TeraWave® ULL Single-Mode Optical Fiber

Fiber for the Long Haul

Features and Benefits

- Effective area of 125 μm²
- Ultra low loss ≤0.17 dB/km at 1550 nm
- Long term attenuation and mechanical reliability
- Ultra low PMD
- Low latency
- Improved OSNR
- Supports coherent and non-coherent transmission systems
- Optimized for 100 G and beyond
- Designed for terrestrial cables
- 1.5 dB increase in non-linear limit
- High performance D-Lux® Ultra Coating

Product Description

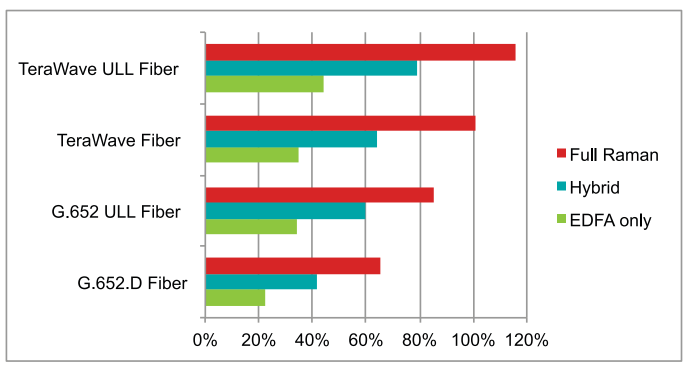
TeraWave® ULL Single-Mode Optical Fiber is a 125 μm² large area, ultra low loss ITU-T G.654.B and ITU-T G.654.E fiber designed for terrestrial optical networks. The fiber is optimized for long haul transmission in the C- and L-bands (1530 nm – 1625 nm) at 100 Gb/s, 400 Gb/s and beyond. It features a core with an effective area 49% greater than G.652.D single-mode fiber to reduce nonlinear effects that limit the reach of G.652.D fiber. As a result, TeraWave ULL fiber supports greater distances between regeneration and amplification sites, helping to lower the overall cost of deploying coherent systems – now and in the future.

TeraWave ULL fiber features very good cabling properties, and an ultra low loss to provide superior optical signal-to-noise ratio (OSNR) performance in optical links compared to low loss G.652.D fibers. The fiber takes the best aspects of highly engineered submarine fibers and combines them with cabling performance that is similar to conventional single-mode terrestrial fiber. These improvements allow system designers to increase distances between amplification and regeneration sites to help reduce overall system costs.

Operating optical systems beyond 100 G will require a significant improvement in the optical signal noise ratio (OSNR) for the end user to have regeneration distances comparable to those observed with G.652.D fiber at 100 Gb/s. Optimizing fiber attributes and amplification strategy is needed to increase the regeneration distances. The graph shows that in a 400 G system with TeraWave ULL fiber and Raman amplification regeneration distances comparable to 100 G systems using erbium-doped fiber amplifiers (EDFA) with G.652.D fiber can be achieved.

TeraWave ULL fiber supports all of the major optical amplifier types including EDFA, Raman, and hybrid amplification to help system designers and service providers cost optimize performance for each network's unique hut spacing and reach requirements.

This fiber supports longer un-regenerated reach for any coherent modulation format and can also operate with the same equipment used with conventional C- and L-band 10 Gb/s and 100 Gb/s systems. The ultra low loss and higher launch power limit of TeraWave ULL fiber can also be leveraged to increase hut spacing or supporting long distance unrepeatered links.



Expected regeneration distance at 400 G compared to standard single-mode fiber at 100 G using EDFA

For additional information please contact your sales representative.

You can also visit our website at www.ofsoptics.com or call 1-888-fiberhelp (1-888-342-3743) USA or 1-770-798-5555 outside the USA.

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Applications

A combination of ultra-low loss and higher nonlinear performance recommended for the highest spectral efficiency TeraWave® ULL Single-Mode Optical Fiber provides outstanding cable performance and design freedom for terrestrial long haul systems:

- 100 Gb/s, 400 Gb/s, and 1 Tb/s using coherent modulation formats
- Ultra-long haul 10 Gb/s and 100 Gb/s
- Terabit super-channels
- Dense wave-division multiplexing
- Optically-routed mesh networks
- Long unrepeatered spans such as those encountered in remote regions
- POP-to-landing-site connections for submarine cables

Product Specifications	TeraWave® ULL Optical Fiber	
Physical Characteristics		
Clad Diameter	125.0 ± 0.7 μm	
Clad Non-Circularity	≤ 0.7 %	
Core/Clad Concentricity Error (Offset)	≤ 0.8 μm	
Coating Diameter (Natural)	240 - 250 μm	
Coating-Clad Concentricity Error (Offset)	≤ 12 μm	
Tensile Proof Test (Other proof test levels available on request)	100 kpsi (0.69 GPa)	
Coating Strip Force	Range: 1.0 N ≤ CSF ≤ 9.0 N	
Standard Reel Lengths	Up to 50.4 km (31.3 miles)	
Optical Characteristics		
Attenuation	Maximum	
at 1550 nm	≤ 0.17 dB/km, typical 0.168 dB/km	
at 1625 nm	≤ 0.20 dB/km	
Attenuation vs. Wavelength		
Range (nm)	Reference (nm) λ	α
1525 – 1575	1550	0.03
1475 – 1625	1550	0.05
The attenuation in a given wavelength range does not exceed the attenuation of the reference wavelength (λ) by more than the value λ.		
Attenuation Uniformity / Point Discontinuities at 1310 nm and 1550 nm	≤ 0.05 dB	
Macrobending Attenuation:	100 Turns 30 mm radius ≤ 0.1 dB at 1625 nm	
Chromatic Dispersion		
Chromatic Dispersion at 1550 nm	≤ 22 ps/nm-km	
Chromatic Dispersion Slope at 1550 nm	< 0.070 ps/nm^2-km	
Group Refractive Index at 1550 nm	1.465	
Mode Field Diameter	12.4 ± 0.5 μm	
Effective Area at 1550	Typical: 125 μm^2	
Cable Cut-off Wavelength (λ_{CC})	≤ 1520 nm	
Polarization Mode Dispersion (PMD) [1]		
Fiber PMD Link Design Value (LDV) [2]	≤ 0.04 ps/$\sqrt{km}$	
Maximum Individual Fiber	≤ 0.1 ps/$\sqrt{km}$	
Typical Fiber LMC PMD	≤ 0.02 ps/$\sqrt{km}$	
[1] As measured with low mode coupling (LMC) technique in fiber form, value may change when cabled. Check with your cable manufacturer for specific PMD limits in cable form.		
[2] The PMD Link Design Value complies with IEC 60794-3, September 2001 (N = 20, Q = 0.01%). Details are described in IEC 61282-3 TR Ed 2, October 2006.		
Environmental Characteristics (at 1310, 1550 & 1625 nm)		
Temperature Cycling (-60 + 85 °C)	≤ 0.05 dB/km	
High Temperature Aging (85 ± 2 °C)	≤ 0.05 dB/km	
Temperature & Humidity Cycling (at -10 to +85 °C and 85 to ~98% RH)	≤ 0.05 dB/km	
Water Immersion (23 ± 2 °C)	≤ 0.05 dB/km	