connectors is often even more desirable. In the absence of an official link model from IEEE for 40/100G, Berk-Tek has developed its own proprietary end-to-end model that allows data center designers to create flexible, high-performance links. This model was developed by Berk-Tek's Data Communications Competence Center and validated through extensive testing in real-world scenarios. Berk-Tek's model uses information about the VCSELs, connectors, fibers and receivers and allows designers to trade length and bandwidth for increased loss budgets. This facilitates the use of MPO/MTP based cassettes as part of a migration path from 10G to 40G for ease of use and

network topologies with more than two connectors. The Berk-Tek Link Loss Tool is an easy-to-use interface to Berk-Tek's proprietary model.

### **What is GIGAlite™-10XB grade fiber from Berk-Tek?**

GIGAlite™-10XB fiber is an OM4+ product that features effective modal bandwidth at 850nm of 4900MHz•km or more and attenuation of 3.0dB/km or less. When used in our MDP solution, the attenuation is 2.7dB/km or better. This extra bandwidth and improved attenuation allow designers to create more flexible, higher performance cabling topologies to support the data rates of today and tomorrow. For 40/100G, GIGAlite-10XB enables maximum link lengths up to 300m for 40GBASE-SR4 and 100GBASE-SR10. For 40G transceivers that are compliant to the 10GBASE-SR specification, GIGAlite-10XB enables distances of 600m, the longest in the industry.