# GRADING GUIDELINES
# for UHD HDR & SDR Productions

November 2022

**Please Note:**

The most recent version of this document is available at

https://www.rtl-service.de/richtlinien.html

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This document describes the technical framework for UHD HDR & SDR productions, in terms of file delivery formats and grading. With UHD, the aim is to create an overall audiovisual experience that is of high quality and appealing to a wide variety of viewers across as many devices and distribution channels as possible. It is not intended to influence the creative process and look of a production, but to provide the necessary (technical) framework and guidelines.

## Fundamentals

UHD productions for RTL should preferably be created in HDR (*High Dynamic Range,* according to ITU-R BT.2100). Productions in UHD SDR (*Standard Dynamic Range,* according to ITU-R BT.709) require an agreement with RTL production management beforehand. Upscaling SD or HD content to UHD resolution, as well as (cross)-conversion of differing HDR formats is to be avoided and only permitted in special cases (e.g. using archive material) with professional software and should be agreed beforehand. In principle, grading for HDR & SDR content should lead to an overall high-quality experience and should support dramaturgy on a visual level. UHD productions (files) must be delivered separately to the regular HD version.

### *UHD HDR Productions*

UHD HDR productions must meet the following requirements:

- Use of material with min. native resolution of UHD (3840 x 2160)
- Lowest possible compression recording with ideally > 10 bit quantization
- For grading, the highest quality raw or logarithmic source material must be used (e.g. RAW, R3D, S-Log, C-Log, Log C, etc.)
- The grading must be performed with a 1000 nits [cd/m²], PQ (BT.2100/BT.2084) capable display. The display must at least cover the complete P3 D65 color space.
- The finished HDR master should not contain any signal values that result in luminances outside the valid range of 0 to 1000 nits.
- Color values are stored in BT.2020 container but preferably do not exceed the range of P3 D65, since there are no widely available display technologies that cover the complete BT.2020 color space.
- Credits and other text or graphic elements should be graded to approximately 58% (≈ 205 nits). Texts and graphics that, without a dramaturgical reason, result

in luminance levels way above 400 nits will not be accepted. It is recommended to follow ITU-R BT.2408.
- High luminance levels should generally be reserved for highlights, such as reflections, lights/spots, special effects, etc.
- If the delivered file originates from a Dolby Vision master, it must be ensured that the 1000 nits trim matches the original's color impression as similar as possible.
- File delivery according to the currently valid technical requirements or see chapter "File Delivery Formats".

### *UHD SDR Productions*

UHD SDR productions must meet the following requirements:

- Use of material with min. native resolution of UHD (3840 x 2160)
- Lowest possible compression recording with at least 10 bit quantization
- For grading, the highest quality source material must be used (ideally raw or logarithmic).
- The grading must be performed with a BT.709 compatible display
- Video signals must meet ITU-R BT.709 & EBU R 103
- If the UHD SDR delivery originates from a Dolby Vision master or any other HDR format, it must be ensured that the BT.709 version matches the original's color impression as similar as possible.
- File delivery according to the currently valid technical requirements or see chapter "File Delivery Formats".

## File Delivery Formats

Following tables show the two file formats that are accepted for delivery of UHD HDR & SDR.

### *UHD HDR (PQ)*

| | |
|---|---|
| Container | MXF OP 1a |
| File Naming | Max. 64 characters (no spaces, no special characters) |
| Program Start | First image frame (no color bars, no black) |
| Start Timecode | 00:00:00:00 |
| | |
| Codec | XAVC 4K Intra Class 300 (SMPTE RDD32) |
| Framerate | 25p or 50p |
| Data Rate | ~ 250 Mbps (25p), 500 Mbps (50p) - CBG or VBR |
| Resolution | 3840 x 2160 |
| Aspect Ratio | 16:9 |
| Video Signal Format | YUV |
| Chroma Subsampling | 4:2:2 |
| Color Space | ITU-R BT.2020 (up to 100% of P3 D65 subset) |
| Bit Depth | 10 bit |
| HDR Standard | EOTF: PQ (ITU-R BT.2100, SMPTE ST.2084) |
| | Mastering: 1000 nits, BT.2020 (up to 100% of P3 D65 subset) |
| | Static Metadata: Mastering Display Color Primaries & Luminance (min. & max.) must be correctly set to the file. |
| Audio Codec | PCM, discrete tracks |
| Number of Audio Tracks | 8 or 16 (1 channel per track) |
| Sample Rate | 48 kHz |
| Bit Depth | 24 bit |
| Loudness | EBU R 128 |

## *UHD SDR*

| | |
|---|---|
| Container | MXF OP 1a |
| File Naming | Max 64 characters (no spaces, no special characters) |
| Program Start | First image frame (no color bars, no black) |
| Start Timecode | 00:00:00:00 |
| | |
| Codec | XAVC 4K Intra Class 300 (SMPTE RDD32) |
| Framerate | 25p or 50p |
| Data Rate | ~ 250 Mbps (25p), 500 Mbps (50p) - CBG or VBR |
| Resolution | 3840 x 2160 |
| Aspect Ratio | 16:9 |
| Video Signal Format | YUV |
| Chroma Subsampling | 4:2:2 |
| Color Space | ITU-R BT.709 |
| Bit Depth | 10 bit |
| Audio Codec | PCM, discrete tracks |
| Number of Audio Tracks | 8 or 16 (1 channel per track) |
| Sample Rate | 48 kHz |
| Bit Depth | 24 bit |
| Loudness | EBU R 128 |

## *Audio Track Layout*

| | Stereo + 5.1-Version | Stereo-Version |
|---|---|---|
| A1 | Stereo Mix – L / German | Stereo Mix – L / German |
| A2 | Stereo Mix – R / German | Stereo Mix – R / German |
| A3 | 5.1 Mix – FL / German | Stereo Mix – L / Language 2 or MnE |
| A4 | 5.1 Mix – FR / German | Stereo Mix – R / Language 2 or MnE |
| A5 | 5.1 Mix – C / German | |
| A6 | 5.1 Mix – LFE / German | |
| A7 | 5.1 Mix – SL / German | |
| A8 | 5.1 Mix – SR / German | |
| A9 | Stereo Mix – L / Language 2 or MnE | |
| A10 | Stereo Mix – R / Language 2 or MnE | |
| A11 | 5.1 Mix – FL / Language 2 or MnE | |
| A12 | 5.1 Mix – FR / Language 2 or MnE | |
| A13 | 5.1 Mix – C / Language 2 or MnE | |
| A14 | 5.1 Mix – LFE / Language 2 or MnE | |
| A15 | 5.1 Mix – SL / Language 2 or MnE | |
| A16 | 5.1 Mix – SR / Language 2 or MnE | |
| Unused tracks must contain AES-0 (mute) | | |
| Differing Audio Track Layouts must be individually agreed with RTL. | | |

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