

# Standard Fiber Jumpers in a Non-Zero Dispersion Shifted Fiber System

## AEN 53, Revision 3

Non-zero dispersion-shifted fiber, such as Corning® LEAF™, is used in long distance optical systems to minimize chromatic dispersion while taking advantage of the lower attenuation in the long wavelength region. Dispersion-unshifted single-mode fiber has been used for long distance optical communication applications, but has significantly higher dispersion characteristics.

Long distance optical systems are usually limited by chromatic dispersion, rather than by attenuation. Typical OC-192 transmission equipment allows for 1500 picoseconds (ps) of total chromatic dispersion.

The maximum chromatic dispersion of LEAF fiber is 6 ps/(nm·km) across the 1530 to 1565 nm range. Four LEAF fiber 3-meter jumpers would result in a maximum of 0.07 ps of chromatic dispersion. The worst case dispersion of an equivalent length of SMF-28 jumpers will be 0.23 ps.

The difference between these two values, 0.16 ps, is the additional dispersion induced by using SMF-28 jumpers instead of jumpers made with LEAF fiber. In a LEAF fiber system, one picosecond of dispersion occurs every 167 meters of fiber (worst case), so 0.16 ps is equivalent to (167 X 0.16=) 27 meters. This means that for twelve meters of SMF-28 installed in a LEAF system, the maximum system length limit is reduced by only 27 meters or less. Since LEAF systems are capable of operating at lengths over 400 km, this penalty is minor unless the system is operating at the very edge of the envelope. Accordingly, most systems are installed with standard SMF-28 jumpers. Similar calculations can be completed for systems with different jumper lengths.

The difference in attenuation between fiber types is negligible over the short jumper lengths, as is the difference in connector insertion loss and fusion splice loss due to the slightly different mode-field diameters.

In conclusion, the use of SMF-28 jumpers in a LEAF system results in a negligible increase in dispersion, and has minimal impact on overall system length.