
1. SCOPE

This Operational Practice provides specifications for UHDTV / High Dynamic Range production of video and audio associated with the delivery of HDTV commercials and recommends the formats and quality for file delivery to the Australian terrestrial television broadcast industry. It incorporates recommendations for the down conversion of UHDTV / HDR signal characteristics in accordance respectively with Recommendations ITU-R BT.2020 and Recommendation ITU-R BT.2100.

N.B. the Australian terrestrial television broadcast industry seeks file delivery to the Australian terrestrial television broadcast industry with picture characteristics with HDTV Standard Dynamic Range.

Television commercials / advertisements for broadcast in Australia must comply with the Commercial Television Industry Code of Practice that has been registered by the Australian Communications and Media Authority (ACMA).

Television commercials / advertisements broadcast in Australia are inserted into breaks between programs and within programs. Hourly limits of advertising content vary between 13 to 16 minutes dependent upon time of day. The commercials advertising breaks are constituted by a sequential series of advertisements for products and services.

Recognising that the Television Program Standard for Australian Content in Advertising (TPS 23) permits a percentage of foreign produced advertising content advice is provided on standards conversion from overseas formats to the specifications required by Australian television broadcasters.

Free TV OP 74 seeks to establish uniform quality specifications for presentation of advertising content on Australian free to air commercial television.

Free TV OP 36 recommends the format and quality of video and audio associated with the delivery of SDTV and HDTV commercials.

2. GENERAL

2.1 This Operational Practice describes delivery systems, which deliver television commercials via satellite or land-line.

2.2 The data reception system, associated server, data base and the interface to the broadcaster's plant shall be at the Distributor's cost and the format of the video/audio signals ex the interface shall be by agreement between the Distributor and the Broadcaster.

3. DEFINITIONS

3.1 Distributor

The organisation responsible for delivering the commercial to the destination.

3.2 Destination

The broadcaster or organisation receiving the commercial.

3.3 Ultra-High Definition

3.3.1 Ultra High Definition is a signal produced in accordance with the specifications of ITU-R Recommendation BT. 2020¹.

3.3.2 The Aspect Ratio of the image shall be 16:9. The preferred video format for the exchange of programme material is:

UHD-1

3840 horizontal pixels

2160 active lines

25 or 50 frames per second

25 / 50 progressive

4:2:2 Asymmetric Chroma Resolution or

4:2:0 Symmetrical Chroma Resolution

3.3.3 UHDTV program content will be in the 25 / 50 progressive picture formats.

3.3.4 It is necessary in the UHDTV to HDTV conversion to avoid any subjectively disturbing temporal artefacts, from both film and video originated program material.

3.3.5 UHDTV pictures will be subject to MPEG, specifically High Efficiency Coding video compression at high compression ratios, as found in ISO / IEC 15444 aka ITU-T H.265. This places a significant demand on the quality of the program content with respect to video signal to noise ratio, image stability and freedom from artefacts which may waste data in the MPEG coding process.

¹ The companion signal interface document is being developed in ITU-R in a Preliminary draft new Recommendation ITU-R BT.2077 - Real-time serial digital interfaces for UHDTV signals

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- 3.3.6 Due to the continually advancing state of television technology, this documentation will evolve and will be added to and modified as required in the future.

3.4 Standard Dynamic Range Image Formats

Standard Dynamic Range Image Formats are those found in Recommendations ITU-R BT.709 for HDTV and BT.2020 for UHDTV.

3.5 High Dynamic Range Image Formats

Standard Dynamic Range Image Formats are those found in Recommendation ITU-T BT.2100.

3.6 Next Generation Audio

- 3.6.1 The associated audio signal should be 8 discrete PCM audio channels comprising *two* audio programmes, stereo & 5.1 Surround. The 8 discrete channels representing – Stereo Left / Stereo Right / 5.1 Front Left / 5.1 Front Right / 5.1 Centre / 5.1 Low Frequency Effects (LFE) / 5.1 Left Surround / 5.1 Right Surround².

These audio signals shall be carried on the video storage medium as discrete PCM channels, and clearly identified.

Bit depth should be 24bit.

Audio format should be AES3.

Audio sampling rate should be 48kHz

If a 5.1 surround audio mix is not available, then the preferred minimum audio requirement should be a stereo pair, optionally encoded Dolby Surround (Pro Logic II), with the centre and surround information encoded into the Lt and Rt signals. Regular stereo (Lo and Ro) is also acceptable. The remaining audio channels shall be present but remain silent.

- 3.6.2 The UHDTV picture formats will be subject to a down conversion process to a HD resolution level prior to commencement of UHDTV transmissions. In order to achieve optimum colour gamut and image quality in a conversion from UHDTV to HDTV, it is essential that the luminance and chrominance values are transferred accurately in accordance with the parameter values of Recommendations ITU-R BT.2020 and BT.709 for hue, lightness and chroma mapping.

² In an audio channel / 5.1 track order as specified in SMPTE 320M

3.4 High Definition

3.4.1 High Definition is a signal produced in agreement with the specifications of ITU-R BT. 709-6.³

3.4.2 The aspect ratio shall be a full height 16: 9 image. The preferred video format for the exchange of commercial material is:

1125 lines total per frame

1920 horizontal pixels by 1080 active lines

25 frames per second, 2:1 interlace

3.4.3 The associated audio signal should be 6 discrete channels representing Left / Right / Centre / Low Frequency Effects (LFE) / Left Surround / Right Surround.

The preferred minimum audio requirement should be a stereo pair, optionally encoded Dolby Surround (Pro Logic II), with the centre and surround information encoded into the Lt and Rt signals, however, regular stereo (Lo/Ro) is also acceptable.

4. DELIVERY

4.1 High Definition

4.1.1 For High Definition commercials shall be supplied in an 1125 line, 1080 active 25 frame per second 2:1 interlace format system.

4.1.2 By prior arrangement with the broadcaster, multiple commercials may be delivered provided that each item is clearly and uniquely identified with its own identification.

5. DELIVERY SYSTEM

The delivery system shall provide the following minimum functionality:

5.1 Metadata

The delivery system shall include metadata as part of the delivery package providing all necessary data required by the Destinations administrative and/or Presentation system.

Metadata shall comply with Free TV OP56.

³ The companion signal interface document is ITU-R BT.1120-8 *Digital Interfaces for HDTV studio signals*.

This metadata shall include, but not be necessarily limited to the identification information specified in Clause 12.3.

The timing (time duration) of the commercial shall be determined as in Clause 11.

5.2 Delivery System Storage

A delivery system shall be provided with a mutually agreed Destination based server.

Associated with the destination server there shall be a managed database containing all metadata relevant to the delivered commercials. External access to the database shall be possible, enabling browsing and updating, if necessary, by the Destination's Traffic/Sales and/or Presentation system.

For reasons of security there shall be a log-on facility providing authorised access only.

5.3 Database Utilities

All functions and actions of the server/data base, including space management, shall be monitored and printed reports can be requested of all actions.

Commercials may be searched for by using a number of possible descriptors – Key Number, House Number, Title, Product, and Client.

5.4 Closed Captions

The delivery system shall be transparent to any "Closed Caption" information on the original material supplied to the Distributor.

6. Material eXchange Format (MXF)

6.1 Australian television broadcasters support the SMPTE Material eXchange Format (MXF). The specifications can be found in:

- SMPTE 377M *Material eXchange Format (MXF) File Format Specification (Standard)*
- SMPTE 378M-2004, *Material Exchange Format (MXF) -- Operational pattern 1A (Single Item, Single Package)*
- SMPTE 381M *Material eXchange Format (MXF) Mapping MPEG streams into the MXF Generic Container (Dynamic).*

- 6.2 It is essential to ensure that the Distributor and the Destination employ the same data compression and coding systems so that the unwrapped MXF file may be satisfactorily decoded.
- 6.3 The following minimum requirements are provided as guidelines for SDTV and HDTV television commercials. File formats for a specific commercial television broadcaster shall be by agreement between the Distributor and the Broadcaster.

HDTV

| Resolution | Video Bit rate | Aspect Ratio | Video codec | Audio Bitrate | Audio codec | No. of Audio Channels | Wrapper |
|---------------|----------------|--------------|-----------------|---------------------|-------------|-----------------------|-----------|
| 1920x1080/50i | 50Mbps | 16:9 | MPEG-2 Long-GOP | 768kbps per channel | PCM | 8 | .mxf OP1a |

7. VIDEO REQUIREMENTS

7.1 Common Video Requirements

- 7.1.1 Television commercials / advertisements should not be produced with monitors in an overscan display mode during the production and post-production process.
- 7.1.2 The commercial shall be produced in a full height 16:9 Aspect Ratio format - and shall be delivered to the broadcaster in that format. It shall also be produced so that there is meaningful and useful image content to the 16:9 image area limits. Distortion of the geometry of the original picture aspect ratio is not acceptable.
- 7.1.3 If commercial producers observe the requirements of 7.1.1 then acceptable presentation will occur. Failure to observe these requirements will cause problematic presentation.
- 7.1.4 Australian terrestrial television broadcast currently prefer programme content delivered as Standard Dynamic Range i.e. colour gamut and gamma corresponding to HDTV parameter values.
- 7.1.5 Wide Colour Gamut for UHDTV is in accordance with Recommendation ITU-R BT.2020.
- 7.1.6 High Dynamic Range for HDTV and UHDTV in accordance with Recommendation ITU-R BT.2100.
- 7.1.7 All titles and essential information must fall into the safe areas defined in Annex A and B. Refer Annex C for Recommended Text Size.

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- 7.1.8 Black level shall not extend below blanking level (0mV luma in the analog domain).
- 7.1.9 If a commercial is originated on film the horizontal and vertical instability, the rate of any picture movement shall not be subjectively annoying.
- The film elements shall be clean and free of both surface dirt and printed dirt and shall not have any emulsion or base side damage.
- 7.1.10 In all cases a commercial shall be of the highest quality suitable for television broadcast without further processing of the picture.
- 7.1.11 If the commercial is delivered by satellite or land line, then the delivery system shall provide the minimum functionality as described in Clause 5.
- 7.1.12 In association with the general Video/Audio quality requirements set out in this document, there will be an additional requirement when the delivery system involves data compression.

It will be necessary to ensure that no visible or audible artifacts are created by the concatenation of the following –

Delivery Payout to Destination

Network distribution

Broadcast re-transmission.

- 7.1.13 Frame rates of 100 fps or higher are not currently accepted. If a production has been shot at 100 fps, it needs to be converted to 50 fps prior to delivery, preferably using a high quality vector motion compensated frame rate converter, which will add the correct amount of simulated motion blur to the resulting 50p signal. Simply deleting every second frame from a 100 fps signal to obtain 50 fps will result in possible motion artefacts such as 'shuttering' of the image due to the smaller amount of time the camera shutter was open during original capture.
- 7.1.14 The agreed UHD-1 video delivery format shall have a bit depth of 10 bits.

7.2 Standards Conversion / artifacts / frame duplication / field blending

- 7.2.1 The object is always the elimination of temporal motion artifacts.

Inherent motion blur as a result of low frame rate capture, like 23.976p, 25p or blurring as a rendered video effect, is not

rejected. However, poor standards conversions which result in frame blending/interpolation and repeated frames will be rejected when detected by Australian commercial television broadcasters.

Australian TV networks transmit mostly in interlaced format whilst, most commonly the monitoring used in non-linear editing systems displays in progressive format.

Extra care needs to be taken to ensure that commercials delivered to Australian television broadcasters do not have artifacts or errors which may not have been evident in the progressive environment, but which are evident on the broadcast interlaced display.

It is essential that production, post production and standards conversion for picture content **MUST** be undertaken on interlace television picture monitors. Otherwise standards conversion artefacts or errors may not be detected on progressive displays.

- 7.2.3 Video should be free of frame duplication. A typical example is where the 24th frame has been duplicated to fill the 25th frame resulting in the picture “stuttering” - i.e., appearing to stop on a regular basis and is seen when 24 fps original material has been converted to 25 fps using low quality conversion.
- 7.2.4 If the supplied footage does contain frame duplication then the duplicated frames must be removed before being supplied to the television broadcaster.
- 7.2.5 An advertiser may choose to speed up material shot at 24 fps by 4% to 25fps, provide audio “pitch correction” if required and correct end frames to fulfil total duration. If speeding up 24 fps material is not appropriate, then high quality standards conversion may be employed where good interpolation results in minimized artifacts from the “blending” of frames.
- 7.2.6 Material originally shot on film or electronically at 24 fps which is then converted to 30fps (60 interlaced fields per second*) by the 3:2 field pull-down technique and then converted back to 24fps or 25fps without the use of 3:2 pull-down removal algorithms (cadence detection, correction & removal), can result in a soft, blurred picture. The Advertiser may deem quality issues resulting from poor blending or conversion artifacts as acceptable by notifying the Broadcaster of such acceptance by the Advertiser.
- *30 fps also refers to 29.97 fps & 59.94 interlaced fields per second
- 7.2.7 Colour gamut conversion from Recommendation ITU-R BT.2020 to Recommendation ITU-R BT.709 should be in accordance with

Report ITU-r BT.2407 *Colour gamut conversion from Recommendation ITU-R BT.2020 to Recommendation ITU-R BT.709*

- 7.2.8 Any HDTV to UHDTV conversion should recognize Recommendation ITU-R BT.2087 *Colour conversion from Recommendation ITU-R BT.709 to Recommendation ITU-R BT.2020.*

7.3. Reverse Field Dominance

- 7.3.1 Field dominance simply states whether the top/odd field or the bottom/even field is supposed to be shown first. For example, a dominance of 'top field first' would mean that the top field is displayed before the bottom field in a frame. 'Top field first' is the requirement in the context of this document. Commercials delivered with Reverse Field Dominance will be rejected by a broadcaster. A typical example is where a crawl has been added with the wrong field dominance in progressive mode, resulting in errors when replayed in interlaced mode. This effect is impossible to see on many progressive-displays but easily visible on interlaced TV displays.

It is essential that production, post production and standards conversion for picture content **MUST** be undertaken on interlace television picture monitors. Otherwise standards conversion artefacts or errors may not be detected on progressive displays. Content must be viewed on broadcast grade monitors which can accept interlaced signals and display them properly.

8. SUBJECTIVE VIDEO QUALITY

8.1 Common Subjective Video Quality

- 8.1.1 Picture quality appreciation and production grading shall be made in a Review Room which meets SMPTE recommendations for that purpose, including a 6500°K illuminant monitor surround.
- 8.1.2 The picture black level shall appear to be subjectively correct with respect to content, free of any noticeable black crushing, compression or clipped dark areas.
- 8.1.3 Low key scenes shall have sufficient contrast and APL (average picture level) to appear acceptable under typical domestic viewing conditions.
- 8.1.4 Picture white areas where detail is required shall appear normal and free of noticeable highlight compression.

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- 8.1.5 The transient (edge) response shall be crisp and clean - free of any noticeable horizontal or vertical pre-shoot, overshoot, ringing, smear/streak, echoes or telecine afterglow errors.
 - 8.1.6 Moire and fixed pattern noise shall not be visible.
 - 8.1.7 The resulting subjective resolution shall meet the specification of the electro-optical production chain.
 - 8.1.8 Any video noise shall be fine grained (i.e. high frequency) and not visible at normal viewing distances. However, the use of MPEG video data compression does require an image which is not only noise free but also free of artifacts such as film dirt or scratches or unwanted image movement.

Note: The excessive use of noise reduction will cause motion artifacts and a noticeable loss of resolution. The amount of noise reduction should only be sufficient to minimise noise.

- 8.1.9 The colour balance of the image shall be essentially neutral i.e. appears to be illuminated by light of 6500°K. The correct hue of skin tones shall be achieved and these skin tones shall be natural and characteristic in both hue and saturation. The above in no way prevents the use of colour variations for artistic purposes.
- 8.1.10 Ultra high Definition images preferably shall be viewed on a correctly calibrated grade 1 display of at least 100cm diagonal and viewed at approximately 1.6 times picture height⁴ which complies to Recommendation ITU-R BT.2020. The light emitters of the calibrated display should be assessed in relation to the colorimetry specified in ITU-R Recommendation BT.2020.
- 8.1.11 Assessment of HDR images are under consideration.

8.2 High Definition

- 8.2.1 High Definition images shall be viewed on a correctly calibrated grade 1 display of at least 100cm diagonal and viewed at approximately 3 times picture height. The light emitters shall have ITU-R BT.709-6 colorimetry.

⁴ Refer Recommendation ITU-R BT.2022 *General viewing conditions for subjective assessment of quality of SDTV and HDTV television pictures on flat panel displays*

9. AUDIO REQUIREMENTS

9.1 High Definition

9.1.1 For the High Definition commercial the audio should consist of 8 discrete PCM audio channels comprising *two* audio programmes, stereo & 5.1 Surround. The 8 discrete channels representing Stereo Left / Stereo Right / 5.1 Front Left / 5.1 Front Right/ 5.1 Centre / 5.1 Low Frequency Effects (LFE) / 5.1 Left Surround / 5.1 Right Surround. The associated XML file shall also flag the presence of the 5.1 mix.

If a 5.1 surround audio mix is not available, then the minimum shall be a stereo full mix on channels 1 & 2, with the remaining audio channels being silent. This minimum audio requirement shall be a Dolby Surround (Pro Logic II) encoded stereo pair (Lt & Rt), however, regular stereo (Lo/Ro) is also acceptable. The average level on the stereo tracks shall have a combined loudness measuring -24LKFS across the duration of the commercial; refer to OP-59 for loudness measurement and management techniques.

9.1.2 If discrete multichannel audio is present, the track assignment shall be:

| | | |
|---------|------------------|-------------------|
| Track 1 | Left (Lt) | (Full Stereo Mix) |
| Track 2 | Right (Rt) | (Full stereo mix) |
| Track 3 | Left Front | (5.1 mix) |
| Track 4 | Right Front | (5.1 mix) |
| Track 5 | Centre | (5.1 mix) |
| Track 6 | LFE ⁵ | (5.1 mix) |
| Track 7 | Left Surround | (5.1 mix) |
| Track 8 | Right Surround | (5.1 mix) |

Any associated XML file shall also flag the presence of a 5.1 mix.

9.1.3 If multi-channel audio is present then tracks 1 and 2 shall carry a suitably⁶ downmixed Lt/Rt version of the multi-channel signal.

9.1.4 The file will have Video and all audio tracks in sync.

9.1.5 The alignment level of the PCM Audio Signal (AES) shall be minus 20 dB with respect to the onset of digital clipping i.e. minus 20dBFS (SMPTE RP.155).

⁵ Note on LFE use/misuse: The LFE channel should be used as intended; as an occasional low frequency special effects channel only, and not simply for bass that is filtered off from the main channels.

⁶ Refer Free TV OP60 *Multi-Channel Sound Track Down-Mix and Up-Mix*

9.1.6 The True Peak recorded audio level, as measured on a BS-1770-4⁷ compliant loudness meter, shall not exceed -2dBTP

10. SUBJECTIVE AUDIO QUALITY

- 10.1 The overall quality shall be pleasing and free of any audible noise or spurious signals (e. g. hum, buzz, distortion, wow, flutter or excessive sibilance) when monitored in a noise free environment on an essentially flat wide-band speaker system.
- 10.2 The tonal balance, bass to mid range to treble shall be pleasing and natural.
- 10.3 Stereo and multi-channel material shall have the correct spatial relationships between audio and picture content (such as left-right or front-rear).
- 10.4 Program audio shall be in lip sync with the picture content.
- 10.5 Any supplied 5.1 audio shall be mixed in such a way that it will create an acceptable downmix to 2.0 stereo L_t and R_t if required, using industry standard downmix parameters. Refer Free TV OP60.

11. COMMERCIAL TIMING

- 11.1 The duration of commercial or promotional material should be measured from the start of active video to the end of active video.
- 11.2 Sound should commence 0.5 seconds after the commencement of active video. This provides time for the sound channel to be opened after the start of video without risk of sound clipping and provides aural separation between adjacent commercials and program material.
- 11.3 The end of the commercial sound including any sound tag shall occur 0.5 seconds before the end of active video.
- 11.4 Accurate identification of first frame of active video on commercials is important to commercial television broadcasters. This is particularly important with respect to commercials which “fade up from black”. This can be provided by the inclusion of a white marker on the colour black in the 2 second interval prior to the start of active video, top right of picture, outside picture safe, immediately before first frame of active video. The white marker should be a minimum picture height for HD of 24 lines and a minimum width of 36 pixels.

Timing of the commercial is referenced from the first frame of active video.

⁷ Loudness measurements made on BS.1770-2 and BS.1770-3 meters are identical.

12. SPECIFICATION OF ALIGNMENT SIGNALS AND COMMERCIAL IDENTIFICATION

12.1 The following describes formats of the commercial product that shall be possible, if required, by the Destinations administrative or presentation systems.

12.2 Each individual television commercial / advertisement shall have some form of identification, such as an associated XML file – refer Annex E for the fields required in the XML file in accordance with 13.3. Legibility of the identification is most important to commercial television broadcasters.

12.3 The identification should contain information on:

- a) Client / Advertiser
- b) Agency / Production Company
- c) Product
- d) Title
- e) Key Number
- f) Duration (in seconds)
- g) CAD Number / CAD Number Pending
- h) Classification – as provided by CAD / CAD Number Pending
- i) Video format – HDTV
- j) Audio Loudness Level and Compliance to Free TV OP48 (-24LKFS)⁸
- k) Audio format (Stereo)
- l) Audio format (5.1 Surround)
- m) Aspect ratio (always 16:9)
- n) Closed captions
- o) Date (delivery date)

Note 1. Advertisers, agencies, production companies and TVC delivery vendors should note that if amendments are made to a commercial after a CAD number has been issued and the commercial has been despatched to broadcasters, a revised Key Number will need to be associated with the final commercial and a new CAD number sought.

Note 2. When a CAD Number is not available the field in the XML file should state “CAD Number Pending” i.e. in the case of delivery to CAD for approval and early delivery to a television broadcaster.

13. TIME AND CONTROL CODE

If time code is provided by the Destination’s server replay then it shall be as follows:

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- 13.1 24Hz Longitudinal Time and Control Code according to ITU-R Rec. BR.780-2 (2004).
 - 13.2 For Standard Definition, the Vertical Interval Time Code (VITC) shall appear on lines 18/331 and 20/333.
 - 13.3 For High Definition, the Vertical Interval Time Code (VITC) shall be according to a standard yet to be identified.
 - 13.4 Both Longitudinal and Vertical Interval Time Codes shall match and be continuous and ascending for the duration of the signal.
 - 13.5 The Time Code shall not pass through 2400 hours for the duration of the signal.

14. CLOSED CAPTIONS – HIGH DEFINITION

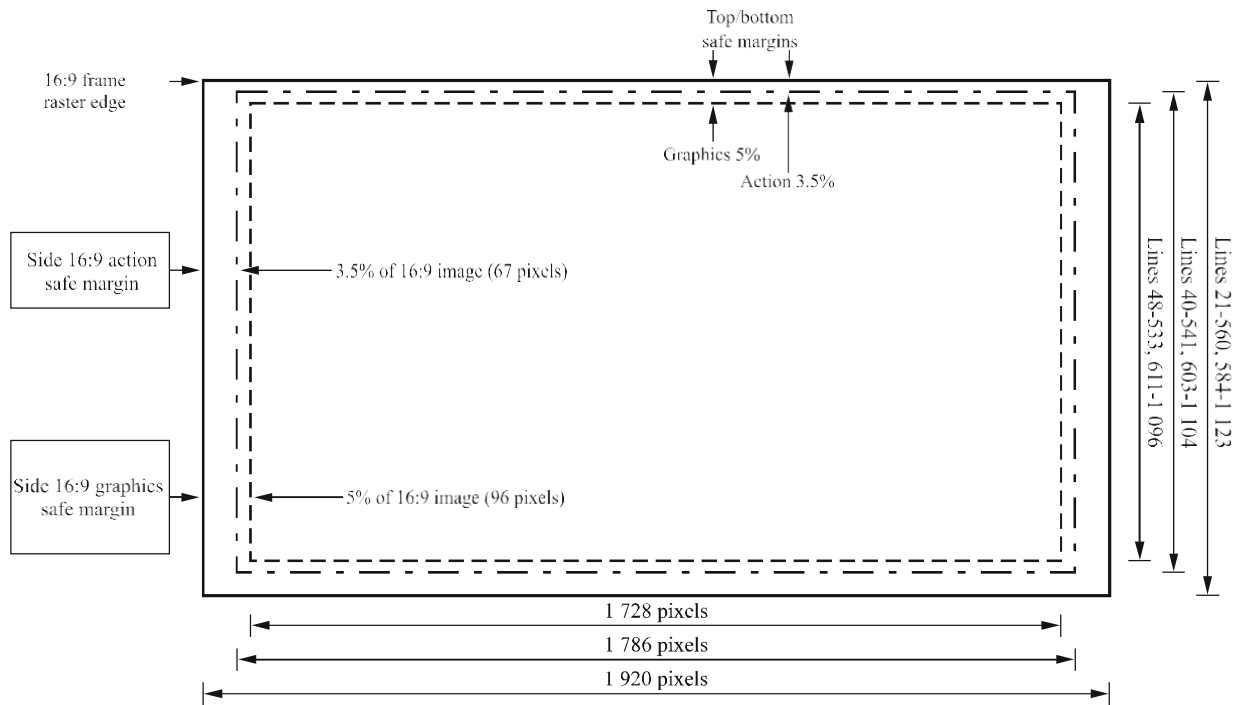
- 14.1 Carriage of closed captions for High Definition shall be in accordance with the requirements of Free TV Australia Operational Practice OP47 and SMPTE Registered Disclosure Document RDD 8.
- 14.2 A command to clear any existing caption shall be included in the first half (0.5) second of the commercial. Where closed caption data is included, the caption information should commence no earlier than a half (0.5) second after the start of active video and a caption erase signal is required (last caption time code out) not later than a half (0.5) second before the end of active video. First caption time code in will be at an arbitrary point determined by content.

Annex A

1. HDTV – SAFE ACTION AND SAFE GRAPHIC AREAS

- 1.1 The recommended HDTV 'Safe Action' and 'Safe Graphic' areas are defined by the following diagram.
- 1.2 Figure A.1 is the HD transmission situation, 16:9 Shoot to Protect 16:9, with a line length of 1920 pixels. The safe areas are calculated to this base.
- 1.3 The overscan of domestic displays is assumed to be 7% of overall picture width or height (i.e. 3.5% at each edge) but any one picture edge should not exceed 4% of total picture width or height.

FIGURE A.1
16:9 shoot-to-protect the 16:9 full image, 1 080-line interlaced scan



1848-04

Annex B

1. RECOMMENDED TEXT SIZE (lower frame supers)

Considering that it is desirable that text be readable under normal display and viewing conditions and that additionally in certain circumstances there may be a legal requirement for the text to be readable.

The following is recommended:

For high definition images, the minimum height of the text lower case elements should be 28 pixels / lines in 1080 displayed lines on a professional monitor's raster.



Figure B.12 Minimum height for text in a High Definition Television Commercial

More information is available on the Free TV website at -
http://www.freetv.com.au/content_common/pg-engineering-guides.seo

Annex C

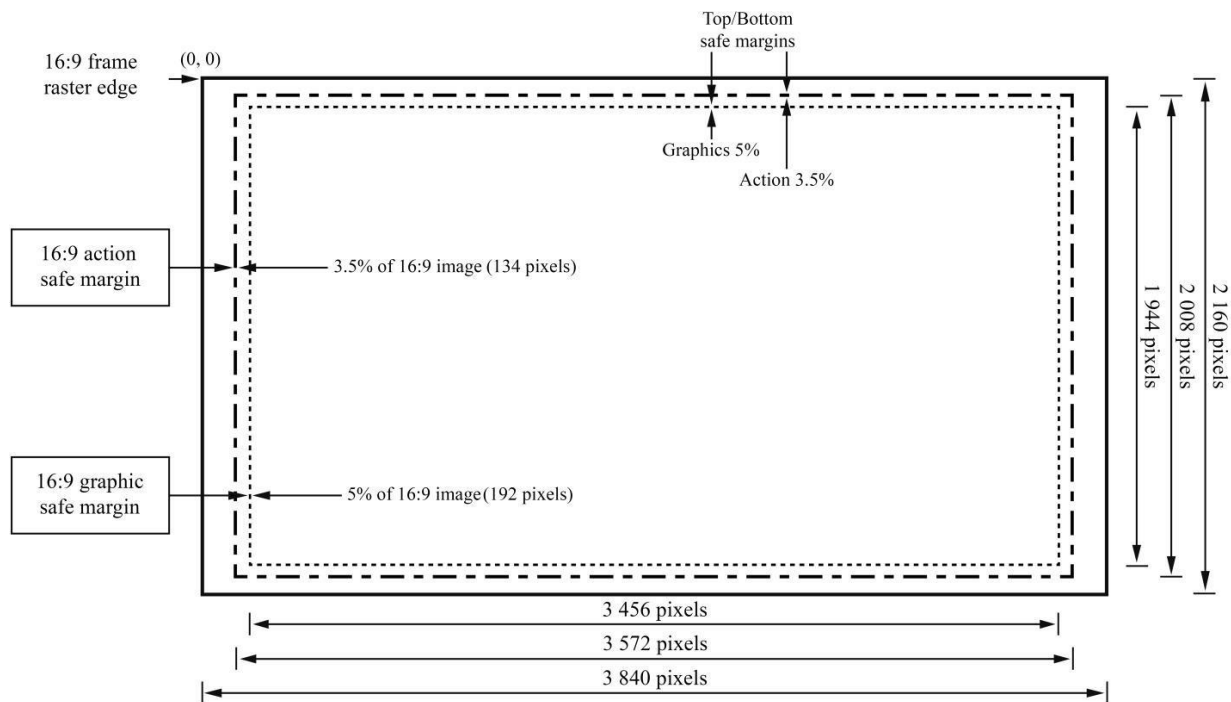
1. UHDTV – SAFE ACTION AND SAFE GRAPHIC AREAS

The recommended UHDTV ‘Safe Action’ and ‘Safe Graphic’ areas are defined by the following diagram in accordance with Recommendation ITU-R BT.1848 Safe areas of wide screen 16:9 aspect ratio digital productions.

- 1.2 Figure A.1 shows 16:9 “shoot and protect” limits for a UHD 16:9 picture with a displayed picture size of 3840 pixels horizontally by 2160 lines vertically. The safe areas are calculated to this base.
- 1.3 The overscan of displays is assumed to be up to 7% of overall picture width or height (i.e. 3.5% at each edge) but any one picture edge should not exceed 4% of total picture width or height.

FIGURE C.1

16:9 shoot-to-protect the 16:9 full image, 2 160-line progressive scan



Annex D.

1. Recommended Text Size (lower frame supers).

Considering that it is desirable that text be readable under normal display and viewing conditions. The following is recommended:

For ultra high definition images, the minimum height of the text lower case elements should be 56 pixels / lines in 2160 displayed lines on a professional monitor's raster.

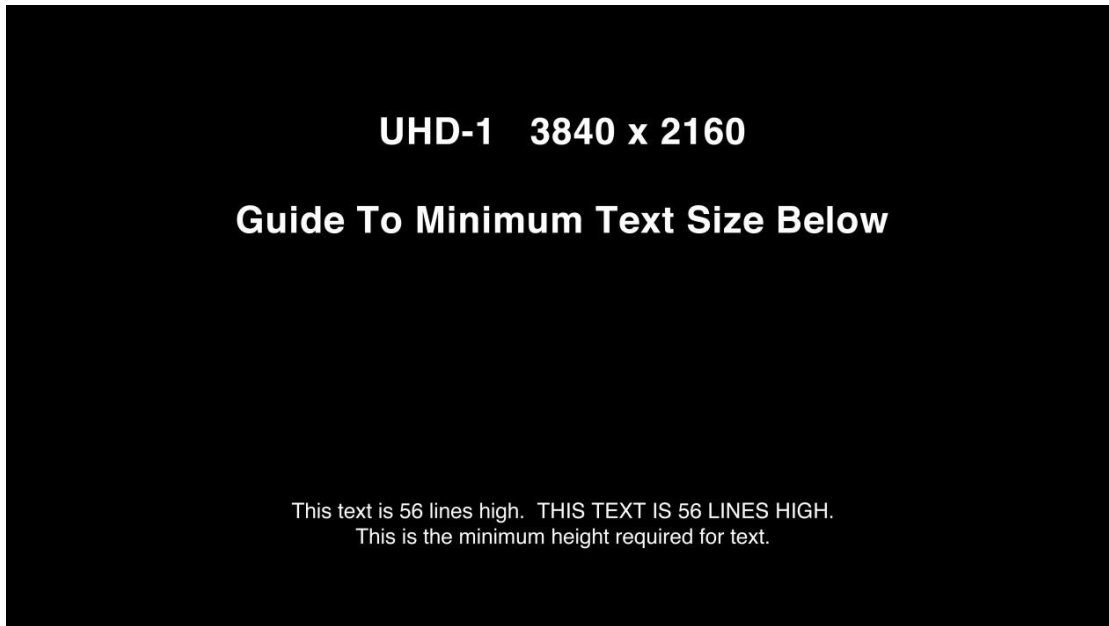


Figure D.1: Recommended height for text in a Ultra High Definition Television lower frame text

Annex E

1. AUDIO LEVELS AND LOUDNESS

This annex provides advice on the relationship of this OP and Free TV Australia OP48 *Audio Levels and Loudness* which sets out the requirements for television advertisements (commercials) in relation to audio levels and loudness and applies to all commercials.

The elements of an advertising soundtrack, namely dialogue, music and effects are subject to various processes during production. Where these elements sit in the final sound track, with respect to audio levels and loudness, is the result of a final mix and effectively it is here that the loudness of the soundtrack will be principally influenced.

Most advertisement sound track pre-final mix elements are passed through devices such as *equalisers* and *compressors*, which are designed to enhance their *presence* i.e. to make them sound “up close” or brighter or more immediate. This is referred to as “processing”.

Material that has been compressed will sound louder, even though there is no increase in volume. This is because compression of a sound track raises the energy content of the sound by reducing the dynamic range (i.e. the difference between the loudest and softest levels of the sound) thereby making it more dense.

Many modern processors are not calibrated in dB, have constantly varying compression ratios and are likely to be multi-band devices which apply different amounts of compression in different frequency bands. This makes it difficult for sound track producers to accurately measure and quantify how much compression is applied to a soundtrack. However, prior to the final mix it is recommended that every effort should be made to ensure that the nature of any compression or equalisation used is such that the end result does not produce a sound track with a loudness characteristic which is incompatible with program material.

Broadcasters provide the following advice and recommendations for definition of a compression profile related to any processing applied AFTER the final mix.

In all cases the loudness of the final mix should be measured using a ITU-R BS-1770-4⁹ compliant loudness meter to ensure conformance to the -24LKFs loudness level.

If any further peak limiting were to be necessary, it would be provided automatically by the transmission processor.

It is undesirable and not creatively responsible to simply use aggressive compression on the final mix to reach -24LKFS compliance. A degree of dynamic contrast in the soundtrack is encouraged and professional mixing techniques should be employed to achieve -24LKFS compliance.

⁹Loudness measurements made on BS.1770-2 and BS.1770-4 meters are identical.

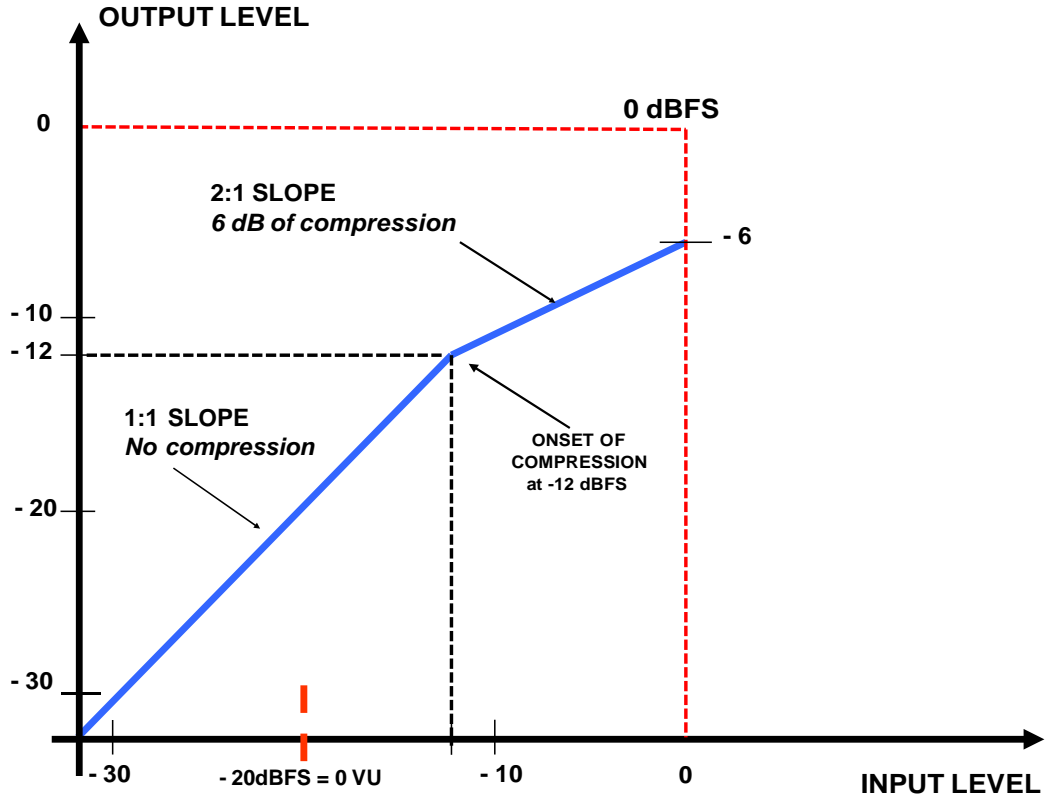


Figure 1

Annex F

1. XML FILE REQUIREMENTS FOR IDENTIFICATION OF A TELEVISION COMMERCIAL

XML format for SD and HD commercials in accordance with Clause 12:

<Client / Advertiser> Text
<Agency / Production Company> Text
<Product> Text
<Title> Text
<Key Number> alphanumeric
<Duration (in seconds)> XX
<CAD Number> CAD Number / CAD Number Pending
<Classification> as provided by CAD / CAD Number Pending
<Video format> HDTV
<Audio Loudness Level and Compliance to Free TV OP48 (-24LKFS)> Yes
<Audio format (Stereo)> Yes / No
<Audio format 5.1 Surround> Yes / No
<Aspect ratio (always 16:9)> 16:9 preferred or 16x9 (note lower case "x")
<Closed captions> Yes / No
<Date (delivery date)> DD/MM/YYYY