# SLOVENSKI STANDARD
# SIST EN 301 141-4 V1.1.1:2005

**01-januar-2005**

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**Digitalno omrežje z integriranimi storitvami (ISDN) – Ozkopasovni večstoritveni dostavni sistem (NMDS) – 4. del: Zgradba preskušalnega niza in namen preskušanja (TSS&TP) – Specifikacija za omrežno plast (stran NTN)**

Integrated Services Digital Network (ISDN); Narrowband Multi-service Delivery System (NMDS); Part 4: Test Suite Structure and Test Purposes (TSS&TP) specification for the network layer (NTN side)



**Ta slovenski standard je istoveten z:** **EN 301 141-4 Version 1.1.1**

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**ICS:**

| | | |
|---|---|---|
| 33.080 | Digitalno omrežje z integriranimi storitvami (ISDN) | Integrated Services Digital Network (ISDN) |
| 35.100.30 | Omrežni sloj | Network layer |

**SIST EN 301 141-4 V1.1.1:2005** **en**

# ETSI EN 301 141-4 V1.1.1 (2002-02)

*European Standard (Telecommunications series)*

# Integrated Services Digital Network (ISDN); Narrowband Multi-service Delivery System (NMDS); Part 4: Test Suite Structure and Test Purposes (TSS&TP) specification for the network layer (NTN side)

Reference
DEN/SPAN-130103-4

Keywords
access, basic, ISDN, layer 3, NMDS, PSTN, TSS&TP, user

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Sous-Préfecture de Grasse (06) N° 7803/88



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# Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Services and Protocols for Advanced Networks (SPAN).

The present document is part 4 of a multi-part deliverable covering the Integrated Services Digital Network (ISDN); Narrowband Multi-service Delivery System (NMDS), as identified below:

Part 1: "NMDS interface specification";

Part 2: "Protocol Implementation Conformance Statement (PICS) proforma specification";

Part 3: "Test Suite Structure and Test Purposes (TSS&TP) specification for the data link layer (NTN side)";

**Part 4: "Test Suite Structure and Test Purposes (TSS&TP) specification for the network layer (NTN side)";**

Part 5: "Test Suite Structure and Test Purposes (TSS&TP) specification for the network layer (LE side)";

Part 6: "Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) specification for the NMDS Layer 2 PSTN-GW function (NTN side)";

Part 7: "Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) specification for the PSTN NMDS interface Layer 3 (NTN side)";

Part 8: "Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) specification for the PSTN NMDS interface Layer 3 (LE side)".



| National transposition dates | |
|---|---|
| Date of adoption of this EN: | 8 February 2002 |
| Date of latest announcement of this EN (doa): | 31 May 2002 |
| Date of latest publication of new National Standard or endorsement of this EN (dop/e): | 30 November 2002 |
| Date of withdrawal of any conflicting National Standard (dow): | 30 November 2002 |

# 1 Scope

The present document contains the Test Suite Structure (TSS) and Test Purposes (TPs) for the Network layer (NWK) of a NMDS interface.

The objective of the present document is to provide conformance tests giving a high probability of inter-operability of an Network Termination Node (NTN) and a Local Exchange (LE) from different manufacturers over the NMDS interface. The present document covers only the procedures described in EN 301 141-1 [1].

ISO/IEC 9646-1 [7] is used as the basis for the methodology of conformance testing.

Concerning the Public Switched Telephone Network (PSTN) protocol testing, only the procedures defined in EN 301 141-1 [1] are covered by the tests defined in the present document. An Implementation Under Test (IUT), however, will have implemented a national PSTN protocol part as well. This requires that the tester generates messages containing the national PSTN protocol specific optional Information Elements (IEs), otherwise the IUT would not act on messages according to the PSTN protocol procedure definition. However, this does not provide a comprehensive test of the national PSTN protocol mapping specification, which is outside the scope of the present document.

As the tests use PSTN messages containing optional IEs according to national specifications, the test result is only valid for the implemented national mapping of the V5.1 PSTN protocol.

The present document does not cover tests related to functions of the bearer channel. Those functions should be tested in conjunction with testing of the national PSTN protocol mapping specification.

The present document contains no requirements concerning NWK tests for Integrated Services Digital Network Basic Access (ISDN-BA).



# 2 References



The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

[1] ETSI EN 301 141-1 (V2.1.1): "Integrated Services Digital Network (ISDN); Narrowband Multi-service Delivery System (NMDS); Part 1: NMDS interface specification".

[2] ETSI EN 301 141-2 (V1.3.1): "Integrated Services Digital Network (ISDN); Narrowband Multi-service Delivery System (NMDS); Part 2: Protocol Implementation Conformance Statement (PICS) proforma specification".

[3] ISO/IEC 7498-1: "Information technology - Open Systems Interconnection - Basic Reference Model: The Basic Model".

[4] ISO/IEC 7498-2: "Information processing systems - Open Systems Interconnection - Basic Reference Model - Part 2: Security Architecture".

[5] ISO/IEC 7498-3: "Information technology - Open Systems Interconnection - Basic Reference Model: Naming and addressing".

[6] ISO/IEC 7498-4: "Information processing systems - Open Systems Interconnection - Basic Reference Model - Part 4: Management framework".

[7] ISO/IEC 9646-1: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts".

[8] ETSI EN 300 324-1 (V1.2.3): "V interfaces at the digital Local Exchange (LE); V5.1 interface for the support of Access Network (AN); Part 1: V5.1 interface specification".

[9] ETSI ETS 300 402-2 (1995): "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Data link layer; Part 2: General protocol specification [ITU-T Recommendation Q.921 (1993), modified]".

# 3 Definitions and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in EN 300 324-1 [8] and the following apply:

**Abstract Test Case (ATC):** Refer to ISO/IEC 9646-1 [7].

**Abstract Test Suite (ATS):** Refer to ISO/IEC 9646-1 [7].

**data link layer:** Refer to ISO/IEC 7498 [3] to [6].

**implementation under test:** Refer to ISO/IEC 9646-1 [7].

**incorrect information element:** specified information element carrying information element types not defined in EN 301 141-1 nor in EN 300 324-1

**invalid PSTN information element:** PSTN information element not according to national specific requirements



**invalid Protocol Data Unit:** PDU which contains incorrect message format

**invalid PSTN message:** PSTN message carrying information elements not according to national specific requirements



**lower tester:** Refer to ISO/IEC 9646-1 [7].

**network layer:** Refer to ISO/IEC 7498 [3] to [6].

**network termination:** equipment providing the network side at the ISDN user-network interface for the basic access

NOTE: This term is used in the present document to indicate network-terminating aspects of NT1 and NT2.

**physical layer:** Refer to ISO/IEC 7498 [3] to [6].

**Protocol Implementation Conformance Statement (PICS):** Refer to ISO/IEC 9646-1 [7].

**PICS proforma:** Refer to ISO/IEC 9646-1 [7].

**specified information element:** information element identifier defined in EN 300 324-1

**System Under Test (SUT):** Refer to ISO/IEC 9646-1 [7].

**Test Purpose (TP):** Refer to ISO/IEC 9646-1 [7].

**unspecified Information Element:** information element identifier not defined in EN 301 141-1 nor in EN 300 324-1

**valid information element:** PSTN information element according to national specific requirements

**valid PSTN message:** PSTN message carrying information elements according to national specific requirements

## 3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

| | |
|---|---|
| AN | Access Network |
| ATC | Abstract Test Case |
| ATS | Abstract Test Suite |
| FE | Function Element |
| FSM | Finite State Machine |
| IE | Information Element |
| ISDN | Integrated Services Digital Network |
| ISDN-BA | ISDN Basic Access |
| IUT | Implementation Under Test |
| L3addr | Layer 3 address |
| LE | Local Exchange |
| NTN | Network Termination Node |
| NWK | NetWorK layer |
| PDU | Protocol Data Unit |
| PICS | Protocol Implementation Conformance Statements |
| PL | Permanent Line |
| PSTN | Public Switched Telephone Network |
| SUT | System Under Test |
| TP | Test Purpose |
| TSS | Test Suite Structure |
| UNI | User Network Interface |



# 4 Test Suite Structure (TSS)

## 4.1 TSS overview



Figure 1 shows the structure of the NTN side NMDS test suite.

- NMDS_NTN
  - PSTN
    - Valid
      - PSTN FSM AN States (AN1, AN2, AN3, AN4, AN5, AN7)
      - Inopportune
      - PSTN FSM AN States (AN1, AN2, AN3, AN4, AN5, AN7)
    - Syntactically Invalid
      - PSTN FSM AN States (AN1, AN2, AN3, AN4, AN5, AN7)
    - Timers
      - PSTN FSM AN States (AN1, AN2, AN3, AN4, AN5, AN7)
  - ISDN
    - Valid
    - Syntactically Invalid

**Figure 1: NMDS NTN TSS**

## 4.2 Test groups

### 4.2.1 Protocol groups

#### 4.2.1.1 PSTN protocol

All tests in the PSTN protocol (NMDS_NTN/PSTN) test group are intended to verify as thoroughly as possible the various procedures of the NTN_PSTN_protocol entity.

The following PSTN procedures are covered:

- all path related normal operation procedures;
- significant path related exceptional procedures;
- the status enquiry procedure;
- the error handling procedures;
- the layer 3 error detection procedure.

#### 4.2.1.2 ISDN maintenance protocol

All tests in the ISDN protocol (NMDS_NTN/ISDN) test group are intended to verify as thoroughly as possible the various procedures of the NTN_ISDN_protocol entity.

The following ISDN procedures are covered:



- the status enquiry procedure;
- the error handling procedures.



### 4.2.2 Main test groups

#### 4.2.2.1 Valid Behaviour (V) tests

Predefined state transitions are considered as valid. The test purpose in the Valid Behaviour test subgroup cover as far as reasonable the verification of the normal and exceptional procedures of the various FSMs.

A valid test is a test where the message sequence and the message contents is considered as valid (no error indication shall be indicated).

#### 4.2.2.2 Inopportune Behaviour (I) tests

This test subgroup is intended to verify that the IUT is able to react properly in the case an inopportune protocol event occurring. Such an event is syntactically correct but occurs when it is not expected and an error indication is caused.

#### 4.2.2.3 Syntactically Invalid Behaviour (S) tests

This test subgroup is intended to verify that the IUT is able to react properly having received an invalid PDU. An invalid PDU is defined as a syntactically incorrect message and therefore an error indication is caused.

#### 4.2.2.4 Timer (T) expiry and counter mismatch tests

Different timers and counters are defined to supervise the various state transitions.

## 4.3 Test step structure

General dynamic behaviours are described in test steps which can be called from all ATCs within the ATS:

- state transitions;
- preconditions;
- preambles;
- postambles;
- status checks;
- common behaviours.

### 4.3.1 State transitions

The following clauses identify the test steps used in the ATS. In general, each test step represents a state transition. For example in the PSTN protocol, PSTN_NTN1_2 is the test step which brings the NTN PSTN_protocol_FSM from PSTN_path_state AN1 to PSTN_path_state AN2. The state transitions are declared in the parenthesis (originating state - destination state) which follow the test step names.

**PSTN:** state transitions used to preamble and postamble the PSTN protocol before and after a test purpose can be performed.

To test the NMDS interface certain sequences (i.e. preamble) shall be executed to reach the state which is the subject for the TPs.



#### 4.3.1.1 PSTN protocol

Refer to EN 301 141-1 [1] and EN 300 324-1 [8].



All messages sent within the test steps shall be valid PSTN messages.

**PSTN_AN1_2**
On receipt of an originating call attempt (FE-subscriber_seizure) the IUT shall send the message ESTABLISH and enter the PSTN_path_state AN2 (Path initiated by AN).

**PSTN_AN2_3**
On receipt of a FE-subscriber_release, the IUT shall enter the PSTN_path_state AN3.

**PSTN_AN1_4**
On receipt of the event FE-line_information, the IUT shall send the ESTABLISH message and enter the PSTN_path_state AN4.

**PSTN_AN1_5**

On receipt of the ESTABLISH message the IUT shall send the message ESTABLISH ACK and enter the PSTN_path_state AN5 (Path active).

**PSTN_AN5_7**
On receipt of a SIGNAL message containing a faulty sequence number the IUT PSTN protocol shall send a DISCONNECT message and enter the PSTN_path_state AN7.

### 4.3.2 Preconditions

The precondition step of a test group applies at the UP via the user interface as a Permanent Line (PL) condition. This line condition shall be permanent during all tests in that test group.