Final draft ETSI EN 302 769 V1.2.1 (2010-12)

European Standard (Telecommunications series)

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

Reference
REN/JTC-DVB-288

Keywords
audio, broadcasting, cable, data, digital, DVB,
MPEG, TV, video

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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 Joint Technical Committee (JTC) Broadcast of the European Broadcasting Union (EBU), Comité Européen de Normalisation ELECtrotechnique (CENELEC) and the European Telecommunications Standards Institute (ETSI), and is now submitted for the ETSI standards One-step Approval Procedure.

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 standardisation, interoperability and future proof specifications.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

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.

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].

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.

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.