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SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

Digital sections and digital line system – Optical line systems for local and access networks

10-Gigabit-capable passive optical network (XG-PON) systems: Definitions, abbreviations, and acronyms

Recommendation ITU-T G.987

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Recommendation ITU-T G.987

10-Gigabit-capable passive optical network (XG-PON) systems: Definitions, abbreviations, and acronyms

Summary

Recommendation ITU-T G.987 contains the common definitions, acronyms, abbreviations, and conventions of the ITU-T G.987-series of Recommendations.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T G.987	2010-01-29	15

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

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10-Gigabit-capable passive optical network (XG-PON) systems: Definitions, abbreviations, and acronyms

1 Scope

This Recommendation contains the common definitions, acronyms, abbreviations, and conventions of the ITU-T G.987-series of Recommendations.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T G.902] Recommendation ITU-T G.902 (1995), *Framework Recommendation on functional access networks (AN) – Architecture and functions, access types, management and service node aspects*.

[ITU-T G-Sup.39] ITU-T G-series of Recommendations – Supplement 39 (2008), *Optical system design and engineering considerations.*

[ITU-T I.112] Recommendation ITU-T I.112 (1993), *Vocabulary of terms for ISDNs.*

[MEF 6.1] MEF Technical Specification MEF 6.1 (2008), *Ethernet Services Definitions – Phase 2.*

[DSLF TR-101] Broadband Forum (formerly, DSL Forum) Technical Report TR-101 (2006), *Migration to Ethernet-Based DSL aggregation*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 access network (AN) [ITU-T G.902]: An implementation comprising those entities (such as cable plant, transmission facilities, etc.) which provide the required transport bearer capabilities for the provision of telecommunications services between a service node interface (SNI) and each of the associated user-network interfaces (UNI).

3.1.2 service node (SN) [ITU-T G.902]: A network element that provides access to various switched and/or permanent telecommunication services.

3.1.3 service node interface (SNI) [ITU-T G.902]: An interface which provides customer access to a service node.

3.1.4 user-network interface (UNI) [ITU-T I.112]: The interface between the terminal equipment and a network termination at which interface the access protocols apply.

3.1.5 Ethernet LAN service (E-LAN) [MEF 6.1]: An Ethernet service type that is based on a multipoint-to-multipoint Ethernet virtual connection.

3.1.6 Ethernet line service (E-Line) [MEF 6.1]: An Ethernet service type that is based on a point-to-point Ethernet virtual connection.

3.1.7 Ethernet tree service (E-Tree) [MEF 6.1]: An Ethernet service type that is based on a rooted-multipoint Ethernet virtual connection.

3.1.8 Ethernet virtual connection (EVC) [MEF 6.1]: An association of UNIs to which the exchange of service frames is limited.

3.1.9 1:1 VLAN [DSLF TR-101]: A VLAN forwarding paradigm involving a one-to-one mapping between user port and VLAN. The uniqueness of the mapping is maintained in the access node and across the aggregation network.

3.1.10 N:1 VLAN [DSLF TR-101]: A VLAN forwarding paradigm involving many-to-one mapping between user ports and VLAN. The user ports may be located in the same or different access nodes.

3.2 Optical access architecture terms

This Recommendation defines the following terms:

3.2.1 optical access network (OAN): A part of an access network whose network elements are interconnected by optical communication channels.

NOTE – An OAN may or may not extend all the way to the UNI, so that the user-side interface of the OAN does not necessarily coincide with the UNIs of the AN.

3.2.2 optical distribution network (ODN): A point-to-multipoint optical fibre infrastructure. A simple ODN is entirely passive and is represented by a single-rooted point-to-multipoint tree of optical fibres with splitters, combiners, filters, and possibly other passive optical components. A composite ODN consists of two or more passive segments interconnected by active devices, each of the segments being either an optical trunk line segment or an optical distribution segment. A passive optical distribution segment is a simple ODN itself. Two ODNs with distinct roots can share a common subtree.

3.2.3 optical distribution segment (ODS): A simple ODN (optical distribution network), that is, a point-to-multipoint optical fibre infrastructure that is entirely passive and is represented by a single-rooted tree of optical fibres with splitters, combiners, filters, and possibly other passive optical components.

3.2.4 optical line termination (OLT): A network element in an ODN (optical distribution network)-based optical access network that terminates the root of at least one ODN and provides an OAN SNI (optical access network service node interface).

3.2.5 optical network terminal (ONT): An ONU supporting a single subscriber.

3.2.6 optical network unit (ONU): A network element in an ODN (optical distribution network)-based optical access network that terminates a leaf of the ODN and provides an OAN (optical access network) user-side interface.

3.2.7 optical trunk line (OTL): A passive point-to-point segment of a composite ODN.

3.2.8 passive optical network (PON) system: A combination of network elements in an ODN-based optical access network that includes an OLT (optical line termination) and multiple ONUs and implements a particular coordinated suite of physical medium dependent layer, transmission convergence layer, and management protocols.

3.2.9 gigabit passive optical network (G-PON): A PON system supporting transmission rates in excess of 1.0 Gbit/s in at least one direction, and implementing the suite of protocols specified in the ITU-T G.984-series of Recommendations.

3.2.10 10-Gigabit passive optical network (XG-PON): A PON system supporting nominal transmission rates on the order of 10 Gbit/s in at least one direction, and implementing the suite of protocols specified in the ITU-T G.987-series of Recommendations. XG-PON is a subclass of NG-PON1.

3.2.11 next generation PON (NG-PON): In the context of ITU-T standards development activity, a generic term referencing the PON (passive optical network) system evolution beyond G-PON. The concept of NG-PON currently includes NG-PON1, where the ODN (optical distribution network) is maintained from B-PON and G-PON, and NG-PON2, where a redefinition of the ODN is allowed from that defined in B-PON and G-PON.

3.2.12 XG-PON1: A variant of XG-PON system that operates at a nominal line rate of 10 Gbit/s downstream and 2.5 Gbit/s upstream.

3.2.13 XG-PON2: A variant of XG-PON system that operates at a nominal line rate of 10 Gbit/s downstream and upstream.

3.3 Optical parameters, power and loss budgets

3.3.1 attenuation: The total relative optical power loss of an optical signal propagating through the ODN. Attenuation is caused by absorption and scattering of light in the fibre (caused by fibre impurities and imperfections, fluctuations of the refractive index, material dispersion), as well as connectors, splices, splitters, wavelength couplers, attenuators and other passive optical components.

3.3.2 differential fibre distance: The absolute difference between the fibre distances of two particular ONUs connected to the same OLT PON interface.

3.3.3 dispersion: A physical phenomenon comprising the dependence of the phase or group velocity of a light wave in the medium on its propagation characteristics such as optical frequency (wavelength) or polarization mode.

3.3.4 dynamic range: An optical receiver characteristic that represents the difference between the worst-case sensitivity (i.e., maximum over the operating conditions) and the worst-case overload (i.e., minimum over the operating conditions), and is usually expressed as a ratio of the former to the latter.

3.3.5 extinction ratio: With respect to a digital signal generated by an optical source (laser diode), the ratio of the two optical power levels corresponding to the high and low intensities of light emission.

3.3.6 fibre distance: The overall length of fibre (and, if applicable, equivalent fibre runs representing delay-inducing components) between the R/S and S/R reference points.

3.3.7 mean optical launch power: An optical transmitter characteristic expressing the average optical power of an optical signal transmitted into the fibre and carrying a given digital sequence. When specified as a range, the minimum mean launch power provides the power level that the transmitter should guarantee at all times, and the maximum mean launch power provides the power level that the transmitter should never exceed.

3.3.8 nominal line rate: The total number of bits that can be physically transferred per unit of time over a communication link. Nominal line rate accounts for useful data as well as for all possible protocol overheads and necessarily exceeds the effective data rate on any given protocol level.

3.3.9 optical path penalty (OPP): The apparent reduction of receiver sensitivity due to distortion of the signal waveform during its transmission over the optical path. The optical path penalty accounts for total degradations including the effects of reflections, intersymbol interference, mode partition noise, and laser chirp.

3.3.10 optical return loss (ORL): The total reflection at the source reference point of the optical signal propagation path associated with both the discrete reflections at the refractive index discontinuities and distributed backscattering, such as Rayleigh scattering, along the path. Optical return loss is measured as a ratio of the transmitted power to the reflected power.

3.3.11 overload: A receiver parameter that characterizes the maximum value of the average received optical power to achieve the BER at or below the specified reference level.

3.3.12 reflectance: The reflection from any single discrete reflection point in the optical signal propagation path, which is defined to be the ratio of the reflected optical power present at a point, to the optical power incident to that point.

3.3.13 sensitivity: A receiver parameter that characterizes the minimum value of the average received optical power to achieve the BER at or below the specified reference level.

3.3.14 tolerance to reflected power: The admissible ratio of the average optical input power incident at the receiver to the average reflected power regarded as a noise.

3.4 Transmission convergence layer terms

3.4.1 activation: A set of distributed procedures executed by the OLT (optical line termination) and the ONUs (optical network units) that allows an inactive ONU to join or resume operations on the PON. The activation process includes three phases: parameter learning, serial number acquisition, and ranging.

3.4.2 bandwidth allocation: An upstream transmission opportunity granted by the OLT (optical line termination) for a specified time interval to a specified traffic-bearing entity within an ONU (optical network unit).

3.4.3 dynamic bandwidth assignment (DBA): A process by which the OLT (optical line termination) distributes upstream PON capacity between the traffic-bearing entities within ONUs (optical network units), based on dynamic indication of their activity and their configured traffic contracts.

3.4.4 embedded OAM: An operation and management channel between the OLT (optical line termination) and the ONUs (optical network units) that utilizes the structured overhead fields of the downstream XGTC frame and upstream XGTC burst and supports time-sensitive functions.

3.4.5 equalization delay (EqD): The requisite delay assigned by the OLT (optical line termination) to an individual ONU (optical network unit) in order to ensure that the ONU's transmissions are precisely aligned on a common OLT-based upstream frame reference. ONU's equalization delay is assigned as a result of ranging and is subject to in-service updates in the course of the burst arrival phase monitoring.

3.4.6 ONU management and control interface (OMCI): An operation and management channel between the OLT (optical line termination) and an ONU (optical network unit) that is message-based and employs extendable management information base.

3.4.7 XG-PON encapsulation method (XGEM): A data frame transport scheme used in XG-PON systems that is connection-oriented and that supports fragmentation of user data frames into variable sized transmission fragments.

3.4.8 XG-PON transmission convergence (XGTC) layer: A protocol layer of the XG-PON protocol suite that is positioned between the physical media dependent (PMD) layer and the XG-PON clients. The XGTC layer is composed of the XGTC service adaptation sublayer, the XGTC framing sublayer, and the XGTC PHY adaptation sublayer.

3.4.9 XGEM port: An abstraction in the XGTC service adaptation sublayer representing a logical connection associated with a specific client packet flow.

3.4.10 XGTC PHY adaptation sublayer: A sublayer of the XG-PON transmission convergence layer that supports the functions forward error correction (FEC) and line coding.

3.4.11 XGTC service adaptation sublayer: A sublayer of the XG-PON transmission convergence layer that supports the functions of SDU (user data and OMCI traffic) fragmentation and reassembly, XGEM encapsulation, XGEM frame delineation, and XGEM port-ID filtering.

3.4.12 XGTC framing sublayer: A sublayer of the XG-PON transmission convergence layer that supports the functions of XGTC frame/burst encapsulation and delineation, embedded OAM processing, and Alloc-ID filtering.

3.4.13 physical layer OAM (PLOAM): An operation and management channel between the OLT and the ONUs that is close to real time and is based on a fixed set of messages.

3.4.14 pre-assigned delay (PrD): The common requisite delay that all ONUs (optical network units) on the PON are required to use prior to completion of the ranging phase of the activation process.

3.4.15 quiet window: A time interval during which the OLT (optical line termination) suppresses all bandwidth allocations to the in-service ONUs (optical network units) in order to avoid collisions between their upstream transmissions and the transmissions from the ONUs whose burst arrival time is uncertain. The OLT opens a quiet window to allow new ONUs to join the PON and to perform ranging of specific ONUs.

3.4.16 ranging: A procedure of measuring the logical distance between the OLT (optical line termination) and any of its subtending ONUs (optical network units) with the objective to determine and assign the appropriate equalization delay, which is necessary to align the ONU's upstream transmissions on a common OLT-based upstream frame reference. Ranging is performed during the ONU activation and may be performed while the ONU is in service.

3.4.17 requisite delay: A general term denoting the total extra delay the OLT (optical line termination) may require an ONU (optical network unit) to apply to the upstream transmission beyond the ONU's regular response time. The purpose of requisite delay is to compensate for variation of propagation and processing delays of individual ONUs, and to avoid or reduce the probability of collisions between upstream transmissions.

3.4.18 status reporting DBA (SR-DBA): A method of dynamic bandwidth assignment that infers the dynamic activity status of the traffic-bearing entities within ONUs (optical network units) based on explicit buffer occupancy reports communicated over the embedded OAM channel.

3.4.19 traffic-monitoring DBA (TM-DBA): A method of dynamic bandwidth assignment that infers the dynamic activity status of the traffic-bearing entities within ONUs based on observation of idle GEM (G-PON encapsulation method) frame transmissions during granted upstream bandwidth allocations.

3.4.20 transmission container (**T-CONT)**: A traffic-bearing object within an ONU (optical network unit) that represents a group of logical connections, is managed via the ONU management and control channel (OMCC), and is treated as a single entity for the purpose of upstream bandwidth assignment on the PON (passive optical network).

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations:

AES	Advanced Encryption Standard
AIS	Alarm Indication Signal
AN	Access Network
ANI	Access Node Interface

ATA	Analogue Telephony Adaptor (VoIP)
ATM	Asynchronous Transfer Mode
BER	Bit-Error Ratio
BES	Block Errored Second
BITS	Building Integrated Timing Source
B-PON	Broadband Passive Optical Network
CAS	Channel Associated Signalling
CBS	Committed Block Size
CBU	Cell-site Backhauling Unit (ONU type)
CES	Circuit Emulation Service
CID	Consecutive Identical Digits
CIR	Committed Information Rate
CLEI	Common Language Equipment Identification
CO	Central Office
CPE	Customer Premises Equipment
CRC	Cyclic Redundancy Check
CSS	Controlled Slip Second
DBA	Dynamic Bandwidth Assignment
DFB	Distributed Feedback (laser type)
DEI	Discard Eligibility Indicator (bit)
DHCP	Dynamic Host Configuration Protocol
DSL	Digital Subscriber Line
DWDM	Dense Wavelength Division Multiplexing
E-LAN	Ethernet LAN service
E-Line	Ethernet Line service
E-Tree	Ethernet Tree service
EDFA	Erbium-Doped Fibre Amplifier
EMS	Element Management System
ES	Errored Second (-L: -line, -P: path, -FE: far-end)
EVC	Ethernet Virtual Connection
ER	Extinction Ratio
FEC	Forward Error Correction
FCAPS	Fault, Configuration, Accounting, Performance, Security management
FFS	For further Study
FTTCell	Fibre To The Cell site base stations
FTTx	Fibre To The x (B – building, business; H – home; C – cabinet, curb)
GEM	G-PON Encapsulation Method
G-PON	Gigabit Passive Optical Network
GTC	G-PON Transmission Convergence

HOL	Head Of Line (queuing)
HPNA	Home Phoneline Networking Alliance
IANA	Internet Assigned Numbers Authority
ICMP	Internet Control Message Protocol
ID	Identifier
IGMP	Internet Group Management Protocol
IP	Internet Protocol
IPTV	Internet Protocol TV
LAN	Local Area Network
LOS	Loss Of Signal
LSB	Least Significant Bit (not to be used when the meaning is least significant byte)
LT	Line Termination
MAC	Medium Access Control
MD	Maintenance Domain [b-IEEE 802.1ag]
MDU	Multi Dwelling Unit (ONU type)
ME	Managed Entity
MEF	Metro Ethernet Forum
MEP	Maintenance association Endpoint [b-IEEE 802.1ag]
MIB	Management Information Base
MIP	Maintenance domain Intermediate Point [b-IEEE 802.1ag]
MLD	Multicast Listener Discovery (protocol)
MLM	Multi-Longitudinal Mode (laser type)
MLT	Mechanized Loop Testing
MP	Maintenance Point [b-IEEE 802.1ag]
MoCA	Multimedia over Coax Alliance
MSB	Most Significant Bit (not to be used when the meaning is most significant byte)
MTU	Maximum Transmission Unit
NAT	Network Address Translation
NGN	Next Generation Network
NMS	Network Management System
NRZ	Non-Return-to-Zero
NT	Network Termination
NTP	Network Timing Protocol
OA	Optical Amplifier
OAN	Optical Access Network
ODF	Optical Distribution Frame
ODN	Optical Distribution Network
ODS	Optical Distribution Segment
OEO	Optical-Electronic-Optical

OLT	Optical Line Termination
OMCC	ONU Management and Control Channel
OMCI	ONU Management and Control Interface
ONT	Optical Network Terminal
ONU	Optical Network Unit
OPEX	Operational Expenditure
OPP	Optical Path Penalty
ORL	Optical Return Loss
OSS	Operations Support System
OTDR	Optical Time-Domain Reflectometer
OTL	Optical Trunk Line
PBS	Peak Block Size
PDU	Protocol Data Unit
PHY	Physical interface
PIR	Peak Information Rate
PLOAM	Physical Layer Operations, Administration and Maintenance
PM	Performance Monitoring
PMD	Physical Medium Dependent
PON	Passive Optical Network
POTS	Plain Old Telephone Service
PPPoE	Point-to-Point Protocol over Ethernet
PSN	Packet Switched Network
QoS	Quality of Service
R/S	Reference point at the interface of the ONU to the ODN
R'/S'	Reference point at the interface of the reach extender to the OTL
RDI	Remote Defect Indication
RE	Reach Extender
RF	Radio Frequency
RG	Residential Gateway
RMS	Root Mean Square
RSOA	Reflective Semiconductor Optical Amplifier
RTC	Real Time Clock (protocol)
RTCP	RTP Control Protocol
RTP	Real-time Transport Protocol
Rx	Receiver
S/R	Reference point at the interface of the OLT to the ODN
S'/R'	Reference point at the interface of reach extender to ODN
SBU	Small Business Unit (ONU type)
SCTE	Society of Cable Television Engineers

SD	Signal Degrade
SES	Severely Errored Second (-L: -line, -P: path, -FE: far-end)
SF	Signal Fail
SFU	Single Family Unit (ONU type)
SIP	Session Initiation Protocol
SLM	Single Longitudinal Mode (laser type)
SN	Service Node
SNI	Service Node Interface
SNMP	Simple Network Management Protocol
SNR	Signal to Noise Ratio
SOA	Semiconductor Optical Amplifier
TBD	To be defined
TC	Transmission Convergence
T-CONT	Transmission Container
TCP	Transmission Control Protocol
TDM	Time Division Multiplexing
TE	Terminal Equipment
TLS	Transparent LAN Service
Tx	Transmitter
UAS	Unavailable Seconds (-L: -line, -P: path, -FE: far-end)
UDP	User Datagram Protocol
UNI	User Network Interface
VBES	VLAN-based Business Ethernet Services
VDSL	Very high speed Digital Subscriber Line
VID	VLAN Identifier
VLAN	Virtual Local Area Network
VoIP	Voice over IP
VPN	Virtual Private Network
V-Rx	Video Receiver
VRP	Video Return Path
V-Tx	Video Transmitter
VBES	Ethernet VLAN for Business Ethernet Services
WBF	Wavelength Blocking Filter
WDM	Wavelength Division Multiplexing
WDM1	Wavelength Division Multiplexor 1 (coexistence device)
WDM1r	Wavelength Division Multiplexor 1 revised (coexistence device)
WDM1rn	Wavelength Division Multiplexor 1 revised – narrow-band (coexistence device)
WFQ	Weighted Fair Queuing
WRR	Weighted Round Robin

X/S Crosstalk-to-Signal ratio

XGEM XG-PON Encapsulation Method

XG-PON 10-Gigabit Passive Optical Network, ITU-T G.987-series of Recommendations

5 Conventions

5.1 Optical access concepts

This Recommendation adopts the basic definition of access network (AN) provided by [ITU-T G.902] and formalizes the definition of optical distribution network, deriving the key PON-related definitions based on these two concepts. An example of an access network architecture satisfying the ITU-T G.987 definition system is shown in Figure 5-1.

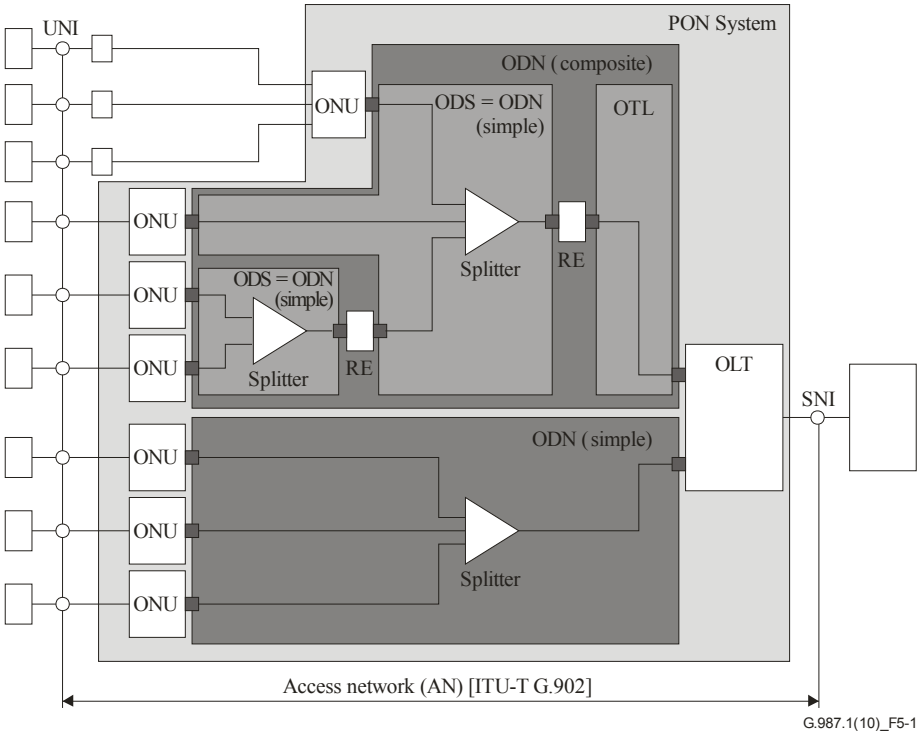

Figure 5-1 – Reference access network architecture

5.2 Power and loss budget parameters

The relationships between power and loss budget parameters are captured in Figure 5-2.

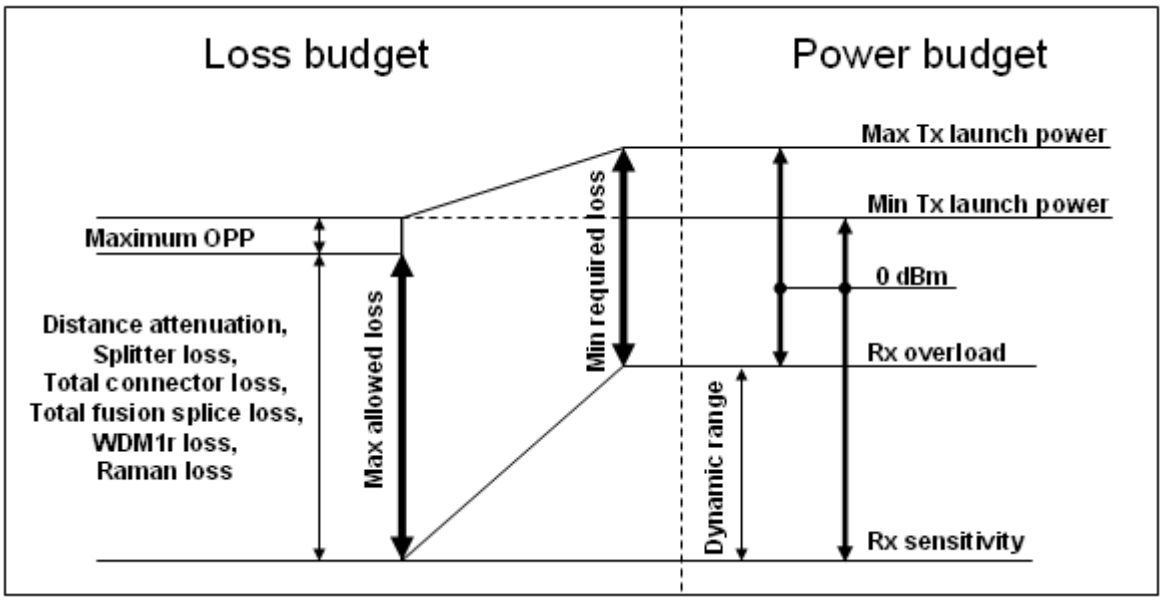

Figure 5-2 – Relationship between the power and loss budget parameters

The details of the dynamic range concept definition are illustrated in Figure 5-3. The receiver sensitivity and overload are defined, respectively, as the minimum and maximum average received optical power under which the BER at the receiver output remains at or below the specified reference level. The observed values of receiver sensitivity and overload may vary as the operating conditions change. The operation conditions that impact receiver sensitivity and overload may include the transmitter extinction ratio, connector degradations, effects of aging, etc. In definition of the dynamic range, both receiver sensitivity and receiver overload are represented by their respective worst-case values, i.e., maximum sensitivity and minimum overload over the range of operating conditions.

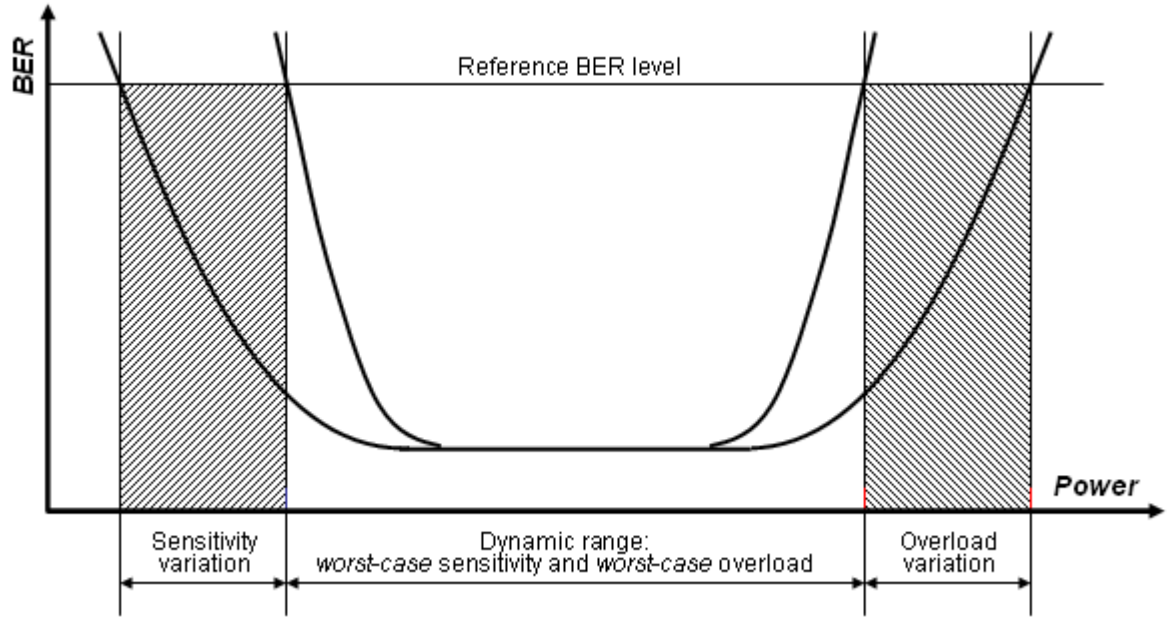

Figure 5-3 – Rx output BER as a function of received optical power and the definition of dynamic range

5.3 Sensitivity and overload in the presence of FEC

To simplify the optical component verification, [b-ITU-T G.987.2] specifies the sensitivity and overload at the high reference BER level corresponding to the Rx output and the FEC decoder input. It is assumed that the FEC algorithms specified, respectively, for the continuous mode downstream and burst mode upstream transmission are sufficiently strong to ensure the BER not worse than 10^{-12} at the FEC decoder output. See [ITU-T G-Sup.39] for further discussion.

5.4 Reach and distance

The ITU-T G.987-series of Recommendations addresses the reach parameters of XG-PON using the single concept of fibre distance. An ONU is characterized by its fibre distance, and for each pair of ONUs on the same OLT PON interface the differential fibre distance is the difference between the two individual fibre distances. Each specific PMD layer parameter set contains a provision to support a specific maximum fibre distance. The XG-PON TC layer specification contains a provision for a system to support the specific ranges of maximum fibre distance and maximum differential fibre distance, as well as a provision to maintain configurability of the supported maximum fibre distance and maximum differential fibre distance within the specified range. It is expected that for each XG-PON deployment, the configured TC layer maximum fibre distance will match the maximum fibre distance supported by the selected PMD layer parameter set.

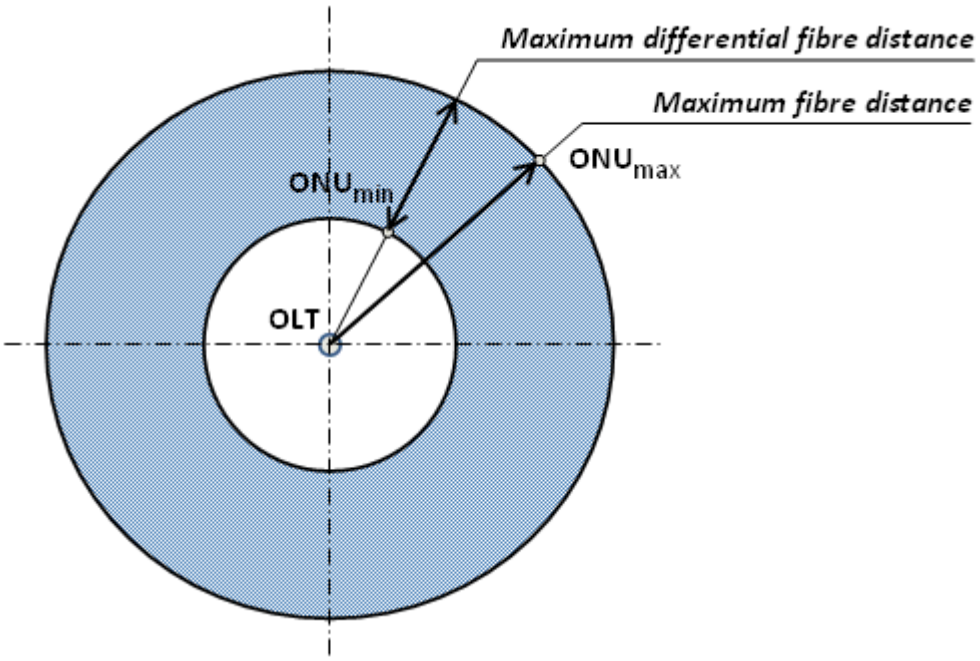

Figure 5-4 – Fibre distance concepts

The physical reach system parameter of the ITU-T G.984 series corresponds to the maximum fibre distance supported by the system PMD layer. The logical reach system parameter of the ITU-T G.984 series corresponds to the maximum fibre distance supported by the system TC layer.

5.5 Usage of the term PON

Historically, the term PON was introduced to describe a point-to-multipoint fibre infrastructure composed of exclusively passive optical components. This strict-sense usage was soon naturally extended to include a fibre-in-the-loop communication system employing such an infrastructure and using time-division multiplexing to share the available digital bandwidth among many subscribers (TDM PON). As new types of PON-based systems were introduced, leveraging various TDM transport mechanisms (ATM-PON, B-PON, EPON) or alternative multi-access methods

(WDM-PON), it became common to use the word PON with appropriate qualification in reference to the specific architectural variations. While the term remained overloaded, referring in different contexts to a network, a system, architecture or technology, all the referenced entities shared a common attribute of containing, using or relying upon a fibre infrastructure with no active (electronic) components between the central office interface and the user equipment interface. Most recently, introduction of active reach extenders within the optical distribution network in [b-ITU-T G.984.6] created a paradoxical situation when an infrastructural component of a G-PON system may not be entirely passive, that is, nominally, no longer a PON. Thus it became apparent that the excessive overloading of what was once meant to be a precise term may adversely impact the clarity and perspicuity of technical presentation.

This present series of Recommendations deliberately restricts the usage of the term PON to the contexts where it denotes a system, that is, a combination of network elements including at least one OLT and multiple ONUs interconnected by an ODN that implements a particular coordinated suite of physical medium dependent layer, transmission convergence layer, and management protocols. It also strives to provide a consistent, unambiguous, and extensible definition system that allows to support efficient communication on the subject.

5.6 Usage of the term ODN

In the ITU-T G.983 B-PON and pre-ITU-T G.984.6 G-PON series of Recommendations, the term optical distribution network (ODN) refers to a passive point-to-multipoint distribution means extending from the user-facing interface of the OLT to the network-facing interfaces of the ONUs. The introduction of active reach extenders and the concept of dual homing call for a revision of the term's scope and usage, as in the prospect being strictly passive, comes into a contradiction with extending between OLT and ONUs.

This present series of Recommendations endorses a generalized usage of the term ODN to denote a point-to-multipoint fibre infrastructure, which is not required to be entirely passive. In the contexts where the internal structure of the ODN is not a concern, it is the ODN that interconnects the OLT and the ONUs to form a PON system. In the contexts where the internal structure of the ODN is relevant, two types of ODN can be distinguished. A simple ODN is entirely passive and is represented by a single-rooted point-to-multipoint tree of optical fibres with splitters, combiners, filters, and possibly other passive optical components. A composite ODN consists of two or more segments interconnected by active devices, each of the segments being either an optical trunk line segment or an optical distribution segment. A passive optical distribution segment is a simple ODN in itself. The definition allows two ODNs with distinct roots to share a common subtree, thus supporting the notions of dual homing and protection within the definition system.

5.7 Usage of the terms ONU and ONT

Throughout the ITU-T G.987-series of Recommendations, the network element interfacing the end-user access facilities and the ODN is referred to as an ONU, or an optical network unit, irrespective of the number and type of user interfaces or the depth of fibre deployment. Historically, the term ONT, or optical network terminal/termination, has been used either interchangeably with ONU or with the particular semantics of "an ONU that is used for FTTH and includes the user port function" (ITU-T G.983.1), or "a single-subscriber ONU" (ITU-T G.984 series). This Recommendation follows the latter approach in defining ONT. Note, however, that while this definition captures one established trade interpretation of the term, the concept itself is not used as a part of the ITU-T G.987 reference access architecture. Outside of the ITU-T G.987 series scope, alternative interpretations may apply and, therefore, the reader is advised to clarify the exact meaning of the term in each specific context.

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