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SERIES L: CONSTRUCTION, INSTALLATION AND
PROTECTION OF CABLES AND OTHER ELEMENTS OF
OUTSIDE PLANT

**Multi-pair copper network cable supporting
shared multiple services such as POTS, ISDN
and xDSL**

Recommendation ITU-T L.19



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Summary

Recommendation ITU-T L.19 describes some general considerations on services and systems, such as ISDN and xDSL, to be supported by the access network. Some requirements for the digital local line characteristics are also given, as a factor contributing to the provision of good quality of service to the users. Furthermore, some issues for the use of multi-pair copper network cable supporting shared multiple services such as ISDN/xDSL are also described. This revision updates Recommendation ITU-T L.19 to include recent new or revised Recommendations for ADSL2 (ITU-T G.992.3, ITU-T G.992.4), ADSL2plus (ITU-T G.992.5) and VDSL (ITU-T G.993.1).

History

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FOREWORD

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Introduction

The local subscriber network has been providing the means for subscriber connection to the basic telephone service, without encountering any major transmission problems at voice frequencies (300 to 3400 Hz). With the evolution of transmission technologies, services and systems such as ISDN, HDSL, SHDSL, ADSL, ADSL2, ADSL2plus, VDSL and VDSL2 are being used into the existing copper line. And there is now a trend also to support multiple services of one or more providers on common cables and in other parts of the network. This is called "unbundling the network", i.e., more than one operator are sharing the network or are co-located in the same network. Providing the unbundling network makes crosstalk environment severer. Therefore, it is necessary to establish the quality of the subscriber loops for new services and systems such as ISDN, HDSL, SHDSL, ADSL, ADSL2, ADSL2plus, VDSL and VDSL2.

Recommendation ITU-T L.19

Multi-pair copper network cable supporting shared multiple services such as POTS, ISDN and xDSL

1 Scope

This Recommendation deals with the general considerations and the requirements of the digital local line characteristics, which are used between the line termination and the network termination, to provide ISDN and xDSL services. The field of home network is not addressed in this Recommendation. Moreover, this Recommendation describes the guidance for the use of multi-pair copper cable supporting shared multiple services such as ISDN/xDSL.

The values used in this Recommendation are based on a number of DSL technologies as they are known at the moment of publication of this Recommendation. However, the general principles are applicable to any type of DSL technology, generally referred to as xDSL.

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.961] Recommendation ITU-T G.961 (1993), *Digital transmission system on metallic local lines for ISDN basic rate access*.
- [ITU-T G.991.1] Recommendation ITU-T G.991.1 (1998), *High bit rate digital subscriber line (HDSL) transceivers*.
- [ITU-T G.991.2] Recommendation ITU-T G.991.2 (2003), *Single-pair high-speed digital subscriber line (SHDSL) transceivers*.
- [ITU-T G.992.1] Recommendation ITU-T G.992.1 (1999), *Asymmetric digital subscriber line (ADSL) transceivers*.
- [ITU-T G.992.2] Recommendation ITU-T G.992.2 (1999), *Splitterless asymmetric digital subscriber line (ADSL) transceivers*.
- [ITU-T G.992.3] Recommendation ITU-T G.992.3 (2009), *Asymmetric digital subscriber line transceivers 2 (ADSL2)*.
- [ITU-T G.992.4] Recommendation ITU-T G.992.4 (2002), *Splitterless asymmetric digital subscriber line transceivers 2 (splitterless ADSL2)*.
- [ITU-T G.992.5] Recommendation ITU-T G.992.5 (2009), *Asymmetric digital subscriber line (ADSL) transceivers – Extended bandwidth ADSL2 (ADSL2plus)*.
- [ITU-T G.993.1] Recommendation ITU-T G.993.1 (2004), *Very high speed digital subscriber line transceivers (VDSL)*.
- [ITU-T G.993.2] Recommendation ITU-T G.993.2 (2006), *Very high speed digital subscriber line transceivers 2 (VDSL2)*.
- [ITU-T G.995.1] Recommendation ITU-T G.995.1 (2001), *Overview of digital subscriber line (DSL) Recommendations*.

- [ITU-T G.996.1] Recommendation ITU-T G.996.1 (2001), *Test procedures for digital subscriber line (DSL) transceivers.*
- [ITU-T G.996.2] Recommendation ITU-T G.996.2 (2009), *Single-ended line testing for digital subscriber lines (DSL).*
- [ITU-T O.9] Recommendation ITU-T O.9 (1999), *Measuring arrangements to assess the degree of unbalance about earth.*
- [IEC 62255-x] IEC 62255-x (in force), *Multicore and symmetrical pair/quad cables for broadband digital communications (High bit rate digital access telecommunication networks) – Outside plant cables.*

3 Definitions

For the purpose of this Recommendation, the definitions given in [ITU-T G.961], G.991.x-series, G.992.x-series, [ITU-T G.995.1] and in [IEC 62255-x] apply.

4 Abbreviations

This Recommendation uses the following abbreviations:

ADSL	Asymmetric Digital Subscriber Line
BT	Bridged Tap
DLL	Digital Local Line
DSL	Digital Subscriber Line
ELFEXT	Equivalent Level Far-End crosstalk
FEXT	Far-End crosstalk
HDSL	High-speed Digital Subscriber Line
ISDN	Integrated Services Digital Network
LCL	Longitudinal Conversion Loss
LT	Line Termination
NEXT	Near-End crosstalk
NT	Network Termination
PSL	Power Sum Loss
SHDSL	Single-pair High-speed Digital Subscriber Line
UADSL	Universal Asymmetric Digital Subscriber Line
VDSL	Very high-speed Digital Subscriber Line
xDSL	Any of the various types of Digital Subscriber Line systems

5 Conventions

None.

6 General considerations

6.1 Objectives

Considering that the digital access section between the local exchange and the customer is a key element of the successful ISDN/xDSL services and systems, the following requirements for the network should be taken into account:

- the ability to operate on the existing two-wire unloaded lines, with open wires being excluded;
- the objective of achieving 100% cable fill for ISDN/xDSL services and systems without pair selection, cable rearrangements or the removal of bridged taps (BTs);
- the objective of being able to extend the new ISDN/xDSL services and systems to the majority of customers without the use of regenerators. In the remaining few cases special arrangements may be required;
- the coexistence, in the same cable unit, with most of the existing services such as telephony and voiceband data transmission;
- various national regulations concerning electro-magnetic compatibility (EMC);
- the provision of power feeding via the network under normal or restricted modes;
- the provision of the capability to support maintenance functions.

6.2 ISDN/xDSL technologies

The most important technologies, shown in Table 1, are:

- ISDN ITU-T G.961 basic access, which offers 160 kbit/s (2B + D) full duplex.
- HDSL ITU-T G.991.1, which offers 2 Mbit/s in each direction, but requires up to three copper pairs.
- SHDSL ITU-T G.991.2, which offers 2 Mbit/s in each direction over a single copper pair.
- ADSL ITU-T G.992.1, which offers up to 8 Mbit/s (in case of ITU-T G.992.2 ADSL, 1.5 Mbit/s) bandwidth in downstream for fast Internet access but not video applications.
- ADSL2 ITU-T G.992.3, which offers up to 8 Mbit/s (in case of ITU-T G.992.4 ADSL, 1.536 Mbit/s) bandwidth in downstream for fast Internet access but not video applications.
- ADSL2plus ITU-T G.992.5, which offers up to a minimum of 16 Mbit/s bandwidth in downstream for fast Internet access but not video applications.
- VDSL ITU-T G.993.1, which offers up to tens of Mbit/s bandwidth in downstream for fast Internet access but not video applications.
- VDSL2 ITU-T G.993.2, which offers up to 200 Mbit/s at a bidirectional net data rate (the sum of upstream and downstream rates).

The technologies considered in this clause were the most popular ones at the time of approval of this Recommendation. The list should be revised according to the development of new processes.