Technical requirements for the reception of TV and non-linear (Voyo) programs, with the exception for news and public affairs programs, with Technical requirements for the takeover of stl subtitle files and closed captions

Effective as of January 1st, 2024

The technical requirements for the takeover of all TV programs, including non-linear (Voyo), in high definition (HD), Ultra high definition (UHD), and standard definition (SD), with the exception of programs intended for news and public affairs programs, are specified as follows.

1) The file-based delivery in accordance with the file formats specified in Appendix B of these requirements is the preferred way of content delivery.

2) The minimum resolution required for the content delivery is HD (1920x1080). It is possible to deliver SD quality in justified cases. The recorded SD video signal follows PAL 625/50 specification and must comply with the CCIR international recommendations.

The HD video signal must be recorded in 1080i25 or 1080p50. UHD video signals are only allowed in 2160p50.

In case the source content has already been shot in 1080p25 or 2160p25, it is also possible to deliver in these formats. Conversions from 25p to 50p (and vice versa) are prohibited!! Newly filmed programs in a progressive format are accepted exclusively in 1080p50 or 2160p50. If necessary, filming and delivery in 1080p25 format to achieve the motion effect must be done exclusively with the appropriate shutter. This process must be agreed by TV Nova s.r.o. in advance. Achieving a film motion effect in post-production by converting 1080i/25 material is not allowed!

3) Upon prior agreement with TV Nova s.r.o., HDCAM, XDCAM HD 422, or Digital Betacam tape formats can be accepted in rare and justified cases. Even in these cases, materials must be delivered without defects and on the highest quality tape media available. Details of tape delivery are stipulated in the paragraph 10) below.

4) The arrangement of audio tracks and their possible combinations is shown in the table in Appendix A of these requirements. If the sound is delivered in the MONO version, the audio signal must be identical in both A1 and A2 channels. The following order must be followed in the STEREO version:

A1 = L (left channel); A2 = R (right channel).

For two-channel recording, the following applies:

A1 = primary audio modulation (Czech version);
A2 = secondary audio modulation (original version).

5) All Spots (i.e. Advertising Spots, Sponsorship Spots, and Teleshopping Spots) and own production must comply with **EBU R128** recommendation:

- The audio signal shall generally be measured in its entirety, without emphasis on specific elements such as voice, music, or sound effects;
- The measurement shall be made in compliance with both ITU-R BS.1770 and EBU Tech Doc 3341;
- The Program Loudness Level shall be normalized to a Target Level of -23 LUFS. The permitted deviation from the Target Level shall generally not exceed ±1 LU for programs where an exact normalization to the Target Level is not achievable practically.
- The maximum permitted True Peak Level is -1 dBTP.
- The recommended Loudness Range (LRA) is less than 20 LU.

Exceptions include sports and other special programs where peak signal levels must not exceed -9 dBFS

6) Programs consisting of both music and speech must respect the balanced physiological perception of sound, i.e. music and spoken word must be perceived at an equal volume level (see EBU-R128).

7) The offset (time shift) between the picture and sound must be subjectively imperceptible, according to EBU-R37-1997 recommendations it must not exceed 40 ms if sound gains time and 60ms if sound is delayed after the image.

8) The preferred format of programs is 16:9 in HD or UHD definition, as seen in Figure 1a. In the case the program is natively produced in UHD resolution, we prefer to be provided with the UHD version according to the specification described in Appendix B of these requirements.

In SD resolution, 16:9 anamorphic (Full Height Anamorphic) programs are accepted, as seen in Figure 1b. Inserting a 16:9 letterbox into a broadcast master is not permitted. The broadcast master must not contain areas with inserted black bars in the left and right parts of the image as a result of format conversion, not even in single cuts.

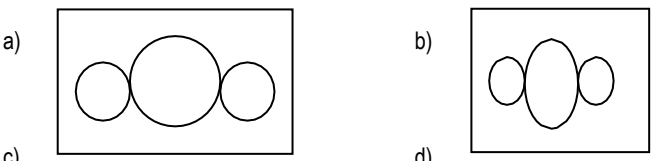
Film wide-screen formats (18:9 or 21:9) are preferentially accepted at 16:9 aspect ratio in HD or UHD resolution. In SD resolution, they are accepted in a 16:9 anamorphic ratio. Black stripes at the top and bottom of the image are acceptable in these cases, see Figure 2. In the case of an aspect ratio of 21:9, the image will be adjusted (if possible) according to EBU recommendation R93-1998 to 18:9.

The recommended aspect ratio for commercial spots is 16:9 (for SD 16:9 FHA).

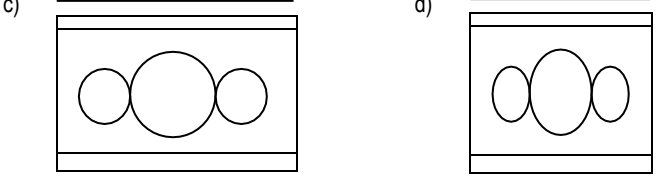
Any form of deformation as a result of format conversions is not permitted. Subsequent playout and distribution of the program will in principle avoid deformation or removal of parts of the image. The format of the image must be unchanged throughout post-production.

Captions and graphics must always be located only in the active part of the image signal. A safe area is specified in the EBU R95-2000 recommendation. For 16:9 programs, it's 5% below the top or above the bottom edge, and 10% from the left or right edge. For 4:3 programs, a safe area of 10% from the edges must be maintained.

Pict. 1: TV programs in format HD 16:9 (a) a SD 16:9 anamorphic (b)



Pict. 2: Wide screen film converted into HD 16:9 (c) a SD 16:9 FHA (d)



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9) The Luminance Y signal must be within a range of - 1% (- 0.007 V) to 103% (0.721 V) relative to the black level. The color range must be within the valid RGB gamut, i.e. after decoding to RGB, all color components must fit within the legal range of -5% to 105%. Signals in HD resolution must be kept in accordance with ITU-R BT.709-5 recommendation.

10) Tape based (non-preferred) delivery of programs – only upon prior agreement with TV Nova s.r.o.

a) All synchronization impulses, especially H and burst as well as chrominance signal, must remain in a consistent mutual time and phase relation. Extracting of lines or even absence of lines and visible disturbances of modulation are unacceptable. The allowed offset of the picture against synchronization impulses is by 2 TV lines in the vertical direction and by no more than 400ns in the horizontal direction against the blanking impulse.

b) The cassette and its case must be marked by identical labels. The minimum scope of information on the labels is:
- The name of the company that produced the program;
- The name of the program (including the number of the episode and the subhead);
- The start and end of the program in LTC;
- Sound: mono, stereo, dual channel, Dolby Surround, Dolby E;
- The picture format: 16:9, 16:9 FHA (anamorphic)…

It is also necessary to deliver accompanying documents that will contain, in addition to the above, the length of adjustment signals and their level (LTC data).

c) The time and control code must be recorded in the LTC track with a parallel use of VITC.

d) The signals of the recording must be spread out as follows:
- Adjustment section
  - Duration 90 sec; picture – color bars PAL 100-0-75-0; sound – reference tone according to clause 10e);
- Lead-in section
  - 30 sec with the black burst signal in the picture and with no sound;
- Program section
  - The beginning and ending of the program in LTC must be identical to the indication on the labeling of the program;
- Lead-out section
  - 30s after the end of the program with black burst in the picture and with no sound.

There must be continuous video signal in the black-program recording-black sections (b-c-d).

e) For HDCAM and Digital Betacam: Reference tone with the frequency of 1 kHz must be recorded in accordance with the level of -18 dBFS, i.e. A/D and D/A converters must be set up so the difference of levels between the full code of converters and the reference tone amounts to 18 dB. The values for modulation signal of the program measured by an analog peak indicator may exceed the reference level by + 6 dB. Extraordinary modulation peaks measured by a peak analog indicator may exceed the reference level by + 9dB. Pre-emphasis must not be used.

f) For XDCAM HD 422: The same conditions apply as for the HDCAM, but the disk must be recorded with continuous LTC (like a tape); file recording is not allowed.

g) Spots (i.e. Advertising Spots, Sponsorship Spots, and Teleshopping Spots) are not allowed to be delivered on XDCAM media.

11) File based delivery of programs and spots

a) **Prior to delivery** of a program as a file, the method of reception and interface must be individually specified with the supplier. Before regular program deliveries from a specific supplier, a test transfer must be performed following which the compatibility of files with technical equipment of TV Nova s.r.o. is agreed upon.

b) The Advertiser is obliged to deliver Spots (i.e. Advertising Spots, Sponsorship Spots, and Teleshopping Spots) exclusively in a file-based manner through approved suppliers designated by TV Nova s.r.o. for this purpose. An approved supplier is a supplier listed on the list of approved suppliers published on the TV Nova s.r.o. website (the "**Approved Supplier**"). TV Nova s.r.o. is entitled to unilaterally amend the list of Approved Suppliers. In rare and justified cases, it is possible to arrange an individual procedure for the delivery of Spots by email to traffic@nova.cz.

c) Video and sound in the delivered file must meet all the above-mentioned conditions for sound and video signal. The video sampling should be 4:2:2 or 4:4:4. The only acceptable compression method is MPEG-2 and H.264 (for XAVC formats). No sampling in the sound other than 48 kHz is allowed.

d) All acceptable format types are defined in Appendix B of these requirements. For interlaced video formats, the field order must be Upper/Top Field First.

e) Other acceptable formats for news and public affairs:
For the purposes of news and public affairs, also permissible would be video sampling 4:2:0 and 4:1:1. In the case of compression method MPEG 2, the minimum bit rate is 10 Mbit/s (long GOP). Furthermore, compression methods DV 25, H.264 (minimum bit rate 3 Mbit/s) are allowed for SD definition and for HD definition compression methods HDV, H.264 (minimum 7 Mbit/s bit rate) and AVCintra (card P2) are accepted. The field order in all delivered video files must be Upper/Top Field First.

12) Allocation of audiotracks

In the delivered materials, it is necessary to comply with the prescribed order of audio tracks, which is shown in the table in Appendix A of these requirements. Other combinations of audio tracks are not allowed.

13) Closed captions

All subtitle files have to be delivered as a stl file according to EBU TECH. 3264-E specification (Specification of the EBU Subtitling data exchange format).

a) The subtitle file has to contain the correct title language.
The only allowed language is Czech – Country of Origin = "CZE".
b) One-row subtitles have to be targeted on row 23 (Vertical position), two-row subtitles have to be targeted on row 22.
c) Maximum allowed number of rows: 2.
d) Maximum allowed characters on a row: 36.
e) Reading speed should be 10 characters per second.
In general, one-row subtitles should be visible for about 2 seconds (minimum is 01:19).
In general, two-row subtitles should be visible for about 4 seconds (maximum is 08:00).
f) Subtitle alignment is always set to center.

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APPENDIX A. Acceptable / Prescribed order of audio tracks

Number of audio tracks	Audio label	Audio track order
2 audio tracks	Mono	A1: CZ Mono, A2: CZ Mono
	Stereo	A1, A2: CZ Stereo
	Dual	A1: CZ Mono, A2: Orig Mono
4 audio tracks	Stereo CZ + mix without music	A1, A2: CZ Stereo A3, A4: mix without music
	Stereo CZ + Orig.	A1, A2: CZ Stereo A3, A4: Orig Stereo
	Stereo CZ + M&E	A1, A2: CZ Stereo A3, A4: M&E
	Stereo CZ + Stereo CZ	A1, A2: CZ Stereo A3, A4: CZ Stereo
	Stereo CZ + Dolby E	A1, A2: CZ Stereo A3, A4: Dolby E data
6 audio tracks	Stereo CZ + M&E + Mix without music	A1, A2: CZ Stereo A3, A4: M&E A5, A6: Mix without music
8 audio tracks	Stereo CZ + Dolby E + Orig + M&E	A1, A2: CZ Stereo A3, A4: Dolby E data A5, A6: Orig A7,A8: M&E
	Stereo CZ + Dolby E + Orig	A1, A2: CZ Stereo A3, A4: Dolby E data A5, A6: Orig A7, A8: empty
	Stereo CZ + Dolby E + M&E	A1, A2: CZ Stereo A3, A4: Dolby E data A5, A6: empty A7, A8: M&E
	Stereo CZ + Orig + M&E	A1, A2: CZ Stereo A3, A4: empty A5, A6: Orig A7, A8: M&E
	Stereo CZ + Audio 5.1	A1, A2: CZ Stereo A3-A8: Audio 5.1
	Stereo CZ + Orig + M&E + CZ dialogues	A1, A2: CZ Stereo A3, A4: Orig A5, A6: M&E A7, A8: CZ dialogues
16 audio tracks	Stereo CZ + Audio 5.1 CZ + Mix without music + M&E 5.1	A1, A2: CZ Stereo A3-A8: Audio 5.1 A9,A10: Mix without music, A11-A16: M&E 5.1

Upon agreement, if the maximum of 16 audio tracks is surpassed, it is possible to deliver M&E 5.1 as a separate audio wav file.

Channel order for surround sound (Audio 5.1)

audio 5.1						
channel order	1	2	3	4	5	6
audio track	left	right	center	LFE	left surround	right surround

Channel order for dolbyE sound

Dolby E								
channel order	1	2	3	4	5	6	7	8
audio track	left	right	center	LFE	left surround	right surround	stereo left	stereo right

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APPENDIX B. - Acceptable types of files for file-based delivery

Detailed Technical Specifications

accepted formats

Specification	Profile SD (Interlaced)	Profile HD (Interlaced)	Profile HD (Progressive or Interlaced)	Profile UHD (Progressive)
General				
Profile Name / description	SD IMX50	XDCAM HD 422	XAVC HD	XAVC UHD
Main viewing environment	TV	TV	TV	TV
File Container	MXF OP1a	MXF OP1a	MXF OP1a	MXF OP1a
Preferred Encoder/ Transcoder SW or HW	Telestream	Telestream	Telestream	Telestream
Audio received separately?	no	no	no	no
Video				
Video Codec	MPEG-2 (D10)	MPEG-2	H.264	H.264
Video Bitrate in Mbps	50 Mbps	50 Mbps	*Long GoP* 50 Mbps (1080p/25, 1080i/25) 100 Mbps (1080p/50) ***I-Frame only*** **100 Mbps (1080p/25, 1080i/25)** 200Mbps (1080p/50)	*Long GoP* 200 Mbps (2160p/25) 250Mbps (2160p/50) *I-Frame only* 250 Mbps (2160p/25) 500Mbps (2160p/50)
CBR or VBR?	CBR	CBR	CBR	CBR
Keyframe	I-Frame only	GOP (M=3,N=12)	I-Frame only or GOP	I-Frame only or GOP
Open or Closed GOP	-	closed	closed	closed
Aspect Ratio	16:9FHA / 4:3	16:9 / 4:3PB *1	16:9 *1	16:9 *1
3840 X 2160				x
1920 X 1080		x	x	
720 X 608 (16X9)	x			
16 X 9 anamorphic flag	yes	-	-	-
Remove black bars if letterbox? results in lower vertical resolution	yes	-	-	-
Color sampling	4:2:2	4:2:2	4:2:2	4:2:2, 4:4:4
Color bit depth	8	8	10	10
Time code	EBU SOM 00:00:00:00	EBU SOM 00:00:00:00	EBU SOM 00:00:00:00	EBU SOM 00:00:00:00
Frame rate (fps)	25	25	25/50	25/50
Interlaced	yes	yes	- / yes	-
Field order (for interlaced content)	Top Field First	Top Field First	- / Top Field First	-
Overlays	no	no	no	no

notes:
*1 - 18:9 a 21:9 formats are also accepted (if possible, they will be reformatted to 18:9 in accordance with EBU R93-1998)

Specification	Profile 1	Profile 2	Profile 3	Profile 4
Audio				
Multiple Audio streams	yes	yes	yes	yes
Audio Container	AES3	AES3	AES3	AES3
Audio Codec	PCM (EBU) DolbyE	PCM (EBU) DolbyE	PCM (EBU) DolbyE	PCM (EBU) DolbyE
No. of Channels, Layout	described in section 12	described in section 12	described in section 12	described in section 12
Bit depth	16/24	16/24	16/24	16/24
Sample rate in KHz	48	48	48	48

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