SLOVENSKI STANDARD
SIST ETS 300 814 E1:2003

01-december-2003

Digitalna videoradiodifuzija (DVB) – Vmesniki DVB do omrežij sinhrone digitalne hierarhije (SDH)

Digital Video Broadcasting (DVB); DVB interfaces to Synchronous Digital Hierarchy (SDH) networks

Ta slovenski standard je istoveten z: **ETS 300 814 Edition 1**

ICS:

33.170	Televizijska in radijska difuzija	Television and radio broadcasting

SIST ETS 300 814 E1:2003 **en**

EUROPEAN TELECOMMUNICATION STANDARD

ETS 300 814

March 1998

Source: EBU/CENELEC/ETSI JTC

Reference: DE/JTC-DVB-29

ICS: 33.020

Key words: DVB, broadcasting, digital, video, TV, SDH

European Broadcasting Union Union Européenne de Radio-Télévision

Digital Video Broadcasting (DVB); DVB interfaces to Synchronous Digital Hierarchy (SDH) networks

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

Contents

Blank page

Foreword

This European Telecommunication Standard (ETS) has been produced by the Joint Technical Committee (JTC) of the European Broadcasting Union (EBU), Comité Européen de Normalisation ELECtrotechnique (CENELEC) and the European Telecommunications Standards Institute (ETSI).

NOTE: The EBU/ETSI JTC was established in 1990 to co-ordinate the drafting of standards in the specific field of broadcasting and related fields. Since 1995 the JTC became a tripartite body by including in the Memorandum of Understanding also CENELEC, which is responsible for the standardization of radio and television receivers. The EBU is a professional association of broadcasting organizations whose work includes the co-ordination of its members' activities in the technical, legal, programme-making and programme-exchange domains. The EBU has active members in about 60 countries in the European broadcasting area; its headquarters is in Geneva.

* European Broadcasting Union
CH-1218 GRAND SACONNEX (Geneva)
Switzerland

Tel: +41 22 717 21 11
Fax: +41 22 717 24 81

Digital Video Broadcasting (DVB) Project

Founded in September 1993, the DVB Project is a market-led consortium of public and private sector organizations in the television industry. Its aim is to establish the framework for the introduction of MPEG2 based digital television services. Now comprising over 200 organizations from more than 25 countries around the world, DVB fosters market-led systems, which meet the real needs, and economic circumstances, of the consumer electronics and the broadcast industry.

Transposition dates	
Date of adoption of this ETS:	6 March 1998
Date of latest announcement of this ETS (doa):	30 June 1998
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	31 December 1998
Date of withdrawal of any conflicting National Standard (dow):	31 December 1998

Blank page

1 Scope

This European Telecommunication Standard (ETS) specifies the transmission of MPEG2 Transport Streams (TS) between two DVB interfaces as defined in EN 50083-9 [11] within SDH networks working at the ITU-T Recommendation G.707 [15] hierarchical bit rate of 155 520 kbit/s or at a bit rate of 51 840 kbit/s. The use of any of these bit rates is optional, if however one or more rates are selected the complete specification applies. The definition of the network aspects of the transmission of MPEG2-TSs is based to the maximum extent on existing international and European standards.

The equipment considered in this ETS is the Network Adapter (NA) performing the adaptation between MPEG2-TSs and the interfaces of SDH networks.

2 References

This ETS incorporates by dated and 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.

2.1 ETSI and CENELEC publications

[1] ETS 300 147: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH)"; Multiplexing structure".

[2] ETS 300 417-1-1: "Transmission and Multiplexing (TM); Generic functional requirements for Synchronous Digital Hierarchy (SDH) equipment; Part 1: Generic processes and performance".

[3] ETS 300 417-2-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 2-1: Synchronous Digital Hierarchy (SDH) and Plesiochronous Digital Hierarchy (PDH) physical section layer functions".

[4] ETS 300 417-3-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 3-1: Synchronous Transport Module-N (STM-N) regenerator and multiplex section layer functions".

[5] ETS 300 417-4-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 4-1: Synchronous Digital Hierarchy (SDH) path layer functions".

[6] ETS 300 417-6-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 6-1: Synchronization distribution layer functions".

[7] EN 300 421: "Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for 11/12 GHz satellite services".

[8] EN 300 429: "Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for cable systems".

[9] ETS 300 462-1: "Transmission and Multiplexing (TM); Generic requirements for synchronization networks; Part 1: Definitions and terminology for synchronization networks".

[10] ETS 300 462-5: "Transmission and Multiplexing (TM); Generic requirements for synchronization networks; Part 5: Timing characteristics of slave clocks suitable for operation in Synchronous Digital Hierarchy (SDH) equipment".

[11] EN 50083-9: "Cabled distribution systems for television, sound and interactive multimedia signals; Part 9: Interfaces for CATV/SMATV headends and similar professional equipment for DVB/MPEG2 transport streams" (CENELEC).

[12] ETR 290: "Digital Video Broadcasting (DVB); Measurement guidelines for DVB systems".

2.2 ITU publications

[13] ITU-R Recommendation F.750-1: "Architectures and functional aspects of radio-relay systems for SDH-based networks".

[14] ITU-T Recommendation G.703: "Physical/electrical characteristics of hierarchical digital interfaces".

[15] ITU-T Recommendation G.707: "Network node interface for the synchronous digital hierarchy (SDH)".

[16] ITU-T Recommendation G.783: "Characteristics of Synchronous Digital Hierarchy (SDH) equipment functional blocks".

[17] ITU-T Recommendation G.825: "The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy".

[18] ITU-T Recommendation G.826: "Error performance parameters and objectives for international, constant bit rate digital paths at or above the primary rate".

[19] ITU-T Recommendation H.222.0: "Information technology - Generic coding of moving pictures and associated audio information: Systems".

[20] ITU-T Recommendation I.361: "B-ISDN ATM layer specification".

[21] ITU-T Recommendation I.363.1: "B-ISDN ATM Adaptation Layer specification".

[22] ITU-T Recommendation I.432: "B-ISDN User-Network Interface - Physical layer specification".

[23] ITU-T Recommendation I.732: "Functional characteristics of ATM equipment".

[24] ITU-T Recommendation J.82: "Transport of MPEG-2 constant bit rate television signals in B-ISDN".

[25] ITU-T Recommendation M.2120: "PDH paths, section and transmission system and SDH path and multiplex section fault detection and localization procedures".

[26] ITU-T Recommendation Q.822: "Stage 1, stage 2 and stage 3 description for the Q3 interface - Performance management".

[27] ITU-T Recommendation G.957: "Optical interfaces for equipments and systems relating to the synchronous digital hierarchy".

3 Definitions and abbreviations

3.1 Definitions

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

fixed stuff: Bytes that are used to fill up unused data positions.

MPEG2-TS packet: A data packet possessing a length of 188 bytes including 4 bytes of header information. The header contains MPEG related data.

RS coded MPEG2-TS packet: A data packet possessing a length of 204 bytes. Bytes 1 to 188 contain an MPEG2-TS packet. Bytes 189 to 204 contain the parity-check bytes for the error correction of the preceding bytes of this packet. These parity-check bytes are generated using a shortened Reed-Solomon Code RS (204, 188).

3.2 Abbreviations

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

AAL	ATM Adaptation Layer
APS	Automatic Protection Switching
ASI	Asynchronous Serial Interface
ATM	Asynchronous Transfer Mode
AU	Administrative Unit
BER	Bit Error Rate
CATV	Community Antenna TeleVision
CRC	Cyclic Redundancy Check
CS	Convergence Sublayer
EMF	Equipment Management Function
FAS	Frame Alignment Signal
FEC	Forward Error Correction
HEC	Header Error Control
HOA	Higher Order Assembler
HOVC	Higher Order Virtual Container
LOF	Loss Of Frame
LOP	Loss Of Pointer
LOS	Loss Of Signal
LOVC	Lower Order Virtual Container
LSB	Least Significant Bit
MAA	MPEG ATM Adaptation
MMI	Man Machine Interface
MON	MONitored
MP	Management Points
MPEG	Motion Picture Expert Group
MPI	MPEG Physical Interface
MSB	Most Significant Bit
MSOH	Multiplex Section OverHead
NE	Network Element
PAPI	Path Access Point Identifier
PDU	Protocol Data Unit
POH	Path OverHead
PT	Path Trace
QOS	Quality Of Service
RDI	Remote Defect Indication
REI	Remote Error Indication
RFI	Remote Failure Indication
RR	Radio-Relay
RS	Reed-Solomon
RSOH	Regenerator Section OverHead
SAR	Segmentation And Reassembly Sublayer
SDH	Synchronous Digital Hierarchy
SETG	Synchronous Equipment Timing Generator
SETPI	Synchronous Equipment Timing Physical Interface
SETS	Synchronous Equipment Timing Source
SLC	Signal Label Checking
SMATV	Satellite Master Antenna TeleVision
SmTT	Sm Trail Termination
SN	Sequence Number
SOH	Section OverHead
SPI	Synchronous Parallel Interface
SSI	Synchronous Serial Interface
STM	Synchronous Transport Module
TCM	Tandem Connection Monitoring

TIM	Trace Identifier Mismatch
TS	Transport Stream
TTF	Transport Terminal Function
TTI	Trail Trace Identifier
TUG	Tributary Unit Group
UI	Unit Interval
UTC	Universal Time Co-ordinated
VC	Virtual Container
VP	Virtual Path
VPE	VP Entity
VPME	VP Multiplexing Entity

4 Baseline specification

The Network Adapter is an equipment which performs the adaptation of data structured as an MPEG2-TS [19] to the characteristics of an SDH link. The solution selected for the transmission of MPEG2-TS packets, respectively RS coded MPEG2-TS packets, over SDH links is based on the use of ATM cells. Therefore, the adaptation of the transport of an MPEG2-TS basically consists in:

- adaptation of MPEG2-TS packets or RS coded MPEG2-TS packets to ATM cells;
- adaptation of ATM cells to SDH framing.

The normative references applicable to the adaptation unless specifically mentioned are given here below:

- the adaptation of MPEG2-TS packets into ATM cells using an AAL type 1 shall be performed as described in ITU-T Recommendation J.82 [24]. AAL type 1 is specified in ITU-T-Recommendation I.363.1 [21], the ATM layer is specified in ITU-T Recommendation I.361 [20];

- the adaptation of ATM cells into SDH framing shall be performed as described in ITU-T-Recommendation G.707 [15].

There is no normative reference for the adaptation of RS coded MPEG2-TS packets to ATM cells. This adaptation shall be performed as described in ITU-T Recommendation J.82 [24] for MPEG2-TS packets, with the only exception that the RS coded MPEG2-TS packets are not aligned with the structure of the AAL1 interleaving matrix.

The Network Adapter (NA) is described as a group of functional blocks. The partitioning into functional blocks is based on existing recommendations on SDH equipments (ITU-T Recommendation G. 783 [16]) and ATM equipments (ITU-T Recommendation I.732 [23]). The equipment consists of the following blocks (see also figure 1):

- MPEG Physical Interface;
- MPEG / ATM Adaptation;
- Virtual Path Entity;
- VP Multiplexing Entity;
- Sm Trail Termination;
- Higher Order Assembler;
- S4 Trail Termination;
- Transport Terminal Function;
- Synchronous Equipment Timing Source;
- Synchronous Equipment Timing Physical Interface; and
- Equipment Management Function.

The present description is a functional description and does not imply any specific equipment implementation but it allows for the implementation of a separate transmitter and receiver as well as a combined transmitter / receiver.

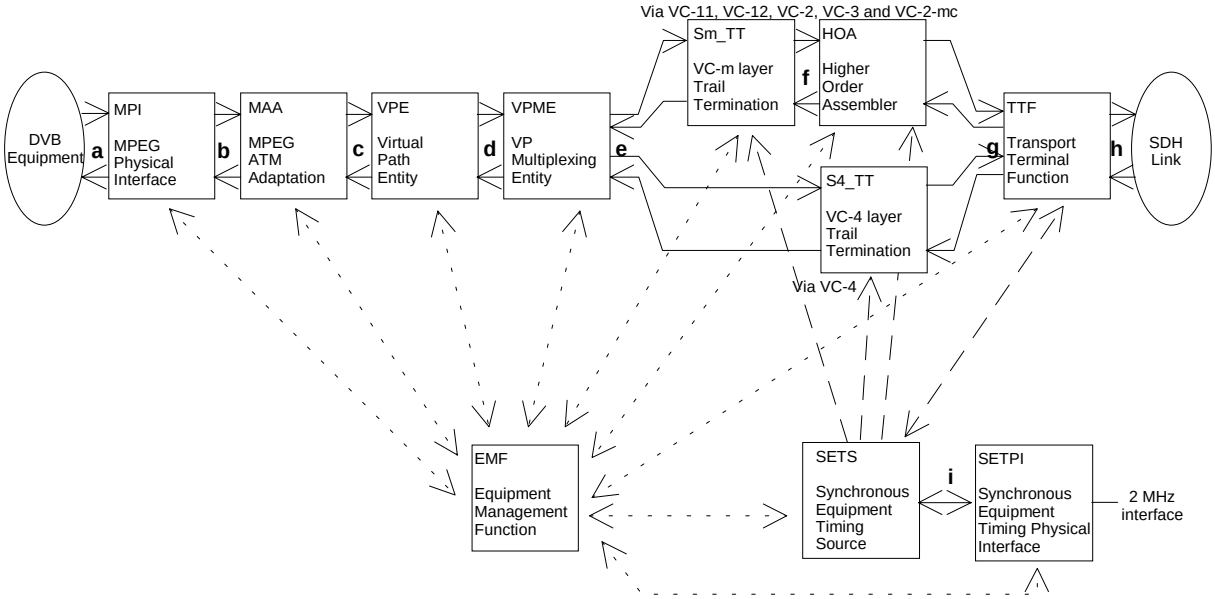

Figure 1: Functional blocks of the Network Adapter

NOTE: Most of ATM functional blocks contained in ITU-T Recommendation I.732 [23] do not appear in figure 1 as they are not relevant for the adaptation. Furthermore, the blocks "Higher Order Assembler" and "Transport Terminal Function" consist of several sub-blocks that reflect the description of the functional structure of SDH equipment following the recommendations given in ETS 300 417-2-1 [3], ETS 300 417-3-1 [4] and ETS 300 417-4-1 [5]. A fully detailed block diagram of the Network Adapter is given in annex A.

This adaptation corresponds to the protocol stack shown in figure 2:

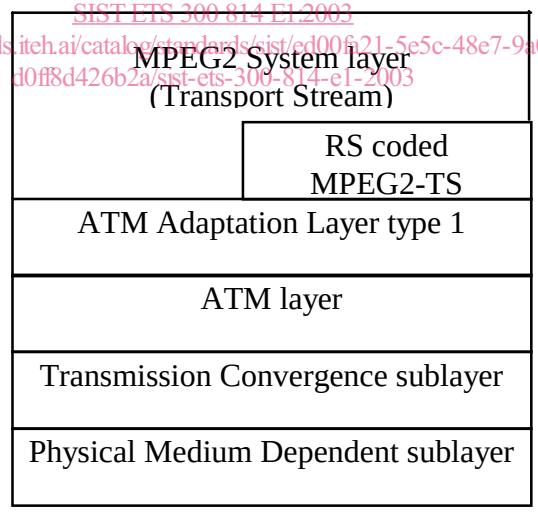

Figure 2: Protocol stack for the adaptation process

The following functional blocks are identified:

- *The MPEG2-TS Physical Interface:* the Network Adapter accepts, at its input port, either an MPEG2-TS consisting of consecutive MPEG2-TS packets, or an extended version of an MPEG2-TS that already contains error protection (RS coded MPEG2-TS packets). Packets length of 188 bytes and 204 bytes can be handled.

- *The MPEG / ATM Adaptation:* this corresponds to the adaptation between the MPEG2-TS respectively the RS coded MPEG2-TS and the ATM cells via an AAL type 1. This adaptation, besides format adaptation, provides functions for the MPEG2-TS clock transmission transparency (adaptive clock method) and information transparency using the clock and data recovery

mechanism of AAL1. It is expected that under normal transmission conditions the received MPEG2-TS will be quasi error free, corresponding to a Bit Error Rate (BER) of about 10^{-10} to 10^{-11} at the input of an MPEG2 equipment at the receiver site. This requirement is in accordance with the standards for the DVB systems using satellite services (see ETS 300 421 [7]) and cable systems (see ETS 300 429 [8]).

- *The Virtual Path Entity:* the only function performed is the VP setting. It allows the simultaneous transmission of several independent MPEG2-TS on one SDH link.

- *The VP Multiplexing Entity:* if different MPEG2-TS have to be simultaneously transported, the ATM cells belonging to different VPs are multiplexed in the transmitter respectively demultiplexed in the receiver. If only one MPEG2-TS has to be transported, only one VP is used. The adaptation to the useful bit-rate offered by the SDH link is performed by adding respectively removing idle cells. At the receiver, this block also performs cell delineation and ATM cell header checking.

- *The Sm Trail Termination:* this block generates and adds the error monitoring, the status and the control OverHead information to lower order Virtual Containers (VC-11, VC-12, VC-2 or VC-3) at the transmitter site. In the receiver the appropriate Virtual Containers are monitored for errors and the payload independent OverHead information is extracted.

- *The S4 Trail Termination:* this block generates and adds the error monitoring, the status and the control OverHead information to a Virtual Container VC-4 at the transmitter site. In the receiver the Virtual Container VC-4 is monitored for errors and the payload independent OverHead information is extracted.

- *The Higher Order Assembler:* in the transmitter, this block is responsible for the multiplexing of lower order VCs into a VC-4, for the processing of the relevant pointers and for the setting of a part of the VC4-POH. In the receiver, parts of the VC4-POH are evaluated and the pointer information is used in order to ensure a correct demultiplexing of the VC-4 contents into lower order VCs.

- *The Transport Terminal Function:* The AU-4 pointer is processed respectively evaluated to indicate the phase of the first byte of the VC-4-POH relative to the first byte of the STM-1 SOH. Additionally, this function generates the MSOH and the RSOH in the process of forming an SDH frame signal and terminates these types of OverHead information in the receiver. The STM-1 frame is scrambled/descrambled and the appropriate signal at the physical interface is created in the transmitter respectively converted into an internal logical signal in the receiver.

- *The Synchronous Equipment Timing Source:* this function provides timing reference to relevant parts of an SDH equipment and represents the SDH Network Element clock.

- *The Synchronous Equipment Timing Physical Interface:* this function provides the interface between an external synchronization signal and the SETS. It also provides a 2 MHz synchronization output signal.

- *The Equipment Management Function:* this block manages all the other functional blocks. It ensures the Man Machine Interface.

The processing of the MPEG data for the transmission inside an SDH network can be done using several types of Virtual Containers depending on the wanted payload capacity. It is not mandatory to implement all types of VC processing inside the Network Adapter. If however one or more types of VC processing are selected as described in this present document the complete specification applies.

Unless otherwise mentioned, in this ETS the following conventions hold true: the order of transmission of information in all diagrams is first from left to right and then from top to bottom. Within each byte or octet the Most Significant Bit (MSB) is transmitted first.

4.1 MPEG Physical Interface (MPI)

This function provides the interface between the Network Adapter and the MPEG2-TS sources or receivers. The physical characteristics of this interface shall follow the specification given in EN 50083-9 [11]. Three different types of interfaces are specified.

They are called:

- the Synchronous Parallel Interface (SPI);
- the Synchronous Serial Interface (SSI);
- the Asynchronous Serial Interface (ASI).

The interfaces use the MPEG2-TS Packet structure (188 bytes) or the RS-coded packet structure (204 bytes). For the SPI and the SSI, the 204-byte format may be used either for the transmission of 188-byte MPEG2-TS packets with 16 dummy bytes, or for the transmission of 204-byte RS-coded packets.

In order to prevent alarms being raised and failures being reported during set-up procedures or if the input port is not in use (in the case of a multi-port equipment), the MPI function shall have the ability to enable or disable fault case declaration. The MPI shall be either monitored (MON) or not monitored (NMON). The state MON or NMON is provisioned by the equipment manager to the MPI via the EMF function.

Signal processing in the transmitter (Signal flow from a-to-b in figure 1)

a) Recovery of MPEG2 packets

This function recovers the data bytes and their clock from the received signals:

- For the SPI, this recovery is based on the use of the Data (0-7), the DVALID, PSYNC and clock signals, as specified in paragraph 4.1 of EN 50083-9 [11].

- For the SSI interface, the processing includes optical receiver (for fibre-optic-based link) or coupling/impedance matching (for coaxial cable), amplifier/buffer, clock recovery and biphase decoding, serial to parallel conversion, as specified in annex A of EN 50083-9 [11].

- For the ASI interface, the processing includes optical receiver (for fibre-optic-based link) or coupling/impedance matching (for coaxial cable), amplifier/buffer, clock/data recovery and serial-to-parallel conversion, FC comma deletion, 8B/10B decoding, as specified in annex B of EN 50083-9 [11]. In the next step, the recovery of the TS clock is performed (cf. annex E of EN 50083-9 [11]: implementation guidelines and deriving clocks from the MPEG2 packets for the ASI).

The function also realizes the sync acquisition of the MPEG2-TS packets respectively of the RS-coded MPEG2-TS packets, on the basis of the method proposed in subclause 3.2 of ETR 290 [12] (five consecutive correct sync bytes for sync acquisition; two or more consecutive corrupted sync bytes should indicate sync loss).

The packet size (188 bytes or 204 bytes) may be recovered from the received signals, on the basis of the PSYNC signal for the parallel interface, or on the basis of periodicity of the synchronization bytes for the serial interfaces. For the case of the Synchronous Parallel Interface and of the SSI interface, the decision between 204-byte format for MPEG2-TS packets with 16 dummy bytes and 204-byte format for RS-coded MPEG2-TS packets can be made:

- on the basis of the DVALID signal for the SPI: a high level during the last 16 bytes indicate RS redundancy bytes (paragraph 4.1.1 of EN 50083-9 [11]); or

- on the basis of the value of received synchronization bytes for the SSI interface: 47H indicates 204 byte format with 16 dummy bytes and B8H indicates 204-byte RS coded (paragraph A.3.2 of EN 50083-9 [11]). For the RS coded transmission the synchronization byte has to be changed to 47H.

For the case of the ASI Interface, the following decision is taken: If the packet size is 204 bytes, it is an RS-coded MPEG2-TS packet.

Dummy bytes are discarded by the MPI function in the case of the 204-byte format with 16 dummy bytes.

The function passes the recovered MPEG2-TS packets or the RS coded MPEG2-TS packets and the timing information to point b of figure 1.