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Digital Video Broadcasting (DVB); Plano-stereoscopic 3DTV; Part 1: Overview of the multipart

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DVB Digital Video Broadcasting

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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.

The present document is part 1 of a multi-part deliverable covering Digital Video Broadcasting (DVB); Plano-stereoscopic 3DTV, as identified below:

Part 1: "Overview of the multipart";

Part 2: "Frame Compatible Plano-stereoscopic 3DTV";

Part 3: "HDTV Service Compatible Plano-stereoscopic 3DTV";

Part 4: " Service frame compatible Plano-stereoscopic 3DTV for HEVC coded services ".

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).

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

Introduction

Plano-stereoscopic imaging systems deliver two images (left and right) that are arranged to be seen simultaneously, or near simultaneously, by the left and right eyes. Viewers perceive increased depth in the picture, which becomes more like the natural binocular viewing experience. Since 2010 many 3DTV capable consumer products have been launched in the market.

The present document provides an overview of the "phases" of DVB 3DTV specifications, which constitute the further parts of this multi-part deliverable.

ETSI TS 101 547-2 [i.1] specifies the delivery system for frame compatible plano-stereoscopic 3DTV services, enabling service providers to utilize their existing HDTV infrastructures to deliver 3DTV services that are compatible with 3DTV capable displays already in the market. This system covers both use cases of a STB delivering 3DTV services to a 3DTV capable display device via an HDMI connection, and a 3DTV capable display device receiving 3DTV services directly via a built-in tuner and decoder. The abbreviated name for Part 2 is FC-3DTV.

ETSI TS 101 547-3 [i.2] specifies the delivery system for HDTV service compatible plano-stereoscopic 3DTV services, enabling service providers to provide 3DTV services with full resolution high-definition video per eye, while allowing existing HDTV receivers to derive a conventional full-resolution HDTV service from the 3DTV service. This system covers both use cases of a STB delivering 3DTV services to a 3DTV capable display device via an HDMI connection, and a 3DTV capable display device receiving 3DTV services directly via a built-in tuner and decoder. The abbreviated name for Part 3 is SC-3DTV.

ETSI TS 101 547-4 [i.5] specifies the delivery system for service frame compatible plano-stereoscopic 3DTV for HEVC coded services, enabling service providers to utilize their existing HDTV infrastructures to deliver 3DTV services that are compatible with 3DTV capable displays already in the market, while allowing existing HDTV receivers to extract the left view from the two views contained in the frame compatible plano-stereoscopic 3DTV service video stream and up-scale it to simulate the reception of an HDTV service. This system covers both use cases of a STB delivering 3DTV services to a 3DTV capable display device via an HDMI connection, and a 3DTV capable display device receiving 3DTV services directly via a built-in tuner and decoder. The abbreviated name for Part 4 is SFC-3DTV. This specification is limited to HEVC coded services.

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1 Scope

The present document provides an overview of the methods to encode and deliver DVB plano-stereoscopic 3DTV services and their decoding by a digital receiver. Each part includes the selection of corresponding plano-stereoscopic 3DTV formats, the definition of plano-stereoscopic 3DTV service signalling information, and the handling of graphics and captions overlays in the receiver during the reception of the respective plano-stereoscopic 3DTV service. Some elements are contained in amendments and extensions to the appropriate existing DVB specifications.

The production and contribution of plano-stereoscopic 3DTV content prior to delivery, as well as the method of rendering the plano-stereoscopic 3DTV content to the viewer at the 3DTV capable display device after its reception and decoding, are outside the scope of the present document.

2 References

2.1 Normative 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.

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

[1] ETSI TS 101 154 (V1.11.1): "Digital Video Broadcasting (DVB); Specification for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream".

[2] DVB BlueBook A038: "Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems".

[3] ETSI EN 300 743 (V1.4.1): "Digital Video Broadcasting (DVB); Subtitling systems".

2.3 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] ETSI TS 101 547-2: "Digital Video Broadcasting (DVB); Plano-stereoscopic 3DTV; Part 2: Frame Compatible Plano-stereoscopic 3DTV".

[i.2] ETSI TS 101 547-3: "Digital Video Broadcasting (DVB); Plano-stereoscopic 3DTV; Part 3: HDTV Service Compatible Plano-stereoscopic 3DTV".

[i.3] Recommendation ITU-T H.264: "Advanced video coding for generic audiovisual services".

[i.4] Recommendation ITU-T H.222.0: "Information technology - Generic coding of moving pictures and associated audio information: Systems".

[i.5] ETSI TS 101 547-4: "Digital Video Broadcasting (DVB); Plano-stereoscopic 3DTV; Part 4: Service frame compatible Plano-stereoscopic 3DTV for HEVC coded services".

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[i.6] ETSI TS 101 547: "Digital Video Broadcasting (DVB) Frame Compatible Plano-stereoscopic 3DTV".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

3DTV: DVB plano-stereoscopic three-dimensional television

3DTV cognisant IRD: IRD that is able to identify plano-stereoscopic 3DTV services via the corresponding Service Information (DVB-SI), and the plano-stereoscopic 3DTV video format, but that is not necessarily able to render plano-stereoscopic 3DTV video content correctly

3DTV compliant IRD: IRD that is both 3DTV cognisant and that is able to render plano-stereoscopic 3DTV video content correctly, being either a **25 Hz, 30 Hz, 50 Hz or 60 Hz plano-stereoscopic 3DTV IRD** as defined in ETSI TS 101 154 [1]

3DTV incognisant IRD: IRD that is not able to identify plano-stereoscopic 3DTV services via the corresponding Service Information (DVB-SI), nor the plano-stereoscopic 3DTV video format

captions: text and visual elements intended to be overlaid on the picture as an optional feature, e.g. subtitles for foreign language source material, or for viewers with impaired hearing

disparity: difference between the horizontal positions of a pixel representing the same point in space in the right and left views

NOTE: Positive disparity (horizontal right coordinate greater than horizontal left coordinate) implies a position behind the plane of display, and negative disparity implies a position in front of the display.

Frame Compatible (FC): arrangement of the Left and Right images in a spatial multiplex which results in an image which can be treated like a normal HDTV image by the receiver demodulator and compression decoder

natural binocular viewing: process of viewing with two eyes, as is done by most people

pixel arrangements: arrangement of horizontal and vertical image samples

NOTE: This has an impact on vertical, horizontal, or diagonal resolution.

plano-stereoscopic: three-dimensional picture that uses two single pictures, Left and Right, displayed on a single plane surface (the TV screen in the case of 3DTV)

polarisation planes: optical filter system used to direct the left and right eye images to the appropriate eye

Service Compatible (SC): arrangement of the Left and Right images such that an existing HDTV receiver is able to extract a 2D version of the video content from a plano-stereoscopic 3DTV service

Service frame compatible (SFC): arrangement of the Left and Right images in a spatial multiplex which results in an image which can be treated like a normal HDTV image by the receiver demodulator and compression decoder accompanied by signalling enabling an HDTV receiver to extract the left view and up-scale it to simulate the reception of an HDTV service

service guide: usually information on programme choice displayed on the screen, and often derived from now and next information broadcast in the multiplex

simulcast: parallel broadcasting of the same programme, often in different forms or formats

titles: usually all forms of text and graphics that appear on top of a TV scene or another background, intended to be visible for all TV viewers

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3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

3DTV	Three Dimensional Television
AVC	Advanced Video Coding
CI	Common Interface
DSS	Disparity Signalling Segment
DVB	Digital Video Broadcasting
EIT	Event Information Table
FC	Frame Compatible
HD	High Definition
HDMI	High-Definition Multimedia Interface
HDTV	High Definition Television
HEVC	High Efficiency Video Coding
IRD	Integrated Receiver Decoder

NOTE: As defined in Recommendation ITU-T H.264 [i.3].

MPEG-2	Motion Picture Experts Group version 2
PES	Packetised Elementary Stream
SC	Service Compatible
SFC	Service Frame Compatible
SDT	Service Description Table
SDTV	Standard Definition TV
SEI	Supplemental Enhancement Information

NOTE: As defined in Recommendation ITU-T H.264 [i.3].

SI	Service Information
STB	Set Top Box
STC	System Time Clock
TV	Television

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4 Plano-stereoscopic 3DTV services in DVB delivery systems

4.1 Scope

Figure 1 depicts the scope of this multi-part deliverable, highlighted by the grey area, and the general concepts of the compatibility of DVB plano-stereoscopic 3DTV services with HDTV services over the encoding, transmission, and decoding stages of operation in a DVB delivery system. It shows, as a hypothetical example, a frame compatible plano-stereoscopic 3DTV (FC-3DTV) service, a service frame compatible plano-stereoscopic 3DTV (SFC-3DTV) service and a HDTV service compatible plano-stereoscopic 3DTV (SC-3DTV) service being multiplexed with a conventional HDTV service into a single MPEG-2 Transport Stream for delivery to a population of IRDs, some of which are SC-3DTV, SFC-3DTV and/or FC-3DTV compliant (as defined in this multi-part deliverable), and some of which are HDTV capable, i.e. not 3DTV compliant.

Each 3DTV format-specific part of this multi-part deliverable defines signalling for the respective format of plano-stereoscopic 3DTV services.

The delivery system for plano-stereoscopic 3DTV services defined in this multi-part deliverable is intended to be applicable for any broadcast or delivery channel that uses the DVB MPEG-2 Transport Stream to carry DVB services, hence no delivery-system specific features are defined.

The features of HDTV services and IRDs are not impacted by the present document. They are depicted in the scope diagram due to the fact that plano-stereoscopic 3DTV service delivery may share the same HDTV infrastructure, in certain valid use cases even including a HDTV IRD that has no 3DTV service cognisance.

While the compatibility with HDTV infrastructure and content formats enables the rapid and convenient roll-out of 3DTV services due to the transparent re-use of the existing HDTV delivery infrastructure, there are potentially also complications that need to be addressed around 3DTV service configuration and their co-existence with HDTV services within the delivery system.

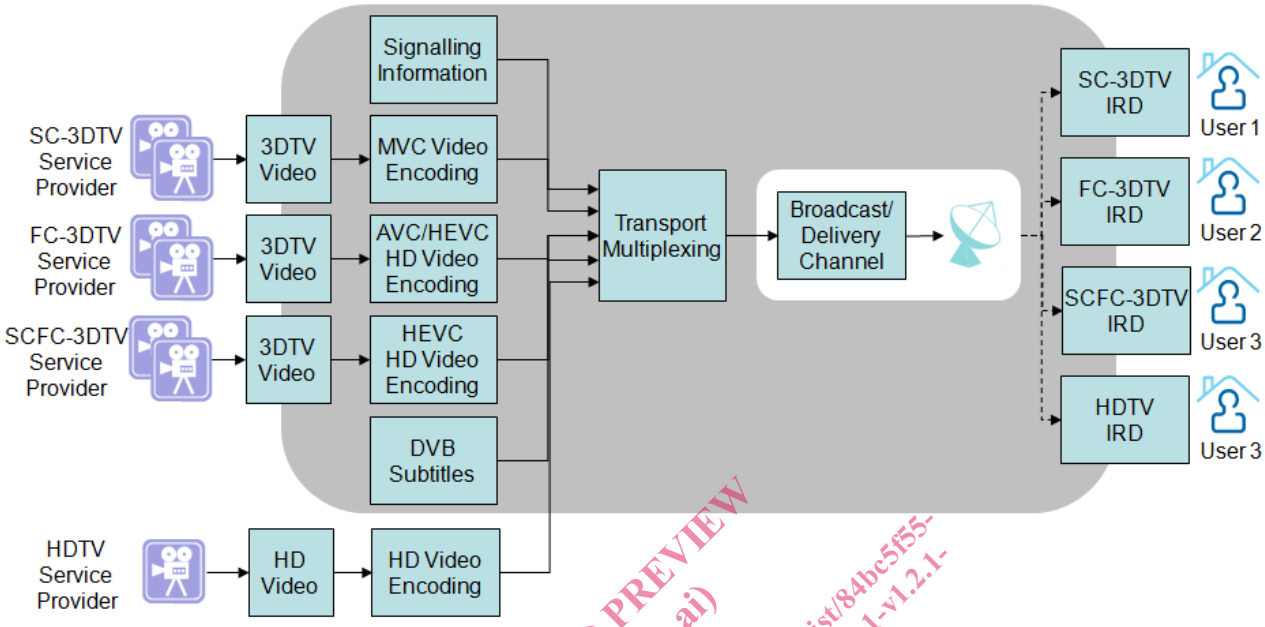


Figure 1: Scope of the DVB plano-stereoscopic 3DTV specification

Each of the variants of DVB plano-stereoscopic 3DTV delivery systems is specified in the further parts of the present document. Each part contains an informative description of various aspects of the respective 3DTV system and some normative specification for compliant services and IRDs. Each variant refers normatively to revised versions of other DVB specifications that have been created to provide relevant 3DTV-specific features.

Clause 5 of the present document contains the normative specification of features that are common to all variants of DVB plano-stereoscopic 3DTV systems.

4.2 3DTV Services

For the purpose of discussing the various service configuration and co-existence scenarios, various generic forms of 3DTV service are defined informatively:

- The "24/7" 3DTV service, i.e. a 3DTV service that operates permanently in 3DTV mode.
- The "time-exclusive" 3DTV service, i.e. a 3DTV service that operates for only a certain fixed time (e.g. daily, weekly), and whose network resources are relinquished for use by another service at other times.
- The "predominant" 3DTV service, i.e. a service that contains predominantly 3DTV format content, but occasionally switches to HDTV mode.
- The "composite" 3DTV service, i.e. a service that has an arbitrary mix of HDTV and 3DTV format content.
- The "occasional" 3DTV service, i.e. a service that contains predominantly HDTV content, but occasionally switches to 3DTV mode.

Figure 2 depicts a hypothetical timeline of various types of DVB service, including the above generic 3DTV service types, for the purposes of introducing the aspects specified in this multi-part deliverable, the issues around the co-existence of plano-stereoscopic 3DTV services with HDTV services, and the possible event linkage between 3DTV services, and HDTV and SDTV services.

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