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Digital Video Broadcasting (DVB); Frame structure channel coding and modulation for a second generation digital transmission system for cable systems (DVB-C2)

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Digital Video Broadcasting (DVB);
Frame structure channel coding and modulation for a second generation digital transmission system for cable systems (DVB-C2)

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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.

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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.

National transposition dates	
Date of adoption of this EN:	22 October 2015
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Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 July 2016
Date of withdrawal of any conflicting National Standard (dow):	31 January 2019

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**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).

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Introduction

Since 1994 enhanced digital transmission technologies have evolved somewhat:

- New channel coding schemes, combined with higher order modulation, promise more powerful alternatives to the DVB-C coding and modulation schemes. The result is a capacity gain in the order of 30 % at a given cable channel bandwidth and CATV network performance.
- Variable Coding and Modulation (VCM) may be applied to provide different levels of error protection to different services (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.
- DVB-C is strictly focused on a unique data format, the MPEG Transport Stream (ISO/IEC 13818-1 [i.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.

Version 1.2.1 of the present document defines a "second generation" modulation and channel coding system (denoted the "C2 System" or "DVB-C2" for the purposes of the present document) to make use of the improvements listed above. DVB-C2 is a single, very flexible standard, covering a variety of applications by cable, 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 (Bose Chaudhuri Hocquenghem) codes, allowing Quasi Error Free operation close to the Shannon limit, depending on the transmission mode (AWGN channel, modulation constrained Shannon limit);
- a wide range of code rates (from 2/3 up to 9/10); 5 constellations, ranging in spectrum efficiency from 1 to 10,8 bit/s/Hz, optimized for operation in cable networks;
- Adaptive Coding and Modulation (ACM) functionality, optimizing channel coding and modulation on a frame-by-frame basis.

DVB-C [i.4] was introduced as a European Norm in 1994. It specifies single carrier QAM modulation and Reed-Solomon channel coding and is used today by many cable operators worldwide for television and data broadcasting as well as for forward channel transmission of the Data Over Cable System defined in [i.7].

Version 1.3.1 of this specification (the present document) made a number of clarifications and corrections to the wording. No changes have been made to existing features. Three new technical features have been added:

- Early Warning System signalling
- DVB-C2 version number
- Additional MODCOD 4/5 for 4096-QAM

The new features are defined backward compatible. This means that receivers compliant to version 1.2.1 are not affected when receiving a 1.3.1 compliant signal, which does not include additional MODCOD 4/5 for 4096-QAM or extended PLP Bundling over several C2-Systems.

New signalling elements (EWS and C2-versioning) are deemed to be ignored by 1.2.1 compliant receivers.

Further details of the specification of PLP bundling have been added in annex F, especially addressing the optimization of the buffer size, both at transmitter and at receiver side. Furthermore a new mechanism is defined to allow PLP bundling also over several **C2_Systems**.

1 Scope

The present document describes a second generation baseline transmission system for digital television broadcasting via Hybrid Fibre Coax (HFC) cable networks and Master Antenna Television (MATV) installations. It specifies the channel coding, modulation and lower layer signalling protocol system intended for the provision of digital television services and generic data streams.

The scope is as follows:

- it gives a general description of the Baseline System for digital cable TV;
- it specifies the digital signal processing in order to establish compatibility between pieces of equipment developed by different manufacturers. This is achieved by describing in detail the signal processing at the transmitting side, while the processing at the receiving side is left open to individual implementations. However, for the purpose of securing interoperability it is necessary in this text to refer to certain implementation aspects of the receiving end.

2 References

2.1 Normative references

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

[1] ETSI TS 101 162: "Digital Video Broadcasting (DVB); Allocation of identifiers and codes for Digital Video Broadcasting (DVB) systems".

2.2 Informative references

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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] ISO/IEC 13818-1: "Information technology - Generic coding of moving pictures and associated audio information: Systems".

[i.2] ETSI TS 102 606: "Digital Video Broadcasting (DVB); Generic Stream Encapsulation (GSE) Protocol".

[i.3] ETSI EN 302 307: "Digital Video Broadcasting (DVB); Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications (DVB-S2)".

[i.4] ETSI EN 300 468: "Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems".

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

[i.6] ETSI EN 302 755: "Digital Video Broadcasting (DVB); Frame structure channel coding and modulation for a second generation digital terrestrial television broadcasting system (DVB-T2)".

[i.7] CENELEC EN 50083-2:2006: "Cable networks for television signals, sound signals and interactive services - Part 2: Electromagnetic compatibility for equipment".

[i.8] ETSI EN 300 421: "Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for 11/12 GHz satellite services".

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