

**Minimum Requirements on the Receiving Equipment for Services in
the DVB-T and DVB-T2 Networks**

D-Book

Release 3.05 (19 June 2012)

1. Introduction

1.1. Purpose of document.....	4
1.2. Symbols and acronyms used in this document.....	5
1.3. Relevant regulations and standards	6
1.4. Document history log.....	8

2. Technical properties and configuration of the equipment.....9

2.1. Electromagnetic compatibility, equipment security	9
2.2. Power supply	9
2.3. Radio frequencies and bandwidths.....	9
2.4. DVB-T and DVB-T2 modulation formats.....	9
2.4.1. Equipment categories 1 and 2 (DVB-T)	10
2.4.2. Equipment of categories 3 and 4 (DVB-T2)	10
2.5. Input interface	11
2.6. Minimum sensitivity, maximum input signal, selectivity of the equipment	11
2.6.1. Equipment of categories 1 and 2 (DVB-T)	11
2.6.2. Equipment of categories 3 and 4 (DVB-T2)	11
2.6.2.1. Minimum sensitivity (DVB-T2)	11
2.6.2.2. Maximum input signal (DVB-T2).....	13
2.6.2.3. Selectivity (DVB-T2)	13
2.7. Compression method and format.....	14
2.7.1. Receiving equipment of categories 1 and 2 (DVB-T).....	14
2.7.1.1. Image source coding	14
2.7.1.2. Sound source coding	14
2.7.2. Receiving equipment of categories 3 and 4 (DVB-T2).....	15
2.7.2.1. Image source coding	15
2.7.2.1.1. SDTV.....	15
2.7.2.1.2. HDTV	15
2.7.2.2. Sound source coding	15
2.8. Audio / Video interface.....	15
2.9. Conditional access CA.....	16
2.10. Remote control	17

3. Functions of the equipment18

3.1. Methods of tuning	18
3.2. Programme classification.....	18
3.3. System service information (SI) in the DVB-T/T2 system.....	18
3.3.1. Basic requirements on SI data transmission.....	18
3.3.2. Basic requirements on SI data processing	19
3.3.3. Support to dynamic changes to SI tables	19
3.3.4. Rules for the numbering of services and networks in the Czech Republic ...	19
3.3.5. EIT tables	19
3.3.6. Location of SI tables (use of national characters in SI tables)	20
3.3.7. Synchronisation of the internal clocks of the receiving equipment.....	20
3.4. Programme guide (EPG)	20
3.5. Teletext.....	20
3.6. Language localisation	21
3.6.1. User interface	21

3.6.2. Teletext.....	21
3.6.3. Localisation of SI tables (use of national characters in SI tables).....	21
3.6.4. SI table localisation (language indication in the SI tables).....	21
3.6.5. Interpretation of programme type.....	21
3.7. Subtitles.....	21
3.8. Control of home recording equipment (VPS, PDC).....	22
3.9. Audio Description.....	22
4. Data interfaces, interactivity.....	24
5. DVB-3DTV	25
6. Additional services	25
6.1. System software update (SSU)	25
7. Document reviewing	25
Appendix 1 – Table of channels for DVB-T/T2.....	26
Appendix 2 – Codes indicating programme type (genre) – interpretation in the Czech language	27

1. Introduction

1.1. Purpose of document

This document summarises the minimum requirements to be met by newly launched receiving equipment to be used to provide services to end users in the Czech Republic via electronic communication networks, using the DVB-T and DVB-T2 systems. For the purposes of this document, four major receiving equipment categories are introduced:

1	<i>set top box intended for reception of the DVB-T (DVB-T STB) signal</i>
2	<i>integrated digital TV receiver intended for reception of the DVB-T (DVB-T IDTV) signal</i>
3	<i>set top box intended for reception of the DVB-T2 (DVB-T2 STB) signal</i>
4	<i>integrated digital TV receiver intended for reception of the DVB-T2 (DVB-T2 IDTV) signal</i>

As to receiving equipment under points 3 and 4 above, it is taken for granted that it also enables reception of DVB-T signals and that, in this respect, it must meet the same requirements as the equipment under points 1 and 2. Where necessary, the document may also refer in brief to other categories of receiving equipment.

Minimum requirements are expressed by means of defined technical parameters or properties. The requirements indicated in the individual parts of this document are denoted, where necessary, using the following acronyms or terms:

M	<i>The requirement is MANDATORY (sometimes replaced by a phrase with <u>must</u>: must comply, must support etc.)</i>
R	<i>The requirement is RECOMMENDED</i>
O	<i>The requirement is OPTIONAL (sometimes replaced by a phrase with <u>may</u>: may comply, may support etc.)</i>

More detailed descriptions of the meanings of certain acronyms may be provided in some parts of the document.

If the requirements indicated in the document are met, the technical parameters of the receiving equipment do not hinder the use of the equipment by end users within the electronic communication networks provided in the Czech Republic for services provided through the DVB-T and DVB-T2 systems. The document is prepared as a recommendation aimed at contributing to the development of the market for receiving equipment for the end users of these services.

The document does not cover the issues of interoperability between the customer equipment in domestic networks and in networks enabling remote access (DVB-CPCM – system of content protection and copying management in accordance with the ETSI TS 102 825-1 to 14 standards of 2011).

1.2. Symbols and acronyms used in this document

AAC	Advanced Audio Coding
AVC	Advanced Video Coding
BER	Bit Error Rate
CA	Conditional Access
CI	Common Interface
CI+	Common Interface Plus
DO	Remote control (<i>Dálkový ovladač</i>)
DVB	Digital Video Broadcasting
DVB-T	System defined by the ETSI EN 300 744 standard for providing terrestrial digital broadcasting
DVB-T2	Second generation system defined by the EN 302 755 standard for providing terrestrial digital broadcasting
EHS	European Economic Community, EEC (<i>Evropské hospodářské společenství</i>)
EIT	Event Information Table
EPG	Electronic Programme Guide
ES	European Community, EC (<i>Evropské společenství</i>)
ETSI	European Telecommunication Standards Institute
FEC	Forward Error Correction
FEF	Future Extension Frames
HbbTV	Hybrid Broadcast Broadband TV
HDCP	High-bandwidth Digital Content Protection
HDMI	High Definition Multimedia Interface
HDTV	High Definition Television
HE AAC	High Efficiency AAC
HEM	High Efficiency Mode
ID	Identification
IEC	International Electro Technical Commission
ISO	International Organization for Standardisation
ITU	International Telecommunication Union
IDTV	Integrated Digital TV Receiver
LDPC	Low Density Parity Check
MISO	Multiple Input / Single Output
MPEG	Motion Picture Experts Group
OSD	On Screen Display
PAPR	Peak-to-Average Power Ratio
PDC	Programme Delivery Control
PID	Packet Identifier
PLP	Physical Layer Pipe
PSI	Programme Specific Information
PVR	Personal Video Recorder (digital recorder, using as a rule, hard disk as a recording medium)
QAM	Quadrature Amplitude Modulation
QEF	Quasi Error Free
QPSK	Quadrature Phase Shift Keying
RCA	Designation of a connector, also known as Cinch
R&TTE	Radio and Telecommunication Terminal Equipment
SCART	21-pole connector for connecting audio/video equipment (<i>Syndicat des Constructeurs d'Appareils Radiorécepteurs et Téléviseurs</i>)

SDTV	Standard Definition Television
SI	Service Information
SISO	Single Input Single Output
S/PDIF	Sony/Philips Digital Interface
SSU	System Software Update
STA	Common TV Antenna (block distribution)
STB	Set-top Box (equipment to receive the DVB-T signal and then to gain access to provided services through an ordinary TV set or other terminal equipment. STB also denotes equipment with integrated PVR, DVD recorder or other similar equipment. A STB may also have an integrated display panel, e.g. an LCD).
TFS	Time Frequency Slicing
TR	Tone Reservation
TS	Technical Specification
USB	Universal Serial Bus
VBI	Vertical Blanking Interval
VPS	Video Programming System
WLAN	Wireless Local Area Network
WSS	Wide Screen Signalling
3DTV	Three-dimensional Television

1.3. Relevant regulations and standards

Directive 1999/5/EC of 9 March 1999

on radio equipment and telecommunication terminal and the mutual recognition of their conformity (R&TTE Directive)

Directive 89/336/EEC of 3 May 1989

on the approximation of the laws of the Member States relating to electromagnetic compatibility

Directive 108/2004/EC of 15 December 2004

on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC

Commission Regulation (EC) No. 1275/2008 of 17 December 2008, implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment

Commission Regulation (EC) No. 107/2009 of 4 February 2009, implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for simple set-top boxes

Commission Regulation (EC) No. 642/2009 of 22 July 2009, implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for televisions

ČSN EN 62216-1 Standard (2003)

Digital terrestrial television receivers for the DVB-T System – Part 1: Baseline receiver specification

ČSN EN 62216 Standard (2011)

Digital terrestrial television receivers for the DVB-T system

ČSN ETSI EN 300 744 V1.6.1 Standard (2009)

Digital Video Broadcasting (DVB) – framing structure, channel coding and modulation for terrestrial digital television

EN 50049-1 (1997)

Domestic and similar electronic equipment interconnection requirements.

Part 1: Peritelevision connector

EN 50157-2-1

Domestic and similar electronic equipment interconnection requirements: AV link –

Part 2-1: Signal quality matching and automatic selection of source devices

EN 50221 (1997)

Common interface specification for conditional access

ČSN ETSI EN 300 472 V1.3.1 (2003)

Digital video broadcasting (DVB). Specification for conveying ITU-R system B teletext in DVB bitstreams

ČSN ETSI EN 301 775 V1.2.1 (2003)

Digital video broadcasting (DVB). Specification for the carriage of vertical blanking information (VBI)

ETSI TS 102 006 V1.3.2 (2008)

Digital video broadcasting (DVB). Specification for system software update in DVB systems

ČSN ETSI EN 302 755 V1.2.1 (2011)

Digital video broadcasting (DVB); frame structure channel coding and modulation for a second-generation digital terrestrial television broadcasting system (DVB-T2)

DVB BlueBook A133 (2012)

Digital video broadcasting (DVB); implementation guidelines for a second generation digital terrestrial television broadcasting system (DVB-T2)

ETSI TS 102 796 (2010)

Hybrid broadcast broadband TV (HbbTV)

ETSI TS 102 809 (2010)

Digital video broadcasting (DVB); signalling and carriage of interactive applications and services in hybrid broadcast/broadband environments

ETSI TS 101 154

Digital video broadcasting (DVB); specification for the use of video and audio coding in broadcasting applications based on the MPEG-2 transport stream

ETSI TS 101 547 V1.1.1 (2012-01)

Digital video broadcasting (DVB); frame compatible plano-stereoscopic 3DTV

DVB Document A156

Digital video broadcasting (DVB); subtitling systems. Addition to EN 300743 v1.3.1 for subtitles with plano-stereoscopic content (3D), DVB Document A156

ETSI EN 300 468 V1.12.1 (2011-10)

Digital video broadcasting (DVB); specification for service information (SI) in DVB systems

HDMI Licensing, LLC

HDMI, High-definition multimedia interface, rev. 1.3

CI Plus LLP

CI Plus specification; content security extensions to the common interface, v1.3

1.4. Document history log

Date	Description
April 2008	Invitation to comment on the proposed draft
November 2008	Final draft (release 2.04) submitted
November 2011	Document revision – added the minimum requirements for equipment intended for use in the DVB-T2 system (release 3.00)
January 2012	Sound support added – Dolby Digital Plus format. Reference to HbbTV standard (release 3.01) extended
March 2012	Comments incorporated, final draft (release 3.02) submitted

2. Technical properties and configuration of the equipment

2.1. Electromagnetic compatibility, equipment security

Any receiving equipment launched to the market in the Czech Republic must have a statement of conformity in accordance with the legislation in force in the Czech Republic and in the EU, and must bear the CE mark (see Section 1.3 Relevant Regulations and Standards).

2.2. Power supply

A set-top-box or IDTV must be equipped for power supply from the 230 V / 50 Hz mains. Equipment intended for use in transport and instruments supplied with power from external sources may be an exception. For external receiving equipment intended for joint operation with a personal computer, power supply must be provided by means of an appropriate connecting interface between the equipment and the computer.

2.3. Radio frequencies and bandwidths

The receiving equipment must be able to receive on all channels of TV bands IV and V (470 – 790 MHz) at a channel width of 8 MHz, and on all channels of TV band III (174 – 230 MHz) at a channel width of 7 MHz – see Appendix 1.

For solving certain specific issues related to the reception of the DVB-T/T2 terrestrial digital television broadcasting through a STA (common antenna) it is an advantage if the receiving equipment is also capable to receive on the channels of TV band III with a channel width of 8 MHz – see Appendix 1.

Equipment category	TV band III (174 - 230 MHz) channel width 7 MHz	TV band III (174 - 230 MHz) channel width 8 MHz	TV band IV / V (470 - 790 MHz) channel width 8 MHz
DVB-T STB	M	R	M
DVB-T IDTV	M	R	M
DVB-T2 STB	M	R	M
DVB-T2 IDTV	M	R	M

The receiving equipment must be able to process a signal with a maximum frequency deviation of up to 50 kHz from the nominal channel centre frequency.

2.4. DVB-T and DVB-T2 modulation formats

The receiving equipment must be able to process the input radio signal transmitting the data flow with a framework structure, channel coding and modulation by category – see the table below:

Equipment category	framework structure, channel coding and modulation by EN 301 744	framework structure, channel coding and modulation by EN 302 755
DVB-T STB	M	-
DVB-T IDTV	M	-
DVB-T2 STB	M	M
DVB-T2 IDTV	M	M

2.4.1. Equipment categories 1 and 2 (DVB-T)

As to DVB-T, the following modes, which must be supported by category 1 and 2 receiving equipment, are currently used in the Czech Republic:

parameter	networks 1 & 2	network 3	network 4
bandwidth*	8 MHz	8 MHz	8 MHz
transmitting mode	8k	8k	8k
guard interval	1/4	1/8	1/8
code ratio	2/3	3/4	2/3
constellation	64QAM	64QAM	64QAM
hierarchical mode	non-hierarchical	non-hierarchical	non-hierarchical
total bit rate	19,906 Mbit/s	24,882 Mbit/s	22,118 Mbit/s

* see the Channel Table – Appendix 1

As follows from the above table, support to the hierarchical mode is not mandatory at present.

The receiving equipment must automatically detect how each of the above parameters is set.

2.4.2. Equipment of categories 3 and 4 (DVB-T2)

As to DVB-T2, the basic T2 signal parameters are currently assumed in the Czech Republic to be limited to the following values to be mandatorily supported by category 3 and 4 equipment (of course, only in permitted combinations):

parameter	Use in the Czech Republic
bandwidth*	7 MHz (TV band III), 8 MHz (TV bands IV & V)
transmitting mode	8k, 16k, 32k normal (channel 7 MHz), 8k, 16k, 32k extended (channel 8 MHz)
guard interval	1/4, 1/8, 1/16, 1/32, 1/128, 19/128, 19/256
code ratio (PLP)	3/5, 2/3, 3/4, 4/5, 5/6
constellation (PLP)	64 QAM, 256 QAM both with and without rotation
pilot pattern	PP2, PP3, PP4, PP5, PP6, PP7
PAPR parameter reduction method	NONE / TR
Length of the FEC framework	64800 (long)
PLP mode	High Efficiency Mode (HEM)

** see the Channel Table – Appendix 1

As to other T2 signal parameters / properties, indicated in the following table, it has not yet been finally decided in the Czech Republic how they are to be used in the future (the table shows the current state and the nearest future prospects). The existing category 3 and 4 equipment must match at least the following situation:

parameter / property	current use / nearest future
(input mode)	Mode A (single PLP) / Mode A and Mode B
SISO/MISO transmission mode	SISO
TFS (Time Frequency Slicing)	not used
FEF (Future Extension Frames)	not used
auxiliary streams	not used

The receiving equipment must automatically detect how each of the above parameters is set. If a mode not supporting the receiving equipment is used, no failure is allowed to occur.

2.5. Input interface

The connector at the input of the receiving equipment must be of the IEC female type with an impedance of 75 Ω according to the IEC 60169-2 recommendation.

The input connector may provide input for connecting an active antenna and in such case it must meet the following parameters:

voltage	5 V (the positive conductor being the central wire)
current load	minimum 30 mA, short-circuit protected
control	ON/OFF from the receiver's user interface
Initial status	OFF

2.6. Minimum sensitivity, maximum input signal, selectivity of the equipment

2.6.1. Equipment of categories 1 and 2 (DVB-T)

The values of the parameters characterising the vf properties of the receiving equipment for DVB-T (categories 1 and 2) must correspond to the values and tolerances set out in the EN 62216-1 standard.

2.6.2. Equipment of categories 3 and 4 (DVB-T2)

Requirements for the values of the parameters indicating the vf characteristics of the receiving equipment for DVB-T2 (categories 3 and 4) are not yet definitely determined. Most of the specified data are based on computer simulations, and their accuracy is planned to be gradually improved on the basis of practical and laboratory tests. Nonetheless, requirements for certain selected basic vf characteristics are indicated here as guidelines intended for receiving equipment manufacturers.

2.6.2.1. Minimum sensitivity (DVB-T2)

The ETSI TS 102 831 technical specification (DVB BlueBook A133) contains tables of minimum spacing between signal (carrier) and noise (C/N) necessary to reach the required error rate level at a FEC frame length of 64800 bits. Upon corrections, taking into account the transmission mode used (32k), the pilot carrier distribution (pilot pattern PP2 and PP4, respectively), the tolerance respecting the assumed practical implementation of the receiver and the error rate roughly corresponding to QEF reception ($BER = 1 \times 10^{-7}$ after LDPC decoder), these values of the minimum C/N required for the individual modes of the T2 signal and the Gaussian channel are as indicated in the table below:

Constellation	Code ratio	Gaussian channel C/N [dB] for 32k, PP2	Gaussian channel C/N [dB] for 32k, PP4
QPSK	1/2	3.5	3.1
	3/5	4.7	4.3
	2/3	5.6	5.2
	3/4	6.6	6.2
	4/5	7.2	6.8
	5/6	7.7	7.3
16-QAM	1/2	8.7	8.3
	3/5	10.1	9.7
	2/3	11.4	11.0
	3/4	12.5	12.1
	4/5	13.3	12.9
	5/6	13.8	13.4
64-QAM	1/2	13.0	12.6
	3/5	14.8	14.4
	2/3	16.2	15.7
	3/4	17.7	17.3
	4/5	18.7	18.3
	5/6	19.4	18.9
256-QAM	1/2	17.0	16.5
	3/5	19.4	18.9
	2/3	20.8	20.4
	3/4	22.9	22.4
	4/5	24.3	23.8
	5/6	25.1	24.6

From the indicated minimum C/N values necessary to provide QEF reception, it is possible, using a simple calculation, to derive the minimum necessary levels of the T2 signal at the receiving equipment's input, or the minimum sensitivities for the individual mode combinations.

The calculations used:

$$P_n = F + 10 \log (kT_0B) + 30$$

$$P_{smin} = P_n + C/N$$

where

B – noise bandwidth of the receiver [Hz]

C/N – minimum spacing between signal and noise required by the system [dB]

F – noise number of the receiver [dB]

P_n – input noise performance of the receiver [dBm]

P_{smin} – minimum signal performance at receiver input [dBm]

k – Boltzmann's constant = 1.38×10^{-23} Ws/K

T_0 – absolute temperature = 290 K

The minimum levels necessary for QEF reception for the individual T2 signal modes are indicated in the table below. The values are indicated for the bandwidth of B = 7.77 MHz (corresponding to the 8 MHz channel) and for receiver noise number F = 6 dB.

Constellation	Code ratio	Gaussian channel min. sensitivity [dBm] for 32k, PP2	Gaussian channel min. sensitivity [dBm] for 32k, PP4
QPSK	1/2	-95.5	-96.0
	3/5	-94.3	-94.8
	2/3	-93.4	-93.9
	3/4	-92.4	-92.9
	4/5	-91.8	-92.3
	5/6	-91.3	-91.8
16-QAM	1/2	-90.3	-90.8
	3/5	-88.9	-89.4
	2/3	-87.6	-88.0
	3/4	-86.5	-86.9
	4/5	-85.7	-86.1
	5/6	-85.2	-85.6
64-QAM	1/2	-86.0	-86.4
	3/5	-84.2	-84.6
	2/3	-82.9	-83.3
	3/4	-81.3	-81.8
	4/5	-80.3	-80.7
	5/6	-79.7	-80.1
256-QAM	1/2	-82.0	-82.5
	3/5	-79.7	-80.1
	2/3	-78.2	-78.6
	3/4	-76.2	-76.6
	4/5	-74.7	-75.2
	5/6	-73.9	-74.4

Receiving equipment of categories 3 and 4 must reach the minimum sensitivity values indicated in the table above for the individual modes. The noise number of equipment in categories 3 and 4 must be equal to 6 dB at the maximum in all frequency bands (bands III, IV and V).

2.6.2.2. Maximum input signal (DVB-T2)

Receiving equipment of categories 3 and 4 must enable QEF reception for T2 signals up to the level of -35 dBm.

2.6.2.3. Selectivity (DVB-T2)

Receiving equipment of categories 3 and 4 must enable QEF reception in the presence of an interfering DVB-T/T2 signal on a neighbouring, mirror or other channel, provided that the maximum admitted ratio between the interfering and useful signal I/C shown in the table below is not exceeded.

Band	Bandwidth [MHz]	maximum I/C ratio [dB]		
		adjacent channels	other channels	mirror channels
TV band III	7	28	38	---
TV band IV	8	28	38	28
TV band V	8	28	38	28

These values apply to the use of any mode combinations from Section 2.4.2 above.

2.7. Compression method and format

The receiving equipment must be able to support the data transport flow according to the ISO/IEC 13818-1 Standard. The parameters indicated below are mandatory. Extension beyond this recommendation is possible.

2.7.1. Receiving equipment of categories 1 and 2 (DVB-T)

2.7.1.1. Image source coding

- By the ISO/IEC 13818-2 Standard
- Main Profile @ Main Level
- Frame frequency 25 Hz
- Definition 720, 704, 544 and 480 (points) x 576 (lines) for “full screen” image
- Image format 4:3 and 16:9

Indication of image format 4:3 and 16:9 is transmitted within the elementary image data flow in the item of ***aspect_ratio_information*** of each sequence header. The decoder in the receiver must evaluate the value of this identifier on an ongoing basis and the receiver’s output signal must be adequately set at each moment. The minimum options and requirements for processing are shown in the table below:

Display device	Signal 4:3	Signal 16:9
4:3	no processing	vertical compression (letterbox)
16:9	horizontal compression (pillarbox)	no processing
4:3 with the possibility to reduce the vertical dimension	no processing	signalling 16:9 for display device

To provide for signalling 16:9 to receivers, the SCART output connector has a 12 V voltage on contact No. 8 at image format 4:3, and a 6 V voltage at image format 16:9.

2.7.1.2. Sound source coding

Based on the ISO/IEC 11172-3 standard, i.e. MPEG-1 Audio Layer II, with bit streams according to specification, using sampling frequencies of 32, 44.1 and 48 kHz.

The receiver must support the stereo, joint stereo and mono modes. Information about the format of the sound is transmitted within the elementary data flow in the “mode” item in the audio frame header and has a value of 0x00 for stereo, 0x01 for joint stereo and 0x03 for mono. This information must be evaluated by the receiver on an ongoing basis (in real time). The receiver’s user interface must be adjusted in accordance with this in order for the user to be able to make simple choices between the transmitted sound options.

The receiver must support the “audio description” (AD) sound mode according to specification in Section 3.9 below. The user interface must be adjusted accordingly to allow the user to simply choose the receiver mix and control separately the sound volume between the main transmitted sound and the accompanying AD sound.

Alternatively, multi-language accompanying sound may be transmitted in separate elementary data flows.

Optionally, the receiver may support (decode) sounds compressed in accordance with the ISO/IEC 14496-3 standard, MPEG-4 HE AAC coding.

2.7.2. Receiving equipment of categories 3 and 4 (DVB-T2)

2.7.2.1. Image source coding

By ITU-T Recommendation H.264 / ISO / IEC 14496-10 (AVC)

2.7.2.1.1. SDTV

- Main Profile @ Level 3
- Frame frequency 25 Hz
- Image format 4:3, 16:9
- Definition 720, 704, 544, 480 (point) x 576 (lines).

2.7.2.1.2. HDTV

- High Profile @ Level 4
- Frame frequency 25 and 50Hz (see the table below)
- Image format 16:9
- Formats supported: at least by the table below:

Vertical size	Horizontal size	Frame rate	Progressive/ Interlaced
1080	1920	25	I
1080	1440	25	I
720	1280	50	P

2.7.2.2. Sound source coding

The receiver must support (decode) sounds compressed:

- in accordance with the ISO/IEC 11172-3 standard, i.e. MPEG-1 Audio Layer II (with bit streams according to specification, using sampling frequencies of 32, 44.1 and 48 kHz and with support to the stereo, joint stereo and mono modes);
- in accordance with the ISO/IEC 14496-3 standard, coding MPEG-4 HE AAC. Support to multichannel (surround) audio in this format is also recommended;
- in the E-AC-3 (Dolby Digital Plus) format, including multichannel (surround) audio. The equipment must enable transparent E-AC-3 transmission via HDMI output, and provide conversion from E-AC-3 to AC-3 for S/PDIF output. As to multichannel audio, the equipment must enable conversion to stereo audio (L/R) and enable audio description in accordance with Section 3.9 above.

2.8. Audio / Video interface

The tables below show an overview of A/V inputs/outputs to be available in the receiving equipment of each category.

		receiving equipment category			
		1.	2.	3.	4.
VIDEO		DVB-T STB	DVB-T IDTV	DVB-T2 STB	DVB-T2 IDTV
SCART	input	-	M	-	M
	output	M	O	M	O
RCA (composite)	input	-	R	-	R
	output	R	O	O	O
RCA (component YPbPr)	input	-	R	-	R
	output	-	-	R	O
HDMI	input	-	M	-	M
	output	-	-	M	-

		receiving equipment category			
		1.	2.	3.	4.
AUDIO		DVB-T STB	DVB-T IDTV	DVB-T2 STB	DVB-T2 IDTV
SCART	input	-	M	-	M
	output	M	O	M	O
RCA (stereo L/R)	input	-	R	-	R
	output	R	O	O	O
S/PDIF	input	-	-	-	-
	output	R	R	M	M
HDMI	input	-	M	-	M
	output	-	-	M	-
Headphone output 3.5 mm jack	output	-	R	-	R

The configuration of the SCART interface must be in compliance with the EN 50049-1 Standard and in certain cases also EN 50157-2-1 Standard. Presence of another SCART interface, enabling connection of external equipment, is recommended for receiving equipment of categories 1 and 3.

HDMI interface must comply with the specification of HDMI Licensing, LLC: HDMI, “High-definition Multimedia Interface”, at least in release 1.3. HDMI interface must meet the requirements for protection against unauthorised access to content (HDCP, High Bandwidth Digital Content Protection System).

The S/PDIF digital audio output (if present) may be either in the optical or electric version.

If the receiving equipment supports multichannel audio decoding, it must also be able to convert it to stereo audio.

2.9. Conditional access CA

Receiving equipment of categories 3 and 4 must be furnished with at least one CI+ slot according to the specification of CI Plus LLP: CI Plus Specification, Content Security Extensions to the Common Interface, v1.3 (2011-01).

2.10. Remote control

Equipment for the reception of DVB-T/T2 signals, except the equipment to be connected to personal computers, must be furnished with remote control to provide access to all functions of the equipment via OSD and thereby to make it possible to use all the available services.

The raised bump on digit “5” enables (in particular) users with impaired vision to find the centre of the numeric keyboard.

3. Functions of the equipment

3.1. Methods of tuning

When first started and then whenever the user does the tuning, the receiving equipment must automatically search (identify) the broadcast services at least on all channels of TV bands IV and V (channels 21 to 60) and band III. For equipment of categories 1 and 2, the search is limited only to the services transmitted in the DVB-T format. Besides automatic tuning, it is also recommended to furnish the receiver with the function of manual tuning of the selected channel.

The receiver must automatically offer the saving of a new broadcast service and the updating of an already saved service in accordance with newly identified parameters (e.g., addition of another sound modulation, teletext etc.).

In the Czech Republic, certain programmes (services) are provided in regional modifications. The regional programme versions use the same Service IDs and PIDs; however, they use different Network ID and Transport Stream ID identifiers. During automatic tuning, the receiver must save all regional versions of programmes (i.e., some programmes will be saved more than once).

On the other hand, programmes that have the same identification and can be received on a multiple basis should be saved only once during automatic tuning. The receiving equipment should automatically select the programme from the transmitter with the best signal.

3.2. Programme classification

The transmitter must enable the user to classify the selected channels in an arbitrary manner and allocate them to the remote control keys. It is recommended to furnish the receiver with the possibility to create groups of favourite channels.

3.3. System service information SI in the DVB-T/T2 system

3.3.1. Basic requirements on SI data transmission

Data contained in the transmitted transport data streams intended for processing in receiving equipment:

Table	Actual
Programme association table (PAT)	M, m
Programme map table (PMT)	M, m
Conditional access table (CAT)	C, m
Network information table (NIT),	M, m
Bouquet association table (BAT)	U
Service description table (SDT)	M, m
Event information table (EIT) present/following	M, m
Event information table (EIT) schedule	R, m
Time and date table (TDT)	M, m
Time offset table (TOT)	R, m
Running status table (RST)	R

M	mandatorily transmitted
m	mandatorily interpreted in the receiving equipment
C	transmitted under certain conditions (e.g. in the case of paid services)
R	recommended to be transmitted
O	optionally transmitted
U	use not defined in this specification
N/A	not specified

3.3.2. Basic requirements on SI data processing

The equipment enables to process the necessary service information (SI) transmitted within individual DVB-T/T2 transport data streams so that its proper function is secured and the end user is able to make full use of the services provided. The processing of the SI is governed by the conditions and rules set out in the EN 300 468 Standard.

3.3.3. Support to dynamic changes to SI tables

The equipment must dynamically evaluate any changes to the PAT, PMT, SDT and NIT tables in individual transport data streams and to respond to these changes in real time. Changes may occur, in particular,

- when a new programme is added to the transport flow;
- when the transmission of a certain programme is terminated;
- during regular exchange of programmes within the daily or weekly cycle;
- when switching between the regional programme versions;
- when language versions are added or removed;
- when subtitles are added;
- when the transmission frequency is changed as planned (NIT table)
- when other data services are added, such as SSU etc.

The number of the changed table's version is incremented with each change.

3.3.4. Rules for the numbering of services and networks in the Czech Republic

The rules for the numbering of services and networks are set out in "Regulation of General Application No. SP/4/07.2011-13 laying down the identification marking of networks, data flows and services in the terrestrial digital television broadcasting networks"(issued by the Czech Telecommunication Office), which is to be extended also to cover the issues of the use of the PLP channel.

3.3.5. EIT tables

The event times in the planned EITs (schedules) are the published times. The actual transmission times are indicated in the EITs (event information tables – present/following information), provided that they are synchronised with the studio's presentation system.

The receiving equipment must prepare (mandatorily) a **short_event_descriptor** and **extended_event_descriptor**. It is recommended to use a **content_descriptor** and a **parental_rating_descriptor**.

If the **extended_event_descriptor** is displayed, it is recommended to use at 1000 characters.

In the tables designated as **Other**, it is possible to transmit information about programmes in other multiplexes of the same operator, or also those of other operators, provided that an agreement is reached. The use of the 'Other' tables is not specified in detail in this document.

3.3.6. Location of SI tables (use of national characters in SI tables)

The display of Czech characters in SI tables and in the EPG is addressed in Section 3.6.3.

3.3.7. Synchronisation of the internal clocks of the receiving equipment

The internal clocks of the receiver, from which the synchronisation of the EPG application is derived, must be set in accordance with the data in the TDT and TOT tables.

3.4. Programme guide (EPG)

The receiving equipment must provide users with a navigation function through the OSD interface to guide them through the environment of the services provided. The data necessary for preparing and updating the guide are transmitted within the transport data stream part reserved for the transmission of service information (SI/PSI). The equipment must be able to process the EPG data flow at a rate of 1 Mbps. It is governed by the EN 300 468 Standard and the TR 101 211 Recommendation and by the ISO/IEC 13818-1 Standard and the TR 101 154 Recommendation. The graphic format and extent of the electronic programme guide are given by the receiving equipment's system software, which must meet the conditions set out in the preceding sections, including localisation for the national environment. The receiving equipment must mandatorily display the present/following information immediately after switching the programme and at any time on request (after pressing the relevant Info button to 'DO'). The overview of the planned programmes must be available for at least seven days.

The receiving equipment must display all characters of the **short_event_descriptor** item, which is responsible for displaying the name and short description of the programme.

3.5. Teletext

The receiving equipment must

- either ensure teletext decoding and displaying in accordance with the ETSI EN 300 472 and EN 300 706 Standards (World System Teletext, variant Level 1.5 having a G0 set of characters with Czech/Slovak national characters at C12C13C14 = 110, and with the same set modified with diacritical signs from the G2 Latin character set);
- or/and ensure teletext insertion in the vertical blanking interval for decoding and displaying on the connected TV set (on the SCART, RCA interfaces only).

3.6. Language localisation

3.6.1. User interface

The receiving equipment must ensure that all and any information and instructions that are related to its operation and appear on the display (user interface) are in the Czech language, including the diacritical signs. If the receiver does not start in the localised (Czech) environment, it must offer language options when first started.

3.6.2. Teletext

Teletext display in the Czech language must be provided in accordance with Section 3.5.

3.6.3. Localisation of SI tables (use of national characters in SI tables)

The receiving equipment must be able to properly (in the Czech language) display the information transmitted in the text fields of the SI/PSI tables, for which the ISO/IEC 6937 is used (character table 00 – Latin alphabet, see Appendix A.2, Fig. A.1, the ETSI EN 300 468 Standard).

3.6.4. SI table localisation (language indication in the SI tables)

As to the indication of the language of the information transmitted in the text fields of the SI/PSI table according to the ETSI EN 300 468 Standard, it is possible in compliance with the ISO 639-2 Standard to use the CZE prefix as well as the CES prefix to indicate Czech in the **ISO_639_language_code** item. The receiving equipment must be able to correctly identify both methods of language indication and then to use them for proper determination of the language.

3.6.5. Interpretation of programme type

The codes indicating the type of programme (genre), transmitted according to the ETSI EN 300 468 Standard (Table 28 in Section 6.2.9.) in the Content descriptor, is interpreted by the receiving equipment in Czech in accordance with the table in Appendix 2.

3.7. Subtitles

Receiving equipment of classes 3 and 4 must enable decoding and displaying the so-called DVB subtitles in accordance with the ETSI EN 300 743 Standard. Support to at least certain characteristics is required:

- a) At least objects of type 0x00 must be drawn up (basic bit map).
- b) The range of regions must cover at least four lines of subtitles in one picture. The total number of processed points in one picture must be 112,960 points in the SD service and 457,440 points in the HD service. At least one line must be extensible to 706 • 40 points in the SD service and to 1,906 • 60 points in the HD service.
- c) At least 128 objects must be processed.
- d) At least one CLUT table must be supported with 16 items for each region. The use of the **non_modifying_colour** flag is optional.

- e) At least five transparency levels must be implemented (0%, 30%, 50%, 70% and 100%). The remaining values may be rounded to the nearest implemented levels.
- f) The receiving equipment must be able to process at least one DVB subtitle stream.

As to teletext subtitles, the receiving equipment may either decode them and display them directly or may ensure that teletext is inserted in the vertical blanking impulse (VBI) – only on the SCART, RCA interfaces.

The decoding of the subtitles with the above minimum parameters is also recommended for equipment of classes 1 and 2.

3.8. Control of home recording equipment (VPS, PDC)

The preferred method of programming home recording equipment is to use EPG. The equipment must always enable programming by manually entering the date and time and editing the programme's time parameters from the EPG (e.g., changing the end of the recording, compared to what is indicated in the EPG).

Any of the methods indicated below can be used to start and stop the recording:

- start at preset times;
- use the times indicated in the service information (SI) dates;
- use the times indicated in SI dates, combined with monitoring the change of status from '**following**' to '**present**' for a certain event with a specific **event_id**;
- use the times indicated in SI dates, combined with monitoring the RST tables, if they are transmitted;
- use the PDC descriptor in teletext data, if teletext is broadcast,
- use the PDC descriptor in SI data under the ETSI EN 300 468 Standard.

At least the first two options must always be implemented.

The receiving equipment supporting the control of the external recording equipment must control the external recording equipment (e.g. VHS or DVD recorder) either by means of the closing voltage at the SCART connector or by generating a VPS signal on the 16th scanning line, or must generate teletext with a relevant PDC descriptor.

3.9. Audio Description

The receiving equipment supporting the Audio Description function must be able to process the signal in the so-called receiver-mixed mode in accordance with the ETSI TS 101 154 Standard.

In this mode, the main sound and the voice description of the scene are transmitted separately. The voice description of the scene is a monophonic sound and contains only the voice. The receiver supporting AD then decodes both these accompanying sounds and enables the user to choose between reproduction of the main sound alone and reproduction of the main sound in combination with voice description. In the latter case, reproduction of the main sound in combination with voice description, the receiver enables to correct the volume ratio between the two sound components.

In the SI/PSI Audio Description, the broadcasting in the Receiver-Mixed mode is signalled in the programme map table (PMT), using the following descriptors:

- ISO_639_Language_descriptor (EN ISO/IEC 13818-1)
 - Main sound – elementary stream
 - audio_type = 0x00 (Undefined)
 - Audio Description – elementary stream
 - audio_type = 0x03 (Visual impaired commentary)
- supplementary_audio_descriptor (ETSI EN 300 468)
 - Main sound – elementary stream (optional)
 - mix_type = 1 (Complete and independent stream)
 - editorial_classification = 0 (Main Audio)
 - Audio Description – elementary stream
 - mix_type = 0 (Supplementary stream)
 - editorial_classification = 1 (Audio description for the visually impaired)

4. Data interfaces, interactivity

Receiving equipment may be furnished with any of the interfaces indicated below, intended for data transmission:

data interface	prevailing use	equipment category			
		1	2	3	4
RS-232C	servicing (e.g., for equipment firmware updating)	R	R	R	R
USB	servicing (e.g., for equipment firmware updating); for content playing/recording from/to external storage device	R	R	R	R
Ethernet under IEEE 802.3 (at least 100Base-T)	back channel, internet access	R	R	R	R
WLAN under IEEE 802.11, b, g	back channel, internet access	O	O	O	O

If any data interface is used for recording the received content to an external storage medium, the protection (if any) against unauthorised access must also be maintained in the data provided at such an interface (i.e., the data at this interface must not be modified by decoding or removing this protection).

When any of the interfaces (Ethernet, WLAN) is used as a back channel, it is recommended – as a platform for the provision of interactive services – to use the HbbTV system implemented in accordance with the current versions of the technical specifications of ETSI TS 102 796 (Hybrid Broadcast Broadband TV) and ETSI TS 102 809 (Digital Video Broadcasting (DVB); Signalling and carriage of interactive applications and services in Hybrid broadcast/broadband environments).

5. DVB-3DTV

Implementation, if any, of the elements enabling to receive DVB-3DTV in equipment of categories 3 and 4 must comply with the current versions of the following documents:

- ETSI TS 101 547 V1.1.1 (2012-01) Digital Video Broadcasting (DVB); Frame Compatible Plano-Stereoscopic 3DTV
- Digital Video Broadcasting (DVB); Subtitling systems. Addition to EN 300743 v1.3.1 for Subtitles with Plano-Stereoscopic Content (3D), DVB Document A156
- ETSI EN 300 468 V1.12.1 (2011-10) Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems

6. Additional services

6.1. System software update (SSU)

It is recommended that the receiving equipment should support the possibility of updating its own system software with the transport data stream. If this function is implemented, the implementation must be based on the technical specification ETSI TS 102 006: Specification for SSU in DVB systems. In such a case the receiving equipment must support at least the simple profile on the basis of this specification. It is recommended also to support enhanced profile, based on the specification, because of its higher flexibility and the effectiveness of the utilisation of the data stream.

7. Document reviewing

This document reflects the current state of implementation of digital broadcasting technologies. This document is expected to be complemented as new digital broadcasting technologies and implemented.

Appendix 1 – Table of channels for DVB-T/T2

TV band III bandwidth 7 MHz		TV band III bandwidth 8 MHz		TV band IV/V bandwidth 8 MHz		TV band IV/V bandwidth 8 MHz	
channel	frequency ¹ [MHz]	channel	frequency ¹ [MHz]	channel	frequency ¹ [MHz]	channel	frequency ¹ [MHz]
5	177.5	6	178	21	474	46	674
6	184.5	7	186	22	482	47	682
7	191.5	8	194	23	490	48	690
8	198.5	9	202	24	498	49	698
9	205.5	10	210	25	506	50	706
10	212.5	11	218	26	514	51	714
11	219.5	12	226	27	522	52	722
12	226.5			28	530	53	730
				29	538	54	738
				30	546	55	746
				31	554	56	754
				32	562	57	762
				33	570	58	770
				34	578	59	778
				35	586	60	786
				36	594		
				37	602		
				38	610		
				39	618		
				40	626		
				41	634		
				42	642		
				43	650		
				44	658		
				45	666		

¹ Frequency in the centre of the channel's frequency range

Appendix 2 – Codes indicating programme type (genre) – interpretation in the Czech language

Content_nibble level 1 and 2 assignments

Content_nibble_level_1	Content_nibble_level_2	Description	Popis
0x0	0x0 to 0xF	undefined content	nedefinovaný obsah
		Movie/Drama:	Film / Dramatické pořady:
0x1	0x0	movie / drama (general)	film / dramatický pořad (obecně)
0x1	0x1	detective / thriller	detektivka / akční film
0x1	0x2	adventure / western / war	dobrodružství / western / válka
0x1	0x3	science fiction / fantasy / horror	vědeckofantastický / fantasy / horror
0x1	0x4	comedy	komedie
0x1	0x5	soap / melodrama / folkloric	mýdlová opera / melodram / folklor
0x1	0x6	romance	romantika
0x1	0x7	serious / classical / religious / historical movie / drama	vážný / klasický / náboženský / historický film / drama
0x1	0x8	adult movie / drama	film / drama pro dospělé
0x1	0x9 to 0xE	reserved for future use	rezervováno pro budoucí použití
0x1	0xF	user defined	definováno uživatelem
		News / Current affairs:	Zprávy / Aktuální události:
0x2	0x0	news / current affairs (general)	zprávy / aktuální události (obecně)
0x2	0x1	news / weather report	zprávy / počasí
0x2	0x2	news magazine	zpravodajský magazín
0x2	0x3	documentary	dokumentární pořad
0x2	0x4	discussion / interview / debate	diskuze / interview / debata
0x2	0x5 to 0xE	reserved for future use	rezervováno pro budoucí použití
0x2	0xF	user defined	definováno uživatelem

Content_nibble_level_1	Content_nibble_level_2	Description	Popis
		Show / Game show:	Zábavné / Soutěžní pořady:
0x3	0x0	show / game show (general)	zábavný / soutěžní pořad (obecně)
0x3	0x1	game show / quiz / contest	zábavný soutěžní pořad / kvíz / soutěž
0x3	0x2	variety show	varieté / estráda
0x3	0x3	talk show	tóčkou
0x3	0x4 to 0xE	reserved for future use	rezervováno pro budoucí použití
0x3	0xF	user defined	definováno uživatelem
		Sports:	Sport:
0x4	0x0	sports (general)	sport (obecně)
0x4	0x1	special events (Olympic Games, World Cup, etc.)	sportovní přenos
0x4	0x2	sports magazines	sportovní magazín
0x4	0x3	football / soccer	fotbal
0x4	0x4	tennis / squash	tenis / squash
0x4	0x5	team sports (excluding football)	kolektivní sporty (kromě fotbalu)
0x4	0x6	athletics	atletika
0x4	0x7	motor sport	motoristický sport
0x4	0x8	water sport	vodní sporty
0x4	0x9	winter sports	zimní sporty
0x4	0xA	equestrian	jezdeckví
0x4	0xB	martial sports	bojové sporty
0x4	0xC to 0xE	reserved for future use	rezervováno pro budoucí použití
0x4	0xF	user defined	definováno uživatelem
		Children's / Youth programmes:	Pořady pro děti a mládež:
0x5	0x0	children's / youth programmes (general)	pořady pro děti a mládež (obecně)
0x5	0x1	pre-school children's programmes	pořady pro předškolní děti
0x5	0x2	entertainment programmes	zábavné pořady pro věk 6 až 14 let

Content_nibble_level_1	Content_nibble_level_2	Description	Popis
		for 6 to 14	
0x5	0x3	entertainment programmes for 10 to 16	zábavné pořady pro věk 10 až 16 let
0x5	0x4	informational / educational / school programmes	pořady informační / vzdělávací / pro školy
0x5	0x5	cartoons / puppets	kreslený / loutkový
0x5	0x6 to 0xE	reserved for future use	rezervováno pro budoucí použití
0x5	0xF	user defined	definováno uživatelem
		Music / Ballet / Dance:	Hudba / Balet / Tanec:
0x6	0x0	music / ballet / dance (general)	hudba / balet / tanec (obecně)
0x6	0x1	rock / pop	rok / pop
0x6	0x2	serious music / classical music	vážná hudba / klasická hudba
0x6	0x3	folk / traditional music	folková / lidová a tradiční hudba
0x6	0x4	jazz	džez
0x6	0x5	musical / opera	muzikál / opera
0x6	0x6	ballet	balet
0x6	0x7 to 0xE	reserved for future use	rezervováno pro budoucí použití
0x6	0xF	user defined	definováno uživatelem
		Arts / Culture (without music):	Umění / Kultura (kromě hudby):
0x7	0x0	arts / culture (without music, general)	umění / kultura (kromě hudby, obecně)
0x7	0x1	performing arts	hrané umění
0x7	0x2	fine arts	múzická, krásná umění
0x7	0x3	religion	náboženství
0x7	0x4	popular culture / traditional arts	lidová kultura / tradiční umění
0x7	0x5	literature	literatura
0x7	0x6	film / cinema	film / kinematografie

Content_nibble_level_1	Content_nibble_level_2	Description	Popis
0x7	0x7	experimental film / video	experimentální film / video
0x7	0x8	broadcasting / press	vysílání / tisková média
0x7	0x9	new media	nová média
0x7	0xA	arts / culture magazines	umělecké / kulturní magazíny
0x7	0xB	fashion	móda
0x7	0xC to 0xE	reserved for future use	rezervováno pro budoucí použití
0x7	0xF	user defined	definováno uživatelem
		Social / Political issues / Economics:	Sociální / Politické záležitosti / Ekonomika:
0x8	0x0	social / political issues / economics (general)	sociální / politické záležitosti / ekonomika (obecně)
0x8	0x1	magazines / reports / documentary	magazíny / reportáže / dokumenty
0x8	0x2	economics / social advisory	ekonomické / sociální rady a informace
0x8	0x3	remarkable people	významní lidé
0x8	0x4 to 0xE	reserved for future use	rezervováno pro budoucí použití
0x8	0xF	user defined	definováno uživatelem
		Education / Science / Factual topics:	Vzdělání / Věda / Fakta:
0x9	0x0	education / science / factual topics (general)	vzdělání / věda / fakta (obecně)
0x9	0x1	nature / animals / environment	příroda / zvířata / životní prostředí
0x9	0x2	technology / natural sciences	technické / přírodní vědy
0x9	0x3	medicine / physiology / psychology	medicína / fyziologie / psychologie
0x9	0x4	foreign countries / expeditions	cizí země / expedice
0x9	0x5	social / spiritual sciences	sociální / duchovní vědy
0x9	0x6	further education	další vzdělávání
0x9	0x7	languages	jazyky

Content_nibble_level_1	Content_nibble_level_2	Description	Popis
0x9	0x8 to 0xE	reserved for future use	rezervováno pro budoucí použití
0x9	0xF	user defined	definováno uživatelem
		Leisure hobbies:	Aktivity pro volný čas:
0xA	0x0	leisure hobbies (general)	aktivity pro volný čas (obecně)
0xA	0x1	tourism / travel	turistika / cestování
0xA	0x2	handicraft	ruční práce
0xA	0x3	motoring	motorismus
0xA	0x4	fitness and health	zdraví a tělesná zdatnost
0xA	0x5	cooking	vaření
0xA	0x6	advertisement / shopping	reklamy / nakupování
0xA	0x7	gardening	zahrádkářství
0xA	0x8 to 0xE	reserved for future use	rezervováno pro budoucí použití
0xA	0xF	user defined	definováno uživatelem
		Special characteristics:	Speciální charakter:
0xB	0x0	original language	původní znění
0xB	0x1	black and white	černobílý
0xB	0x2	unpublished	nepublikovaný
0xB	0x3	live broadcast	živé vysílání
0xB	0x4	plano-stereoscopic	plano-stereoskopický
0xB	0x5 to 0xE	reserved for future use	rezervováno pro budoucí použití
0xB	0xF	user defined	definováno uživatelem
0xC to 0xE	0x0 to 0xF	reserved for future use	rezervováno pro budoucí použití
0xF	0x0 to 0xF	user defined	definováno uživatelem