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Digitalna videoradiodifuzija (DVB) - Radiodifuzijski sistem naslednje generacije za dlančnike, specifikacija fizične plasti (DVB-NGH) - 1. del: Osnovni profil

Digital Video Broadcasting (DVB) - Next Generation broadcasting system to Handheld, physical layer specification (DVB-NGH) - Part 1: Base Profile

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The DVB Project is an industry-led consortium of broadcasters, manufacturers, network operators, software developers, regulators and others from around the world committed to designing open, interoperable technical specifications for the global delivery of digital media and broadcast services. DVB specifications 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.

The present document is part 1 of a multi-part deliverable covering the Next Generation broadcasting system to Handheld, physical layer specification (DVB-NGH), as identified below:

Part 1: "Base Profile";

Part 2: "MIMO Profile";

Part 3: "Hybrid Profile";

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Introduction

The present document is structured as follows:

- it gives a general description of the transmission system for digital terrestrial and hybrid broadcasting to handheld terminals;
- it 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 at the modulator side, while the processing at the receiver side is left open to different implementation solutions. However, it is necessary in this text to refer to certain aspects of reception.

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The multi-part deliverable consists of four parts each covering a different structure of the transmitter network:

- Base Profile (the present document): Covers sheer terrestrial transmission with single and multi-aerial structures that require only a single aerial and tuner on the receiver side.
- MIMO Profile (ETSI EN 303 105-2 [i.1]): Covers sheer terrestrial transmission with multi-aerial structures on both ends. Terminals suitable for this profile need to employ two tuners as well.
- Hybrid Profile (ETSI EN 303 105-3 [i.2]): Covers a combination of terrestrial and satellite transmissions that requires only a single tuner on receiver side.
- Hybrid MIMO Profile ((ETSI EN 303 105-4 [i.3]): Covers a combination of terrestrial and satellite transmission requiring a double aerial and tuner set-up on receiver side. Once again, a part of the configurations can be handled by MIMO profile [i.1] receivers, other configurations require a special hybrid MIMO [i.3] receiver. The present document describes the base profile in full detail. For the MIMO [i.1] and hybrid profiles [i.2] and [i.3] only the differences between those and the base profile are described, i.e. additional functional blocks and parameter settings and those that are permitted in the MIMO [i.1] or hybrid profile [i.2]. The hybrid MIMO profile [i.3] is not formulated solely as a list of differences to the other three profiles. Instead it defines how previously-described elements are to be combined to provide hybrid MIMO [i.3] transmission, as well as introducing profile-specific information. Functional blocks and settings that are the same as in the base profile are not described again, but can be derived from the base profile reflected by the present document.

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1 Scope

The present document describes the next generation transmission system for digital terrestrial and hybrid (combination of terrestrial with satellite transmissions) broadcasting to handheld terminals. It specifies the entire physical layer part from the input streams to the transmitted signal. This transmission system is intended for carrying Transport Streams or generic data streams feeding linear and non-linear applications like television, radio and data services. DVB-NGH terminals might also process DVB-T2-lite signals.

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 referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at https://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.

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

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

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

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

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[4] ETSI TS 102 992: "Digital Video Broadcasting (DVB); Structure and modulation of optional transmitter signatures (T2-TX-SIG) for use with the DVB-T2 second generation digital terrestrial television broadcasting system".

2.2 Informative 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 referenced document (including any amendments) applies.

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

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 EN 303 105-2: "Digital Video Broadcasting (DVB); Next Generation broadcasting system to Handheld, physical layer specification (DVB-NGH); Part 2: MIMO Profile".

[i.2] ETSI EN 303 105-3: "Digital Video Broadcasting (DVB); Next Generation broadcasting system to Handheld, physical layer specification (DVB-NGH); Part 3: Hybrid Profile".

[i.3] ETSI EN 303 105-4: "Digital Video Broadcasting (DVB); Next Generation broadcasting system to Handheld, physical layer specification (DVB-NGH); Part 4: Hybrid MIMO Profile".

[i.4] 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)".

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3 Definition of terms, symbols and abbreviations

3.1 Terms

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

active data cell: OFDM cell which is not a pilot, tone reservation cell or unmodulated cell in the frame closing symbol

anchor PLP: is the PLP of a PLP cluster which is always decoded in order for the receiver to play out the service partially or fully, i.e. with a part or all of the service components respectively

NOTE: The anchor PLP carries the in-band signalling for all PLPs (anchor and associated PLPs) in the given PLP cluster.

aP1 symbol: additional P1 symbol that carries S3 and S4 signalling fields and is located right after the P1 symbol

associated PLP: is a PLP associated with an anchor PLP in a given PLP cluster

NOTE: The associated PLP carries a service component of the full service carried by the given PLP cluster. An associated PLP does not carry in-band signalling, which in turn is carried by the anchor PLP of the given PLP cluster.

auxiliary stream: sequence of cells carrying data of as yet undefined modulation and coding, which may be used for future extensions or as required by broadcasters or network operators

baseband frame: set of K_{bch} bits which form the input to one FEC encoding process (BCH and LDPC encoding)

cell: OFDM carrier in an OFDM symbol and its associated modulation state (incl. data cells, pilot cells, dummy cells, reserved tones, etc.)

common PLP: PLP having one slice per logical frame, transmitted after the L1-POST signalling, which may contain data shared by multiple PLPs

data cell: OFDM cell which is not a pilot or tone reservation cell (may be an unmodulated cell in the frame closing symbol)

data PLP: PLP of type 1, type 2, type 3 or type 4

data symbol: OFDM symbol in an NGH frame which is neither a P1, an aP1 or a P2 symbol

dummy cell: OFDM cell carrying a pseudo-random value used to fill the remaining capacity not used for L1 signalling, PLPs or auxiliary streams

elementary block of frames: block of not more than four NGH frames belonging to the same NGH profile and building an instance of the frame type sequence of the related NGH system (e.g. SISO/SISO/SISO/MIMO)

elementary period: time period which depends on the system bandwidth and is used to define the other time periods in the NGH system

FEC block: set of N_{cells} OFDM cells carrying all the bits of one LDPC FECFRAME

FEC chain: part of the BICM block reaching from the FEC encoder to the I/Q component interleaver (if present, otherwise to the cell interleaver) for PLPs and the cell mapper for L1 signalling

FECFRAME: set of N_{ldpc} (16 200 or 4 320) bits from one LDPC encoding operation

FEF interval: number of NGH frames between two FEF parts of an NGH signal

FEF part: part of the super-frame between two NGH frames which contains FEFs

NOTE: A FEF part always starts with a P1 symbol. The remaining contents of the FEF part should be ignored by a DVB-NGH receiver and may contain further P1 symbols.

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FFT size: nominal FFT size used for a particular mode, equal to the active symbol period T_s expressed in cycles of the elementary period T

frame closing symbol: OFDM symbol with higher pilot density used at the end of an NGH frame in certain combinations of FFT size, guard interval and scattered pilot pattern

hybrid combining: simultaneous reception of a DVB-NGH signal from a terrestrial transmitter and one from a satellite carrying an identical input stream, and generation of a single output stream (by combining both signals) that is more robust than the output stream gained from only one signal

input stream: stream of data for an ensemble of services delivered to the end users by the NGH system

NOTE: Each service can be made up of multiple service components . An input stream may be structured into a number of logical channel groups defined in accordance with the service requirements.

interleaving frame: unit over which dynamic capacity allocation for a particular PLP is carried out, made up of an integer, dynamically varying number of FEC blocks and having a fixed relationship to the logical frames

NOTE: The interleaving frame may be mapped directly to one logical frame or may be mapped to multiple logical frames. It may contain one or more TI blocks.

L1-POST configurable signalling: L1 signalling consisting of parameters which remain the same for the duration of one logical super-frame

L1-POST dynamic signalling: L1 signalling consisting of parameters which may change from logical frame to logical frame within the same logical super-frame

L1-POST signalling: signalling carried in the beginning of a logical frame providing detailed L1 information about the NGH system and the PLPs. L1-POST signalling consists of a configurable and a dynamic part

L1-PRE signalling: signalling carried in the P2 symbols having a fixed size, coding and modulation, including basic information about the NGH system as well as information needed to decode the L1-POST signalling

NOTE: Some fields of the L1-PRE signalling may change from one NGH frame to another within the same NGH super-frame, for example, L1_POST_DELTA for logical channel types B and C.

logical channel: sequence of logical super-frames for the transport of data over a given repeating pattern of RF channels in the NGH system

logical channel group: group of logical channels such that the NGH frames which carry the logical frames of one logical channel in the group are never transmitted parallel in time to the NGH frames which carry the logical frames of another logical channel in the same group

logical frame: container with a fixed number of (uniform or non-uniform) QAM cells and a given structure for the carriage of data into the NGH frames

logical super-frame: entity composed of a number of logical frames. The logical configurable signalling information may only change at the boundaries of two logical super-frames

MIXO: either MISO or MIMO

MIXO group: group (1 or 2) to which a particular transmitter in a MIXO network belongs, determining the type of processing which is performed to the data cells and the pilots

NOTE: Signals from transmitters in different groups will combine in an optimal manner at the receiver.

NGH frame: fixed physical layer TDM frame that may be further divided into variable size sub-slices

NOTE: An NGH frame starts with one P1 symbol, followed for a part of the frame types by an additional P1 (aP1) symbol and always one or multiple P2 symbols carrying the L1-PRE information.

NGH profile: subset of all configurations allowed by the related part of the present document

NOTE: The present document defines a base profile, a MIMO profile, a hybrid profile and a hybrid MIMO profile.

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