SLOVENSKI STANDARD
SIST ETS 300 795:1999

01-julij-1999

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V interfaces at the digital Local Exchange (LE); Access Network (AN) supporting V5; Transmission characteristics and performance design objectives for call handling and bearer channel connection management

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Ta slovenski standard je istoveten z: **ETS 300 795 Edition 1**

<u>**ICS:**</u>

33.040.35   Telefonska omrežja   Telephone networks

SIST ETS 300 795:1999   **en**

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ETSI

EUROPEAN
TELECOMMUNICATION
STANDARD

ETS 300 795

May 1998

Source: SPS

Reference: DE/SPS-03027

ICS: 33.020

Key words: AN, LE, performance, V5 interface

V interfaces at the digital Local Exchange (LE);
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ec1b55931c78/sist-ets-300-795-1999

ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE
Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE
Internet: secretariat@etsi.fr - http://www.etsi.fr - http://www.etsi.org

Tel.: +33 4 92 94 42 00 - Fax: +33 4 93 65 47 16

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Foreword

This European Telecommunication Standard (ETS) has been produced by the Signalling Protocols and Switching (SPS) Technical Committee of the European Telecommunications Standards Institute (ETSI).

Transposition dates	
Date of adoption of this ETS:	20 March 1998
Date of latest announcement of this ETS (doa):	31 August 1998
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	28 February 1999
Date of withdrawal of any conflicting National Standard (dow):	28 February 1999

Introduction

The work on a new V interface concept, initiated by a request from the ETSI Technical Assembly (TA), was taken over by a Special Experts Group, set up by TC SPS and working under STC SPS3, with experts from several STCs, e.g. SPS5, TM3 and NA4.

TC SPS identified in the terms of reference two interface concepts, one called the $V_{5.1}$ interface, based on a static multiplexing principle, and the other called the $V_{5.2}$ interface, based on a dynamic, concentrator type, principle.

The following set of standards form part of the V_5 concept:

ETS 300 324-1 (1994): "$V_{5.1}$ interface for the support of Access Network (AN)" (G.964);

ETS 300 347-1 (1994): "$V_{5.2}$ interface for the support of Access Network (AN)" (G.965);

ETS 300 376-1 (1994): "Q_3 interface specification to the access network for the configuration management of V_5 interface and associated user ports" (Q.57CM);

ETS 300 378-1 (1995): "Specifications of the Q_3 interface to the access network for the support of V_5 interfaces; Fault and performance management of V_5 interfaces and associated user ports" (Q.57FPM).

This ETS includes a number of informative annexes:

Annex A: Loading Levels; Performance can be measured, independent of services applied. Reference loads are specified for a characteristic mix of originating and terminating call attempts.

Annex B: Teletraffic Aspects; Background and Teletraffic aspects of AN delay performance objectives.

Annex C: Performance Investigations.

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1   Scope

This European Telecommunication Standard (ETS) specifies the performance design objectives of an Access Network (AN) for call handling and bearer channel connection management. It is assumed that the Local Exchange (LE) meets delay criteria as recommended by ITU-T Recommendation Q.543 [9]. Specified delays for the AN are additional to the ones for the LE. This ETS is applicable to both the $V_{5.1}$ interface as specified in ETS 300 324-1 [1]and $V_{5.2}$ interface as specified in ETS 300 347-1 [2].

Relationship of design performance requirements to operational performance requirements as defined within this ETS, should be considered as design objectives for systems under the conditions stated in this ETS. These conditions are defined by such parameters as average circuit occupancy, busy hour call attempts, etc. They should be distinguished from the operational performance requirements which AN and service providers establish for remote access arrangements across interfaces at the V_5 reference point operating in their specific environment.

This standard is mainly intended for Access Networks involving optical or copper transmission media, circuit based transfer mode, and PCM voice encoding. Other Access Network technologies, particularly Radio technologies, may require further study.

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 hereafter. For dated references subsequent amendments to, or revisions of, any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1]   ETS 300 324-1: "Signalling Protocols and Switching (SPS); V interfaces at the digital Local Exchange (LE); $V_{5.1}$ interface for the support of Access Network (AN); Part 1: $V_{5.1}$ interface specification".

[2]   ETS 300 347-1: "Signalling Protocols and Switching (SPS); V interfaces at the digital Local Exchange (LE); $V_{5.2}$ interface for the support of Access Network (AN); Part 1: $V_{5.2}$ interface specification".

[3]   ETS 300 463 (1996): "Transmission and Multiplexing (TM); Requirements of passive Optical Access Networks (OANs) to provide services up to 2 Mbit/s bearer capacity".

[4]   ETS 300 011 (1992): "Integrated Services Digital Network (ISDN); Primary rate user-network interface; Layer 1 specification and test principles".

[5]   ETS 300 012 (1992): "Integrated Services Digital Network (ISDN); Basic user-network interface Layer 1 specification and test principles".

[6]   ETS 300 166 (1993): "Transmission and Multiplexing (TM); Physical and electrical characteristics of hierarchical digital interfaces for equipment using the 2 048 kbit/s - based plesiochronous or synchronous digital hierarchies".

NOTE 1:   This ETS is based on ITU-T Recommendation G.703 (1991).

[7]   ETS 300 233 (1994): "Integrated Services Digital Network (ISDN); Access digital section for ISDN primary rate".

NOTE 2:   This ETS is based on ITU-T Recommendation G.962 (1993).

[8]   ETS 300 297 (1995): "Integrated Services Digital Network (ISDN); Access digital section for ISDN basic access".

NOTE 3:   This ETS is based on ITU-T Recommendation G.960 (1993).

[9]   ITU-T Recommendation Q.543 "Digital exchange performance design objectives".

[10]   ITU-T Recommendation Q.551: "Transmission characteristics of digital exchanges".

[11]   ITU-T Recommendation Q.552: "Transmission characteristics at 2-wire analogue interfaces of digital exchanges".

[12]   ITU-T Recommendation Q.554 "Transmission characteristics at digital interfaces of a digital exchanges".

3   Definitions and abbreviations

3.1   Definitions

For the purposes of this ETS the following definitions apply:

Access Network (AN): A system implemented between the Local Exchange (LE) and the user, replacing part or the whole of the local line distribution network.

bearer channel: A 64 kbit/s time slot in the V5 interface, allocated for a B-channel of an ISDN user port or a PCM encoded 64 kbit/s channel for a PSTN user port.

control: Is concerned with status and control of user ports, V5 interface layer 1 and 2 establishment and other common procedures.

Local Exchange (LE): An exchange on which user lines are terminated via an AN.

Q_3 interface: A general term for the family of Q interfaces for the OAM&P of network elements (e.g., a Q_3-AN or Q_3-LE interface).

V5 interface: A general term for the family of V interfaces for connection of ANs to the LE (e.g., a $V_{5.1}$ or $V_{5.2}$ interface).

3.2   Abbreviations

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

AN	Access Network
BCC	Bearer Channel Connection
C-channel	Communication channel
C-path	Communication path
DC	Direct Current (feeding, signalling)
FSM	Finite State Machine
ISDN	Integrated Services Digital Network
ISDN-BA	ISDN-Basic Access
ISDN-PRA	ISDN-Primary Rate Access
LE	Local Exchange
NT1	Network Termination type 1
PCM	Pulse Code Modulation
PSTN	Public Switched Telephone Network
UNI	User-Network Interface

4 Transmission characteristics

4.1 General

The general definitions associated with transmission characteristics and transmission parameters from a total perspective such as group delay and the transfer functions for jitter and wander are provided in ITU-T Recommendations Q.551 [10], Q.552 [11] and Q.554 [12]. These Recommendations define, for any bearer channel connection which may be set up, the necessary levels of transmission performance to conform with overall objectives for the complete user-to-user connections in which an AN may be involved.

4.2 Characteristics of interfaces

The interfaces taken into account are those defined in the $V_{5.1}$ and $V_{5.2}$ specifications. For voice-frequency interfaces (i.e. Z and analogue leased lines), the electrical parameters refer to the appropriate distribution frame, on the assumption that the length of the cabling between the distribution frame and the AN does not exceed 100 m. For corresponding limitations on the location of digital interfaces, see ETS 300 166 [6].

4.2.1 PSTN access - Interface Z

The interface Z provides for the connection of two-wire analogue subscriber lines and will carry signals such as speech, voice-band data and multi-frequency push button signals, etc. In addition interface Z shall provide for DC feeding the subscriber set and ordinary functions such as DC signalling, ringing and metering, etc., where appropriate.

Detailed transmission characteristics for this interface are provided in ITU-T Recommendation Q.552 [11]; clauses "Characteristics common to all 2-wire analogue interfaces" and "Characteristics of interface Z".

4.2.2 ISDN access - V-type reference points/interfaces

The AN supports the following ISDN access types:

- ISDN basic access;
- ISDN primary rate access (not for $V_{5.1}$);
both with or without NT1 integrated in the AN.

For the detailed characteristics of these ISDN accesses reference should be made to the following documents:

- ETS 300 297 [8] for ISDN basic access with NT1 separate for the AN;
- ETS 300 012 [5] for ISDN basic access with NT1 integrated in the AN;
- ETS 300 233 [7] for ISDN primary rate access with NT1 separate from the AN;
- ETS 300 011 [4] for ISDN primary rate access with NT1 integrated in the AN.

4.2.3 Other analogue or digital access for leased lines

The characteristics of these accesses are for further study.

4.2.4 Interface V_5

The V_5 interface have transmission characteristics as given in ITU-T Recommendation Q.554 [12]; clause "Interface characteristics at interface A", case of 2 048 kbit/s.

4.3 Bearer channel signal transfer delay

Bearer channel signal transfer delay is specified for the transmission capability of allocated B-channels (ISDN access) or PCM encoded 64 kbit/s channels (PSTN access) and is defined in ETS 300 463 [3]; clause "Signal transfer delay".

5 Delay timing characteristics

5.1 General

The delay timing characteristics are defined in terms of "trigger events" which can be observed at "test points" specified for the AN configuration.

Figure 1 illustrates the general location of such "test points" for the definition of delay timings, i.e. at the user ports and the V_5 interface(s).
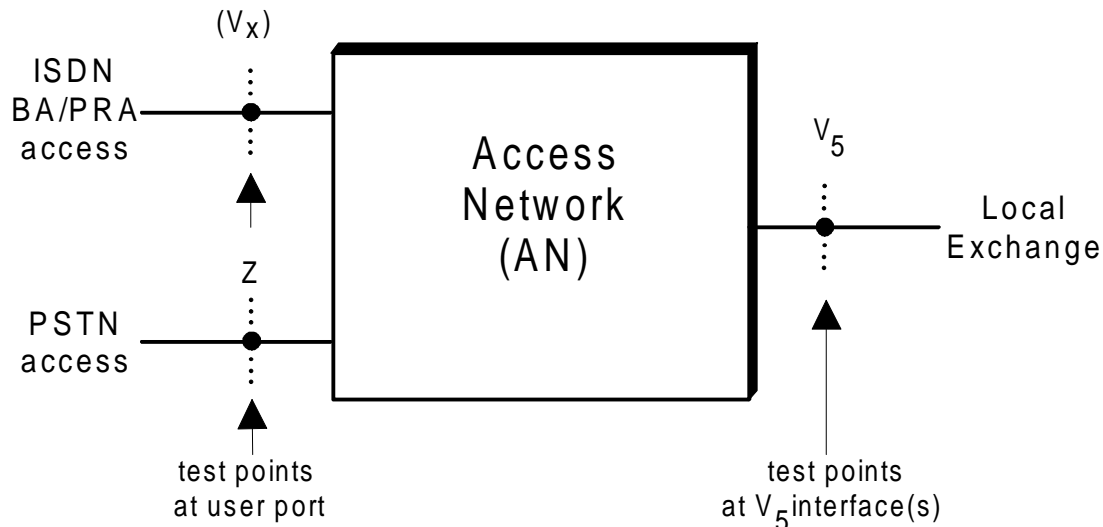

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Figure 1: Test points for AN configuration
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For ISDN accesses the test point is related to the D-channel carrying all information types, i.e. Ds-data, p-data and f-data.

At the V_5 interface (protocol) information from different user accesses as well as from AN internal protocol entities and FSMs is transported on the communication path (C-path). In order to enable an unambiguous specification of delay timing parameters and values, separate test points for all the different information types are defined. On the V_5 interface separate logical test points are defined for each of the different information types, i.e. ISDN Ds-data, ISDN p-data, ISDN f-data, PSTN signalling information, control protocol, the link control protocol, etc.

5.2 Definition of test points and triggers

For the definition of delay parameters and values of the AN, the following general approach is used:

a) At PSTN user ports

For signals from the PSTN terminal the delay timing shall begin with the occurrence of the relevant line signal change at the user port representing that particular PSTN signal, e.g. an on-hook should begin at the time where the loop current falls below a certain value (i.e., any persistency checking time is excluded).

For signals from the user port the delay timing shall terminate with the relevant line signal change at the user port line side representing that particular PSTN signal.

This approach supports the definition of conformance statements and tests. It requires the definition of the voltage and/or current values for the triggering of the measurement at the port on the basis of the national PSTN protocol mapping implemented in the AN.