



Draft - Technical Guidelines UHD

ARTE G.E.I.E.

July 2020

1

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SUMMARY

1	INTRODUCTION.....	5
2	UHD TECHNICAL GUIDELINES.....	5
2.1	FILES FORMATS.....	5
2.1.1	MXF Files.....	5
2.2	CHARACTERISTICS OF THE UHD PROGRAMMES.....	6
2.2.1	Resolution.....	6
2.2.2	Frame rate.....	6
2.2.3	HDR.....	6
2.2.4	Colour Space.....	6
2.2.5	Peak luminance.....	6
2.2.6	Safe Area.....	6
2.3	DELIVERY ON THE “PARTNER PLATFORM”.....	7
2.3.1	Audio versions.....	7
2.3.2	Reminder.....	7
2.3.3	Identification Sheet.....	7
3	APPENDICES.....	8
3.1	FILE SPECIFICATION.....	8
3.2	SAFE AREA.....	9
4	REFERENCES.....	10

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VERSION	DATE	MODIFICATIONS APORTEES
V0-01	17/12/2013	Technical Guidelines for the delivery of UHD Ready For Broadcast files – 1 st Draft
V0-02	02/07/2020	Acceptance of XAVC Class 300, of 25im/s, of SDR, of Rec. 709

1 INTRODUCTION

The broadcasting parameters on the different platforms, Broadcast and Broadband ("Web/OTT/Apps"), are not yet established. ARTE G.E.I.E. is publishing this draft of technical guidelines for the acceptance of the delivery of UHD Ready for Broadcast (RFB) programmes.

UHD RFB programmes are delivered on a dedicated platform. **Under no circumstances does it replace the delivery of HD Ready For Broadcast programmes on existing infrastructures.** The HD and UHD video and audio content of a same programme must be strictly identical.

These technical guidelines are a first draft. They are a supplement to the HD Global Technical Guidelines (www.arte.tv/technical-guidelines)

These technical guidelines are based on the TPRF guidelines (ARD, ZDF, SRG-SSR):

<https://www.irt.de/en/publications/technical-guidelines/technical-guidelines-download/hdr-in-mxf/>

➔ HDR Signalisation in MXF for H.264

As well as on the UHD Standards (See chapter 4 [References](#))

2 UHD TECHNICAL GUIDELINES

2.1 FILES FORMATS

Video, audio, metadata files are wrapped in MXF format in OP-1a configuration with the type "*.mxf" (SMPTE 377 – Single Item Single Package).

The codec to be used for UHD RFB is XAVC QFHD Intra:

- XAVC QFHD Intra, Class 480 VBR (3840 x 2160, 4.2.2, 10-bit)
- XAVC QFHD Intra, Class 300 VBR (3840 x 2160, 4.2.2, 10-bit)

Audio versions must in all cases be delivered in PCM format.

The audio files follow the RIFF structure in Wave format (See § 3.3 www.arte.tv/technical-guidelines) :

- Wave stereo, 48kHz, 24-bit

2.1.1 MXF Files

The following rules apply to MXF Files (See Appendix 3.1 [File specification](#)):

- The material must not contain any technical leaders;
- The Timecode must conform to the rules indicated in the recommendation EBU R122
- The source Timecode is imperatively written in the "Material Package" track of the MXF container and must be continuous. No Timecode jumps or overlaps are allowed.

The Timecode inserted in the video essence is not used as a reference, but it must be increasing and continuous and consistent with the essence.

- The start Timecode must be at 10:00:00:00

- The audio track allocation must comply with the order in which the audio tracks are filled in the delivery interface;
- The MXF file can contain up to 16 audio tracks. These must be managed in AES pairs (For a mono track, please double this in the AES pair). The programme may only be delivered with useful audio pairs. (Unused tracks should not be filled with silence).

2.2 CHARACTERISTICS OF THE UHD PROGRAMMES

When producing UHD programmes, it is expressly requested that no cascading and/or conversions damaging the quality has to be used. The format used should be consistent throughout the production process. This format must be identical or superior to the one accepted by ARTE G.E.I.E.. The use of another format must under no circumstances be masked by its delivery format.

(See Appendix 3.1 [File specification](#))

2.2.1 Resolution

The delivered programmes must have a resolution of 3840 x 2160 pixel.

For programmes whose origin is film, but also 4K and 8K programmes, should be converted to 16:9 format without loss of content (with Letter Box and/or Pillar Box).

2.2.2 Frame rate

The RFB files must be delivered in 50fps.

However, RFB files from film sources at 24 fps and native video sources at 25 or 30 fps can be delivered at 25 fps.

Content produced with a higher frame rate should be converted to 50fps before delivery.

2.2.3 HDR

The RFB files must be delivered with a High Dynamic Range HLG (see ITU-R BT.2100).

Content produced with another HDR format must be converted before delivery.

The transfer function used must be correctly specified in the file (see "HDR signalisation in MXF for H.264"). <https://www.irt.de/en/publications/technical-guidelines/technical-guidelines-download/hdr-in-mxf/>

Note: Deliveries of programs natively produced in SDR Rec. 709, 10-bit are allowed.

2.2.4 Colour Space

The HDR content specified in ITU-R BT.2100 can only be used in the colour space defined by ITU-R BT.2020.

2.2.5 Peak luminance

The Peak luminance must be limited to 1000 cd/m².

2.2.6 Safe Area

The purpose is that all titles, fonts and graphics are displayed on all receivers as they were produced. This will be best provided when they are all placed in the recommended title field.

The values of Safe Area to be respected are indicated in appendix chapter 3.2 [Safe Area](#).

2.3 DELIVERY ON THE “PARTNER PLATFORM”

2.3.1 Audio versions

A RFB is a Ready For Broadcast Programme for a language version. In order for ARTE to produce RFBM (RFB Multilingual), then eventually generate NGA Versions (Next Generation Audio), versions VI – VS – VAO – VMO – VEO – VME and VDO can be delivered (see § 6.7, Labels of the Audio versions delivered, www.arte.tv/technical-guidelines).

2.3.2 Reminder

The delivery of a UHD RFB programme is a "duplicate" of the delivery of the same programme in HD. The complementary files to the video file (original text, subtitle list, music list, etc.) are detailed in chapters 6.2, 6.3 and 6.4 of the Technical Guidelines (www.arte.tv/technical-guidelines).

2.3.3 Identification Sheet

A programme Identification Sheet must be sent via the delivery interface. A model in Excel can be downloaded on the delivery platform. The following information must be provided:

- The programme's ID;
- The lab's/producer's name;
- The programme's title;
- The programme's subtitle;
- File order, if and as appropriate;
- The list of audio versions and designations;
- Clear indication of the audio formats (PCM);
- Clear indication that it is a Dolby Surround production (if that is the case);
- The TC In and TC Out;
- The programme's duration;
- The delivery encoding format fully described;
- The indication of the different digital video compression used, specifying the type of compression as well as the bit rate.

3 APPENDICES

3.1 FILE SPECIFICATION

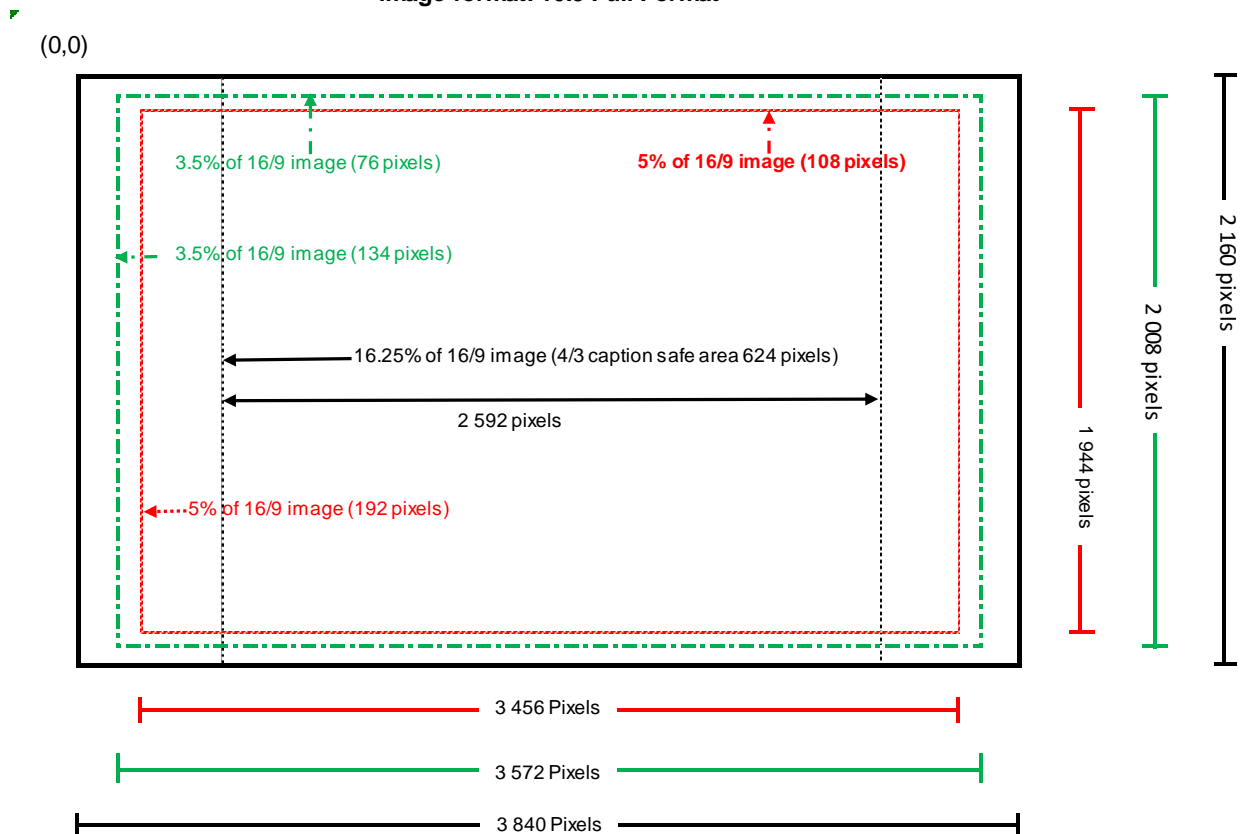
Container	*.MXF - MXF OP1a → SMPTE 377 (Single Item Single Package)
Codec	XAVC QFHD Intra Class 480 VBR XAVC QFHD Intra Class 300 VBR
Resolution	3840 x 2160
Frame Rate	50fps 25fps, native Frame-Rate
Chroma Subsampling	4:2:2
Bit Depth	10-bit
Scan Type	Progressive
HDR Standard	Hybrid Log Gamma (HLG) according to ITU-R BT.2100
SDR Standard	ITU-R BT.709, 10-bit
EOTF	HLG System Gamma: 1.2
Peak Luminance	1000 cd/m ²
Colour Space	ITU-R BT.2020
Audio	File can contain up to 16 mono or 8 stereo audio tracks, 24-bit, 48 kHz, PCM (CHCOUNT=1) – Little-Endian.
	Note: When mono tracks are delivered, they must be managed in AES pairs (In the case of a mono audio version, the version must be delivered in double mono to respect parity). The programme must not have a track without content (no track with silence).
Audio Track Allocation	In accordance with what is specified in the delivery interface (Partner)
Timecode	First frame: 10:00:00:00

3.2 SAFE AREA

The goal is that all titles, fonts and graphics appear the same on every receiver as they looked when they were produced. The best way to do this is to place them all in the recommended title area.

R 95 EBU, Safe Area for 16:9 Television Productions:

**Scanning Raster 2160p 16:9 safe area for 16:9 presentation
image format: 16:9 Full Format**



For the 2160p UHD raster only the term "pixels" is used for horizontal and vertical measurement. All measurements are made from (0,0) origin point

The green frame gives the limits of the positioning of the titles.

The red frame gives the limits of subtitle positioning.

4 REFERENCES

HD Technical Guidelines ARTE G.E.I.E.

These UHD guidelines are a complement to the HD guidelines, HD remaining the main format for the broadcasting of ARTE programmes.

- Complete Technical Guidelines ARTE GEIE: www.arte.tv/technical-guidelines

Requirements of the TPRF-HDTV/(ARD, ZDF, SRG-SSR)

- **Operational Guidelines:** HDR signalisation in MXF for H.264

<https://www.irt.de/en/publications/technical-guidelines/technical-guidelines-download/hdr-in-mxf/>

Recommendations of the ITU

- ITU-R BT.2100: Image parameter values for high dynamic range television for use in production and international programme exchange
- ITU-R BT.2020: Parameter values for ultra-high definition television systems for production and international programme exchange

Recommendations of the EBU

- R 95 EBU, Safe Area for 16:9 Television Productions
- R 122 EBU, Material Exchange Format - Timecode Implementation

2

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The most recent version of these guidelines must be verified on the ARTE website: www.arte.tv/technical-guidelines-UHD



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