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STN	**Digitálne televízne vysielanie (DVB). Štruktúra rámcovania, kanálové kódovanie a modulácia pre systémy druhej generácie určené na vysielanie, interaktívne služby, zber správ a iné širokopásmové družicové aplikácie. Časť 1: DVB-S2**	**STN EN 302 307-1 V1.4.1** 87 2307

Digital Video Broadcasting (DVB); Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications; Part 1: DVB-S2

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ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

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

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
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Contents

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Foreword

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NOTE: The EBU/ETSI JTC Broadcast was established in 1990 to co-ordinate the drafting of standards in the specific field of broadcasting and related fields. Since 1995 the JTC Broadcast 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

The Digital Video Broadcasting Project (DVB) is an industry-led consortium of broadcasters, manufacturers, network operators, software developers, regulatory bodies, content owners and others committed to designing global standards for the delivery of digital television and data services. DVB fosters market driven solutions that meet the needs and economic circumstances of broadcast industry stakeholders and consumers. DVB standards cover all aspects of digital television from transmission through interfacing, conditional access and interactivity for digital video, audio and data. The consortium came together in 1993 to provide global standardization, interoperability and future proof specifications.

The present document is part 1 of a multi-part deliverable covering a "second generation" modulation and channel coding system, denoted "DVB-S2", as identified below:

Part 1: "DVB-S2";

Part 2: "DVB-S2-Extensions (DVB-S2X)".

National transposition dates	
Date of adoption of this EN:	4 November 2014
Date of latest announcement of this EN (doa):	28 February 2015
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 August 2015
Date of withdrawal of any conflicting National Standard (dow):	31 August 2015

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**may not**", "**need**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Introduction

DVB-S (EN 300 421 [2]) was introduced as a standard in 1994 and DVB-DSNG (EN 301 210 [3]) in 1997. The DVB-S standard specifies QPSK modulation and concatenated convolutional and Reed-Solomon channel coding, and is now used by most satellite operators worldwide for television and data broadcasting services. DVB-DSNG specifies, in addition to DVB-S format, the use of 8PSK and 16QAM modulation for satellite news gathering and contribution services.

Since 1997, digital satellite transmission technology has evolved somewhat:

- New channel coding schemes, combined with higher order modulation, promise more powerful alternatives to the DVB-S/DVB-DSNG coding and modulation schemes. The result is a capacity gain in the order of 30 % at a given transponder bandwidth and transmitted EIRP, depending on the modulation type and code rate.
- Variable Coding and Modulation (VCM) may be applied to provide different levels of error protection to different service components (e.g. SDTV and HDTV, audio, multimedia).
- In the case of interactive and point-to-point applications, the VCM functionality may be combined with the use of return channels, to achieve Adaptive Coding and Modulation (ACM). This technique provides more exact channel protection and dynamic link adaptation to propagation conditions, targeting each individual receiving terminal. ACM systems promise satellite capacity gains of up to 100 % to 200 %. In addition, service availability may be extended compared to a constant protection system (CCM) such as DVB-S or DVB-DSNG. Such gains are achieved by informing the satellite up-link station of the channel condition (e.g. C/N+I) of each receiving terminal via the satellite or terrestrial return channels.
- DVB-S and DVB-DSNG are strictly focused on a unique data format, the MPEG Transport Stream (ISO/IEC 13818-1 [1] or a reference to it). Extended flexibility to cope with other input data formats (such as multiple Transport Streams, or generic data formats) is now possible without significant complexity increase.

The present document defines a "second generation" modulation and channel coding system (denoted the "System" or "DVB-S2" for the purposes of the present document) to make use of the improvements listed above. DVB-S2 is a single, very flexible standard, covering a variety of applications by satellite, as described below. It is characterized by:

- a flexible input stream adapter, suitable for operation with single and multiple input streams of various formats (packetized or continuous);
- a powerful FEC system based on LDPC (Low-Density Parity Check) codes concatenated with BCH codes, allowing Quasi-Error-Free operation at about 0,7 dB to 1 dB from the Shannon limit, depending on the transmission mode (AWGN channel, modulation constrained Shannon limit);
- a wide range of code rates (from 1/4 up to 9/10); 4 constellations, ranging in spectrum efficiency from 2 bit/s/Hz to 5 bit/s/Hz, optimized for operation over non-linear transponders;
- a set of three spectrum shapes with roll-off factors 0,35, 0,25 and 0,20;
- Adaptive Coding and Modulation (ACM) functionality, optimizing channel coding and modulation on a frame-by-frame basis.

The System has been optimized for the following **broadband satellite applications:**

Broadcast Services (BS) Digital multi-programme Television (TV)/High Definition Television (HDTV)

Broadcasting services to be used for primary and secondary distribution in the Fixed Satellite Service (FSS) and the Broadcast Satellite Service (BSS) bands.

DVB-S2 is intended to provide Direct-To-Home (DTH) services for consumer Integrated Receiver Decoder (IRD), as well as collective antenna systems (Satellite Master Antenna Television - SMATV) and cable television head-end stations (possibly with remodulation, see EN 300 429 [5]). DVB-S2 may be considered a successor to the current DVB-S standard EN 300 421 [2], and may be introduced for new services and allow for a long-term migration. BS services are transported in MPEG Transport Stream format. VCM may be applied on multiple transport stream to achieve a differentiated error protection for different services (TV, HDTV, audio, multimedia).

Interactive Services (IS) Interactive data services including Internet access

DVB-S2 is intended to provide interactive services to consumer IRDs and to personal computers, where DVB-S2's forward path supersedes the current DVB-S standard EN 300 421 [2] for interactive systems. The return path can be implemented using various DVB interactive systems, such as DVB-RCS (EN 301 790 [6]), DVB-RCP (ETS 300 801 [7]), DVB-RCG (EN 301 195 [8]), DVB-RCC (ES 200 800 [9]). Data services are transported in (single or multiple) Transport Stream format according to EN 301 192 [4] (e.g. using Multiprotocol Encapsulation), or in (single or multiple) generic stream format. DVB-S2 can provide Constant Coding and Modulation (CCM), or Adaptive Coding and Modulation (ACM), where each individual satellite receiving station controls the protection mode of the traffic addressed to it. Input Stream Adaptation for ACM is specified in annex D.

Digital TV Contribution and Satellite News Gathering (DTVC/DSNG)

Digital television contribution applications by satellite consist of point-to-point or point-to-multipoint transmissions, connecting fixed or transportable uplink and receiving stations. They are not intended for reception by the general public. According to Recommendation ITU-R SNG.770-1 [10], SNG is defined as "Temporary and occasional transmission with short notice of television or sound for broadcasting purposes, using highly portable or transportable uplink earth stations ...". Services are transported in single (or multiple) MPEG Transport Stream format. DVB-S2 can provide Constant Coding and Modulation (CCM), or Adaptive Coding and Modulation (ACM). In this latter case, a single satellite receiving station typically controls the protection mode of the full multiplex. Input Stream Adaptation for ACM is specified in annex D.

Data content distribution/trunking and other professional applications (PS)

These services are mainly point-to-point or point-to-multipoint, including interactive services to professional head-ends, which re-distribute services over other media. Services may be transported in (single or multiple) generic stream format. The system can provide Constant Coding and Modulation (CCM), Variable Coding and Modulation (VCM) or Adaptive Coding and Modulation (ACM). In this latter case, a single satellite receiving station typically controls the protection mode of the full TDM multiplex, or multiple receiving stations control the protection mode of the traffic addressed to each one. In either case, interactive or non-interactive, the present document is only concerned with the forward broadband channel.

DVB-S2 is suitable for use on different satellite transponder bandwidths and frequency bands. The symbol rate is matched to given transponder characteristics, and, in the case of multiple carriers per transponder (FDM), to the frequency plan adopted. Examples of possible DVB-S2 use are given in TR 102 376 [i.5].

Annex M specifies the implementation of a DVB-S2 profile suitable for operation in wide-band mode, without requiring a full-speed decoding of the total carrier capacity, by suitably mapping the transmitted services in time-slices.

Digital transmissions via satellite are affected by power and bandwidth limitations. Therefore DVB-S2 provides for many transmission modes (FEC coding and modulations), giving different trade-offs between power and spectrum efficiency (see TR 102 376 [i.5]). For some specific applications (e.g. broadcasting) modes such as QPSK and 8PSK, with their quasi-constant envelope, are appropriate for operation with saturated satellite power amplifiers (in single carrier per transponder configuration). When higher power margins are available, spectrum efficiency can be further increased to reduce bit delivery cost. In these cases also 16APSK and 32APSK can operate in single carrier mode close to the satellite HPA saturation by pre-distortion techniques. All the modes are appropriate for operation in quasi-linear satellite channels, in multi-carrier Frequency Division Multiplex (FDM) type applications.

DVB-S2 is compatible with Moving Pictures Experts Group (MPEG-2 and MPEG-4) coded TV services (see ISO/IEC 13818-1 [1]), with a Transport Stream packet multiplex. Multiplex flexibility allows the use of the transmission capacity for a variety of TV service configurations, including sound and data services. All service components are Time Division Multiplexed (TDM) on a single digital carrier.

1 Scope

The present document:

- gives a general description of the DVB-S2 system;
- specifies the digitally modulated signal in order to allow compatibility between pieces of equipment developed by different manufacturers. This is achieved by describing in detail the signal processing principles at the modulator side, while the processing at the receive side is left open to different implementation solutions. However, it is necessary in the present document to refer to certain aspects of reception;
- identifies the global performance requirements and features of the System, in order to meet the service quality targets.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

[1] ISO/IEC 13818 (parts 1 and 2): "Information technology -- Generic coding of moving pictures and associated audio information".

[2] ETSI EN 300 421 (V.1.1.2): "Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for 11/12 GHz satellite services".

[3] ETSI EN 301 210: "Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for Digital Satellite News Gathering (DSNG) and other contribution applications by satellite".

[4] ETSI EN 301 192: "Digital Video Broadcasting (DVB); DVB specification for data broadcasting".

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

[6] ETSI EN 301 790: "Digital Video Broadcasting (DVB); Interaction channel for satellite distribution systems".

[7] ETSI ETS 300 801: "Digital Video Broadcasting (DVB); Interaction channel through Public Switched Telecommunications Network (PSTN)/ Integrated Services Digital Networks (ISDN)".

[8] ETSI EN 301 195: "Digital Video Broadcasting (DVB); Interaction channel through the Global System for Mobile communications (GSM)".

[9] ETSI ES 200 800: "Digital Video Broadcasting (DVB); DVB interaction channel for Cable TV distribution systems (CATV)".

[10] Recommendation ITU-R SNG.770-1: "Uniform operational procedures for satellite news gathering (SNG)".

[11] ETSI ETS 300 802: "Digital Video Broadcasting (DVB); Network-independent protocols for DVB interactive services".

[12] ETSI EN 300 468: "Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems".

[13] ETSI TS 101 545-1: "Digital Video Broadcasting (DVB);Second Generation DVB Interactive Satellite System (DVB-RCS2); Part 1: Overview and System Level specification".

[14] ETSI EN 302 307-2: "Digital Video Broadcasting (DVB); Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications; Part 2: S2-Extensions (S2X)".

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI TS 102 005: "Digital Video Broadcasting (DVB); Specification for the use of Video and Audio Coding in DVB services delivered directly over IP protocols".

[i.2] Void.

[i.3] ETSI TR 101 154: "Digital Video Broadcasting (DVB); Implementation guidelines for the use of MPEG-2 Systems, Video and Audio in satellite, cable and terrestrial broadcasting applications".

[i.4] ETSI ETR 162: "Digital Video Broadcasting (DVB); Allocation of Service Information (SI) codes for DVB systems".

[i.5] ETSI TR 102 376: "Digital Video Broadcasting (DVB) User guidelines for the second generation system for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications (DVB-S2)".