TrueWave® RS Fiber

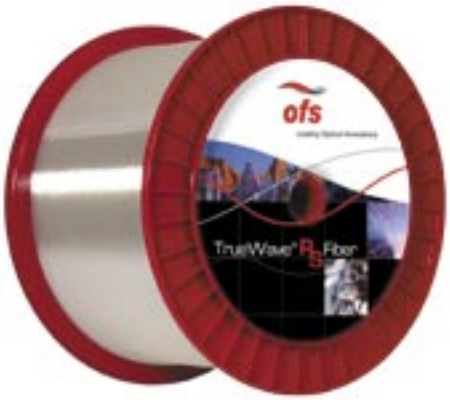
Optimized to enable the lowest total systems cost for EDFA amplified networks in the Metro Express, Regional, and Long Haul application space!

Product Description

OFS' TrueWave® single-mode optical fiber was the industry's first ITU-T G.655 compliant nonzero-dispersion fiber (NZDF). Billions of meters of TrueWave fiber have been installed globally with satisfied customers, and the product line has continued to improve to meet even more exacting network requirements. Today's TrueWave RS reduced dispersion slope fiber is an ITU-T G.655 compliant fiber designed to accommodate both today's lower channel counts and tomorrow's full band capabilities, in metropolitan express, regional, and long haul optical transmission systems. With the lowest dispersion slope in the industry, TrueWave RS fiber enables exceptional performance in dense wavelength division multiplexing (DWDM) systems traditionally operating in the C-band (1530 nm – 1565 nm), as well as in emerging L-band (1565 nm – 1625 nm) systems, while also maintaining transmission capability at 1310 nm.

The low dispersion slope and low dispersion found in TrueWave RS fiber improves performance and enables the lowest total systems cost for both single and WDM channels for erbium doped fiber amplified (EDFA) networks. This combination reduces the need for complex and expensive dispersion compensation – a problem that can arise with other NZDFs, particularly those that have large effective areas. TrueWave RS fiber's low dispersion and dispersion slope combine to allow the longest uncompensated reach for metropolitan and regional networks operating at 2.5 or 10 Gb/s, and also the lowest systems cost for EDFA amplified long haul networks. In addition to the reduction in dispersion compensation module cost, the absence or minimal use of dispersion compensation fiber can enable use of both a simplified and cost-reduced EDFA amplifier, which also contributes to lower overall systems cost.

TrueWave RS fiber has much lower residual dispersion than other NZDFs, which is critical for next generation optical cross-connect (OXC) based networks, such as optical transport network (OTN), and for supporting a migration to 40 Gb/s data rates.



Uniform and Optimum Performance With A Low Dispersion Slope

The chromatic dispersion of all fibers changes with wavelength, with the rate of change expressed as dispersion slope. The smaller the dispersion slope, the less dispersion changes with wavelength. For high speed, multi-channel DWDM networks, a lower dispersion slope enables more uniform and optimum performance across the entire wavelength band. Another advantage to TrueWave RS fiber's low dispersion slope is around the phenomenon of Four Wave Mixing (FWM). Very low dispersion, which can happen at the lower end of the C-band in NZDFs with high dispersion slope, can result in FWM and degradation of multi-channel DWDM system performance. Because of its low dispersion slope, TrueWave RS fiber allows its minimum dispersion to be increased in this region to better suppress FWM, while keeping the fiber's maximum dispersion small enough for signals to travel over long distances with minimum need for costly dispersion compensation.

Clearly, minimizing dispersion compensation costs benefits the total system cost for metro express, regional, and long haul networks. See your OFS representative to hear about the latest system demonstrations that illustrate TrueWave RS fiber's capabilities.

Why choose TrueWave RS fibers for Metro Express, Regional, and Long Haul EDFA Amplified Networks?

TrueWave RS fiber's unique fiber design enables the total systems cost, including compensation, amplifiers, and possibly even lasers, to be significantly reduced relative to conventional single mode fiber and other NZDF fibers. Specifically, TrueWave RS fiber is unique amongst NZDFs providing both immediate first cost benefits, flexibility for low cost capacity upgrade, and capabilities for emerging networks.

BENEFITS NOW

· Longest uncompensated reach for metropolitan express and regional applications, eliminating dispersion compensation costs for metro networks and thus providing lowest first channel costs @ 10 Gb/s

- Lowering dispersion compensation and amplifier costs for EDFA amplified long haul networks

NETWORK FLEXIBILITY

· Lowest dispersion slope over both C-band and L-band wavelength windows to provide similar cost savings over entire C and L band channels.

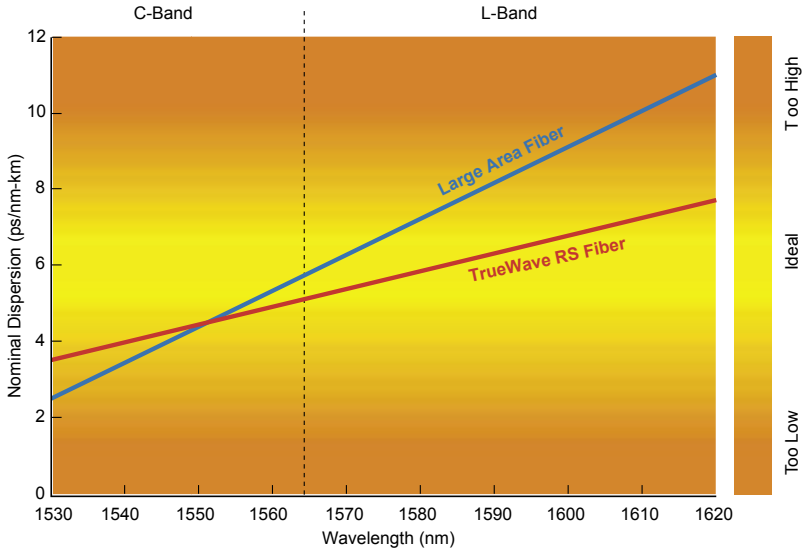
- 1310 nm channel capability

· Low bending induced loss at 1550 nm and at the more sensitive 1625 nm wavelength

EMERGING NEEDS

· Lowest residual dispersion, an important requirement for fiber of the next generation OXC-based optical network and future very high data rates, such as 40 Gb/s

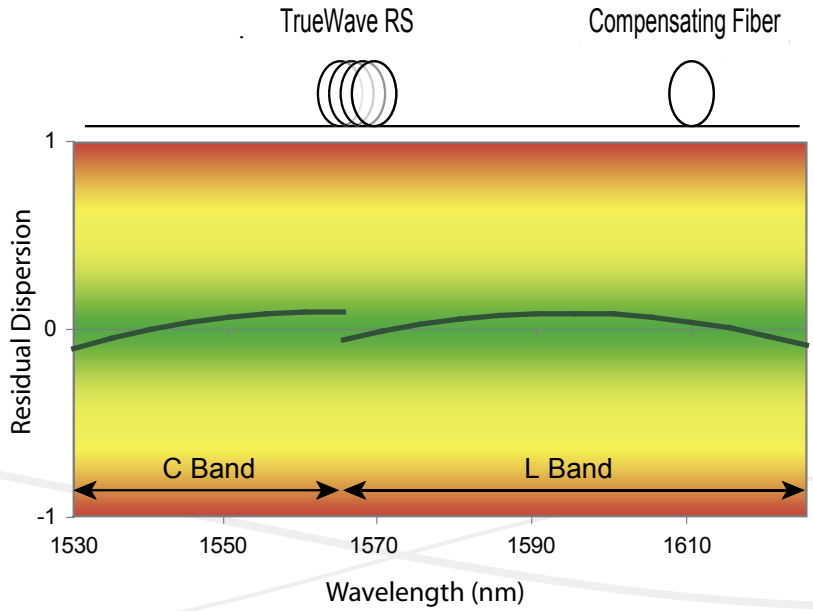
For optical networks, this means lowest system cost for both single channel and full WDM channel use. TrueWave RS fiber also enables minimum and more accurate dispersion compensation for high-speed (10 Gb/s, 40 Gb/s) metro and long haul applications. When planning today's networks, the fiber you choose should optimally operate with optical transmission technologies available today and tomorrow.



Lowest Residual Dispersion With TrueWave RS Fiber's Low Cost Dispersion Compensation

Residual dispersion is the dispersion that remains after transmission over a length of fiber, either with or without dispersion compensation. While it is relatively easy to compensate the accumulated dispersion of a single channel, it is more difficult to compensate the dispersion across the full band of channels in a DWDM system. In a transparent optical network, the residual dispersion will accumulate from one node to the next. Lower residual dispersion minimizes the accumulation of dispersion in an OXC network, thereby enabling larger transparent networks with lower total system costs.

The low dispersion slope of TrueWave RS fiber enables better and lower cost dispersion compensation for high-speed regional and metro express networks. OFS is also a leader in dispersion compensation technology. Using OFS' commercial dispersion compensation modules, the residual dispersion of TrueWave RS fiber can be as low as 0.1 ps/nm/km in both the C- and L-bands, which gives longer reach, larger transparent networks and lower system costs.



Reduce Signal Interference With TrueWave RS Fiber

The moderate dispersion of TrueWave RS fiber suppresses non-linear crosstalk related to FWM by providing a controlled amount of chromatic dispersion throughout the C- and L-bands. This level of dispersion effectively destroys the phase matching between the various wavelengths, thereby virtually eliminating FWM interference in DWDM systems. TrueWave RS does this while keeping dispersion small enough to ensure minimum required compensation in metro express, regional, and long haul networks.

Low System PMD

OFS was the first to adopt specifications for Polarization Mode Dispersion (PMD) in single-mode fibers, a critical parameter for high performance optical systems. Manufactured using a patented fiber drawing process, TrueWave RS fibers meet stringent PMD specifications both in fiber and cabled form.

OFS recognizes that PMD values depend on the geometrical and mechanical condition of the fiber. OFS continues to lead the industry in the understanding and minimization of PMD to ensure that today's fiber will excel in tomorrow's network.

Reduce System Cost With TrueWave RS Fiber

Conventional G.652.B single-mode fiber (SMF) was designed to minimize loss and maximize bandwidth in 1310 nm systems. SMF's high chromatic dispersion at 1550 nm (approximately 17 ps/nm/km) requires costly dispersion compensation when data rates are above 2.5 Gb/s. Since dispersion compensation fiber normally introduces more loss, PMD and cost into a system, it is desired to keep dispersion compensation to its minimum.

TrueWave RS fiber keeps dispersion compensation to a minimum compared with SMF and other NZDFs. NZDFs having large effective areas tend to have large dispersion slopes. For regional and metro DWDM systems, this large dispersion slope necessitates the use of complex dispersion compensation schemes. The wavelength band is typically split into several sub-bands, each of which is individually compensated. TrueWave RS fiber eliminates the need for this complexity, thus reducing total system cost.

TrueWave RS fiber uses a special refractive index profile in the core, surrounded by synthetic silica cladding layers having different refractive indices, to achieve low attenuation and nonzero-dispersion in the C- and L-bands. With its lowest dispersion slope in the industry, lowest residual dispersion, moderate dispersion in C- and L-bands optimized for high data rate DWDM systems, and low cable PMD, TrueWave RS fiber is ideal for metro express, regional, and long haul high-speed optical networks.

Transmission Characteristics:

Attenuation:

Maximum noncabled fiber attenuation coefficient (loss):

@1550 nm ≤ 0.22 dB/km
@ 1625 nm ≤ 0.24 dB/km

Attenuation vs. Wavelength:

The maximum attenuation in the range from 1525 to 1575 nm is no more than 0.02 dB/km greater than the attenuation at 1550 nm.

The maximum attenuation in the range from 1550 to 1625 nm is no more than 0.05 dB/km greater than the attenuation at 1550 nm.

Macrobending Attenuation:

The maximum attenuation with bending does not exceed the specified values under the following deployment conditions:

Deployment Condition	Wavelength	Induced Attenuation
1 turn, 32 mm (1.2 inch) diameter	1550 nm	≤ 0.50 dB
	1625 nm	≤ 0.50 dB
100 turns, 60 mm (2.4 inch) diameter	1550 nm	≤ 0.05 dB
	1625 nm	≤ 0.05 dB

Point Discontinuities:

There are no point attenuation discontinuities greater than 0.05 dB at 1550 nm.

Chromatic Dispersion:	
C-band: 1530 to 1565 nm	2.6 to 6.0 ps/nm-km
L-band: 1565 to 1625 nm	4.0 to 8.9 ps/nm-km
Dispersion Slope at 1550 nm	≤0.05 ps/nm^2 -km

Mode Field Diameter:	
at 1550 nm	8.4 ± 0.6 µm

Fiber Polarization Mode Dispersion at 1550 nm[1]	
PMD Link Design Value (LDV)[2]	≤0.04 ps/$\sqrt{km}$
max. individual fiber	≤0.1 ps/$\sqrt{km}$

[1] PMD value may change when cabled. Check with your cable manufacturer for specific PMD limits in cabled form.

[2] The PMD Link Design Value complies with IEC 60794-3 Ed.3.0, Method 1, March 31, 2000 (n=24, Q=0.1%). Details are described in IEC 61282-3 TR Ed.1.0, October 27, 2000.

Mechanical Characteristics:

Proof Test Level:	0.7 Gpa (100 kpsi)*
Dynamic Tensile Strength:	
The median tensile strength of unaged samples with a 0.5 meter gauge length is:	≥ 3.8 Gpa (550 kpsi)
Coating Strip Force:	
The force to mechanically strip the dual coating is:	≥ 1.3 N (0.3 lbf.) and < 8.9 N (2.0 lbf.)
Pullout Force (Adhesion of Coating to Glass Surface):	
The pullout force is:	> 6.2 N (1.4 lbf.) and < 22.2 N (4.9 lbf.)
Fiber Curl:	≥ 4 m

Fiber Shipping Spool Mechanical Specifications:

	A (for lengths ≤ 30 km)	B (for lengths > 30 km)
Flange diameter	23.50 cm (9.25 in)	26.49 cm (10.43 in)
Barrel Diameter	15.24 cm (6.00 in)	16.99 cm (6.69 in)
Traverse Width	11.94 cm (4.70 in)	15.01 cm (5.91 in)
Weight	0.51 kg (1.36 lbs)	0.89 kg (1.95 lbs)

* Higher proof test levels are available upon request.

Geometrical Characteristics:

Glass Geometry:	
Cladding Diameter	125.0 ± 0.7 µm
Core/Clad Concentricity Error	≤ 0.5 µm
Cladding Non-circularity	≤ 0.7%
Coating Geometry:	
Coating Diameter (uncolored)	245 ± 5 µm
Coating/Cladding Concentricity Error	≤ 10 µm
Length:	
Standard as well as customer specific lengths are available up to 50.4 km	

Environmental Characteristics:

Operating Temperature	-60º C to +85º C
Temperature Dependence of Attenuation	
Induced attenuation at 1310, 1550 & 1625 nm at -60º C to +85º C :	≤0.05 dB/km
Temperature — Humidity Cycling	
Induced attenuation at 1310, 1550 & 1625 nm at -10º C to +85º C and 95% relative humidity:	≤0.05 dB/km
Water Immersion, 23º C	
Induced attenuation at 1310, 1550 & 1625 nm due to water immersion at 23 ± 2º C :	≤0.05 dB/km
Accelerated Aging (Temperature), 85º C	
Induced attenuation at 1310, 1550 & 1625 nm due to temperature aging at 85 ± 2º C :	≤0.05 dB/km
Retention of Coating Color	
OFS coated fiber shows no discernible change in color when aged for: • 30 days at 95º C and 95% relative humidity • 20 days in dry 125º C heat	

Other Performance Characteristics:

Attenuation Coefficient at 1383 nm	< 0.4 dB/km (typical)
Attenuation Coefficient at 1310 nm	< 0.4 dB/km (typical)
Chromatic Dispersion at 1310 nm	-8 ps/nm-km (typical)
Cable Cutoff Wavelength	< 1260 nm
Effective Group Index of Refraction	
1310 nm	1.471
1550 nm	1.470
1625 nm	1.470
Typical Dispersion Slope at 1550 nm	0.046 (ps/nm^2 -km)
Rayleigh Backscattering Coefficient (for 1 µs pulse width)	
1310 nm	-45.4 dB
1550 nm	-49.8 dB
1625 nm	-51.1 dB
Dynamic Fatigue Parameter (N_d)	> 20
Weight per unit length	64 grams/km
Typical Cabled Polarization Mode Dispersion[1, 2]	≤0.02 ps/$\sqrt{km}$

[1] PMD value may change when cabled. Check with your cable manufacturer for specific PMD limits in cabled form.

[2] Low Mode Coupled Measurement

For additional information please contact your sales representative. You can also visit our website at http://www.ofsoptics.com or call 1-888-fiberhelp. For regional assistance

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