



**Digital Video Broadcasting (DVB);  
A Guideline for the Use of DVB Specifications and Standards**

**DVB Document A020 Rev. 1  
May 2000**



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# **A Guideline for the Use of DVB Specifications and Standards**

**TR 101 200, rev.1**

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## **1. Introduction**

In the course of recent years the DVB Project has very successfully developed a considerable list of specifications for Digital Video Broadcasting. As a matter of fact, the term "Digital Video Broadcasting" has even become too restricted, since DVB specifications can be used for broadcasting all kinds of data as well as of sound, accompanied by all kinds of auxiliary information. Some of the specifications aim at the installation of bi-directional communication channels, for example, using cable installations. A very recent development is the specification of the Multimedia Home Platform (MHP), a middleware which allows applications that were written by different content providers to run on receivers and set-top-boxes of different manufacturers in a predictable form and with the same look and feel.

With the development of the MHP the DVB Project has entered its third phase of activity. phase 1 was characterised by the development of systems for data broadcasting and for the infrastructure necessary to make data broadcasting a reality. In phase 2 the project concentrated on systems for interactivity. Now phase 3 goes beyond broadcasting and interactive services by providing solutions for horizontal multimedia markets.

Due to the considerable complexity of the DVB environment many different documents have to be taken into consideration when planning services or equipment. For those who have been deeply involved in the development of the DVB solutions the list of documents may be comprehensible, but at least for newcomers it would be quite natural to overlook some of the existing specifications, guidelines, standards etc.

It is the purpose of this paper to present an overview of the existing DVB documents. This overview should be regarded as a "cookbook", listing all the ingredients for a DVB meal. It does not serve the purpose of giving a detailed description of the contents of the documents described below.

For those readers interested in some introductory literature that describes the DVB environment provided in phase 1 of the systems development globally and/or in detail, the following reading is recommended [Reimers].

## **2. Baseband Processing**

One of the fundamental decisions which were taken during the early days of DVB was the selection of MPEG-2 for the source coding of audio and video and for the creation of programme elementary streams, transport streams etc. - the so-called systems level. The three documents [ISO/IEC 13818 - 1], [ISO/IEC 13818 -2] and [ISO/IEC 13818 -3] are international standards which describe MPEG-2 systems, video and audio. All three are truly generic and can be considered too wide in scope for them to be applied to DVB directly.

Therefore, [ETR 154] was created by the DVB project. This "guidelines document" known as DVB-MPEG includes restrictions to the syntax and parameter values described by MPEG-2 as well as recommendations for preferred values for the use in DVB applications. ETR 154 has been a "living" document. Over the years the original version was amended by paragraphs that describe the video parameters to be chosen when HDTV services are being planned, by paragraphs required for DVB services in countries with 59.94 Hz or 60 Hz frame frequencies and, most recently, by an annex that describes the use of the sound coding system Dolby AC3 with DVB services.

In analogue TV services Teletext has been used for many years. Millions of TV receivers out in the field provide Teletext decoding. Viewers are used to the convenience of obtaining information from Teletext pages. Since for many years to come the existing TV receiver concepts will be used to display DVB services which have been received and decoded by a "black box" which connects the satellite LNB, the cable outlet or the rooftop aerial to the existing receiver (the so-called Integrated Receiver Decoder - IRD), a mechanism needs to be provided which enables the delivery of "analogue" Teletext to the receiver via DVB. This mechanism is described in [EN 300 472] and is known as DVB-TXT.

In many countries it is customary to broadcast TV programmes with the original soundtrack and to provide a translation into the local language in the form of subtitles. Another practice is to add graphic elements to the transmitted images like, for example, station logos etc. In [ETS 300 743] a potent mechanism is described (DVB-SUB) which allows the transmission of all kinds of subtitles and graphic elements as part of the DVB signals.

Future DVB services will consist of a wide variety of programmes carried via a large number of transmission channels. In order for the IRD to be able to tune to such channels and in order for the DVB customer to be able to navigate the profusion of programmes, powerful navigational aids need to be provided as part of the DVB streams. The "Service Information - SI" described in [EN 300 468] constitutes this set of aids, entitled DVB-SI. [ETR 211] includes a set of guidelines describing how the SI should or could be used. In [ETR 162] SI codes are being listed which indicate services by different broadcasters.

### **3. Transmission**

Technical specifications for the transmission of the base band signals (as described in paragraph 2) via all sorts of broadcast delivery channels have been among the principal deliverables of the DVB Project.

The first specification which it was possible to finalise was that for the satellite delivery of DVB signals [EN 300 421] entitled DVB-S. In this document different tools for channel coding were described for the first time, which later on became important for all other delivery media as well. In exceptional situations, for example when broadcasting in the C-Band under very severe interference conditions, it may be useful to change the modulation from QPSK, the modulation used for DVB-S, to BPSK. The set of instructions describing a DVB-S derivative that uses BPSK is described in [TR 101 198].

[EN 300 429] describes channel coding and modulation for DVB signal delivery on cable [CATV] systems (DVB-C). This document forms the basis of [EN 300 473], in which the use of (Satellite) Master Antenna TV ([S]MATV) installations for DVB is described (DVB-CS).

Digital terrestrial transmission using DVB (DVB-T) was first started in the UK in November 1998. Field trials and tests are being carried out in several countries of the world. In the year 2000 DVB-T services will become operational on three continents of the world. The specification relevant to this application is [EN 300 744]. Guidelines for the implementation of DVB terrestrial services are given in [TR 101 190]. If a single-frequency network approach is taken for the transmission of DVB-T signals, the synchronisation of all the transmitters that contribute to the network is of the utmost importance. [TS 101 191] contains the „Specification of a Mega-frame for SFN Synchronisation (DVB-SFN)“.

If microwaves are used for the delivery of DVB signals, three specifications can be chosen for the Multichannel Microwave Distribution System (MMDS). Two of these are depending on the frequency range applied. [EN 300 748] describes MMDS for use at 10 GHz and above (DVB-MS). This transmission system is based on the use of the DVB-S technology. [EN 300 749] is applicable to MMDS transmission at frequencies below 10 GHz. This standard is based on DVB-C technology and has therefore been called DVB-MC. A brand-new specification (DVB-MT) describes how, on the basis of the DVB-T specification, MMDS services can be launched in all frequency ranges [SB 25(99)36].

#### **4. Conditional Access**

In many cases DVB-based services will either be of the „pay“ type or will at least include some elements which are not supposed to be freely available to the public at large. The term „Conditional Access“ is frequently used to describe systems that enable the control over the access to programmes, services etc. Conditional Access (CA) systems consist of several blocks; among others, the mechanism to scramble the programme or service, the „Subscriber Management System (SMS)“, in which all customer data are stored, and the „Subscriber Authorisation System (SAS)“, that encrypts and delivers those code words which enable the descrambler to make the programme legible.

It was one of the strategic decisions taken by the DVB Project that neither SMS nor SAS should be standardised. The only part of a CA system which was developed jointly by members of DVB is the „Common Scrambling Algorithm“ [ETR 289], a powerful tool to make secure scrambling of Transport Streams or Programme Elementary Streams possible. Owing to the peculiar nature of this system it is not disclosed to the public in detail. The specification can be obtained from a „custodian“ by way of a process described in [A 011].

All other parts of CA systems for DVB are offered in the form of several competitive, commercial products which are marketed by DVB members.

To enable an Integrated Receiver Decoder to descramble programmes which have been broadcast in parallel, using different CA systems, a „Common Interface for Conditional Access and other Digital Video Broadcasting Decoder Applications“ [EN 50 221] can be incorporated into the IRD (DVB-CI). By way of inserting a PCM/CIA module into the common interface, different CA systems can be addressed sequentially by that IRD. In [R 206

001] the guidelines for the use of the CI are described. The term „MultiCrypt“ is used to describe the simultaneous operation of several CA systems. The common interface cannot only be used in conjunction with CA systems. It is a powerful input/output interface for applications like audience monitoring or even for inserting a satellite receiver module in a terrestrial receiver. [TS 101 699] describes such “Extensions to the DVB Common Interface Specification”.

Another way of providing the viewer with access to programmes which have been processed by different CA systems is called „SimulCrypt“. In this case commercial negotiations between different programme providers have led to a contract which enables the viewer to use the one specific CA system built into his IRD to watch all the programmes, irrespective of the fact that these programmes were scrambled under the control of one of several CA systems. A basic contract to enable SimulCrypt is described by a „Code of Conduct“ [DVB GA 2 (94) 9, rev. 1]. The specification of the head-end architecture of a SimulCrypt system and the solutions necessary to synchronise different CA systems are described in [TS 101 197-1] (DVB-SIM). Going beyond the contents of this specification [TS 103 197] is a more recent, backwards-compatible, extension which also incorporates head-end control and management architectures.

It is one of the goals of the DVB Project to help create European „Anti-Piracy Legislation“, which should allow strict penalising of so-called "pirates" for the breach of CA systems. A proposal for such legislation is included in [A 006].

If scrambled programmes received via satellite and terrestrial transmission are to be fed into cable networks it may in certain cases be advisable for the operator of that cable to change the CA system so that all the programmes in his network are under the control of only one CA system. The process of changing the CA system at a cable head end is called „Transcontrol“ and is supported by the DVB Project.

## **5. Interactive Services**

Many of the service offers possible in the DVB world will require some form of interaction between, for example, the user and either the programme provider or the network operator. This interaction may consist of the transmission of just a few commands but may be extensive and may thus resemble communication via the Internet.

In DVB the tools for enabling interaction have generally been split into two sets. One is network-independent (DVB-NIP) and can be regarded as a protocol stack which extends approximately via ISO/OSI layers two to three [ETS 300 802]. An important part of this stack was derived from the Digital Storage Media Command Control (DSM-CC) protocols created by MPEG [ISO/IEC 13818 - 6]. Document [TR 101 194] was created as a "guideline" in order for users to be able to understand and use this somewhat complicated stack.

The second group of DVB specifications relates to the lower layers (approximately one to two) of the ISO/OSI model and therefore specifies the network-dependent tools for interactivity. So far (September 1999) six specifications have been created. The first one describes ways how to use Public Switched Telephone Networks (PSTN) and Integrated Services Digital Networks (ISDN) as physical networks for interaction [ETS 300 801] (DVB-

RCT). The second specification describes how cordless telephone systems operating in compliance with the European standard for Digital Enhanced Cordless Telecommunications (DECT) can be used as return and interaction channels (DVB-RCDECT) [EN 301 193]. [EN 301 195] (DVB-RCGSM) describes how the mobile telecommunications system GSM (Global System for Mobile Telecommunications) can be used as a return and interaction channel accompanying DVB broadcasts. This specification is particularly relevant if the user is “on the move” like, for instance, in a car equipped with a DVB receiver. Another European standard, jointly developed by DVB and DAVIC, deals with a comprehensive solution for the use of CATV networks for bi-directional data communication [ETS 300 800] (DVB-RCC). Guidelines for the use of this system are described in [TR 101 196]. In [EN 301 199] a derivative of DVB-RCC is described (DVB-RCL) by which interactive services are being made possible in Local Multipoint Distribution Services. Guidelines for a version of an interaction channel based on satellite and coaxial sections (DVB-RCCS), which can be used in some Satellite Master Antenna Television (SMATV) distribution systems, are available in [TR 101 201]. An interaction channel via satellite has just been developed (DVB-RCS) and is described in [TM 2267].

## **6. Miscellaneous**

One of the strengths of DVB technology lies in the fact that it enables the point-to-multipoint transmission of very large amounts of data at high data rates while very securely protecting them against all kinds of transmission errors. These data may be audio and video but in many applications the data will be files, the content of web pages “pushed” to the receiver or other forms of generic information. In order to enable the transmission of such kind of data, including the possibility of repeat transmissions of the same data at regular or irregular time intervals, a specification for data broadcasting (DVB-DATA) has been created [EN 301 192]. The document describes five application areas, namely „data piping“, „data streaming“, „multiprotocol encapsulation“ a “data carousel” and an „object carousel“. A guideline document [TR 101 202] describes implementation details.

At the request of some broadcasters the DVB Project has designed a set of specifications for Digital Satellite News Gathering (D-SNG). This set consists of [EN 301 210], which describes the framing structure, channel coding and modulation for the main transmission channel from the DSNG van to the central facility (DVB-DSNG), and of [EN 301 222]. In this latter document the techniques used for the co-ordination and the communication channels associated with a DSNG transmission are specified. [TR 101 221] includes user guidelines. The DVB-DSNG solution has become interesting for many broadcasting organisations around the world who want to take advantage of the readily available products for DVB systems in their daily operations. For example, they want to use DVB satellite transmission systems for contribution and primary distribution of their signals. [TR 102 154] describes restrictions to the syntax and parameter values described by MPEG-2 and indicates values for audio and video coding best suited for contribution and primary distribution.

Telecommunications networks will play an important role in connecting, for example, the play-out centre of a broadcaster and the satellite uplink station in another city. Different types of networks will be used (PDH, SDH, ATM etc.) for this purpose. The DVB Project has designed an interface which will be used to connect the world of DVB signals to PDH networks [ETS 300 813]. A comparable interface to SDH networks is described in [300 814]. If

on the other hand a network operator wishes to transmit ATM signals via DVB systems, a set of rules is required which describes how ATM cells can be incorporated in a DVB transport stream. [TR 100 815] describes these rules.

DVB systems are new technology for equipment manufacturers, broadcasters and network providers. The testing and evaluation of such systems therefore require some form of measurement guidelines (DVB-M). These guidelines [ETR 290] will help to distinguish meaningful from useless measurements and help to understand how the measuring should be carried out. ETR 290 has been a “living document” over the years and has become an internationally accepted basis for all kinds of performance evaluation. In order for DVB users to be able to incorporate specific test and measurement signals in the MPEG-2 transport streams, a special packet identifier (PID) was reserved for this purpose. [TR 101 291] explains how this PID can be used.

At the request of manufacturers the DVB Project decided after lengthy discussions that they would restrict their activities to specifying external interfaces only instead of specifying the architecture of the hardware needed in professional DVB installations and in the Integrated Receiver Decoders (IRD). In [EN 50 201] interfaces for IRDs are specified. For procedural reasons the same document exists again as [TS 102 201]. [EN 50 083 - 9] describes interfaces for the use in cable headends, satellite uplink stations and similar professional installations.

The advent of digital networks which reach an office or a private house and are terminated in that house and the need for digital networks which are used to carry DVB signals within the house required solutions to be designed by the DVB Project. [TS 101 224] includes the specification of a Home Access Network (HAN) with an active network termination. In [TS 101 225] the In-Home Digital Network (IHDN) and the Home Local Network (HLN) are described. A guideline for the implementation of the IHDN is included in [TR 101 226].

In order for the IRD to be able to interoperate with future types of storage media (DVD, DVC, D-VHS etc.) certain conditions must be met by DVB data streams. These conditions relate, for example, to the maximum bit rate which may be used for the transmission of programmes and that in turn is defined by the recording capabilities of the respective storage medium. These conditions were included in [ETR 154] and [EN 300 468].

## **7. Conclusion**

The work of the DVB Project has resulted in a comprehensive list of technical and non-technical documents describing solutions required by the market players in order for them to be able to make the best use of the new technology of broadcasting digital signals. These documents are the result of the united efforts of many individuals who spent thousands of hours designing new solutions to new problems.

Many organisations have provided important contributions to the work of the project in such a way that they have either made available some results of their work to DVB (MPEG, DAVIC) or through actively co-operating with DVB in transforming specifications into standards and norms (ETSI, CENELEC).

Both the extremely valuable contributions by the many individuals and the co-operation of the organisations involved are highly appreciated.



The work of the DVB Project has reached a high level of maturity, but it has not ended yet. Numerous design activities still are ongoing. The specification of the MHP has not been finalized completely. Mechanisms for copy management and copy protection are being investigated. A solution for a return and interaction channel embedded in the same frequency spectrum as the DVB-T broadcast stream needs to be developed. The Universal Mobile Telecommunications System (UMTS) - most often called the third generation of mobile telecommunications - is just around the corner and requires careful consideration by the DVB Project. Thus DVB is preparing the medium-term to long-term future of interactive data broadcasting just as over the last few years it has provided solutions for the immediate future of our business.

## 8. References

Because of the rapid development of specifications and standards it is recommended to verify in each case whether the following documents have been replaced by more recent versions. The list was compiled in September 1999. Also visit the two web sites: [www.dvb.org](http://www.dvb.org) and [www.etsi.org/DVB/](http://www.etsi.org/DVB/) to find out about the latest developments.

[A 006]		Antipiracy Legislation for Digital Video Broadcasting. DVB Bluebook A 006, June 1995.
[A 011]		DVB Common Scrambling Algorithm. DVB Bluebook A 011 Rev. 1, September 1996. - See also: ETSI homepage ( <a href="http://www.etsi.org/broadcast/dvb.htm">http://www.etsi.org/broadcast/dvb.htm</a> ) for information about custodianship.
[DVB GA 2 (94) 9, rev. 1]		Code of Conduct - Access to Digital Decoders. Appendix 1 to DVB GA 2 (94) 9, Rev. 1.
[EN 50083-9]	DVB-PI	Cabled distribution systems for television, sound and interactive multimedia signals; Part 9: Interfaces for CATV/SMATV headends and similar professional equipment for DVB/MPEG-2 transport streams. European Norm EN 50083-9, Comité Européen de Normalisation Electrotechnique CENELEC, June 1998.
[EN 50201]	DVB-IRD	Interfaces for DVB-IRDs. European Norm EN 50201, Comité Européen de Normalisation Electrotechnique CENELEC, August 1998.
[EN 50221]	DVB-CI	Common Interface Specification for Conditional Access and other Digital Video Broadcasting Decoder Applications. European Norm EN 50221, Comité Européen de Normalisation Electrotechnique CENELEC, February 1997.
[EN 300 421]	DVB-S	Digital Video Broadcasting (DVB); DVB framing structure, channel coding and modulation for 11/12 GHz satellite services. European Norm EN 300 421, European Telecommunications Standards Institute ETSI, October 1997.
[EN 300 429]	DVB-C	Digital Video Broadcasting (DVB); DVB framing structure, channel coding and modulation for cable systems.

		European Norm EN 300 429, European Telecommunications Standards Institute ETSI, April 1998.
[EN 300 468]	DVB-SI	Digital Video Broadcasting (DVB); Specification for Service Information (SI) in Digital Video Broadcasting (DVB) Systems. European Norm EN 300 468, European Telecommunications Standards Institute ETSI, February 1998.
[EN 300 472]	DVB-TXT	Digital Video Broadcasting (DVB); Specification for conveying ITU-R System B Teletext in Digital Video Broadcasting (DVB) bitstreams. European Norm EN 300 472, European Telecommunications Standards Institute ETSI, August 1997.
[EN 300 473]	DVB-CS	Digital Video Broadcasting (DVB); Satellite Master Antenna Television (SMATV) distribution systems. European Norm EN 300 473, European Telecommunications Standards Institute ETSI, August 1997.
[EN 300 744]	DVB-T	Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for digital terrestrial television (DVB-T). Draft European Norm EN 300 744, European Telecommunications Standards Institute ETSI, January 1999.
[EN 300 748]	DVB-MS	Digital Video Broadcasting (DVB); Multipoint Video Distribution Systems (MVDS) at 10 GHz and above. European Norm EN 300 748, European Telecommunications Standards Institute ETSI, August 1997.
[EN 300 749]	DVB-MC	Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for Multipoint Video Distribution Systems (MVDS) below 10 GHz. European Norm EN 300 749, European Telecommunications Standards Institute ETSI, August 1997.
[EN 301 192]	DVB-Data	Digital Video Broadcasting (DVB); Specification for data broadcasting. Draft European Norm EN 301 192, European Telecommunications Standards Institute ETSI, June 1999.
[EN 301 193]	DVB-RCDECT	Digital Video Broadcasting (DVB); DVB interaction channel through Digital Enhanced Cordless Telecommunications (DECT). European Norm EN 301 193, European Telecommunications Standards Institute ETSI, July 1998.
[EN 301 195]	DVB-RCGSM	Digital Video Broadcasting (DVB); Interaction channel through GSM. European Norm EN 301 195, European Telecommunications Standards Institute ETSI, February 1999.
[EN 301 199]	DVB-RCL	Digital Video Broadcasting (DVB); DVB interaction channel for Local Multipoint Distribution System (LMDS) distribution systems. Draft European Norm EN 301 199, European Telecommunications Standards Institute ETSI,

		January 1999.
[EN 301 210]	DVB-DSNG	Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for Digital Satellite News Gathering (DSNG) and other contribution applications by satellite. European Norm EN 301 210, European Telecommunications Standards Institute ETSI, February 1999.
[EN 301 222]	DVB-DSNG	Digital Video Broadcasting (DVB); Co-ordination channels associated with DSNG. Draft European Norm EN 301 222, European Telecommunications Standards Institute ETSI, January 1999.
[ETR 154]	DVB-MPEG	Digital Video Broadcasting (DVB); Implementation guidelines for the use of MPEG-2 Systems, Video and Audio in satellite, cable and terrestrial broadcasting applications. ETSI Technical Report ETR 154, European Telecommunications Standards Institute ETSI, October 1997.
[ETR 162] EARLY DRAFT	DVB-SI	Digital Video Broadcasting (DVB); Allocation of Service Information (SI) codes for DVB systems. ETSI Technical Report ETR 162, European Telecommunications Standards Institute ETSI, September 1998.
[ETR 211]	DVB-SI	Digital Video Broadcasting (DVB); Guidelines on implementation and usage of Service Information (SI). ETSI Technical Report ETR 211, European Telecommunications Standards Institute ETSI, August 1997.
[ETR 289]	DVB-CS	Digital Video Broadcasting (DVB); Support for use of scrambling and Conditional Access (CA) within digital broadcasting systems. ETSI Technical Report ETR 289, European Telecommunications Standards Institute ETSI, October 1996.
[ETR 290]	DVB-M	Digital Video Broadcasting (DVB); Measurement guidelines for DVB systems. ETSI Technical Report ETR 290, European Telecommunications Standards Institute ETSI, August 1997.
[ETS 300 743]	DVB-SUB	Digital Video Broadcasting (DVB); Subtitling systems. European Technical Standard ETS 300 743, European Telecommunications Standards Institute ETSI, September 1997.
[ETS 300 800]	DVB-RCC	Digital Video Broadcasting (DVB); DVB Interaction Channel for Cable TV Distribution Systems (CATV). European Technical Standard ETS 300 800, European Telecommunications Standards Institute ETSI, July 1998.
[ETS 300 801]	DVB-RCT	Digital Video Broadcasting (DVB); DVB Interaction Channel through the Public Switched Telecommunications Network (PSTN) / Integrated Services Digital Network (ISDN). European Technical Standard ETS 300 801, European Telecommunications Standards Institute ETSI,

		August 1997.
[ETS 300 802]	DVB-NIP	Digital Video Broadcasting (DVB); Network-Independent Protocols for DVB Interactive Services. European Technical Standard ETS 300 802, European Telecommunications Standards Institute ETSI, November 1997.
[ETS 300 813]	DVB-PDH	Digital Video Broadcasting (DVB); DVB interfaces to Plesiochronous Digital Hierarchy (PDH) networks. European Technical Standard ETS 300 813, European Telecommunications Standards Institute ETSI, December 1997.
[ETS 300 814]	DVB-SDH	Digital Video Broadcasting (DVB); DVB interfaces to Synchronous Digital Hierarchy (SDH) networks. European Technical Standard ETS 300 814, European Telecommunications Standards Institute ETSI, March 1998.
[ISO/IEC 13818-1]		Information Technology - Generic Coding of Moving Pictures and Associated Audio Information. Part 1: Systems. ISO/IEC International Standard IS 13818, November 1994.
[ISO/IEC 13818-2]		Information Technology - Generic Coding of Moving Pictures and Associated Audio Information. Part 2: Video. ISO/IEC International Standard IS 13818, November 1994.
[ISO/IEC 13818-3]		Information Technology - Generic Coding of Moving Pictures and Associated Audio Information. Part 3: Audio. ISO/IEC International Standard IS 13818, November 1994.
[ISO/IEC 13818-6]		Information Technology - Generic Coding of Moving Pictures and Associated Audio Information. Part 6: Extension for Digital Storage Media Command and Control (DSM-CC). ISO/IEC International Standard IS 13818, November 1994.
[R 206 001]	DVB-CI	Guidelines for Implementation and Use of the Common Interface for DVB Decoder Applications. Report R 206 001, Comité Européen de Normalisation Electrotechnique CENELEC, March 1997.
[Reimers]		Ulrich Reimers (ed.): Digitale Fernsehtechnik - Datenkompression und Übertragung für DVB. Berlin; Heidelberg; New York: Springer, 2. Aufl. 1997.
[SB 25(99)36]	DVB-MT	Digital Video Broadcasting (DVB); OFDM modulation for microwave digital terrestrial television. DVB Document DVB-SB 25(99)36, June 1999.
[TM 2267]	DVB-RCS	Digital Video Broadcasting (DVB); Interaction channel for Satellite Distribution Systems. DVB Document DVB-TM 2267 (Draft European Norm), European Telecommunications Standards Institute ETSI, August 1999.
[TR 100 815]	DVB-ATM	Digital Video Broadcasting (DVB); Guidelines for the handling of Asynchronous Transfer Mode (ATM) signals

		in DVB systems. Technical Report TR 100 815, European Telecommunications Standards Institute ETSI, February 1999.
[TR 101 190]	DVB-T	Digital Video Broadcasting (DVB); Implementation guidelines for DVB terrestrial services; Transmission aspects. Technical Report TR 101 190, European Telecommunications Standards Institute ETSI, December 1997.
[TR 101 194]	DVB-NIP	Digital Video Broadcasting (DVB); Guidelines for Implementation and Usage of the Specification of Network-Independent Protocols for DVB Interactive Services. Technical Report TR 101 194, European Telecommunications Standards Institute ETSI, June 1997.
[TR 101 196]	DVB-RC	Digital Video Broadcasting (DVB); Interaction channel for Cable TV distribution systems (CATV); Guidelines for the use of ETS 300 800. Technical Report TR 101 196, European Telecommunications Standards Institute ETSI, December 1997.
[TR 101 198]	DVB-S	Digital Video Broadcasting (DVB); Implementation of BPSK modulation in DVB satellite transmission systems. Technical Report TR 101 198. European Telecommunications Standards Institute ETSI, September 1997:
[TR 101 201]	DVB-RCCS	Digital Video Broadcasting (DVB); Interaction channel for Satellite Master Antenna Television (SMATV) distribution systems; Guidelines for versions based on satellite and coaxial sections. Technical Report TR 101 201, European Telecommunications Standards Institute ETSI, October 1997.
[TR 101 202]	DVB-Data	Digital Video Broadcasting (DVB); Implementation Guidelines for Data Broadcasting. Technical Report TR 101 202, European Telecommunications Standards Institute ETSI, February 1999.
[TR 101 205] EARLY DRAFT	DVB-RCL	Digital Video Broadcasting (DVB); Guidelines for the implementation and usage of the DVB interaction channel for Local Multipoint Distribution System (LMDS) distribution systems. Technical Report TR 101 205, European Telecommunications Standards Institute ETSI, March 1999.
[TR 101 221]	DVB-DSNG	Digital Video Broadcasting (DVB); User guideline for Digital Satellite News Gathering (DSNG) and other contribution applications by satellite. Technical Report TR 101 221, European Telecommunications Standards Institute ETSI, February 1999.
[TR 101 226] EARLY DRAFT	DVB-IHDN guide	Digital Video Broadcasting (DVB); In-Home Digital Network (IHDN) guidelines. Technical Report TR 101 226, European Telecommunications Standards Institute ETSI, November 1999.

[TR 101 291]	DVB-M	Digital Video Broadcasting (DVB); Usage of the DVB test and measurement signalling channel (PID 0x001D) embedded in an MPEG-2 Transport Stream (TS). Technical Report TR 101 291, European Telecommunications Standards Institute ETSI, June 1998.
[TR 102 154] EARLY DRAFT	DVB-MPEG	Digital Video Broadcasting (DVB); Implementation guidelines for the use of MPEG-2 Systems, Video and Audio in satellite, cable and terrestrial CONTRIBUTION broadcasting applications. Technical Report TR 102 154, European Telecommunications Standards Institute ETSI, November 1999.
[TS 101 191]	DVB-SFN	Digital Video Broadcasting (DVB); Mega-frame for Single Frequency Network (SFN) synchronization. Technical Specification TS 101 191, European Telecommunications Standards Institute ETSI, April 1997.
[TS 101 197-1]	DVB-SIM	Digital Video Broadcasting (DVB); DVB SimulCrypt; Part 1: Head-end architecture and synchronization. Technical Specification TS 101 197-1, European Telecommunications Standards Institute ETSI, June 1997.
[TS 101 224]	DVB-HAN	Digital Video Broadcasting (DVB); Home Access Network (HAN) with an active Network Termination (NT). Technical Specification TS 101 224, European Telecommunications Standards Institute ETSI, July 1998.
[TS 101 225] EARLY DRAFT	DVB-HLN	Digital Video Broadcasting (DVB); In-Home Digital Network (IHDN), Home Local Network (HLN). Technical Specification TS 101 225, European Telecommunications Standards Institute ETSI, March 1999.
[TS 101 699]	DVB-CI	Digital Video Broadcasting (DVB); Extensions to the DVB Common Interface Specification. Technical Specification TS 101 699, European Telecommunications Standards Institute ETSI, May 1999.
[TS 102 201]	DVB-IRDI	Digital Video Broadcasting (DVB); Interfaces for DVB Integrated Receiver Decoder (DVB-IRD). <i>(NOTE: The DVB input to JTC was converted into an ETSI TS for handing over to the CENELEC maintenance process of EN 50201.)</i> ETSI Technical Specification TS 102 201, European Telecommunications Standards Institute ETSI, March 1999.
[TS 103 197] EARLY DRAFT	DVB-SIM	Digital Video Broadcasting (DVB); DVB Headend implementation of DVB Simulcrypt. Technical Specification TS 103 197, European Telecommunications Standards Institute ETSI, March 1999.