Uninet MULTIMODE FIBER CORE

Part NO. HBGIMM50

Cable Description

HiBand GIMM Fiber Core

Uninet HiBand GIMM fiber is designed specifically for high speed local area network (LAN) such as Gigabit or higher speeds Ethernet. With the extremely refined refractive index profile owing to the optimized PCVD process. Uninet HiBand GIMM fiber eliminates the differential mode delay (DMD) phenomenon observed on the conventional GIMM fibers in Gigabit applications. Thus, there is no need for expensive (DMD) compensation. HiBand fibers satisfy the use at 850 nm and 1300 nm. The maximum link distances (up to 2000 m) for Gigabit Ethernet system are the longest distances available in the world. Two types of HiBand fibers are available: 50/125 µm 62.5/125 µm

Application

The outstanding optical performance of HiBand fibers makes it suitable for applications including not only high speed LAN but also lower bit-rate systems such as FDDI. Ethernet, ATM, etc. The link distance of HiBand fiber is well above 2000 m for lower bit-rate systems. Awide variety of light sources can be used in combination with HiBand fibers, such as LEDs, 850 nm VCSELs, 780 nm CD lasers and 1300 nm Fabry-Perot lasers. HiBand fiber is applicable in all cable types including ribbon cable, loose tube stranded cable. Slotted core cable, unitube cable and tight-buffer cable.

Process and Coating

Uninet fibers are manufactured using the advanced Plasma Activated Chemical Vapor Deposition (PCVD) process. Because of the inherent advantages of the process, Uninet fibers show extremely refined refractive index (RI) profile control, excellent geometrical performance, low attenuation, etc. The optical fiber is coated with a double layer UV curable acryl ate, type DLPC9, which gives the fiber a good protection. Designed for more stringent tight-buffer cable application, the fiber also performs perfectly in loose buffer constructions and demonstrates a high resistance to micro-bending. The coating offers an excellent stable coating strip force over a wide range of environmental conditions and the coating stripping leaves no residues on the bare glass fiber. Ribbon tests show excellent performance in 60°c water soak tests, exceeding 100 days. The DLPC9 coated optical fibers show high and stable values for dynamic stress corrosion susceptibility parameter (nd), Which offers a greatly improved applicability to the fiber when used in harsh environments.

Cable Characteristic

- Designed for use at 850 nm and 1300 nm
- Suited to applications in Gigabit Ethernet and higher bit-rate systems
- No need to use expensive (DMD) compensation in Gigabit Ethernet
- Enabling the longest link distances compared with congener Products
- DLPC9 coating offering good protection and excellent strip force stability

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Cable Norms

Uninet HiBand fiber complies with or exceeds ITU Recommendation G.651 and IEC793-2 type A1b Optical Fiber Specification.

Common Solution to (DMD)

For Gigabit Ethernet Standard, a solution must be found to (DMD) effects. For 1300 nm application, a solution was found by using a special mode-conditioning patch cord. Using this patch cord. The laser source is coupled with a single-mode fiber which is offset spliced to the center of a GIMM fiber (about 17-23 µm for 62.5/125 µm fiber). In this case, the launch power of modes with different delay in the center of GIMM fibers is greatly reduced. However, the solution will not only induce attenuation but also increase the cost of the system due to the expensive module. Are there any more economic and more efficient solutions? HiBand fiber, the achievement of the strenuous efforts of research staff, is just the answer.

Fiber Core Performance

Characteristics	**Conditions**	**Specified Values**			**Units**
Optical characteristics		**50µm**	**62.5µm**	**50µm & 62.5µm**	
Attenuation	850 nm 1300 nm	≤2.5 ≤0.7	≤3.0 ≤0.7		[dB/km] [dB/km]
Fiber capacity	Gigabit Ethernet Standard 50 µm Standard62.5µm HiBand 50 µm HiBand 62.5 µm	SX(850nm) 550 275 750 500	LX(1300nm) 550 550 2000 1000		 [m] [m] [m] [m]
Numerical Aperture (NA)	850 nm	0.20±0.015	0.200±0.015		
Group index of refraction(Typical)	1300 nm	1.482 1.477	1.496 1.491		
Backscatter characteristics 1300 nm					
Step (mean of bidirectional measurement)				≤0.10	[dB]
Irregularities over fiber length and point discontinuity				≤0.10	[dB]
Difference backscatter coefficient (bidirectional measurement)		≤0.8	≤0.10		[dB/km]
Geometrical characteristics					
Core diameter		50±2.5	52.5± 2.	5	[µm]
Cladding diameter				125.0±1.0	[µm]
Cladding non-circularity				≤1.0	[%]
Coating diameter				242±7	[µm]
Coating/cladding concentricity error				≤12.0	[µm]
Coating non-circularity				≤6.0	[%]
Core/cladding concentricity error				≤1.5	[µm]
Delivery length		Standard delivery length up to 8.8 km/reel			

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Table Content Continued:

Environmental characteristics	850 nm, 1300 nm			
Temperature dependence Induced attenuation	-60°c to +85°c		≤0.10	[dB/km]
Temperature-humidity cycling Induced attenuation	-10°c to +85°c, 90% R.H.		≤0.20	[dB/km]
Damp heat dependence Induced attenuation	85°c, 85% R.H., 30 days		≤0.20	[dB/km]
Water soak dependence Induced attenuation	20°c for 30 days		≤0.20	[dB/km]
Mechanical characteristics				
Proof test	off line		≥9.0 ≥1.0 ≥100	[N] [%] [KPSI]
Bending Dependence Induced Attenuation	850 nm, 1300 nm 100 turns, 75 mm diameter		≤0.50	[dB]
Coating strip force	typical average force peak force	≥1.3 ≥1.3	1.7 ≤8.9	[N]
Dynamic stress corrosion susceptibility parameter (nd, Typical)			≥27	[N]

The Better Solution to (DMD)

Fibers made with PCVD process possess the highest profile accuracy. Typically, several thousands of layers are deposited in the core region. By comparison, other fiber processes deposit only hundreds of core layers. Thus, PCVD process can produce ideal profile. To enhance the fiber quality in the laser-based Gigabit or higher speeds systems. Uninet is introducing a new class of high performance PCVD GIMM fibers: HiBand fibers.

In the eary 1980s, a patented etching process was developed for the PCVD process to remove the central dip in the core profile.

This enables GIMM fibers to obtain high bandwidth. Thanks to the absence of central core distortion. HiBand fibers do not require the use of expensive mode-conditioning patch cords. This money-saving feature has been confirmed in a series of comprehensive system tests.

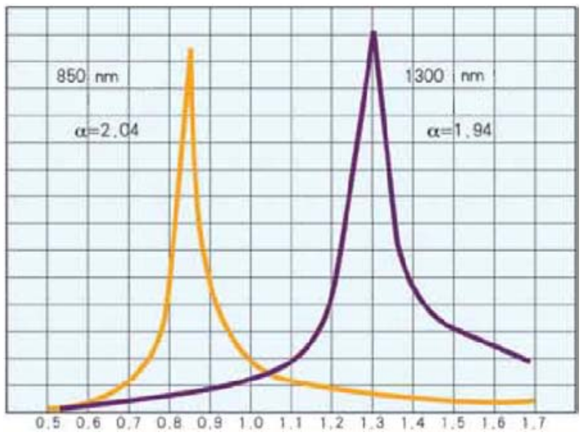

Fig. 3. Example for optimization at 850nm & 1300nm

Furthermore, in order to satisfy various demands, HiBand quality is available in 50/125 μm and 62.5/125 μm diameter fibers. The 50/125 μm type includes a dual window (850 nm and 1300 nm) optimized version. Fig.3. shows two wavelength optimization and 1300 nm optimization.

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Differential Mode Delay (DMD)

During the development of Gigabit Ethernet. Experts observed strong differential mode delay (DMD) effects in a small number of GIMM fibers.
Fig. 1 illustrates a distorted pulse where a portion of the detected power from certain mode groups arrives with additional delay, causing a plateau in the output pulse which scales with the fiber length. Such a pulse distortion introduces a high bit-error-rate (BER).

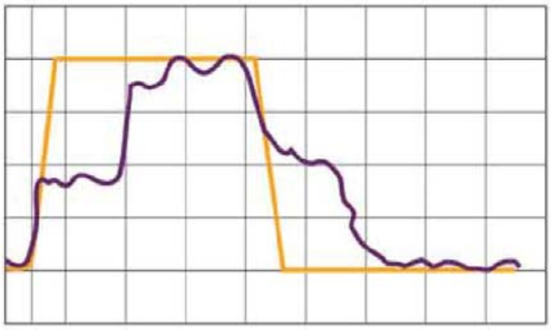

Fig. 1. Example of distorted pulse due to (DMD)

Investigation showed that these fibers exhibit distortions in the central part of the core refractive index profile, and so deviate from the ideal profile. These distortions may originate in certain fiber production processes or under certain uncontrolled process conditions.
Some refractive index profile examples of non-PCVD fibers are shown in Fig.2. Local profile distortions may cause (DMD) for some modes when launched. An extraordinary accurate graded-index profile is needed in order to match the delay time of all launched modes in high speed systems.

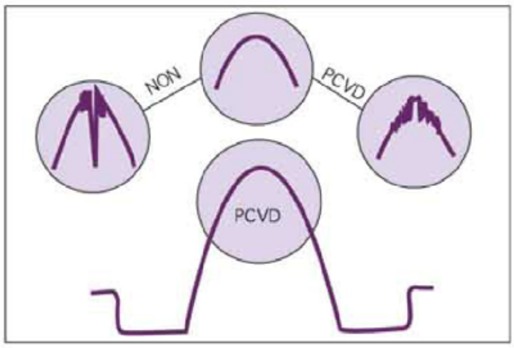

Fig. 2. Typical refractive index profile of PCVD GIMM fiber and some example of non-PCVD fiber central core profile distortions (dip/ flat top/peak)

Link Distance Instead of Bandwidth

HiBand fibers are not defined in terms of bandwidth but in terms of link distance for Gigabit Ethernet applications. This is because he traditional bandwidth does not entirely describe the fiber behavior under laser launch conditions. The Gigabit Ethernet link distances of HiBand fiber are the longest reported in the industry.

Future Upgradeability

Demonstrated by tests. HiBand fibers not only suit Gigabit system but also can transmit over hundreds of meters at 2.5 Gb/s or higher speeds Thereby. HiBand fibers facilitate users to upgrade systems in economic and operational way.