



**SLOVENSKI STANDARD  
SIST ETS 300 681 E1:2003**

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XcglꞤdcj bc`ca fYy`Y`fC5 BŁ**

Transmission and Multiplexing (TM); Optical Distribution Network (ODN) for Optical Access Network (OAN)

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## Foreword

This European Telecommunication Standard (ETS) has been produced by the Transmission and Multiplexing (TM) Technical Committee of the European Telecommunications Standards Institute (ETSI).

Transposition dates	
Date of adoption:	2 May 1997
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Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	31 March 1998
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## 1 Scope

This European Telecommunication Standard (ETS) defines the Optical Distribution Network (ODN) which is that part of the Optical Access Network (OAN) between the Optical Network Unit (ONU) and the Optical Line Termination (OLT).

This ETS primarily addresses the optical aspects related to the transmission of the interactive services in an OAN according to the functional requirements specified in ETS 300 463 [11].

Optical aspects related to the transmission of signals corresponding to distributive services, which may have impact on the definition of this type of ODN (e.g. the use of optical amplification) are also taken into account, even if further studies are required in some cases.

## 2 Normative references

This ETS incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed below. For dated references, subsequent amendments to or revisions of, these publications apply to this ETS only when incorporated by amendment or revision. For undated references the latest edition of the publication referred to applies.

- [1] ETR 247 (1996): "Transmission and Multiplexing (TM); Technical report on statistical approach design".
- [2] ETR 248 (1996): "Transmission and Multiplexing (TM); Use of single-mode fibres in the access network".
- [3] ETR 126 (1994): "Transmission and Multiplexing (TM); Applications of optical fibre amplifiers in long distance and optical fibre networks".
- [4] ETS 300 019-1 (1992): "Equipment Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment Part 1: Classification of environmental conditions".  
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- [5] EN 187101 (1995): "Optical telecommunication cables to be used in ducts and for direct buried applications".
- [6] EN 188101 (1995): "Single-mode dispersion-unshifted (B1.1) optical fibre".
- [7] EN 188102 (1995): "Single-mode dispersion-shifted (B2) optical fibre".
- [8] EN 187102 (1995): "Optical aerial telecommunication cables".
- [9] ETS 300 232 (1996): "Transmission and Multiplexing (TM); Optical interfaces for equipments and systems relating to the Synchronous Digital Hierarchy (SDH) [ITU-T Recommendation G.957 (1995) modified]".
- [10] I-ETS 300 671 (1996): "Transmission and Multiplexing (TM); Passive optical components; Fibre optical connectors for single-mode optical fibre communication systems; Common requirements and conformance testing".
- [11] ETS 300 463 (1996): "Transmission and Multiplexing (TM); Requirements of Optical Access Networks (OANs) to provide services up to 2 Mbit/s bearer capacity".
- [12] EN 60825-1 (1994): "Safety of laser products - Part 1: Equipment classification, requirements and user's guide".
- [13] EN 60825-2, (1994): "Safety of laser products - Part 2: Safety of optical fibre communication systems".

- [14] ITU-T Recommendation G.662 (1995): "Generic characteristics of optical fibre amplifier devices and sub-systems".
- [15] ITU-T Recommendation G.955 (1993): "Digital line systems based on the 1 544 kbit/s and the 2 048 kbit/s hierarchy on optical fibre cables".

### 3 Definitions and abbreviations

#### 3.1 Definitions

For the purposes of this ETS, the following definitions apply:

**diplex (working):** The use of a different wavelength for each direction of transmission over a single fibre.

**downstream:** The transmission direction from OLT to ONUs.

**duplex (working):** The use of the same wavelength for both directions of transmission over a single fibre.

**Optical Access Network (OAN):** The set of access links sharing the same network side interfaces and supported by optical access transmission systems.

NOTE 1: An OAN may include a number of ODNs connected to the same OLT.

**Optical Amplifier (OA):** Optical amplification element without any signal processing.

**Optical Branching Device (OBD):** A passive component (sometimes referred to as splitter/coupler), which has  $h$  inputs and  $n$  outputs, where  $h = 1$  to  $H$  and  $n = 2$  to  $N$ ; it performs optical power splitting/combining according to a fixed factor (balanced or unbalanced).

**optical connector:** A passive component allowing removable interconnection between fibres.

**Optical Distribution Network (ODN):** Provides the optical transmission medium from the OLT towards the ONUs and vice versa between the S/R and R/S reference points.

**optical fibre:** The medium for the transport of optical signals.

**optical filter:** A device for the selection of optical signals at specific wavelengths.

**Optical Line Termination (OLT):** Provides the network-side interface of the OAN, and is connected to one or more ODNs.

**Optical Network Unit (ONU):** Provides (directly or remotely) the user-side interface of the OAN, and is connected to the ODN.

**passive component:** A device that does not require external power (e.g. fibre, optical branching device, connector, filter, etc.).

**point-to-multipoint:** A network configuration which has one input/output at one end with multiple inputs/outputs at the other end.

**point-to-point:** A network configuration which has one input/output at one end with one input/output at the other end.

**reference point:** A point at which optical interfaces are defined.

**reflectance:** The ratio of reflected power to incident power for given conditions of spectral composition, polarization and geometrical distribution.

NOTE 2: In optics, the reflectance is generally expressed as reflectance density or in percentage terms; in communication applications it is generally expressed as  $10 \log(P_r/P_i)$  in dB, where  $P_r$  is the reflected power and  $P_i$  is the incident power.

**simplex (working):** The use of a different fibre for each direction of transmission.

**splice:** A passive component allowing permanent interconnection between fibres (usually fusion of fibre ends).

**upstream:** The transmission direction from ONUs to (OLT).

### 3.2 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

CEN	Comité Européen de Normalisation
EN	European Standard (CEN/CENELEC)
E/O	Electrical-to-Optical (conversion)
FDM	Frequency Division Multiplexing
O/E	Optical-to-Electrical (conversion)
OA	Optical Amplifier
OAN	Optical Access Network
OBD	Optical Branching Device
ODN	Optical Distribution Network
O <sub>l</sub>	OLT/ODN Optical Interface (local exchange side)
OLT	Optical Line Termination
O <sub>m</sub>	optical interface for testing and monitoring equipment
ONU	Optical Network Unit
O <sub>r</sub>	ONU/ODN Optical interface (remote side)
OTDR	Optical Time Domain Reflectometer
R/S	optical Receive/Send reference points
S/R	optical Send/Receive reference points
SDM	Space Division Multiplexing
TCM	Time Compression Multiplexing
WDM	Wavelength Division Multiplexing

### SIST ETS 300 681 E1:2003

## 4 Definition of the ODN in an OAN

The ODN specified in this ETS has a passive distribution function. It shall be able to provide:

- future proof cable plant;
- easily maintainable network;
- longitudinal compatibility;
- reliable network structure;
- high transport capacity;
- a means to allow integration of interactive and distributive services; and
- high availability.

For manufacturing purposes, this ETS caters for ODN elements which can be mass produced, give a cost effective solution and stimulate further development.

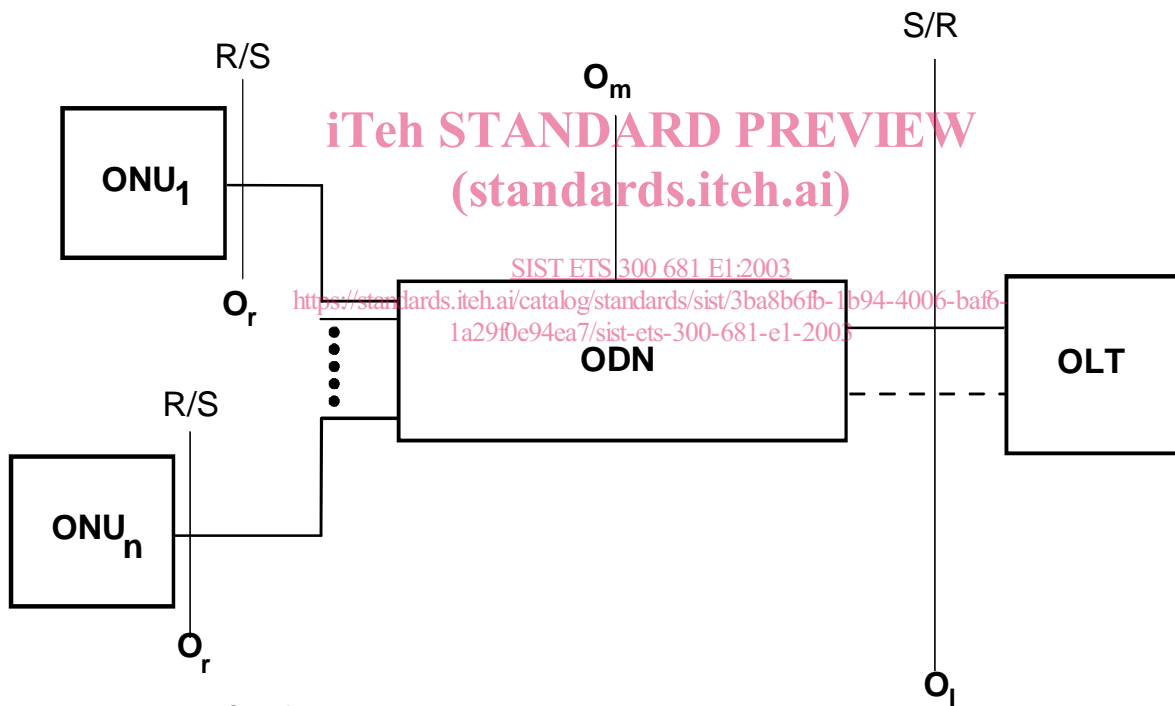
#### 4.1 Introduction

In general, the ODN provides the optical transmission medium for the physical connection of the ONUs to the OLTs.

The ODN consists of passive optical components:

- single-mode fibres, in compliance with EN 188101 [6];
- single-mode optical fibre cables, in compliance with EN 187101 [5] and EN 187102 [8];
- optical fibre ribbons on ribbon cables, (see annex F);
- optical connectors, in compliance with I-ETS 300 671 [10];
- fibre optic branching devices, (see annex F);
- fixed optical attenuators, (see annex F);
- fusion splices, (see annex F).

NOTE 1: Passive components not included in the above list (e.g. optical filters, WDM devices) are for further study.



R, S: reference points

$O_r$ ,  $O_i$ ,  $O_m$ : optical interfaces

bold solid lines represent one or more fibres;

dashed lines represent protection fibres (see annex B)

NOTE: Each line linking any two optical blocks may represent one or more fibres in all subsequent figures.

**Figure 1: Generic physical configuration of the ODN**