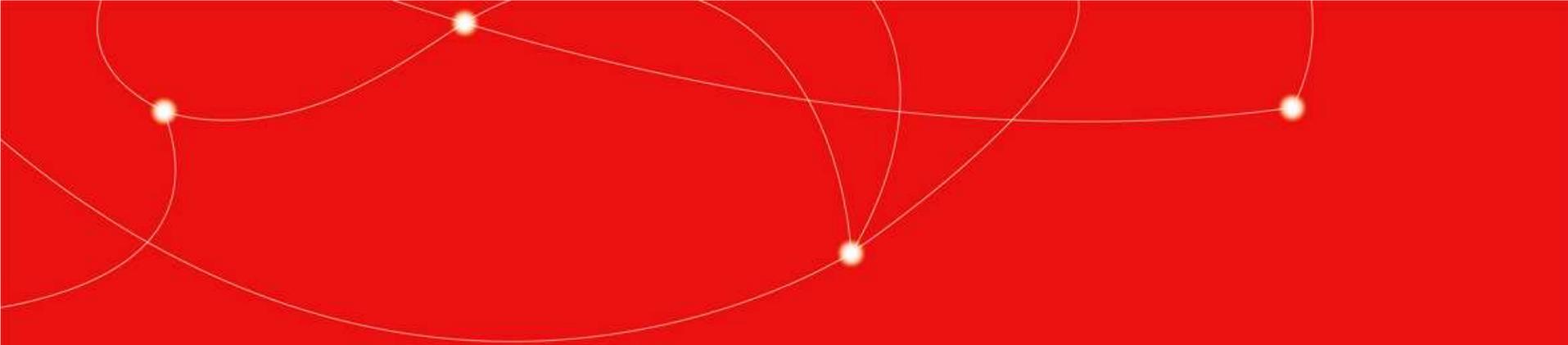


# ***FTTH Optical Infrastructure: Standardization Activities in ITU-T SG15***

***F. Montalti - Telecom Italia Open Access***

***P. Regio - Telecom Italia Lab***

***E. Cottino - Sirti***



## **Summary**

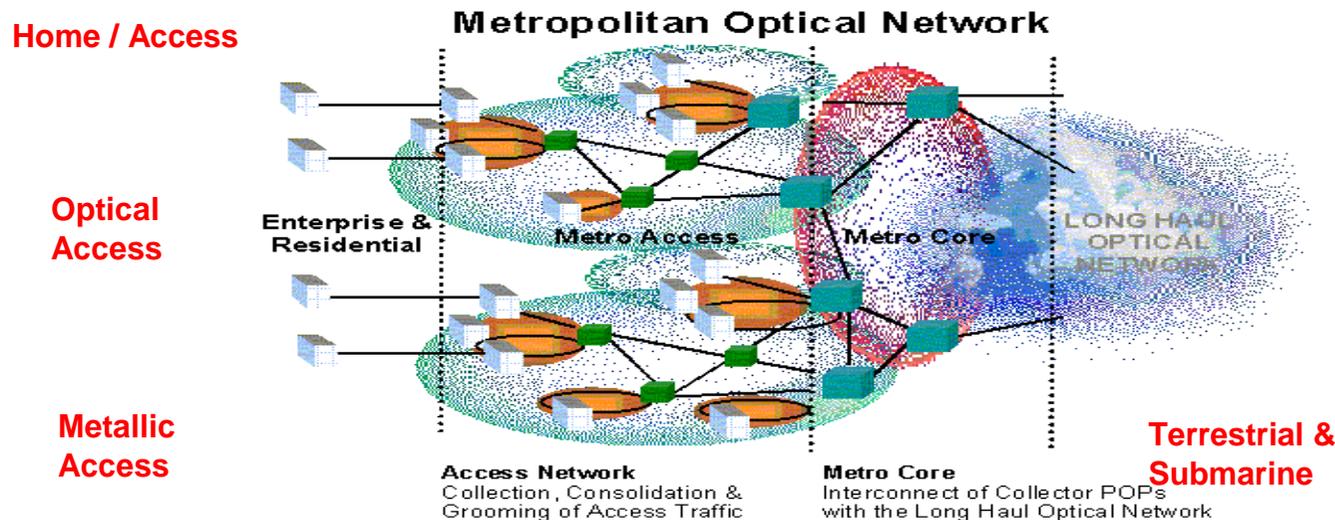
- ▶ **ITU-T Standardization activities**
- ▶ **Other Players in FTTH standards**

## Study Group 15: Overview

### “Optical transport networks and access network infrastructures”

**SG 15 is the focal point in ITU T for the development of standards on optical and other transport network infrastructures, systems, equipment, optical fibres, and the corresponding control plane technologies to enable the evolution toward intelligent transport networks.**

**This encompasses the development of relevant standards for the customer premises, access, metropolitan and long haul sections of communication networks.**



## **Study Group 15: Projects and Opportunities**

### **Major projects**

Lead SG on access network transport

Lead SG on optical technology

Lead SG on optical transport networks

### **New opportunities**

**Home networking and new customer premises cabling**

**Smart Grids**

**Energy management**

**Power saving**

**Home and commercial building automation transceivers**

**Interoperability testing (e.g. with FTTH Council Europe)**

**Packet Transport**

**Device Management**

# ITU-T WP 1/15

## Passive Optical Network access

### ▶ Recommendations in Force

G.983 BPON (622 / 155 Mbps)

G.984 GPON (2.4 / 1.2 Gbps)

G.985 point-to-point EPON (100 Mbps)

G.986 point-to-point EPON (1 Gbps)

G.987 XGPON (10 / 2.5 Gbps) – SR and PMD layers

### ▶ Work in progress for June 2010

G.987 XGPON (10 / 2.5 Gbps) – TC layer

G.988 Generic OMCI (PON management)

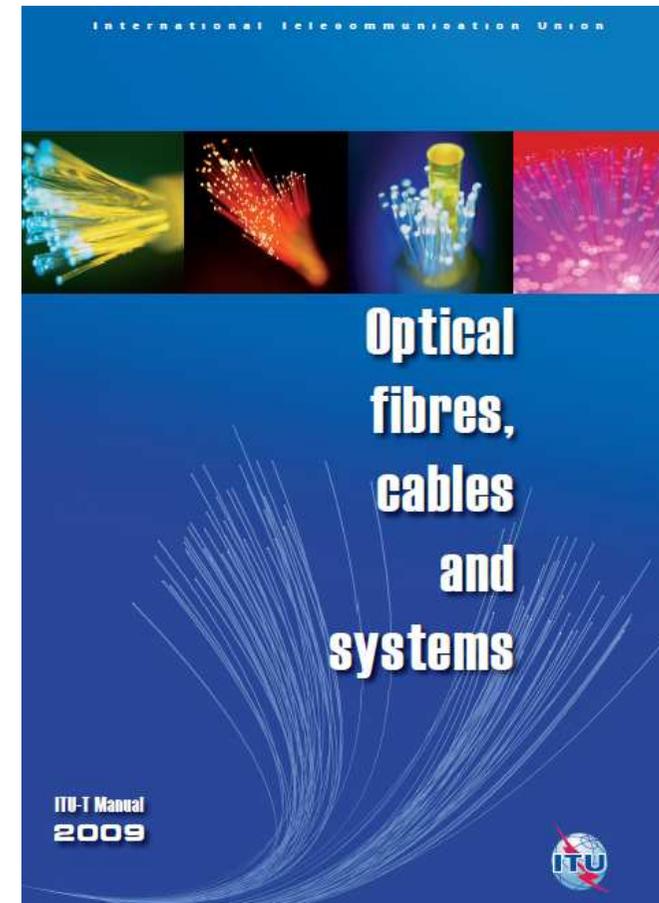
### ▶ Further work

G.987 XGPON2 (10 / 10 Gbps) ?

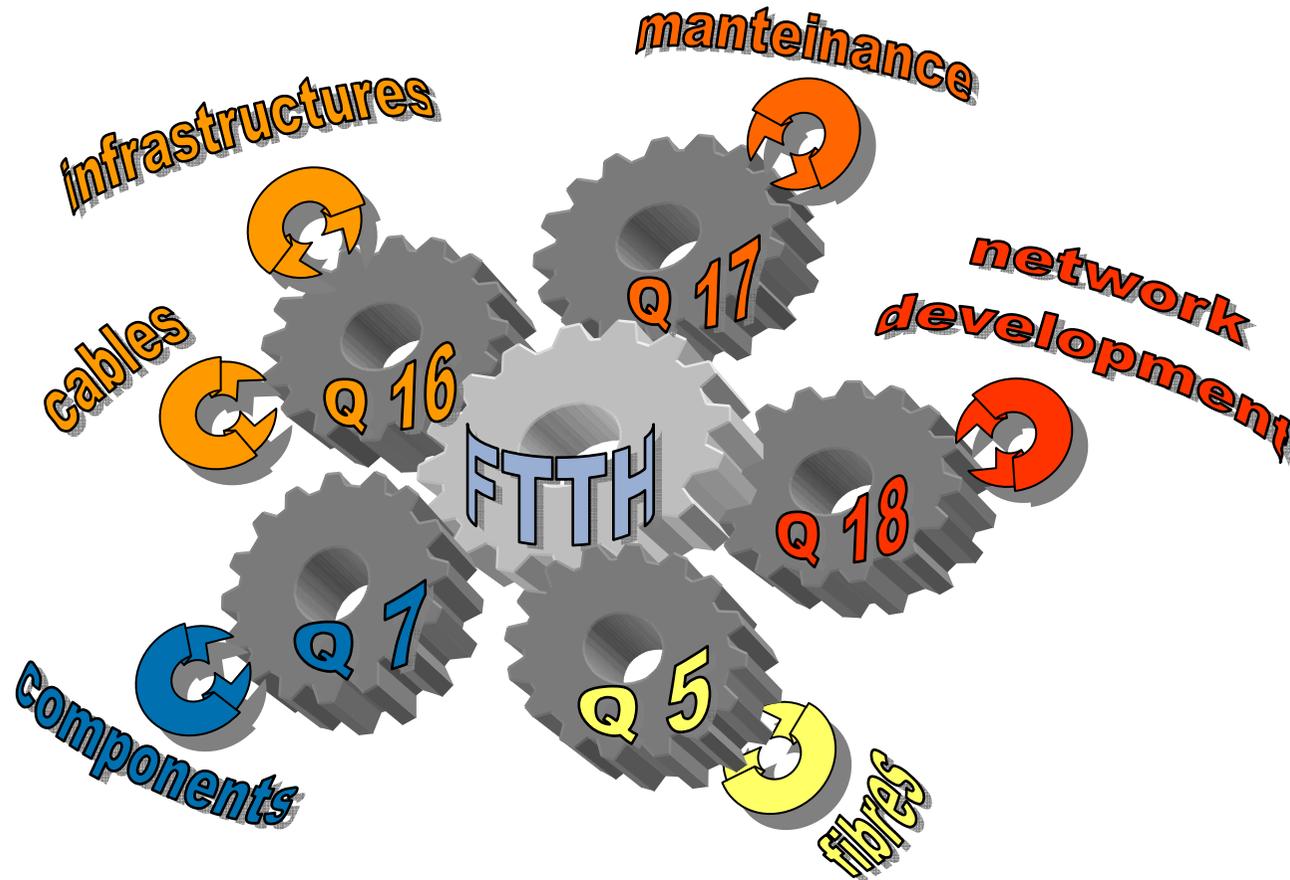
## ITU-T WP 2/15

# Optical access/transport network technologies and physical infrastructures

- ▶ 10 years of study and introduction in the access network of cost effective FTTx technologies
- ▶ ~40 existing recommendations related to FTTH infrastructures produced by SG6 and SG 15
- ▶ ~20 recommendations in preparation in this study period
- ▶ Complete coverage on products, planning, deployment and maintenance
- ▶ Also standards for customer premises, access, metropolitan as well as long haul sections of communication networks
- ▶ Publication in 2009 of the Handbook “Optical Fibres, Cables and Systems”  
(<http://www.itu.int/publ/T-HDB-OUT.10-2009-1/en>)

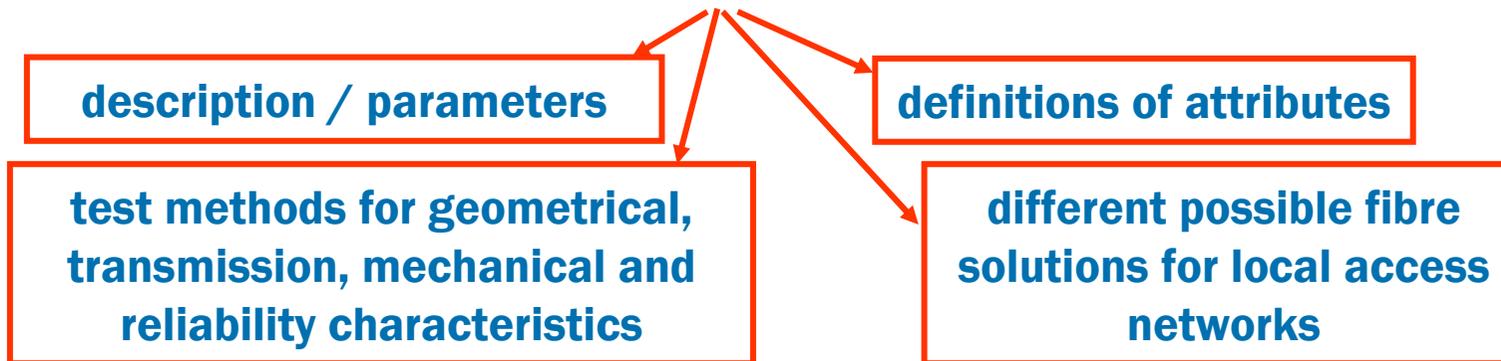


# SG15 WP2 Questions



## Q.5 “Characteristics and test methods of optical fibres and cables”

Areas of responsibility for **single-mode fibres & multimode fibres**



- ▶ **G.650** “Test method series” (2004 – 2008) **REV**
- ▶ **G.651.1** “Multimode 50/125 µm” (07/2007)
- ▶ **G.652** “Dispersion unshifted single-mode optical fibre” (11/2009)
- ▶ **G.653** “Dispersion shifted single-mode optical fibre” (12/2006) **REV**
- ▶ **G.654** “Cut-off shifted single-mode optical fibre” (12/2006)
- ▶ **G.655** “Non-zero dispersion-shifted single-mode optical fibre” (11/2009)
- ▶ **G.656** “Non-zero dispersion-shifted single-mode fibre” (12/2006) **REV**
- ▶ **G.657** “Bending loss insensitive single-mode optical fibre” (11/2009)
- ▶ **G.Sup40** “Optical fibre and cable Recommendations and standards guideline” (11/2006) **REV**

# Q.5 Work in Progress

**G.657 A** (G.652 compliant)

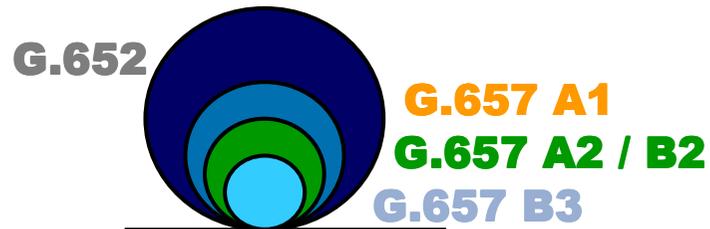
**A1 fibre**  
**A2 fibre**

**10 mm** bending radius  
**7.5 mm** bending radius

**G.657 B** (not G.652 compliant)

**B2 fibre**  
**B3 fibre**

**7.5 mm** bending radius  
**5 mm** bending radius



	Specified loss in dB for 1 turn at 1550 nm for radius:			
Bending Radius	15 mm	10 mm	7.5 mm	5 mm
G. 657A1	<0.025	<0.75	-	-
G. 657A2 / B2		<0.1	<0.5	-
G. 657B3		<0.03	<0.08	<0.15

Following issues are being addressed as the short term study points:

- proposal of A3 fibre
- splicing to G.652 fibre (level of compliance)
- wavelength dependence of the transmission characteristics

**Q7/15****“Characteristics of optical components and subsystems**

The responsibility under this Question includes **active, passive and hybrid or dynamic/adaptive optical components, devices and related network infrastructure equipment**

and the following Recommendations are relevant for FTTH:

- ▶ **G.671** “transmission characteristics of optical components and subsystems” (**PON Splitters, Connectors, Attenuators**)
- ▶ **L.12** “optical fibre splices” (03/2008)
- ▶ **L.13** “sealed closures for outdoor environment” (04/2003)
- ▶ **L.31** “optical fibre attenuators” (10/1996)
- ▶ **L.36** “single-mode fibre optic connectors” (01/2008)
- ▶ **L.37** “optical branching components (non-wavelength selective)” (02/2007)
- ▶ **L.45, L.46** “environment aspects related to the outside plant” (10/2000)
- ▶ **L.47** “Access facilities using hybrid fibre/copper networks” (10/2000)
- ▶ **L.50, L.51** “optical distribution frames for central office environments” (11/2003) **REV**

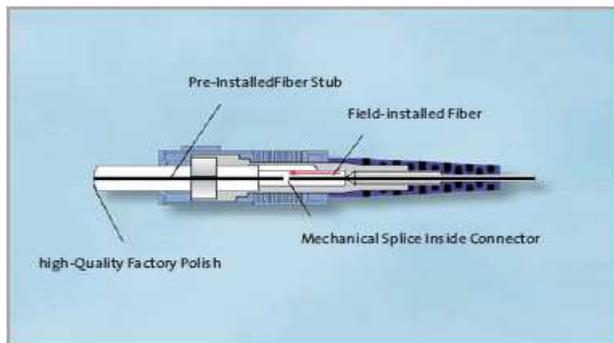
# Q7/15

## Work in Progress

- ▶ **L.distr** “Customer and distribution boxes and terminals”
- ▶ **L.drop** “Pre-terminated fibre drop cables & hardened connectors”
- ▶ **L.modc** “Environmental protection of optical devices and optical connectivity in outside plant conditions”
- ▶ **L.oxcon** “Outdoor optical cross connect cabinets



• Optimization of space  
• Unbundling?



Need of new Recommendation on field mountable connector technologies

## **Q.16 “Optical physical infrastructure and cables”**

The responsibility under this Question includes the study of new cable constructions for different kind of application, underground, in ducts, aerial, as well as solutions related to wired installations at customer premises

### **In force Recommendations on cable construction**

- L.10** Optical fibre cables for duct and tunnel application (12/2002)
- L.26** Optical fibre cables for aerial application (12/2002)
- L.43** Optical fibre cables for buried application (12/2002)
- L.58** Optical fibre cables: Special needs for access network (03/2004)
- L.59** Optical fibre cables for indoor applications (01/2008)
- L.60** Construction of optical/metallic hybrid cables (09/2004)
- L.67** Small count optical fibre cables for indoor applications (10/2006)
- L.78** Optical fibre cable construction for sewer duct applications (05/2008)
- L.79** Optical fibre cable elements for microduct blowing installation application (07/2008)

## **Q.16 “Optical physical infrastructure and cables”**

Moreover Q.16 address the investigation of new cost effective solution for the construction of the infrastructures for cable laying, taking also into account the possible techniques for infrastructure sharing among different subjects

### **In force Recommendations on installation techniques**

**L.35 “Installation of optical fibre cables in the access network” (10/1998)**

**L.38 “Use of trenchless techniques for the construction of underground infrastructures for telecommunication cable installation” (09/1999)**

**L.39 “Investigation of the soil before using trenchless techniques” (05/2000)**

**L.48 “Mini-trench installation technique” (03/2003)**

**L.49 “Micro-trench installation technique” (03/2003)**

**L.57 “Air-assisted installation of optical fibre cables” (05/2003)**

**L.61 “Optical fibre cable installation by floating technique” (09/2004)**

**L.73 “Methods for inspecting and repairing underground plastic ducts” (04/2008)**

**L.77 “Installation of cables in sewer ducts” (05/2008)**

## Q.16 Work in Progress

- ▶ **L.caind** “Optical fibre cable functions for premises indoor application”
- ▶ **L.cda** “Optical fibre cable constructions for drop application” **NEW**
- ▶ **L.teib** “Optical cabling systems in buildings”
- ▶ **L.cna** “Optical fibre cable constructions for new application”
  
- ▶ **L.cigd** “Installation of cables in gas ducts”
- ▶ **L.ciwd** “Installation of cables in water ducts”
- ▶ **L.limt** “Low impact minitrench installation techniques”
- ▶ **L.coi** “Solutions for installation of ducts and cables in an occupied infrastructure”
- ▶ **L.fubt** “Installation of optical fibre units or mini-cables by blowing technique”
- ▶ **L.recc** “Installation of optical fibre cable by replacement of existing copper cables”

## Low impact minitrench installation techniques

- ▶ Installation of mini ducts structures inside a small dimension trench: **width less than 5 cm and depth in the range 20-30 cm** (compared with 10x30 cm of the conventional one)
- ▶ Possibility of installing up to 3 linear arrays of 5 mini ducts  $\varnothing$  10/14 mm directly buried
- ▶ Use of low environmental impact trenching machines



## Solutions for installation of ducts and cables in an occupied infrastructures

Outfitting of existing ducts (telcos, street lighting, power..) with 10/12 mm mini ducts and use of completely dielectric minicables

Separation of the telecommunication access points with the use of reduced dimensions manholes



## Q.17 “Maintenance and operation of optical fibre cable networks”

### In force Recommendations on O&M Issues

- ▶ **L.25** “Optical fibre cable network maintenance” (10/1996)
- ▶ **L.40** “Optical fibre outside plant maintenance support, monitoring and testing system” (10/2000)
- ▶ **L.41** “Maintenance wavelength on fibres carrying signals” (05/2000)
- ▶ **L.53** “Optical fibre maintenance criteria for access networks” (05/2003)
- ▶ **L.64** “ID tag requirements for infrastructure and network elements management” (02/2007)
- ▶ **L.66** “O. F. cable maintenance criteria for in-service fibre testing in access networks (05/2007)

### Work in progress

- ▶ **L.gpsm** “Use of GPS (Global Positioning System) to create referenced network maps”
- ▶ **L.ofid** “Optical fibre identification for the maintenance of optical access networks”
- ▶ Questionnaire on optical fibre identification technologies

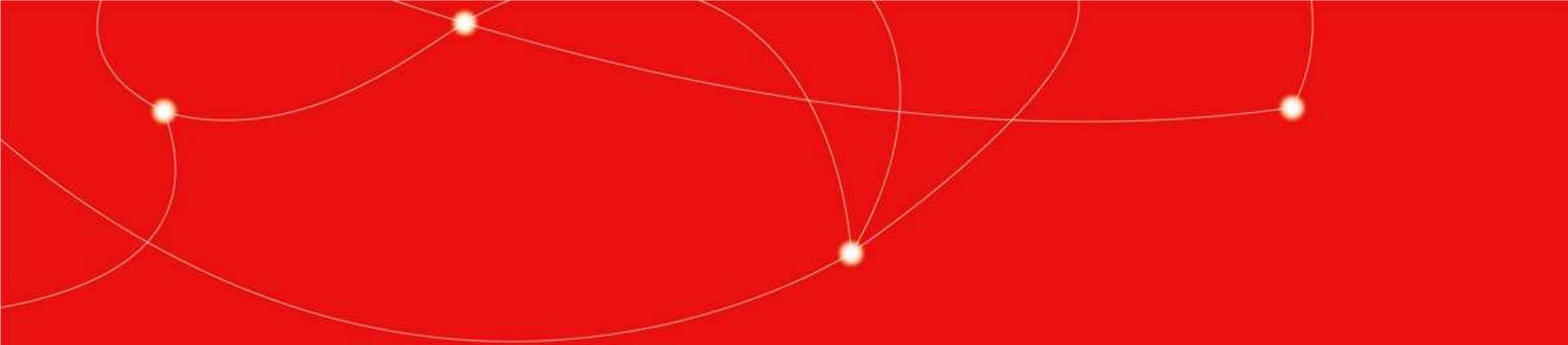
## Q.18 “Development of optical networks in the access area”

### Recommendations on network design

- ▶ **L.42** “Extending optical fibres solutions into the access network” (05/2003)
- ▶ **L.52** “Deployment of passive Optical Networks (PON)” (05/2003)
- ▶ **L.65** “Optical fibre distribution of access networks” (12/2006)
- ▶ **L.72** “Data bases for optical access network infrastructures” (01/2008)

### New Work Items

- ▶ **L.aid** “Aerial infrastructure design for optical access network”
- ▶ **L.teib** “Optical cabling shared with multiple operators in buildings” **NEW**
- ▶ **L.pon** “Passive optical networks (PON) configuration for FTTx” **REV**
- ▶ **L.shropt** “Technical aspects of unbundling and sharing of outside plant elements in optical networks”
- ▶ **L.uara** “Optical access network design for urban and rural areas”
- ▶ Questionnaire on “Optical cabling shared with multiple operators in buildings”



## **Summary**

- ▶ **ITU-T Standardization activities**
- ▶ **Other Players in FTTH standards**



**TC86**

## **Scope**

- ▶ **Preparation of standards for O.F. cables, components, modules, subsystems and systems**
- ▶ **Wide applications spectrum (TLC, Structured cabling, Automotive, Transports, Sensors, Defence, Industrial Automation, ....)**

## **Objectives**

- ▶ **Production of homogeneous and Time to Market standards to the Fibre Optics Industry**
- ▶ **Promotion of “Trade and Commerce”**
- ▶ **Create an/or add value for all needs of industrial applications**



## On going and future activities

### Products for FTTx



- ▶ Cables for vertical in building applications
- ▶ Low Cost Components
- ▶ Bending resistant fibres
- ▶ Optimization of network infrastructures (86A/137/NP)
- ▶ Plant characterization and testing (PON Networks, instruments, measurement techniques ....)

### Multimedia Home Cabling ( JTC1/SC25)

### New hybrid optical components

### Integration, SFF, “Smart “ Optics, nanotechnologies

### Non-linear effects, Large optical power levels

**NORMA ITALIANA CEI**

*Norma Italiana*  
**CEI CLC/TR 50510**  
 La seguente Norma è identica a: CLC/TR 50510:2007-10.

<i>Data Pubblicazione</i>	<i>Edizione</i>
<b>2009-09</b>	Prima

<i>Classificazione</i>	<i>Family</i>
<b>86-251</b>	9956 E

**Accesso in fibra ottica all'utilizzatore finale - Guida alla realizzazione della rete FTTX in fibra ottica**

*Titolo*  
 Fibre optic access to end-user - A guideline to building of FTTX fibre optic network

*Sommario*  
 Il presente Rapporto Tecnico ha lo scopo di fornire una linea-guida di primo livello relativa alle reti FTTX. Questo tipo di rete porta fibre per lo scambio delle informazioni direttamente nella sede dell'utilizzatore sia in singole unità abitative che in blocchi di unità abitative (condomini). Tali linee-guida sono indirizzate a coloro che intendono installare reti FTTX ad elevata larghezza di banda (elevato bit-rate), ossia operatori, associazioni di operatori, enti di distribuzione di energia e installatori che possono mettere in pratica le fasi necessarie per progettare e installare reti FTTX di elevata qualità e ottimo rapporto qualità-prezzo. Questo Rapporto Tecnico viene pubblicato dal CEI nella sola lingua inglese in quanto particolarmente mirato a settori specialistici.

CEI COMITATO ELETTROTECNICO ITALIANO  
 ASS. FEDERAZIONE ITALIANA DI ELETTRONICA, ELETTRONICA, AUTOMAZIONE, INFORMATICA E TELECOMUNICAZIONI  
 CNR CONSIGLIO NAZIONALE DELLE RICERCHE

Copia concessa al CEI COMITATO ELETTROTECNICO ITALIANO in data 17/05/2010 da CEI-Comitato Elettrotecnico Italiano

RAPPORTO TECNICO



**86A/1317/NP**

**NEW WORK ITEM PROPOSAL**

Proposer <b>Secretariat</b>	Date of proposal <b>March 2010</b>
TC/SC <b>SC86A</b>	Secretariat <b>France</b>
Date of circulation <b>2010-03-19</b>	Closing date for voting <b>2010-06-25</b>

A proposal for a new work item within the scope of an existing technical committee or subcommittee shall be submitted to the Central Office. The proposal will be distributed to the P-members of the technical committee or subcommittee for voting on the introduction of it into the work programme, and to the O-members for information. The proposer may be a National Committee of the IEC, the secretariat itself, another technical committee or subcommittee, an organization in liaison, the Standardization Management Board or one of the advisory committees, or the General Secretary. Guidelines for proposing and justifying a new work item are given in ISO/IEC Directives, Part 1, Annex C (see extract overleaf). **This form is not to be used for amendments or revisions to existing publications.**

**The proposal (to be completed by the proposer)**

Title of proposal  
 IEC 6XXXX TS - Guide to the installation of optical fibre cables

Standard       Technical Specification

**Scope** (as defined in ISO/IEC Directives, Part 2, 6.2.1)  
 This guide provides guidance to assist the user and installer with regard to the general aspects of the installation of optical fibre cables covered by the IEC 60794 series of specifications, and the particular aspects of the 'blowing' technique

**Purpose and justification**, including the market relevance, whether it is a proposed horizontal standard (Guide 108)<sup>1)</sup> and relationship to Safety (Guide 104), EMC (Guide 107), Environmental aspects (Guide 109) and Quality assurance (Guide 102). (attach a separate page as annex, if necessary)  
 Optical fibre cabling provides a high performance communications pathway whose characteristics can be degraded by inadequate installation.

<b>Target date</b>	for first CD <b>June 2010</b>	for IS/ TS <b>June 2012</b>
Estimated number of meetings <b>3</b>	Frequency of meetings: <b>2 per year</b>	Date and place of first meeting: <b>April 2010 WUHAN</b>
Proposed working methods	<input type="checkbox"/> E-mail	<input checked="" type="checkbox"/> Collaboration tools

**Relevant documents to be considered**

**Relationship of project to activities of other international bodies**

**Liaison organizations**      **Need for coordination within ISO or IEC**



## Scope

- ▶ **accelerate FTTH solutions deployment in Europa by means of educational activities and promotion**
- ▶ **identify the main market drivers and the constraints to the development of FTTH networks in Europe**
- ▶ **Highlight and promote the technical and commercial advantages of the use of broadband o.f. technologies**
- ▶ **130 associates include manufacturers, engineering companies, research centres, Universities, (but not TLC operators!)**

## Objective

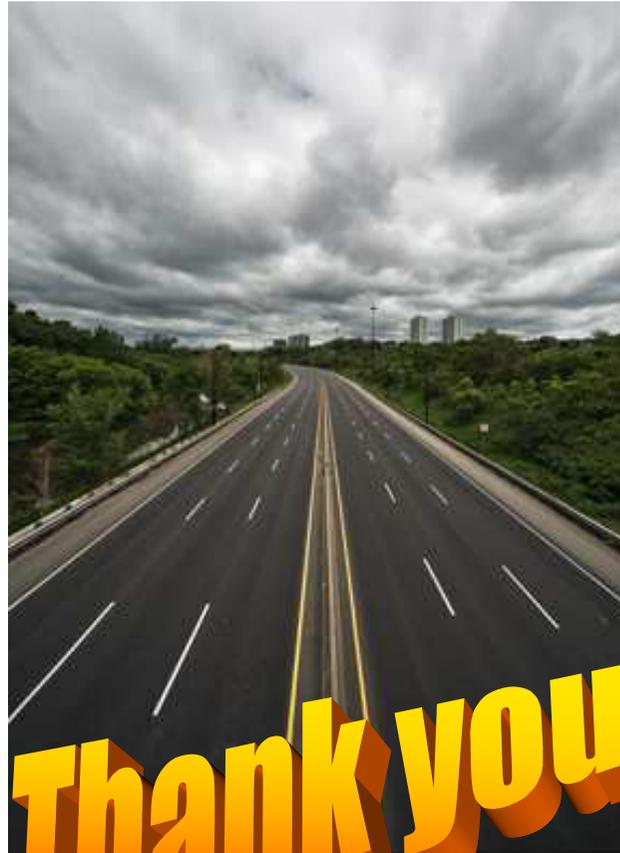
- ▶ **To reach, by 2012, 1% of the families connected with FTTH/B, in almost 15 European Countries, and, among them, at least 8 Countries with more than 10% of penetration.**

**The Annual Conference that was held this year in Lisbon (the next one is schedule to take place in Milan), with more than 2000 participants, is a key event in the european TLC scenario, thanks to the attention to the more recent developments and trends on FTTH technologies**



## Conclusions

- ▶ **The success of the FTTH challenge relies on the possibility for all the Players to build up an infrastructure with the state of the art, most reliable, cost effective and homogeneous technologies. For this purpose STANDARDS are needed.**
- ▶ **In the last ten years of activity, ITU-T (SG15 WP2 and SG6) produced about 40 Recommendations related to FTTH physical layer;**
- ▶ **About 20 Recommendations in preparation in this study period (2009 – 2012) address fibres reliability items, cost effective installation techniques, cables and materials for the indoor brown-field scenario;**
- ▶ **Relationships have been built with other Standardization Bodies (such as IEC, FTTH Council, JTC1/SC25,-..) in order harmonize standards and avoid duplication of efforts;**
- ▶ **The set of Recommendations, Handbooks, Technical Reports produced, will speed up the FTTH deployment, as they give positive answers to the most topical issues and allow the FTTH Players (Operators, Investors...) to make the correct choices for the implementation of a future-proof optical fibre access network.**



**Thank you**

