Glossary of Fiber Optic Terms

A

Absorption: Attenuation in optical fiber as a result of the conversion of optical power to heat (caused by impurities in the fiber).

APC: Abbreviation for Angled Physical Contact. A type of connector with an angled endface designed to minimize backreflection.

Armor: A protective coating around (or integrated into) a fiber optic cable

Attenuation: The decrease in signal strength between two points in a fiber optic waveguide, usually expressed in dB.

Attenuator (as relates to optical networks): A passive device designed to reduce signal strength while minimally distorting the waveform.

B

Backreflection (BR): The scattering of light back towards the source, usually caused by a significant difference in index of refraction between two entities (such as air/glass at a connector interface).

Bandwidth: The range of frequencies within which a fiber can transmit data.

Bend Loss: Attenuation caused by bending a fiber beyond its' minimum recommended bend radius (see macrobending, microbending).

Bend Radius: The minimum radius an optic fiber or cable can bend before attenuation reaches an excessive level (specified by fiber or cable manufacturer).

Bidirectional: Operating in both directions (bidirectional couplers operate similarly regardless of the direction of the signal).

Buffer: Material used as a protective coating around optical fiber (material may vary with flame rating, expected use, etc.)

C

C: Abbreviation for Celcius.

Cable (fiber optic): One or more optical fibers enclosed, typically with strength member, in a protective jacket.

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Cable Assembly (fiber optic): A cable that is terminated on both ends with connectors.

Cable Plant (fiber optic): All of the components between the transmitter and the receiver.

Chromatic Dispersion: A reduction in the bandwidth of a fiber caused by different wavelengths of light traveling at different speeds through the fiber.

Cladding: The material that surrounds the core material in an optical fiber. The cladding has a lower index of refraction than that of the core causing the light beam to reflect and travel into the core.

Cleave: A process by which the fiber is nicked to produce a controlled fracture of the glass, resulting in a clean, flat, smooth end that is nearly perpendicular to the fiber axis.

CWDM (Coarse Wavelength-division Multiplexing): Stacking 8 or fewer channels within the 1550nm region of optical fiber.

Coating: The material surrounding the cladding of an optical fiber, protecting it from damage.

Concatenation: Connecting multiple pieces of fiber.

Concentricity (optical fiber): The measurement of the offset between the center of the core and the center of the cladding.

Concentricity (fiber optic connector): The measurement of the offset between the center of the connector ferrule and the center of the connector hole in the ferrule.

Connector (fiber optic): A mechanical device that allows for connection and disconnection between two fibers (or fiber and source or fiber and detector).

Core: The portion of the fiber that transmits light. The core has a higher index of refraction than the cladding.

Coupler: An optical device that combines or splits power between optical fibers.

D

dB (Decibel): A unit of measurement of relative power on a logarithmic scale.

dBm: Abbreviation to decibel relative to milliwatt.

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Dense Wavelength Division Multiplexing (DWDM): The transmission of many closely spaced wavelengths in the 1550nm region over a single fiber.

Detector (fiber optic): The opto-electric device that converts an optical signal into electrical current.

Diameter mismatch loss: Attenuation caused by mating two optical fibers having different core diameters, when the light is propagated from the large core into the small core.

Dielectric: A substance which does not conduct or transmit electrical current (in fiber optics, this usually refers to cable with no metallic materials).

Dispersion: The spreading of a light signal in an optical fiber caused by light signals traveling at different speeds through the fiber, due to either modal or chromatic effects.

Dispersion-shifted Fiber (DSF): A type of singlemode fiber designed to have zero dispersion near 1550nm.

Dual-window fiber: Fiber optimized to operate at more than one wavelength (typical multimode at 850nm and 1300nm and singlemode at 1310nm and 1550nm).

Duplex Cable: A cable with two fibers, typically designed for interface between transmission equipment and cable plant (transmit/receive).

E

ESCON: Abbreviation for Enterprise Systems Connection, an optical connector used for computer to computer data exchange (antiquated).

Ethernet: Protocol (according to IEEE 802.3) for a 10Mb/s baseband local area network (LAN) bus using carrier sense multiple access with collision detection as the access method. Ethernet is a standard for using various transmission media.

Excess Loss: Term for expressing the portion of light signal that does not emerge from the cumulative ports of a fiber optic coupler.

Extrinsic Loss: The loss in a fiber optic system that is not intrinsic to the fiber itself.

F

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F: Abbreviation for Fahrenheit.

FC: A type of threaded fiber optic connector. FC/PC refers to an FC connector with a PC polish, FC/APC refers to an FC connector with an APC polish.

FDDI: Abbreviation for Fiber Distributed Data Interface. A connector used in a dual counter-rotating ring local area network.

Ferrule: The part of a connector that aligns and works as a terminus for the fiber.

FTTC (Fiber to the Curb): Term for fiber optic service to a node connected by coax to a group of nearby homes.

FTTH (Fiber to the Home): Term for fiber optic service to a node located in a home.

FOTP (Fiber Optic Test Procedure): Standards for testing fiber optic systems, developed by the Electronic Industries Association (EIA).

Fresnel Reflection: Reflection loss at the end of a fiber caused by the difference in the index of refraction between glass and air (maximum reflection loss at a perpendicular air-glass interface is about -14dB).

Fusion Splicer: An instrument that permanently bonds two fibers by heating the ends and stuffing them together.

G

G: Abbreviation for giga or one billion

Ge: Abbreviation for germanium, usually found in detectors.

GHz: Abbreviation for gigahertz, or one billion cycles per second.

Graded Index Fiber: A type of multimode optical fiber in which the refractive index of the core is in the form of a parabolic curve, decreasing toward the cladding.

H

Hertz: One cycle per second.

Hybrid Fiber Coax (HFC): A cable construction that includes both optical fiber and copper components as transmission media.

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HFC Network: A telecommunications network consisting of both fiber optic and copper components, as in FTTC.

I

IEEE: Abbreviation for Institute of Electrical and Electronics Engineers. A professional association that contributes to voluntary standards within these industries.

Index of Refraction: The ratio of the velocity of light in free space to the velocity of light in a fiber.

InGaAsP: Abbreviation for Indium Gallium Arsenide Phosphide. Used in high performance detectors.

Insertion Loss: Loss resulting from inserting a component (connector, splice, etc.) into a fiber path.

Interferometer: An instrument used to measure the endface geometry of a fiber optic connector for critical parameters including apex offset, radius of curvature, and fiber height.

Intrinsic Loss: Loss in spliced fibers due to differences in the fibers being spliced.

J

Jacket: The protective outer covering of a cable.

Jumper: A fiber optic cable assembly with connectors on both ends.

K

Kevlar®: A strong, lightweight material used as a strength member, developed by Dupont.

kHz: One thousand cycles per second.

km: abbreviation for kilometer, or one thousand meters (1km=3280 ft)

L

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LAN (Local Area Network): A communication network between two or more points within a relatively small geographic area (as opposed to a WAN).

Large Core Fiber: Generally any fiber with a core of 200 micron or greater.

Loose Tube: A type of cable where the fiber is contained in a subunit inside the cable jacket.

Loss: The amount of signal power that is lost in connectors, splices, fiber, and external influences (bend, etc.), expressed in dB.

Loss Budget: The overall attenuation in a system.

M

m: Abbreviation for meter. 1m=39.37”

M: Abbreviation for mega, or one million.

mA: Abbreviation for milliamp, or one thousandth of an Amp.

Macrobend(ing): All macroscopic bending of a fiber from a straight line which cause light to leak out from the fiber, causing attenuation.

MAN (Metropolitan Area Network): A network larger than that of a LAN, a series of local area networks (LANs) covering a metropolitan area.

Mass Splicing: Splicing of many fibers (typically in ribbon fiber format).

Mechanical Splice: A fiber splice whereby two optical fibers are butted together and held via mechanical means (typically the use of index matching gel is used to minimize reflections).

MHz: Abbreviation for megahertz. One million Hertz (cycles per second).

Microbending: Mechanical stress on a fiber causing attenuation.

Micrometer: One millionth of a meter (abbreviation: µm).

Microsecond: One millionth of a second (abbreviation: µs).

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Minimum Bend Radius: The smallest radius about which an optical fiber (or cable) can bend before an increase in attenuation occurs (usually specified by the manufacturer).

mm: Abbreviation for millimeter (one thousandth of a meter).

MM: abbreviation for multimode.

Mode: An electromagnetic wave traveling in a fiber.

Mode Field Diameter: A measure of the distribution of optical power intensity across the end face of a singlemode fiber.

Mode Filter: A device that removes higher-order modes from an optical fiber (used mostly in testing).

Mode Stripper: A device that remove modes traveling in the cladding.

ms: Abbreviation for milliseconds (one thousandth of a second).

Multimode (MM) Fiber: An optical fiber that has a core large enough to propagate more than one mode of light.

N

n: Abbreviation for nano (one billionth).

nm: Abbreviation for nanometer (one billionth of a meter).

ns: Abbreviation for nanosecond (one billionth of a second).

Numerical Aperture (NA): The light-gathering ability of a fiber. The maximum acceptance angle (measured to the fiber axis). Also the spread of light from the end of a fiber.

nW: Abbreviation for nanowatt (one billionth of a Watt).

O

O/E: Abbreviation for optical to electrical converter. A device used to convert optical signals to electrical signals.

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OEM: Abbreviation for original equipment manufacturer. A company that manufactures product for another company (private label).

Optical Fiber: A glass or plastic fiber that has the ability to act as a waveguide for light.

Optical Link Loss Budget: The maximum allowable loss in a fiber optic link before system performance degrades. The budget is mostly determined by the output power of the transmitter.

Optical Power Meter (OPM): An instrument used to measure optical power at the end of a fiber.

Optical Return Loss (ORL): The ratio of optical power reflected from a component back towards the light source relative to the incident power (expressed in dB).

Optical Time Domain Reflectometer (OTDR): An instrument used to measure loss and reflections in a fiber link.

P

p: Abbreviation for pico (one trillionth).

pA: Abbreviation for picoamp (one trillionth of an Amp).

PC: Abbreviation for physical contact, typically refers to a type of connector and polish that allows fiber ends to come in contact, reducing backreflection and insertion loss.

Pigtail: A length of fiber (bare, buffered, or cabled) with a connector on only one end. The other end may be bare or attached to a source, detector, etc.

Planar Waveguide: A waveguide fabricated in a dielectric material.

PLC: Abbreviation for planar lightwave circuit. A device incorporating a planar waveguide.

Plenum: Air handling space under floors, in walls, and above drop ceilings where appropriately rated cables may be run.

Plenum cable (UL type OFNP): A cable whose smoke and flammability characteristics meet certain criteria allowing it to be run in plenum areas.

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PON: Abbreviation for passive optical network. A network that brings optical fiber cabling and signals all or most of the way to the end user.

Preform: A glass rod with specific attributes from which optical fiber is drawn.

R

Radiation-hardened Fiber: A type of optical fiber made with materials designed to recover most of their initial properties (attenuation coefficient) after a period of time after exposure to radiation.

Rayleigh Scattering: The scattering of light caused by particles with dimensions much smaller than the wavelength of the of the light. In optical fiber this is caused by minute imperfections along the fiber.

Receiver: Terminology to describe a piece of equipment that contains a detector and converts light signals to electrical signals.

Return Loss: See Optical Return Loss.

Ribbon Cable: A cable in which many fibers (typically 6, 12, or 24) are arranged in a flat, parallel manner and encapsulated in a binding material, forming a flat ribbon like cable.

S

s: Abbreviation for second.

SAN (Storage Area Network): A high speed subnetwork of shared storage devices, connected in a way so that all storage devices are available to all servers on a WAN or LAN.

SC: A push-pull optical connector (Subscription Channel connector).

Sheath: The outer protective layer of the fiber cable (the jacket).

Si: Abbreviation for silicon, sometimes used in multimode detectors for 850nm.

Simplex: Single (as in simplex fiber, simplex connector).

Single-mode (SM) Fiber (SMF): A type of optical fiber through which only a single mode will propagate.

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SMA: A type of threaded optical connector that was used in early optical networks. Used more for large core fibers today, it is considered poor for optical networks due to high losses and lack of repeatability.

Splice: The joining of two optical fibers to make a continuous waveguide, may be permanent (as in fusion splices) or temporary (as in mechanical splices).

Split Ratio: The ratio of power distribution in an optical coupler.

ST: Bayonet style optical connector originally developed by AT&T and still popular today.

Step-index Fiber: A type of optical fiber characterized by a uniform refractive index within the core of the fiber and a sharp decrease in refractive index in the cladding of the fiber.

Strength Member: Elements added to a fiber optic cable to add tensile strength (may include aramid yarn, fiberglass filaments, and/or steel members).

T

T: Abbreviation for tera (one trillion).

Throughput Loss: The ratio of power at the throughput port of a fiber optic coupler to the input port.

Throughput Port: The output port in a fiber optic coupler where the power output is greatest (where the split ratio is not equal).

Tight-Buffer: Material surrounding and protecting an optical fiber.

Total Internal Reflection: Occurs when light traveling in an optical fiber strikes the core/cladding interface at an angle greater than the critical angle.

Transmitter: A device that converts electrical signals to optical signals.

U

UL: Abbreviation for Underwriter's Laboratory, an organization that tests products for safety.

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Unidirectional: Operating in one direction.

V

V: Abbreviation for Volt.

W

W: Abbreviation for Watt.

WAN: Abbreviation for Wide Area Network. A computer network that covers a broad area, the internet is a type of WAN.

Waveguide: A dielectric material whereby the structure has a central higher index of refraction and an outer lower index of refraction, guiding waves by the principle of total internal reflection.

Wavelength-Division Multiplexing (WDM): Utilizing a single fiber to send several signals, each with a different wavelength.

Wideband: Having large bandwidth.

Z

Zipcord: Two cables conjoined in their jackets which may be easily divided along part or all of their lengths by pulling them apart.

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