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Digital sections and digital line system – Optical fibre submarine cable systems

Definition of terms relevant to optical fibre submarine cable systems

ITU-T Recommendation G.972

(Formerly CCITT Recommendation)

ITU-T G-SERIES RECOMMENDATIONS

TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

INTERNATIONAL TELEPHONE CONNECTIONS AND CIRCUITS	G.100–G.199
GENERAL CHARACTERISTICS COMMON TO ALL ANALOGUE CARRIER-TRANSMISSION SYSTEMS	G.200–G.299
INDIVIDUAL CHARACTERISTICS OF INTERNATIONAL CARRIER TELEPHONE SYSTEMS ON METALLIC LINES	G.300–G.399
GENERAL CHARACTERISTICS OF INTERNATIONAL CARRIER TELEPHONE SYSTEMS ON RADIO-RELAY OR SATELLITE LINKS AND INTERCONNECTION WITH METALLIC LINES	G.400–G.449
COORDINATION OF RADIOTELEPHONY AND LINE TELEPHONY	G.450–G.499
TESTING EQUIPMENTS	G.500–G.599
TRANSMISSION MEDIA CHARACTERISTICS	G.600–G.699
DIGITAL TERMINAL EQUIPMENTS	G.700–G.799
DIGITAL NETWORKS	G.800–G.899
DIGITAL SECTIONS AND DIGITAL LINE SYSTEM	G.900–G.999
General	G.900–G.909
Parameters for optical fibre cable systems	G.910–G.919
Digital sections at hierarchical bit rates based on a bit rate of 2048 kbit/s	G.920–G.929
Digital line transmission systems on cable at non-hierarchical bit rates	G.930–G.939
Digital line systems provided by FDM transmission bearers	G.940–G.949
Digital line systems	G.950–G.959
Digital section and digital transmission systems for customer access to ISDN	G.960–G.969
Optical fibre submarine cable systems	**G.970–G.979**
Optical line systems for local and access networks	G.980–G.989
Access networks	G.990–G.999

For further details, please refer to the list of ITU-T Recommendations.

ITU-T Recommendation G.972

Definition of terms relevant to optical fibre submarine cable systems

Summary

The purpose of this Recommendation is to provide definitions of terms relevant to optical fibre submarine cable systems. This Recommendation was firstly issued in 1993 and revised in 1997, and 2000. Amendments have been made taking into account the establishment of new Recommendations relevant to these systems.

Source

ITU-T Recommendation G.972 was revised by ITU-T Study Group 15 (1997-2000) and approved by the World Telecommunication Standardization Assembly (Montreal, 27 September – 6 October 2000).

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. 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.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

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CONTENTS

ITU-T Recommendation G.972

Definition of terms relevant to optical fibre submarine cable systems

1 Scope

The purpose of this Recommendation is to provide definitions of terms relevant to optical fibre submarine cable systems.

A small number of terms defined in this Recommendation are associated with definitions in ITU-T G.601 [1], ITU-T G.602 [2] and ITU-T G.701 [3]. Reference to these definitions are given in parenthesis as an aid to ensure consistency between the different Recommendations in the event of future amendments.

Figure 1/G.971 [4] shows the basic concept of optical fibre submarine cable systems and boundaries. Optical submarine repeaters or optical submarine branching units could be included, depending on each system requirement.

In Figure 1/G.971 [4], A denotes the system interfaces at the terminal station (where the system can be interfaced to terrestrial digital links or to other submarine cable systems), and B denotes beach joints or landing points. Letters in brackets in the definitions of this Recommendation refer to the above figure.

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; all 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.

[1] ITU-T G.601 (1988), *Terminology for cables*.

[2] ITU-T G.602 (1988), *Reliability and availability of analogue cable transmission systems and associated equipments*.

[3] ITU-T G.701 (1993), *Vocabulary of digital transmission and multiplexing, and pulse code modulation (PCM) terms*.

[4] ITU-T G.971 (2000), *General features of optical fibre submarine cable systems*.

[5] ITU-T G.976 (1997), *Test methods applicable to optical fibre submarine cable systems.*

3 Terms and definitions

This Recommendation defines the following terms:

3.1 Terms relevant to elements of system configuration

1001 Optical fibre submarine cable system

A set of equipment designed to permit the interconnection of two or more terminal stations.

The optical fibre submarine cable system is usually composed of terminal equipment (Terminal Transmission Equipment, Power Feeding Equipment, Maintenance Controller, etc.), and submersible equipment [Cable, Repeater(s), Branching Unit(s), etc.].

1002 Optical fibre submarine cable link

A link which interconnects two terminal stations using a single optical fibre submarine cable system or an integrated system using system portions supplied by different suppliers.

1003 Optical fibre submarine cable network

A network which interconnects three or more terminal stations using a single optical fibre submarine cable system or an integrated system made of system portions supplied by different suppliers.

1004 Land portion

The portion between the system interface in the terminal station (A), and the beach joint or landing point (B) when it exists. It includes the optical fibre land cable, land joints, and the system terminal equipment.

1005 Submarine portion

The portion of the system laying on the seabed, between the beach joints or landing points (B), which includes the optical fibre submarine cable and the submarine equipment [e.g. optical submarine repeater(s), optical submarine branching unit(s), and optical submarine cable jointing box(es)].

1006 Beach joint

The cable joint made between the optical fibre submarine cable and the optical fibre land cable.

1007 Terminal station

The telecommunication station usually located in the vicinity of the landing point and housing the optical fibre submarine cable system terminal equipment and that of associated terrestrial systems.

1008 Terminal station equipment (TSE)

The TSE comprises the STE and the ancillary equipment used for the operation of the optical fibre submarine cable system.

1009 System terminal equipment (STE)

The STE comprises all equipments specific to a given optical fibre submarine cable system.

1010 Terminal transmission equipment (TTE)

The equipment terminating the optical submarine transmission line at the optical interface, and connected to the system interface.

1011 Supervisory system

The whole of equipment and subassemblies commonly providing one or more of the following functions:

– monitoring the performance of the submarine equipment and subassemblies;
– monitoring the performance of the system terminal equipment;
– monitoring the end-to-end performance of the digital line sections;
– enabling fault location inside the submarine plant, to within one repeater section, where possible;
– controlling redundancy switching, if provided inside the submarine portion;
– providing interfaces to other management facilities.

1012 Maintenance controller

A computer with an interface to the supervision and remote maintenance equipment, which is commonly used during the supervision and remote maintenance activity.

1013 Power feeding equipment (PFE)

The equipment providing, through a power conductor in the optical fibre submarine cable, a stabilized constant electrical current for powering optical submarine repeaters and/or optical submarine branching units.

1014 Cable terminating equipment (CTE)

The equipment providing the interface between the optical fibre from the TTE and the optical fibre cable, and the interface between the power feeding line from the PFE and the power feeding conductor from the optical fibre cable.

NOTE – The CTE is usually part of the PFE.

1015 Power feed earth

The earth provided to establish the return path of the repeater power feeding current circuit.

1016 Power feed earth electrode cable

The cable installed between the power feed earth and the PFE.

1017 Optical fibre station cable

The optical fibre cable installed inside the cable station.

1018 Optical fibre land cable

The optical fibre cable installed between the CTE and the beach joint.

1019 Optical fibre submarine cable

The submarine cable using optical fibres as transmission line.

1020 Optical submarine repeater

(Related to definition 1001 provided in ITU-T G.601 [1].)

An equipment essentially including one or more regenerators or amplifiers and associated devices, in the submarine portion.

1021 Bipolar repeater

An optical submarine repeater which can be powered by a power feeding current flowing in either direction.

1022 Branching unit (BU)

An equipment connecting more than two optical fibre submarine cable sections.

NOTE – Applications for the optical submarine branching may include the following additional functions:

- optical signal path switching;
- signal regeneration or amplification;
- power path switching.

1023 Undersea branching multiplexer (UBM)

A branching unit that separates lower level digital signals from incoming optical line signals and recombines them differently in outgoing optical line signals.

1024 Integration specification

A set of specification established to permit the interconnection of two or more optical fibre submarine cable systems designed by different suppliers.

1025 Integration line optical interface

The optical interface between fractions of the submarine cable sections provided by different suppliers.

1026 Shallow water

Water depths down to a given limit, corresponding to the depths of fishing activity, or more generally of marine activity, creating a risk of cable fault.

NOTE – The limit of shallow water is of the order of 1000 metres.

1027 Deep water

Water depths exceeding the limit of shallow water.

1028 Elementary cable section

The whole length of optical fibre cable between two pieces of equipment (repeaters, branching units or terminal transmission equipment).

1029 Repeatered submarine cable

An electrically powered underwater optical fibre cable, designed for repeatered applications, and suitable for shallow and deep water use, which has been extensively tested to show it can be installed and repaired *in situ*, even in worst weather conditions, without any impairment of optical, electrical or mechanical performance or reliability.

NOTE – For appropriate test methods, please refer to ITU-T G.976 [5].

1030 Repeaterless submarine cable

An underwater optical fibre cable, designed for unrepeatered applications, and suitable for shallow and deep water use, which has been extensively tested to show it can be installed and repaired *in situ*, even in worst weather conditions, without any impairment of optical, electrical or mechanical performance or reliability.

NOTE 1 – For appropriate test methods, please refer to ITU-T G.976 [5].

NOTE 2 – The term "repeaterless" is also known as "unrepeatered" or "non-repeatered".

1031 Marinized terrestrial cable (MTC)

An underwater optical fibre cable construction, based on a conventional multi-fibre terrestrial cable core protected to withstand the marine environment, designed for unrepeatered applications and tested for use in non-aggressive shallow waters with varying repair capability.

NOTE 1 – Sometimes known in Europe as an "Underwater" cable.

NOTE 2 – Appropriate test methods are under study.

1032 Single wavelength systems (SWS)

A bidirectional optical system that carries on only one LOC.

1033 Wavelength division multiplexing (WDM)

An aggregate of several LOCs to be carried through part or the whole of submarine line on the same line fibre.

1034 Wavelength division multiplexing system (WDMS)

A bidirectional optical system that carries on several LOCs.

3.2 Terms relevant to system aspects

2001 System design life

The period of time over which the optical fibre submarine cable system is designed to operate in conformance with its performance specification.

2002 Optical power budget

The allocation of the available optical power in an optical section.

2003 Digital line section

(Related to definitions 3007 and 3012 provided in ITU-T G.701 [3].)

The whole of the means of transmission of a digital signal at a specified bit rate between the corresponding input and output system interfaces at the digital distribution frame or equivalent. A digital line section forms a part of a digital link and includes terminal equipment, repeaters and branching units. The definition normally applies to the combination of "go" and "return" directions of transmission.

NOTE – This definition differs from the definition of ITU-T G.701 [3] as the latter excludes multiplexers. In an optical fibre submarine cable system, a digital line section is meant to include optical submarine branching multiplexers, if any, and also terminal multiplexing equipment included in the Terminal Transmission Equipment (TTE) which may include multiplexing.

2004 Optical section

The whole of the optical path as physical transmission medium between the optical source output (point O) of one equipment and the optical detector input (point I) of the following equipment.

2005 Optical source output

The point where the launched power is measured (point O).

2006 Optical detector input

The point where the received optical power is measured (point I).

2007 Supervisory section

The fraction of the submarine portion extending from one specified point in a repeater to a similar point in the adjacent repeater which can be identified using the supervisory system for fault location.

2008 System interface

(Related to the definition 1008 provided in ITU-T G.701 [3].)

The point (A) on the specified equipment, such as the digital distribution frame, at which each digital line section terminates. The interfaces are usually designated as I_i, pertaining to the incoming tributaries, and I_o, pertaining to the outgoing tributaries.

2009 Optical interface

(Related to the definition 1008 provided in ITU-T G.701 [3].)

A common boundary between two associated parts of an optical section.

2010 Transmit terminal optical interface

The optical interface at the output port (point S) of a transmit terminal equipment.

2011 Receive terminal optical interface

The optical interface at the input port (point R) of a receive terminal equipment.

2012 Repeater (or BU) optical output interface

The optical interface at the output port (point S) of a repeater (or BU).

NOTE – The output port is usually at the splice between the repeater fibre and the cable fibre.

2013 Repeater (or BU) optical input interface

The optical interface at the input port (point R) of a repeater (or BU).

NOTE – The input port usually is at the splice between the repeater fibre and the cable fibre.

2014 Optical line signal

The optical signal transmitted on one optical fibre in the submarine portion.

2015 Line frame

(Related to the definition 4007 provided in ITU-T G.701 [3].)

A cyclic set of consecutive time slots in the optical line signal, in which the relative position of each time slot can be identified.

NOTE – The line frame results from the multiplexing and coding operations performed by the TTE, taking into account the inclusion of the service and supervisory channels.

2016 System interface bit rate

(Related to the definition 2013 provided in ITU-T G.701 [3].)

The number of bits (binary digits) per unit time in the digital signal at the system interface.

NOTE – Several interface bit rates may coexist for one single optical fibre submarine cable system.

2017 Line error ratio

The error ratio as could be observed using appropriate means at a given location in the submarine portion.

2018 Apparent line error ratio

The value of the line error ratio obtained using the supervisory equipment of the submarine optical fibre cable system.

2019 Electroding

The use of undersea equipment for the detection of a low frequency modulation of the power feeding current for cable location purposes.

2020 Power feeding current

The stabilized electric current provided by the PFE through the cable power conductor with return through the power feed earth.

2021 Line bit rate

(Related to the definition 2014 provided in ITU-T G.701 [3].)

The number of signal elements of the optical line signal per unit time.

NOTE – The line bit rate results from the multiplexing and coding operations performed by the TTE, taking into account the inclusion of the service and supervisory channel.

2022 Line code

(Related to the definition 9002 provided in ITU-T G.701 [3].)

A code chosen to suit the characteristics of the submarine portion, that defines the equivalence between sets of digits presented for transmission and the corresponding sequence of signal elements transmitted over that channel.

NOTE – The line code and violations of the line code can be used for system monitoring and supervisory.

2023 System performance penalty

A parameter included in the optical power budget to take into account phenomena such as chromatic dispersion, partition noise, etc.

2024 Cable section margin

A parameter included in the optical power budget, to take into account the variation of the fibre attenuation due to ageing during the system design life.

2025 Equipment margin

A parameter included in the optical power budget to take into account the variation of the optical power at both ends of a cable section due to equipment component ageing during the system design life.

2026 Repair allowance

A parameter included in the optical power budget to take into account the possible increase of attenuation of the cable fibre due to cable repair during the system design life.

2027 Unassigned margin

A parameter included in the power budget as a provision for unforeseen phenomena.

2028 Guaranteed margin

The minimum margin in the power budget.

2029 Overload margin

The minimum difference between the received power and the input power above which the bit error ratio would exceed a specified level.

2030 Expected ship repair number

The mean number of repairs by cable ship (statistical expectation) due to system failures during the system design life.

NOTE – This excludes faults due to external aggression.

2031 Reliability budget

A reliability model indicating the reliability of each of the components of the submarine portion to be met so as to keep the expected ship repair number below a given limit.

2032 Availability

(See the definitions provided in ITU-T G.602 [2].)

The ability of the system to be in a state to perform adequately at a given instant of time within a given time interval. The availability of an optical fibre submarine cable system is quantified by the ratio of the time during which the system is operating to a specified total time.

NOTE – System interruptions due to faults requiring ship repair are excluded for availability calculation.

2033 End-to-end performance monitoring

The evaluation of the end-to-end transmission quality performance of each digital line section in the submarine optical fibre cable transmission system.

2034 Supervisory of an optical fibre submarine cable system

The function provided by the supervisory system of the optical fibre submarine cable system so as to permit fault localization, repeater performance monitoring and remote controlled redundancy switching.

2035 Forward error correction (FEC)

A technique which consists in transmitting the data in an encoded form such that the redundancy added by the coding allows the decoding to detect and correct errors.

2036 FEC frame

In frame-structured coding algorithms, the cyclic set of consecutive time slots delivered by the FEC encoder which at a minimum contains a frame alignment word, the data at system interface (A) and the redundant information computed with the FEC algorithm.

2037 Q factor

A measurement of the quality of the received signal (see ITU-T G.976 [5]).

2038 Line optical channel (LOC)

A bidirectional optical data channel carried on a specific optical frequency/wavelength for each transmission direction.

2039 Submarine cable optical interface (SCOI)

The bidirectional optical interface between the submarine cable including the terrestrial cable section and the TTE.

2040 LOC-TTE

A TTE whose SCOI is composed of only one LOC.

2041 WDM-TTE

A TTE equipped with WM and WD, whose SCOI is a WDM.

2042 Submarine electro-optic interface (SEOI)

The bidirectional interface inside the TTE where an electro-optic conversion and an electrical generation are performed between a LOC and an electrical channel.

2043 Submarine digital line section (SDLS)

A bidirectional continuous optical path along which one LOC links two TTE at the SEOI level.

2044 Terrestrial interface (TI)

The interface between the submarine system and the terrestrial network.

2045 Intermediate terrestrial interface (ITI)

For further study.

2046 Dispersion map

For further study.

3.3 Terms relevant to terminal equipment

3001 Service channel

A communication channel established between associated terminal stations through the optical fibre submarine cable system for the purpose of operating and maintaining the system.

3002 Order wire channel

A voice service channel.

3003 PFE earth protection equipment

A protective device that automatically routes the power feeding current to the station earth under abnormal PFE earth conditions.

3004 PFE personnel protection equipment

Protective equipment installed to prevent personnel from gaining access to dangerous potentials.

3005 PFE mutual protection

The ability of a power feeding unit installed at one end of a link to provide in an emergency situation the whole of the power necessary for a given link, when in normal operating condition that total power is shared between the power feeding equipment installed at both ends of the link.

3006 PFE nominal current

The nominal value of the power feeding current.

3007 Maximum PFE current

The value of the power feeding current above which the PFE switches off in order to protect the system.

3008 Maximum PFE voltage

The value of the voltage at the PFE output above which the PFE switches off in order to protect the system.

3009 PFE current stability

The limitation of the variation of the PFE current in time.

3010 FEC encoder

A unit included in the transmit TTE which accomplishes all the digital operations needed to translate the digital data at system interface (A) into the desired coded bit sequence according to the employed FEC algorithm.

3011 FEC decoder

A unit included in the receive TTE which accomplishes the correction of the data transmitted through the submarine portion into symbol decisions that reproduce, as accurately as possible, the data that was encoded by the FEC encoder.

3012 Wavelength multiplexer (WM)

The equipment required to combine several LOCs and/or WDM coming from different fibres into a common WDM composed of all the combined LOCs.

3013 Wavelength demultiplexer (WD)

The equipment required to split a WDM into several LOCs and/or WDM to be carried on different fibres.

3014 Submarine cable transmission terminal equipment (SCTTE)

For further study.

3015 Terrestrial network transmission terminal equipment (TNTTE)

For further study.

3016 Umbilic

The extra link used at ITI to exchange information between the two pieces of TTE which are the SCTTE and the TNTTE.

3.4 Terms relevant to optical submarine repeaters and branching units

4001 Repeater (or BU) housing

The mechanical piecepart of a repeater (or branching unit).

4002 Repeater (or BU) optoelectronic unit

The optoelectronic piecepart of a repeater (or branching unit).

4003 Repeater (or BU) supervisory circuit

Electronic circuits installed in a repeater (or branching unit) to perform, in association with the supervisory equipment installed in the terminal station, system supervision and fault localization.

4004 Repeater (or BU) power supply and protection circuit

The electronic circuits installed in a repeater (or BU) to power in association with the PFE the repeater (or BU) electronic unit with a regulated voltage, and to provide a protection against electrical discharges due to cable discharge or lightning.

4005 Branching unit sea electrode

An electrode provided at a BU to establish the return path of the power feeding current through the sea.

4006 Full fibre drop BU (FFD-BU)

A BU where the optical interconnection between the three submarine cables is made by physically connecting fibre pairs between any two cables.

4007 WDM-BU

A BU where the optical interconnection between the three submarine cables made through WM and WD, that is adding and dropping one or more LOCs out the N-WDM.

3.5 Terms relevant to optical fibre submarine cable

5001 Lightweight cable

Cable suitable for laying, recovery and operation, where no special protection is required.

5002 Lightweight protected cable

Lightweight cable with an additional protective layer.

NOTE – This cable is suitable for laying, recovery and operation in areas where cable erosion or fishbite risk is significant.

5003 Single armoured cable

A cable with a single layer of protective armour.

NOTE – This cable is suitable for laying, burial, recovery and operation and is suitably protected for specific area in shallow water.

5004 Double armoured cable

A cable with a double layer of protective armour.

NOTE – This cable is suitable for laying, burial, recovery and operation and is suitably protected for specific area in shallow water.

5005 Rock armoured cable

A cable with a multiple layer of protective armour (usually two), the outer layer being wound with a small pitch.

NOTE – This cable is suitable for laying, recovery and operation and is suitably protected for specific area in shallow water.

5006 Land cable

Cable with suitable protection for installation in duct or direct burying in ground.

5007 Cable breaking load (CBL)

The minimum guaranteed breaking strength of the cable, with ends fixed, taking into account material and dimensional tolerances of the cable components.

5008 Fibre-breaking cable load

The load which when applied longitudinally to the cable with fixed ends results in an instantaneous fibre break.

5009 Nominal permanent tensile strength (NPTS)

The maximum permanent cable tension that does not significantly reduce the system performance, lifetime and reliability. NPTS represents the maximum residual tension that may be permanently applied to the cable on the seabed after installation.

NOTE – NPTS is also known elsewhere as the maximum permanent cable load.

5010 Nominal operating tensile strength (NOTS)

The maximum average operational tension which the cable can support for the period required for marine operations (typically 48 hours) without significantly reducing the system performance, lifetime and reliability. NOTS represents the maximum average operational tension during installation or repair.

NOTE – NOTS is also known elsewhere as the operational cable load.

5011 Nominal transient tensile strength (NTTS)

The maximum short-term tension that can be applied to the cable during an at-sea recovery operation over a cumulative period of approximately one hour without significantly reducing the system performance, lifetime and reliability. NTTS represents the maximum transient or unexpected tension that may be applied to the cable, and is normally limited to a percentage of the CBL from a mechanical safety point of view.

NOTE – NTTS is also known elsewhere as the transitory cable load.

5012 Longitudinal water propagation

The cable length being penetrated by water as a function of water depth or pressure and of duration of submission for an open-ended cable.

5013 Cable jointing box

A mechanical assembly used to join two optical fibre submarine cables.

5014 Cable coupler (or cable termination)

A mechanical assembly used to join an optical fibre submarine cable to a repeater or a branching unit.

5015 Cable transition

A transition between different types of cables, which can be achieved using either a transition cable or a transition joint.

5016 Cable gyration

The rotation of one end of a cable length relative to the other end.

5017 Cable elongation with fixed end

The cable elongation under a load, when both ends are prevented from rotating.

5018 Cable elongation with free gyration

The cable elongation under a load, when one end is free to rotate.

5019 Cable modulus

The length of cable, measured in km, the weight of which in water is equal to the cable breaking load.

5020 Cable operational modulus

The length of cable, measured in km, the weight of which in water is equal to the Nominal Operation Tensile Strength (NOTS).

5021 Cable full safe modulus

The length of cable, measured in km, the weight of which in water is equal to the Nominal Permanent Tensile Strength (NPTS).

5022 Cable transitory modulus

The length of cable, measured in km, the weight of which in water is equal to the Nominal Transient Tensile Strength (NTTS).

5023 Cabled fibre attenuation

The optical attenuation of the cable, including any fibre overlength and fibre splices present, as measured in dB per length of cable.

5024 Cabled fibre strain

The strain in an optical fibre in a cable after manufacture.

5025 Cable safety margin

The cable safety margin is the difference in tensile load between the measured load at failure and the maximum installation/recovery load proposed by the installer. The cable safety margin may typically be expressed as a percentage of measured load at failure.

5026 Duct shielded cable

A cable with a circumferentiel safety shield which may be the fish-bite protection shield, and which is suitable to be pulled into ducts.

5027 Tight cable structure

A cable structure where the fibres are strongly maintained in the cable, so that the fibre elongation is essentially equal to that of the cable.

5028 Loose cable structure

A cable structure where the fibres are free to move inside the cable, so that the fibre elongation is lower than that of the cable, staying zero until the cable elongation reaches a given value.

5029 Transitory cable load

The load, which could be accidentally encountered, particularly during recovery operations.

5030 Operational cable load

The load, which could be encountered during repairs.

5031 Permanent cable load

The load, which characterizes the status of cable after lay.

5032 Minimum cable bending radius

The bending radius which is a guideline for cable handling.

3.6 Terms relevant to manufacturing and installation

6001 Qualification

The activity, part of the development process, intended to demonstrate that a technology, a component or an assembly is able to comply with its performance and reliability specification.

6002 Sea trial

A test made at sea during the development process, as part of the qualification of the submarine portion.

6003 Certification

The activity, part of the manufacturing process, intended to eliminate all components or subassemblies which present a risk of not complying with their performance and reliability specification.

6004 Batch qualification

The activity, part of the manufacturing process, intended to eliminate batches of components suspect to present a generalized failure mechanism.

6005 Route survey

The activity performed prior to cable laying so as to select the cable route and cable protection (fishbite protection, armour, burying).

6006 Link assembly

The activity of jointing the cable sections, the repeaters and the branching units, together with monitoring the performance of each cable section.

6007 Ship loading

The operation of installing the submarine portion or fractions of it on board the cable ship prior to laying.

6008 Cable laying

The operation of laying on the sea bottom the submarine portion or fractions of it.

6009 Laying limit condition

Weather and sea condition above which laying should not be undertaken or should be interrupted.

6010 Slack control

Operation consisting in controlling that a predetermined cable overlength (slack) is layed.

6011 Shore end

The end of the submarine cable, to be laid from the cableship toward the beach so as to be connected to the land cable.

6012 Initial splice

The splice made on board the cableship between parts of the submarine portion at the beginning of a lay.

6013 Final splice

The splice made on board the cableship between parts of the submarine portion at the end of a lay.

6014 Cable burial

The operation consisting in burying the cable in the seabed so as to provide better cable protection.

NOTE – The burial operation may be carried out either during installation or as a post-lay activity.

6015 Laying angle

The angle between the cable being laid (which is theoretically along a straight line) and the sea surface.

6016 Manufacturing inspection

The activity during the manufacturing process intended to verify that the Quality Plan is respected, that each operation is accomplished along the agreed procedure, and that the result is satisfactory.

6017 Commissioning testing

A test prior to installing traffic on the system to ensure that the system meets its overall transmission performance contractual requirement, and that all functionalities with respect to the network management are operating.

3.7 Terms relevant to the maintenance of the submarine portion

7001 Cable recovery

The operation of recovering a cable from the sea bottom.

7002 Deep sea repair

The operation of repairing a submarine cable system installed in deep sea.

7003 Shallow water repair

The operation of repairing a submarine cable system installed in shallow water.

7004 Mini system

A length of cable, pre-equipped with repeaters, to be used for replacing one or more optical cable sections and the associated repeaters during a sea repair.

7005 Spare repeater (or BU)

An additional repeater (or BU) stored in a marine depot or on board a cableship to be used during a repair operation.

7006 Spare cable

An additional cable length, stored in a marine depot or on board a cableship to be used during a repair operation.

7007 Spare storage condition

The environment condition for storing the spare repeaters and cable.

7008 Repair safety procedure

Procedures to be applied on board the cable ship and in the terminal station, so as to ensure the safety of the personnel during a repair.

7009 Submersible robot

A remote-controlled submersible vehicle which can be used for locating, observing, post-lay burying, or recovering a cable installed in shallow water.

7010 Routine maintenance

The periodic monitoring of the system parameters and preventive redundancy switching performed from the terminal station using the supervisory system.

7011 Fault localization

For further study.

7012 Fault location

For further study.

4 Abbreviations

This Recommendation uses the following abbreviations.

BU	Optical Submarine Branching Unit
CBL	Cable Breaking Load
COTDR	Coherent Optical Time Domain Reflectometry
CTE	Cable Terminating Equipment
FEC	Forward Error Correction
FFD-BU	Full Fibre Drop Branching Unit
ITI	Intermediate Terrestrial Interface
LOC	Line Optical Channel
MTC	Marinized Terrestrial Cable
NOTS	Nominal Operating Tensile Strength
NPTS	Nominal Permanent Tensile Strength
NTTS	Nominal Transient Tensile Strength
OFA	Optical Fibre Amplifier
PFE	Power Feeding Equipment

SCOI	Submarine Cable Optical Interface
SCS	Single Channel Systems
SCTTE	Submarine Cable Transmission Terminal Equipment
SDLS	Submarine Digital Line Section
SEOI	Submarine Electro-Optic Interface
STE	System Terminal Equipment
TI	Terrestrial Interface
TNTTE	Terrestrial Network Transmission Terminal Equipment
TSE	Terminal Station Equipment
TTE	Terminal Transmission Equipment
UBM	Undersea Branching Multiplexer
WD	Wavelength Demultiplexer
WDM	Wavelength Division Multiplexing
WDMS	Wavelength Division Multiplexing System
WM	Wavelength Multiplexer

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Series A	Organization of the work of ITU-T
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Series C	General telecommunication statistics
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	**Transmission systems and media, digital systems and networks**
Series H	Audiovisual and multimedia systems
Series I	Integrated services digital network
Series J	Transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Construction, installation and protection of cables and other elements of outside plant
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Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
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Series Y	Global information infrastructure and Internet protocol aspects
Series Z	Languages and general software aspects for telecommunication systems

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