



Specification

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Title

Specification for the network side of the user-network interface: SHDSL modem (STU-R)

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1. Scope

This specification describes the network side of SHDSL access to the network of Telenor as prescribed in Article 4.2 of RTT&E-directive [8]. The requirements in Telenor Networks Specification OA 100 [3] also apply.

This specification depicts the technical parameters for a customer owned SHDSL modem (STU-R) interworking with Telenor DSLAM (STU-C).

The objective is to ensure full interoperability between STU-C and STU-R from different vendors and with different hardware chip sets.

It is recommended that the vender of STU-R defines a test regime to ensure compatibility between the STU-R and the network resources (STU-C, DSLAM etc.).

NOTE: *Presently the focus is to have STU-R from different vendors working together with STU-C from Nokia (ISAM Release 5.2 for 7302/7330 ISAM [1]or later releases).*

In no event shall Telenor be liable to other parties for any direct, indirect, special, incidental, or consequential damages resulting from errors or defects in these specifications.

Functionality and performance at the customer side regarding the local area network (LAN) or the data terminal equipment (DTE) are outside the scope for this specification; e.g. firewalls, DHCP, NAT and interfaces like 10BaseT, USB, PCI and WLAN.

2. References

2.1 Normative references

This specification incorporates by dated or undated references, provisions from other publications/standards. These normative references are cited at the appropriate places in the text and the references are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this specification only when incorporated in it by amendment or revision. For undated references, including amendments, the last edition of the document referred to applies.

- [1] [ISAM FAMILY CAPABILITIES OVERVIEW](#)
- [2] Telenor Networks Specification OA 107, Requirements for equipment to be connected to the local loop in the access network of Telenor. SHDSL equipment providing Nx64 kbit/s digital transmission, full unbundled access (service type G) <http://www.telenorwholesale.no>
- [3] Telenor Networks Specification OA 100, *General requirements for equipment to be connected to the local loop in the access network of Telenor and/or for equipment to be installed and operated in Telelosji* <http://www.telenorwholesale.no>
- [4] ITU-T Recommendation G.991.2 *Single-Pair High-Speed Digital Subscriber Line (SHDSL) transceivers*

- [5] ITU-T Recommendation G.994.1 *Handshake procedures for Digital Subscriber Line (DSL) transceivers*
- [6] ITU-T Recommendation G.996.1 *Test procedures for Digital Subscriber Line (DSL) transceivers*
- [7] ITU-T Recommendation I.610 *B-isdn operation and maintenance principles and functions abstract*
- [8] Directive R&TTE 2014/53/EU: (The Radio Equipment and Telecommunications Terminal Equipment) http://ec.europa.eu/growth/sectors/electrical-engineering/red-directive_en
- [9] CENELEC EN 60603-7:2016, *Connectors for frequencies below 3 MHz for use with printed boards – Part 7: Detail specification for connectors, 8 way, including fixed and free connectors with common mating features* (IEC 60603-7:2016)
- [10] CENELEC EN 60950 *Safety of information technology equipment* (IEC 60950)

2.2 Informative references

- [11] ETSI TS 101524 *Transmission and Multiplexing (TM); Access transmission system on metallic access cables; Symmetrical single pair high bitrate Digital Subscriber Line (SDSL)*
- [12] ETSI EN 300 019-1-1: *Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-1: Classification of environmental conditions; Storage*
- [13] ETSI EN 300 019-1-2: *Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-2: Classification of environmental conditions; Transportation*
- [14] ETSI EN 300 019-1-3: *Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-3: Classification of environmental conditions; Stationary use at weatherprotected locations*
- [15] ITU-T Recommendation K.21 *Resistibility of telecommunication equipment installed in customer's premises to overvoltages and overcurrents*
- [16] Directive 2014/30/EU etc.: <http://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/electromagnetic-compatibility/>
- [17] Norwegian regulations:
<https://lovdata.no/dokument/SF/forskrift/2016-04-15-379>

3. Definitions and abbreviations

IT system A power distribution system having no direct connection to earth, the exposed conductive parts of the electrical installation being earthed.

3.1 Abbreviations

ASAM	ATM subscriber access multiplexer (DSLAM)
ATM	Asynchronous transfer mode
CBR	Constant bit rate
DHCP	Dynamic host configuration protocol
DSL	Digital subscriber line
DSLAM	Digital subscriber line access multiplexer (usually housing the STU-C)
DTE	Data terminal equipment
ETSI	European Telecommunications Standards Institute
IMA	Inverse Multiplexing over ATM
ITU-T	International Telecommunication Union – Telecommunication sector
NAT	Network address translation
nrt-VBR	Non-real-time variable bit rate
OAM	Operation, administration and maintenance
PC	Personal computer
PCI	Peripheral component interconnect
PVC	Permanent virtual connection
SDSL	Symmetrical single pair high bitrate digital subscriber line
SHDSL	Single-pair high-bit-rate DSL
STU	SHDSL transceiver unit
STU-C	STU at the central office (i.e network operator)
STU-R	STU at the remote end (i.e customer's premises)
TE	Terminal equipment
UBR	Unspecified bit rate
UBR+	UBR with minimum cell rate (MCR) specified
USB	Universal serial bus
VBR.3	Conformance definition according to ATM Forum TM4.0. (Cells above SCR but within PCR shall be tagged)
VCI	Virtual channel identifier
VPI	Virtual path identifier
WLAN	Wireless local area network

4. Requirements

4.1 General

Requirements in order to obtain interoperability are considered to be mandatory. The equipment is compliant to this specification if all mandatory requirements are fully compliant.

Some statements may be considered optional or recommended if stated in the heading. Non-compliance to statements indicated as 'optional' or 'recommendations' does not exclude compliance to this specification.

The STU-R shall comply with the generic specification, Telenor Networks Specifications OA 100 [3].

The STU-R is located at the customer's premises as shown in Figure 1. The STU-R may be a stand-alone unit or an integrated part of a DTE. The DTE may be a PC or a router connected to a local area network (LAN).

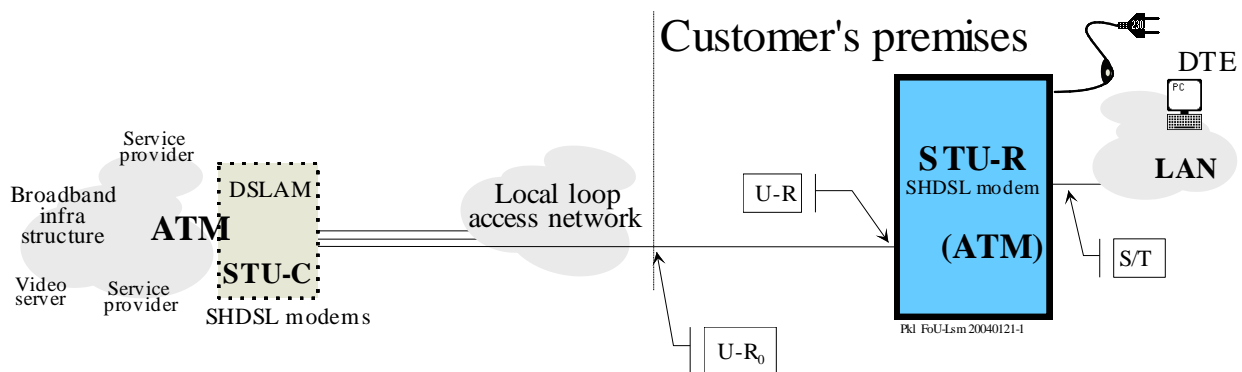


Figure 1 SHDSL system functionality

4.2 Transmission requirements

4.2.1 Electrical and functional requirements

The STU-R shall comply with Telenor Networks Specifications OA 107 [2].

ITU-T Rec. G.991.2 [4] defines the minimal set of requirements to provide satisfactory transmission between the network and the customer interface. All the physical layer aspects required ensuring the compatibility between the network and the STU-R at customer premises are specified.

4.2.1.1 Line code and duplex principle for SHDSL

The relevant line code and duplex principle shall be according to ITU-T Rec. G.991.2 [4].

The number of symmetrical pair needed for the transmission is depended of the service required.

4.2.1.2 One pair transmission capability

Functionality for one-pair transmission is mandatory.

The STU-R shall have transceiver circuits and necessary functionality to transmit and to receive signals on one pair according to ITU-T Rec. G.991.2 [4].

4.2.1.3 Two pair transmission capability

The STU-R should have transceiver circuits and necessary functionality to simultaneously transmit and to receive signals on two pairs according to the service demanded (increased capacity or extended reach). The functionality for inverse (de-) multiplexing shall be implemented according to ITU-T Rec. G.991.2 [4].

4.2.1.4 M-pair mode ($M \leq 8$) transmission capability

The functionality of inverse (de-) multiplexing shall be implemented according to Nokia Interface specifications on the ISAM 7302/7330 [1], which is based on ITU-T Rec. G.991.2 [4].

4.2.1.5 IMA mode ($M=8$) transmission capability

8-wire STU-R shall be compatible with Inverse Multiplexing for ATM (IMA) according to ITU-T Rec. G.991.2.[4]

4.2.1.6 Intermediate regenerator(s)

The STU-R shall be able to operate in presence of intermediate regenerator(s). The provision of remote power feeding for the regenerator(s) is not a part of this specification.

4.2.1.7 ATM transport

The equipment shall transport ATM cells over SHDSL according to ITU-T Rec. G.991.2 [4]. For cell transport, the ATM-specific parts shall apply.

4.2.2 Interworking with the STU-C of Telenor

The Telenor transport service ATM over SHDSL is presently supplied by a vendor of STU-C: Nokia (Formerly Alcatel). The STU-R shall comply, according to clauses **Feil! Fant ikke referansekinden..**

4.2.2.1 Compatibility for Nokia ISAM 7302 SHDSL line cards

The STU-R shall interwork with the STU-C as defined in *7302 ISAM compliance with xDSL modems* [1] regarding ITU-T Rec. G.991.2.

ITU-T Rec. G.991.2 Annex A is not applicable.

4.2.3 Performance

The reach requirements shall apply with STU-R connected to STU-C for all cases as specified in section 4.2.2.1,.

4.2.3.1 Reach for symmetrical bit rate, one pair transmission

The STU-R shall at least support symmetrical transmission on a distance L2 as defined in ITU-T rec. G.991.2 /Table B-2 [4].

The tests shall be performed to confirm compliance to section 4.2.2.1,.

4.2.3.2 Reach for symmetrical bit rate, M-pair transmission

The reach of the M-pair transmission shall be equal to the one pair transmission as specified in section 4.2.3.1.

4.2.3.3 Sync time

The sync time shall be according to ITU-T rec. G.991.2 [4].

4.3 Management and configuration

4.3.1 Vendor identification notation (recommendations)

The STU-C should be able to identify the vendor of the remote STU-R. The data in the vendor ID information block should be available as specified in ITU-T Rec. G.994.1 [5].

4.3.2 Dying gasp (recommendations)

The STU-R should be able to detect when the electrical power has been shut off (loss of power) according to ITU-T Rec. G.991.2 [4].

4.4 ATM requirements

4.4.1 Functionality

The present ATM service categories supported by Telenor are UBR.1, UBR+, and nrt-VBR with conformance VBR.3.

4.4.2 F5 loop back

The ATM OAM F5 end-to-end or segment loop-back functionality at virtual channel level according to ITU-T Rec. I.610 [7] shall be supported.

4.4.3 Pre-configuration of VPI/VCI

A PVC shall be pre-configured with VPI/VCI = 8/35.

4.4.4 Performance functions

The bitrate measured on the ATM level, the ATM header included, should be close to the DSL bitrate verified in section 4.2.3.1 and – if applicable – also in section 4.2.3.2.

4.5 Auxiliary requirements

4.5.1 No pre-configuration needed

Before customer installation and start up, no configuration of the STU-R shall be necessary.

4.6 Physical interface and indicators

4.6.1 Customer premise's interface, U-R₀

The wall socket terminating the access network complies with EN 60603-7 [9] (RJ45).

Pair one is connected to pins 4 and 5. Optionally pair two is connected to pins 3 and 6, pair three is connected to pins 1 and 2 and pair four is connected to pins 7 and 8.

In case of M-pair mode (M=5 to 8) operation, pairs 5 to 8 are terminated to a separate wall socket. Pair five is then connected to pins 4 and 5, pair six is connected to pins 3 and 6, pair seven is connected to pins 1 and 2 and pair eight is connected to pins 7 and 8.

It is important to notice that the provision of cabling arrangements to connect STU-R to the wall socket is at the responsibility of the STU-R provider.

4.6.1.1 External adaptor for one pair connections only (optional)

In case the wall socket terminating the access network is the old three-pin Norwegian/Finish, an adaptor with socket according to EN 60603-7 [9] (RJ45) may be applied (as illustrated).

4.6.2 SHDSL port, U-R (recommendations)

To be decided by the vendor. In case connector is according to EN 60603-7 [9] (RJ45), the pin configuration may be equal to interface U-R₀.

4.6.3 Power status indication

The STU-R shall indicate presence of power.

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4.6.4 Link status Indication

The STU-R shall indicate the following status:

- SHDSL link not available
- SHDSL link available

4.6.5 Link initialisation state indication (recommendations)

The STU-R should indicate presence of link initialisation state (training).

4.6.6 Traffic status indication (recommendations)

The STU-R should indicate presence of SHDSL link traffic.

4.7 Environmental requirements

4.7.1 CE-marking

Equipment shall comply with requirements specified in order to obtain the CE marking.

4.7.2 EMC

The EU directives concerning EMC are in force and conformance to these EU directives is mandatory. The EU directives are made legal also in Norway.

For requirements in Norwegian regulations, see the relevant EEC directives:

<http://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/electromagnetic-compatibility/>

4.7.3 Resistibility

4.7.3.1 Gas discharge tubes

The provision of gas discharge tubes is not mandatory. If gas discharge tubes are provided, the requirements in Telenor Networks Specification OA 100 [3] clause 6.3 shall apply.

4.7.3.2 Protection (recommendations)

The major power distribution system in Norway is the IT system, which is more susceptible for electromagnetic disturbances. It is recommended that equipment connected to telecommunication lines or power lines should resist lightning pulses of 10 kV (instead of 4/6 kV as stated in K.21 [15]).

4.7.4 Climatic and mechanical recommendations

The modems (STU-R) will typically be ordered in large quantities and distributed by one and one unit by public transportation.

4.7.4.1 Storage (recommendations)

Requirements in EN 300019-1-1 class1.2 [12] apply for storage. Humidity is normally not controlled.

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4.7.4.2 Transportation (recommendations)

Requirements in EN 300019-1-2 class 2.3 [13] apply for public transportation.

4.7.4.3 Operational (recommendations)

Requirements in EN 300019-1-3 class 3.2 [14] apply for stationary use at weather-protected locations. Equipment may be exposed to direct sunshine and humidity is normally not controlled. It is recommended that the equipment may operate over the temperature range of +5°C to +55°C.

4.8 Electrical safety

Requirements in CENELEC EN 60950 [10] apply in general.

Requirements in Norwegian regulations [17]: <https://lovdata.no/dokument/SF/forskrift/2016-04-15-379>