IEC 62087-2

Edition 2.0 2023-02
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Audio, video, and related equipment – Determination of power consumption – Part 2: Signals and media

IEC 62087-2:2023-02 RLV(en)

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AUDIO, VIDEO, AND RELATED EQUIPMENT – DETERMINATION OF POWER CONSUMPTION –

Part 2: Signals and media

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 62087-2:2015. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 62087-2 has been prepared by technical area 19: Environmental and energy aspects for multimedia systems and equipment, of IEC technical committee 100: Audio, video and multimedia systems and equipment. It is an International Standard.

This second edition cancels and replaces the first edition published in 2015. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) HDR and UHD video test signals have been added;
b) dynamic box and outline test signals have been added, replacing the static box and outline test signals;
c) all test signals are provided as media files for download from a specified IEC online repository, which replaces previous DVD and Blu-ray media.

The text of this International Standard is based on the following documents:

Draft	Report on voting
100/3771/CDV	100/3848/RVC

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

A list of all parts in the IEC 62087 series, published under the general title *Audio, video, and related equipment – Determination of power consumption*, can be found on the IEC website.

This publication contains multiple test signals downloadable from a specified IEC online repository, available at https://www.iec.ch/tc100/supportingdocuments. These files form an integral part of this standard.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

This document identifies test signals ~~and media~~ to be used to determine power consumption and related characteristics specified in some other parts of the IEC 62087~~:2015~~ series. ~~The media include Blu-ray Discs™ and DVDs.~~

IEC 62087:2008[1] (second edition) added methods for measuring On (average) mode power consumption of television sets, based on three video signal sets. These include static signals, dynamic broadcast content signals, and Internet content signals.

IEC 62087:2011[2] (third edition) revised methods for measuring power consumption of set-top boxes. The signals and media were not changed in this third edition.

IEC 62087-2:2015[3] (first edition) separates ~~the standard into parts, including this signals and media part which specifies signals~~ signals and media that are to be used for determining power consumption and related characteristics into a dedicated part. The three original video signal sets (static, dynamic broadcast-content, and Internet-content) are not changed. This edition adds signals for the purpose of determining the peak luminance ratio that is sometimes associated with television set power consumption measurement programs.

This second edition of IEC 62087-2 adds HDR and UHD video test signals and dynamic box and outline test signals for TV power consumption testing. All test signals are available from a specified IEC online repository for download, replacing the former physical media distribution.

IEC 62087 series currently consists of the following published parts:

– Part 1: General
– Part 2: Signals and media
– Part 3: Television sets
– Part 4: Video recording equipment
– Part 5: Set-top boxes
– Part 6: Audio equipment
– Part 7: Computer monitors

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1 IEC 62087:2008, *Methods of measurement for the power consumption of audio, video and related equipment*

2 IEC 62087:2011, *Methods of measurement for the power consumption of audio, video and related equipment*

3 IEC 62087-2:2015, *Audio, video, and related equipment – Determination of power consumption, Part 2: Signals and media*

AUDIO, VIDEO, AND RELATED EQUIPMENT – DETERMINATION OF POWER CONSUMPTION –

Part 2: Signals and media

1 Scope

This part of IEC 62087 specifies the signals ~~and media~~ used to determine the power consumption of audio, video, and related equipment, such as television sets and computer monitors. It also specifies signals for determining the peak luminance ratio that is sometimes associated with television set power consumption measurement programs. In addition, this part specifies equipment, interfaces, and accuracy related to signal generation.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60107-1:1997, *Methods of measurement on receivers for television broadcast transmissions – Part 1: General conditions – Measurements at radio and video frequencies*

IEC 60268-1~~:1985~~, *Sound system equipment – Part 1: General*
~~IEC 60268-1:1985/AMD1:1988-01~~
~~IEC 60268-1:1985/AMD2:1988-06~~

IEC 60315-1:1988, *Methods of measurement on radio receivers for various classes of emission. Part 1: General considerations and methods of measurement, including audio-frequency measurements*

IEC 60315-3, *Methods of measurement on radio receivers for various classes of emission – Part 3: Receivers for amplitude-modulated sound-broadcasting emissions*

IEC 60315-4:1997, *Methods of measurement on radio receivers for various classes of emission – Part 4: Receivers for frequency-modulated sound broadcasting emissions*

IEC 60958-1~~:2008~~, *Digital audio interface – Part 1: General*
~~IEC 60958-1:2008/AMD1:2014~~

IEC 60958-3~~:2006~~, *Digital audio interface – Part 3: Consumer applications*
~~IEC 60958-3:2006/AMD1:2009~~

IEC 61938~~:2013~~, *Multimedia systems – Guide to the recommended characteristics of analogue interfaces to achieve interoperability (GMT)*

IEC 62087-1~~:2015~~, *Audio, video, and related equipment – Determination of power consumption – Part 1: General*

~~IEC 62087:2015, video_content_DVD_50, *Video content for the IEC 62087:2015 series on DVD, 50 Hz vertical scan frequency*~~

~~IEC 62087:2015, video_content_DVD_60, *Video content for the IEC 62087:2015 series on DVD, 60 Hz vertical scan frequency*~~

~~IEC 62087:2015, video_content_BD_50, *Video content for the IEC 62087:2015 series on Blu-ray™ Disc, 50 Hz vertical scan frequency*~~

~~IEC 62087:2015, video_content_BD_60, *Video content for the IEC 62087:2015 series on Blu-ray™ Disc, 60 Hz vertical scan frequency*~~

IEC 62216~~:2009~~, *Digital terrestrial television receivers for the DVB-T system*

Recommendation ITU-R BT.2100-2, *Image parameter values for high dynamic range television for use in production and international programme exchange*

3 Terms, definitions, and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62087-1~~:2015,~~ as well as in the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1.1
average picture level
APL
~~average luminance level of an internal video signal after the inverse gamma correction within display equipment, such as a television set or computer monitor~~

average level of all the pixels of a single video signal frame or a group thereof in the linear luminance domain

EXAMPLE Display equipment such as television sets or computer monitors that internally use linear encoding after undoing the non-linearity of the input signal.

Note 1 to entry: This note applies to the French language only.

3.1.2
backlit display
display that generates light from a source behind the display panel

EXAMPLE Liquid-crystal display (LCD)

3.1.3
component analogue video
baseband analogue video interface that carries a standard or high-definition colour video signal over three signal lines

Note 1 to entry: See ~~CEA-770.3-E~~ CTA-770.3-E R-2017.

3.1.4
composite analogue video
baseband analogue video interface that carries a standard-definition colour video signal over a single signal line

Note 1 to entry: See SMPTE ST 170M:2004 for the 59,94 Hz version and ITU-R BT.470-5 for the 50 Hz version.

3.1.5
digital visual interface
DVI
video interface that ~~is capable of carrying~~ can carry analogue or digital uncompressed video

Note 1 to entry: This note applies to the French language only.

3.1.6
DisplayPort
digital display interface developed by the Video Electronics Standards Association

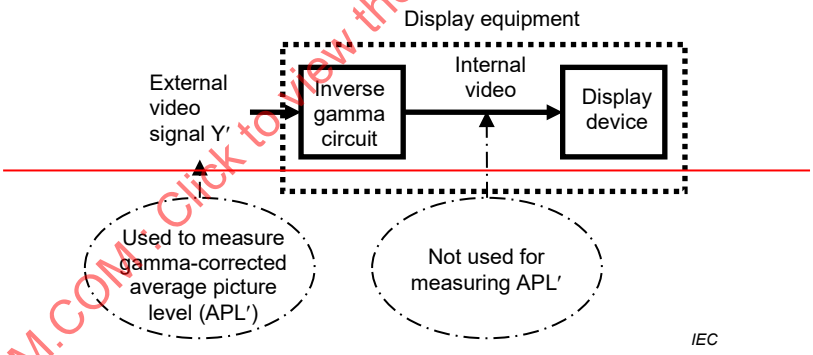
3.1.7
emissive display
display that generates light directly from each sub-pixel

EXAMPLE PDP or OLED displays

~~**3.1.8**~~
~~**gamma-corrected average picture level**~~
~~**APL′**~~
~~average luma (Y′) level of an external video input signal that may be applied to display equipment, such as a television set or computer monitor~~

~~Note 1 to entry: APL′ is determined during the active scanning time integrated over a frame period, defined as a percentage of the range between reference black and reference white level.~~

~~Note 2 to entry: This is not a measure of the inverse gamma-corrected signal that might be available inside of some display equipment and delivered to the display device. The external and internal video signals are shown in Figure 1.~~



~~**Figure 1 – Gamma-corrected average picture level (APL′)**~~

3.1.8
average picture level based on non-linear input signal
APL′
average level of all pixels of a single video signal frame or a group thereof in the non-linear luminance domain

EXAMPLE Display equipment such as television sets or computer monitor receive input signals that encode luminance or brightness in a non-linear way. Examples for such non-linear encoding are PQ (absolute luminance) or HLG (brightness) EOTFs (ITU-R BT.2100-2).

Note 1 to entry: APL′ is defined as a percentage of the range between reference black and reference white level.

Note 2 to entry: This is not a measure of the linear signal that might be available inside of some display equipment and delivered to the display device. The properties and their differences of the external and internal video signals are shown in Figure 1.

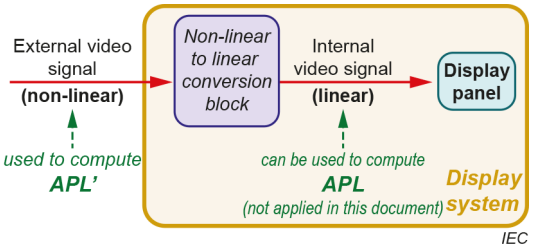


Figure 1 – Occurrence of linear and non-linear signal encodings in context of a typical display processing pipeline for computing APL and APL'

3.1.9
hybrid log-gamma
HLG
one set of transfer functions offering a degree of backwards compatibility by more closely matching the previously established television transfer curves

Note 1 to entry: Sets of transfer functions related to HDR signals are specified in Rec. ITU-R BT.2100-2.

Note 2 to entry: HLG is used both as a description of a dedicated transfer function and as a video format name.

3.1.10
high dynamic range video
HDR video
capability of components in a video pipeline to capture, process, transport or display luminance levels and tone gradations that exceed capabilities of conventional SDR imaging pipelines components

EXAMPLE An HDR video signal typically uses a greater bit depth, luminance and colour volume than standard dynamic range (SDR) video. It also typically utilizes different tone curves such as perceptual quantizer (PQ) or hybrid log gamma (HLG) as specified in ITU-R BT.2100 instead of gamma, as used with SDR. When the HDR video signal is rendered on an HDR display, it is possible to see greater luminance ranges and wider colour gamut

Note 1 to entry: HDR video can provide an enhanced viewer experience and can more accurately reproduce scenes that include, within the same image, deep dark areas, and bright highlights, such as emissive light sources and reflections.

Note 2 to entry: This note applies to the French language only.

3.1.11
high definition
HD
spatial video resolution ranging from 1 280 × 720 to 1 920 × 1 080

3.1.12
ultra-high definition
UHD
Ultra HD
spatial video resolution above 1 920 × 1 080

3.1.13
Universal Serial Bus
USB
digital interface that can be used to connect storage media and peripherals to digital devices like computers and TVs

Note 1 to entry: See USB specification.

Note 2 to entry: This note applies to the French language only.

3.1.14
High-Definition Multimedia Interface
HDMI®[4]
audio-visual interface that is capable of carrying uncompressed video data, compressed or uncompressed digital audio data, and other information

Note 1 to entry: See HDMI® specification.

Note 2 to entry: This note applies to the French language only.

~~**3.1.10**~~
~~**luma**~~
~~**Y'**~~
~~gamma-corrected video signal that represents brightness~~

3.1.15
standard dynamic range video
SDR video
capability of components in a video pipeline to capture, process, transport or display luminance levels and tone gradations that can be characterized by the dynamic range, colour rendering and tone gradation capabilities essentially compatible with cathode ray tube (CRT) displays

EXAMPLE BT.709/BT.1886 and IEC 62966-2-1 (sRGB)

Note 1 to entry: This note applies to the French language only.

3.1.16
S-video
baseband analogue video interface that carries a standard definition colour video signal using two signal lines

Note 1 to entry: See IEC 60933-5.

3.2 Abbreviated terms

′	prime (noting that the signal is non-linear, for example APL')
AM	amplitude modulation
~~APL~~	~~Average Picture Level~~
~~APL'~~	~~Gamma-Corrected Average Picture Level~~
AV	audio-visual
BD	Blu-ray Disc™[5]
BER	bit error ratio
C/N	carrier-to-noise ratio
DAB	digital audio broadcast
dB	decibel
DVD	digital versatile disc
EMF	electromotive force
EPA	Environmental Protection Agency
FM	frequency modulation

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[4] ~~HDMI® is a registered trade mark of HDMI Licensing, LLC. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named.~~

[5] Blu-ray Disc™ is a trademark of the Blu-ray Disc Association. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

Hz	hertz
HDMI®	High Definition Multimedia Interface
JEITA	Japan Electronics and Information Technology industries Association
kb/s	kilo bits per second
LCD	liquid crystal display
LAN	local area network
Mb/s	Mega bits per second
NTSC	National Television Standards Committee
OLED	organic light-emitting diode
OOI	acoustic onset of impairment
PAL	phase alternating line
PDP	plasma display panel
RF	radio frequency
RMS	root mean square
SECAM	séquentiel couleur à mémoire (Sequential colour with memory)
SMPTE	Society of Motion Picture and Television Engineers
~~US~~	~~United States of America~~
USB	Universal Serial Bus
UUT	unit under test

NOTE Other terminology used is device under test (DUT) or equipment under test (EUT).

4 Signals

4.1 Audio-visual signals used for the determination of power consumption

4.1.1 Overview

For general information on SDR video signals, see 4.1.2, 4.1.3.2 and 4.1.4. For general information on HDR signals, see 4.1.3.3. The HDR video format HLG uses sets of transfer functions (EOTF) specified in Rec. ITU-R BT.2100-2 while the HDR video format HDR10 applies those transfer functions (EOTF) of SMPTE ST 2084 (see also 4.1.3.1 and 4.1.3.3).

In this document, all references to '60 Hz media' technically refer to 59,94 Hz coded video content; similarly, '24 Hz media' refers to 23,976 Hz media (see also Table A.1 to Table A.6).

A general description of the video signals is provided in Annex A and Annex B.

4.1.2 Static video signals

4.1.2.1 General

The media includes ~~four~~ five static video signals: black, white, full field colour bar and three bar video signals; see Table 1. All are SDR format. Additional information is available in Clause B.2.

Table 1 – Static video signals overview

Static video signal	Resolution	Dynamic range (format)
Black level video signal	SD	SDR
White level video signal	SD	SDR
SDR 50 Hz full-field colour bar video signal	SD, HD	SDR
SDR 60 Hz colour bar video signal	SD, HD	SDR
Three-bar video signal	SD, HD	SDR

The static video signals shall be downloaded from the specified IEC online repository, see 5.1 and Annex A.

4.1.2.2 Black level video signal

The entire part of the signal representing the active picture shall be black (0 %), as defined in IEC 60107-1:1997, 3.2.1.5. This is an SDR signal. Reference to the signal online repository is provided in 5.1 and Annex A.

4.1.2.3 White level video signal

The entire part of the signal representing the active picture shall be white (100 %), as defined in IEC 60107-1:1997, 3.2.1.5. This is an SDR signal. Reference to the signal online repository is provided in 5.1 and Annex A.

4.1.2.4 SDR 50 Hz full field and 60 Hz colour bar video signals

The active part of the signal shall be a full field colour bar SDR signal. For 50 Hz systems, the (100/0/75/0) colour bar signal for PAL and SECAM receivers as defined in IEC 60107-1:1997, 3.2.1.2 shall be used. In the case of a 60 Hz system, the top section of the (75/0/75/0) colour bar signal for NTSC defined in IEC 60107-1:1997, 3.2.1.2 shall be used and shall cover the full field of the display. Reference to the signal online repository is provided in 5.1 and Annex A.

NOTE The 50 Hz signal has eight bars (including black), and the 60 Hz signal has seven bars (white, yellow, cyan, green, magenta, red and blue, in this order).

4.1.2.5 Three-bar video signal

The active picture area of the signal shall be three bars of white (100 %) over a black (0 %) background as defined in IEC 60107-1:1997, 3.2.1.3. This is an SDR signal. Reference to the signal online repository is provided in 5.1 and Annex A.

4.1.3 Dynamic broadcast-content video signal

4.1.3.1 General

The media includes dynamic broadcast-content video signals in different progressive scan formats, resolutions, and dynamic ranges; see Table 2. Additional information is available in Clause A.2.

~~The dynamic broadcast-content video signal shall be generated from one of the discs available from IEC in a format compatible with the input terminal type under test. These discs include IEC 62087-2:2015 video_content_DVD_50 through IEC 62087-2:2015 video_content_BD_60. The duration of the audio-visual signal is 10 min.~~

~~Additional information is available in Clause A.3.~~

Table 2 – Dynamic broadcast-content video signals overview

Progressive scan formats	Dynamic range (format)
SD 50 Hz	SDR
SD 60 Hz	SDR
HD (1 920 × 1 080 p) 25 Hz	HDR (HLG, HDR10)
HD (1 920 × 1 080 p) 24 Hz	HDR (HLG, HDR10)
HD (1 920 × 1 080 p) 50 Hz	SDR, HDR (HLG, HDR10)
HD (1 920 × 1 080 p) 60 Hz	SDR, HDR (HLG, HDR10)
UHD (3 840 × 2 160 p) 50 Hz	HDR (HLG, HDR10)
UHD (3 840 × 2 160 p) 60 Hz	HDR (HLG, HDR10)

4.1.3.2 Standard dynamic range dynamic video signals

For the generations of CRT, early TFT (with 'always on' backlight) and plasma-based displays, generally very little difference between the display capabilities amongst TVs was assumed and the SDR signal specifications of, for example, ITU-R BT.709 and BT.1886 were deemed sufficient for content delivery, and consequently for power consumption measurement of television sets. For SDR-only capable television sets, suitable SDR test media are available in appropriate resolutions and progressive scan formats. The duration of the SDR audio-visual signal is 10 min.

The standard dynamic range dynamic video signals shall be downloaded from the specified IEC online repository; see 5.1 and Annex A.

4.1.3.3 High dynamic range dynamic video signals

High dynamic range (HDR) video has gained increasing importance throughout the entire video ecosystem from capture, production and processing, through to distribution and presentation. HDR television sets potentially have higher peak luminance level capabilities in comparison to SDR TVs or SDR TV modes. For HDR-capable television sets, suitable HDR test media are available in appropriate codecs, resolutions, and progressive scan formats. All HDR video signals in HDR10 format contain static metadata. The duration of the HDR audio-visual signal in both HLG and HDR10 formats is 5 min.

The high dynamic range dynamic video signals shall be downloaded from the specified IEC online repository; see 5.1 and Annex A.

4.1.4 Internet-content video signal

The media includes an Internet-content video signal. This is an SDR signal. Reference to the signal online repository is provided in 5.1 and Annex A.

~~The Internet-content video signal shall be generated from one of the discs available from IEC in a format compatible with the input terminal type under test. These discs include IEC 62087-2:2015 video_content_DVD_50 through IEC 62087-2:2015 video_content_BD_60. The duration of the audio-visual signal is 10 min.~~

Additional information is available in Clause B.4.

4.1.5 Audio signal associated with video signals

Sine-wave signals at a frequency of 1 kHz or, if 1 kHz cannot be used, signals at the centre frequency of the transfer range~~, as~~ specified by the manufacturer of the UUT shall be used. For digital inputs, the level of the signal shall be 18 dB below full scale. For analogue inputs, the

signal shall be 20 dB below the reference level or greater with a suggested signal level of 500 mV RMS.

The video signals described in 4.1.2, 4.1.3, and 4.1.4 are ~~stored on the associated discs~~ encoded with an accompanying 1 kHz tone with a level of 18 dB below full scale.

4.2 Video signals used for the determination of the peak luminance ratio

4.2.1 General

The use of signals defined in 4.2.2 shall be limited to determining the peak luminance ratio between SDR picture settings and should not be used for determining absolute screen luminance.

NOTE 1 Such luminance comparisons are sometimes associated with TV energy efficiency programmes.

NOTE 2 For more information about choosing the signal for determining the peak luminance ratio, see Annex C.

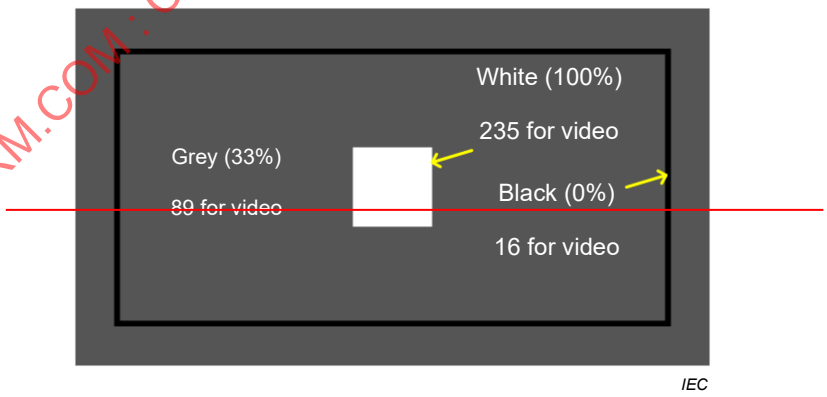
4.2.2 Video signals

4.2.2.1 Three-bar video signal

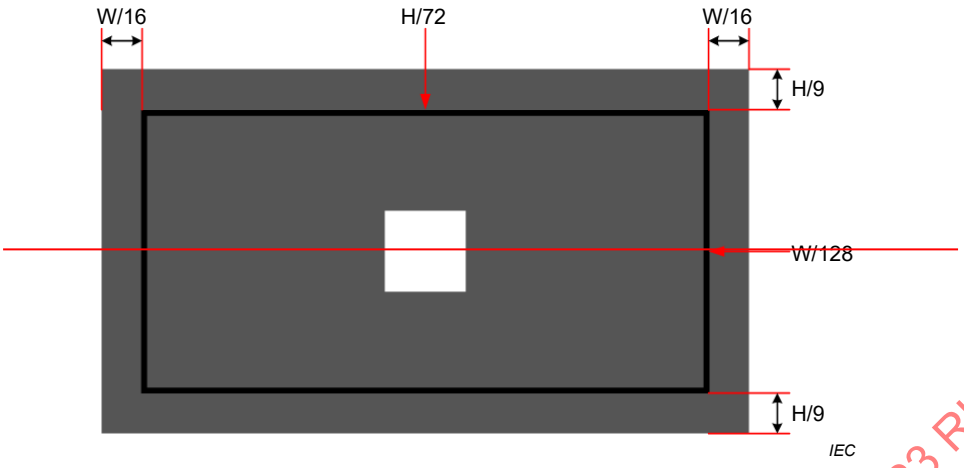
The three-bar video signal is specified in 4.1.2.5. This is an SDR signal. Reference to the signal online repository is provided in 5.1 and Annex A.

4.2.2.2 Dynamic box and outline video signals

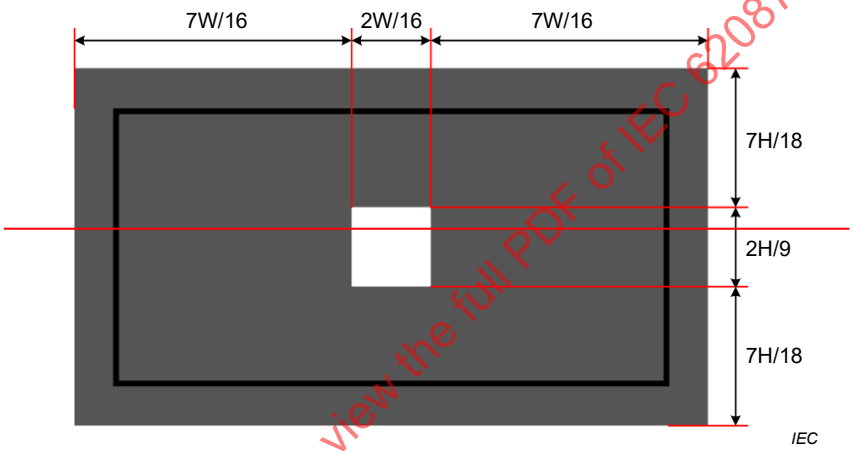
~~The box and outline video signal includes a white (100 %) square on a grey (33 %) background, with a black (0 %) bar near the outer part of the picture. An overview of the picture with signal levels (and drive values) is shown in Figure 2. The width of the white block is 2/16 times the nominal horizontal width (W) of the picture. The height of the white block is 2/9 times the nominal vertical height (H) of the picture. The width of the black bar is W/128 pixels and the height of the black bar is H/72 lines. The position of the black bar is 1/16 times the nominal horizontal width (W) from the picture edge and 1/9 times the nominal vertical height (H) from the picture edge. The dimensions of the outline are shown in Figure 3. The size of the white box is shown in Figure 4.~~



~~**Figure 2 – Box and outline video signal, including signal drive values**~~



~~Figure 3 – Box and outline video signal, outline dimensions~~



~~Figure 4 – Box and outline video signal, box size~~

The set of two box and outline dynamic video signals includes a white (100 %) rectangle on a grey (34 %) background with a black (0 %) border near the outer part of the picture. This border includes a moving pattern comprising black (0 %) and white (100 %) segments. Each corner contains a 1 % coverage full-field colour bar pattern. The dimensions of the central white (100 %) rectangle of the two signals correspond to the defined L20 and L40 static test patterns [IDMS v1.1a Appendix A12]. The signal with the corresponding larger white rectangle may be used when measuring smaller screens in order to provide sufficient white coverage as required by screen luminance contact probes. An example of L20PeakLumMotion is shown in Figure 2.

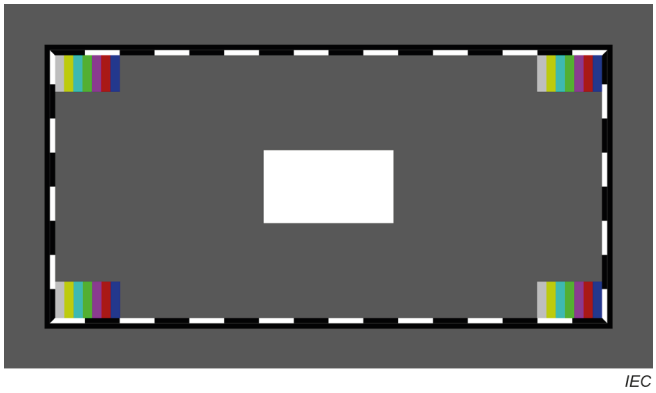


Figure 2 – Dynamic box and outline video signal (L20PeakLumMotion)

The two dynamic video signals as listed in Table 3 below are in SDR, rendered in SD, HD and UHD formats and are available in 50Hz (50p) and 59,94Hz (5994p). The selection of signal format shall be based on the one which most closely resembles the highest supported screen resolution of the UUT. The central white area in L40PeakLumMotion is greater than that in L20PeakLumMotion. Reference to the signal online repository is provided in 5.1 and Annex A.

Table 3 – Dynamic box and outline video signal naming

SD	HD	UHD
L20PeakLumMotionSD50p	L20PeakLumMotionHD50p	L20PeakLumMotionUHD50p
L40PeakLumMotionSD50p	L40PeakLumMotionHD50p	L40PeakLumMotionUHD50p
L20PeakLumMotionSD5994p	L20PeakLumMotionHD5994p	L20PeakLumMotionUHD5994p
L40PeakLumMotionSD5994p	L40PeakLumMotionHD5994p	L40PeakLumMotionUHD5994p

4.3 Audio signals used for determination of audio power consumption

4.3.1 Audio signals

4.3.1.1 Sine wave signal

The signal shall be a sine-wave at a frequency of 1 kHz or, if 1 kHz cannot be used, the sine wave frequency shall be at the centre of the frequency range specified by the manufacturer.

The analogue and digital 1 kHz sine wave signals are not included in the media supplied in Clause 5.

4.3.1.2 Simulated programme signal

A simulated programme signal shall have a mean power spectral density that closely resembles the average of mean power spectral densities of a wide range of programme material, in accordance with IEC 60268-1.

Such a signal may be obtained from pink noise, band-limited by a filter whose response conforms to that given in IEC 60268-1. The crest factor of a noise source should fall between 3 and 4 to avoid clipping of amplifiers.

The simulated programme signal is not included in the media supplied in Clause 5.

4.3.2 Signal levels

4.3.2.1 Audio signal level, analogue

For baseband analogue inputs, the input signal shall be at a level of 500 mV RMS, according to the rated source EMF of IEC 61938.

4.3.2.2 Audio signal level, digital

For digital inputs, the input signal shall be at a level of 12 dB below reference full scale, in accordance with IEC 61938, IEC 60958-1 and IEC 60958-3.

4.3.2.3 Audio signal level, RF

~~For FM radio tuners, the input signal shall be at an aerial input terminal at a level of 40 dB (pW). The modulation factor shall be 54 %, according to IEC 61938.~~

~~For AM radio tuners, the input signal shall be at an aerial input terminal with an induced electromagnetic field (e.m.f.) of 1 mV. The modulation factor shall be 30 %, according to IEC 61938.~~

~~In the case of non-detachable aerial antennas the RF signal level for FM and AM radio tuners shall be high enough to reproduce a noise-free audio signal.~~

For FM radio tuners, the input signal shall be applied to an aerial input terminal at a level of 40 dB (pW). The deviation shall be 40 kHz.

For AM radio tuners with an antenna input terminal, the input signal shall be an EMF of 1 mV from a 50 Ω source. The modulation factor shall be 30 %.

For non-detachable antennas (rod antennas for FM and magnetic antennas for AM), the RF signal level for FM and AM shall be large enough to produce an audio signal-to-noise ratio of 36 dB for FM at 75 kHz deviation and 26 dB for AM at 30 % modulation. Signal-to-noise ratios shall be measured as specified in IEC 60315-1:1988, 6.1.

For AM receivers, the method of measurement with an analogue electromagnetic field generator is described in IEC 60315-3 and IEC 60315-1.

For FM receivers with rod antennas, refer to IEC 60315-4:1997, Clause 7.

For DAB and DAB+, the OOI point is sharply defined as the receiver's C/N (carrier-to-noise ratio) degrades and BER increases, so this may be used as a means to assess the signal requirement of the receiver. The OOI method may be implemented so that it is equivalent to a BER of 10^{-4}. The method involves monitoring (by a human observer or, if available, automated equipment) of an encoded 1 kHz audio sinewave from the audio output source (speaker, headphone, etc) and setting the RF signal level where the onset of audio defects (dropouts, burbles, "chirps", etc.) can just be heard in the sinewave in a 10-second listening period. This RF level is the OOI threshold for sensitivity.

In the case of a non-detachable aerial antenna, the RF signal level shall be high enough to reproduce an audibly defect-free audio signal for DAB and DAB+.

The AM, FM and DAB test signals are not included in the media supplied in Clause 5.

NOTE ETSI EN 300 401, Clause 7 and ETSI TS 102 563 provide additional information about DAB and DAB+.

5 Media

~~5.1 Packaged media~~

~~The packaged media includes four discs: a 50 Hz BD, a 60 Hz BD, a 50 Hz DVD, and a 60 Hz DVD. For all four discs, the signals are numbered as shown in Table 1.~~

~~Table 1 – Signal numbering~~

~~Subclause~~	~~Number on discs~~	~~Description~~
~~4.1.2.2~~	~~1.1.1~~	~~Black level video signal~~
~~4.1.2.3~~	~~1.1.2~~	~~White level video signal~~
~~4.1.2.4~~	~~1.1.3~~	~~Full field colour bar video signal~~
~~4.1.2.5~~	~~1.1.4~~	~~Three bar video signal~~
~~4.1.3~~	~~1.2~~	~~Dynamic broadcast-content video signal~~

Subclause	Number on discs	Description
4.1.4	1.3	Internet-content video signal
4.2.2.1	2.1	Three bar video signal
4.2.2.2	2.2	Box and outline video signal
4.2.2.1	3.1	Three bar video signal
4.1.2.4	3.2	Full field colour bar video signal
N/A	3.3	SMPTE colour bar signal (60 Hz only)

NOTE In addition to the three bar and full field colour bar signals, the 60 Hz DVD and 60 Hz BD attached to the present standard include the SMPTE colour bar signal (SMPTE EG 1:1990) for the user's convenience in calibrating equipment output levels.

5.2 Blu-ray Disc™

Two Blu-ray Discs™ are attached to the present standard, one authorized for 50 Hz systems, the other for 60 Hz systems. The 50 Hz BD is labelled IEC 62087-2:2015 video_content_BD_50. The 60 Hz BD is labelled IEC 62087-2:2015 video_content_BD_60. Both discs contain the signals defined in Clause 4.

5.3 DVD

Two DVDs are attached to the present standard, one authorized for 50 Hz systems, the other for 60 Hz systems. The 50 Hz DVD is labelled IEC 62087-2:2015 video_content_DVD_50. The 60 Hz DVD is labelled IEC 62087-2:2015 video_content_DVD_60. Both discs contain the signals defined in Clause 4.

5.1 Online repository

All the SDR and HDR video signals referenced by this document can be downloaded from the publicly accessible IEC online repository at https://www.iec.ch/tc100/supportingdocuments. The test media can be downloaded individually.

NOTE For file download, you might have to use specific download functions or windows in your browser.

Table A.1 to Table A.6 list all the video signals used for the determination of power consumption with specific file name and media specification, grouped by frame rate, dynamic range and resolution.

The test media shall be downloaded and provided for the test as described in Clause 6. The test media may be updated and only the version of the video signals provided in the online repository shall be used. The notation for minor and major revisions of the test media made available in the IEC online repository is as follows:

a) Major revision (substantial update or change to the respective test media): part of a maintenance action resulting in a new edition of IEC 62087-2. A major revision of a test media shall be indicated by a new major version number. The original test media has the major version number one preceded with 'v' (v1-0).

   EXAMPLE 1 IEC_Broadcast_UHD_50p_HLG_HEVC_AAC_v1-0.MP4

b) Minor revision (small or editorial update or change to the respective test media): maintenance action of MT 62087 independently of a new edition of the standard. A minor revision of a test media shall be indicated by an increase of the minor version number. The original test media has the minor version number zero preceded by a hyphen (v1-0).

   EXAMPLE 2 IEC_Broadcast_UHD_50p_HLG_HEVC_AAC_v1-1.MP4

c) Change log: for the traceability of the history of revisions, a description of the change, the reason, and the date of the release of a new (sub-)version of a test media will be recorded in the overview document of IEC 62087-2 video signals in the IEC online repository.

5.2 Compatibility of test signals with previous packaged media

Test signals from physical media distributed for previous editions of this document shall not be used for this document.

6 Signal ~~generation~~ provision

6.1 General

The parts specific to product categories of the IEC 62087 series provide the requirements on the hierarchy of selection of test equipment and of the interfaces (input ports) to be used for the provision of test signals described in Chapter 4 during the measurements.

In 6.2, four categories of equipment that may be used to feed the test signals are described, while in 6.3 the possible interfaces with associated requirements are provided. The accuracy of video signal levels is addressed in 6.4.

6.2 Signal provision equipment

6.2.1 USB stick media inserted in a USB port of the UUT

A single USB stick of at least 32 GB that supports the chosen USB port's peak data rate and holds all the test media shall be inserted directly into the UUT's USB port. The USB stick should be formatted in either the FAT32 or ExFAT format. The UUTs native file player shall be used to play test files located on the USB stick. Before testing, confirm that the UUT remains in the same preset picture setting when switching from HDMI® input to USB input.

The manufacturer, model and storage size of the USB stick used shall be provided in the test report.

6.2.2 External audio-visual ~~signal generating~~ equipment

The audio-visual ~~signal generating~~ equipment used as a media player during the test shall be capable of playing the media specified in this document and shall be calibrated to conform with the accuracy required in 6.4. Depending on the input terminals to the UUT used during the measurement procedure, the audio-visual ~~signal generating devices~~ equipment shall provide the signals via interfaces as specified in 6.3.

If connecting a particular model of audio-visual ~~signal generating~~ equipment to the UUT causes any settings of the UUT to change, an alternate model shall be used during the measuring procedure. The steps below outline how to confirm and correct should a particular model of audio-visual equipment cause anomalous UUT power consumption readings during testing.

Some video sources with HDMI® outputs have been shown to offset the image rendering settings of the UUT, which in turn will likely lead to anomalous television set power consumption readings. Two possible causes have been identified: miscommunication between source and sink, and proprietary communications between source and sink. If a Blu-ray player is used as the source device, a Blu-ray player model that has a video setting which performs no additional processing (e.g. noise reduction, upscaling, or adjustment of colour, hue, contrast, or brightness) of the IEC test signals as delivered to the UUT shall be used.

To reduce the possibility of miscommunication, multiple models of ~~signal generating~~ audio-visual equipment may be connected, and a spot check of the power consumption may be performed with a static image. A model of ~~signal generating~~ audio-visual equipment that produces anomalous results ~~should~~ shall not be used.

To reduce the likelihood of unwanted proprietary communications, ~~signal generating~~ audio-visual equipment from a different manufacturer than that of the UUT should be used. It is also recommended to verify correct signal communication by using a signal analyser in-between sink

and source devices. Example properties to verify include but are not limited to the image size and frame rate, the chroma subsampling, signal range, any image manipulating metadata.

If a USB stick is used to provide the test media to the external audio-visual equipment, that USB stick shall meet the requirements specified in 6.2.1 and shall be inserted into the USB port on the external audio-visual equipment that is recommended by the manufacturer for media playback.

The manufacturer, model and configuration of the external audio-visual equipment shall be provided in the test report.

6.2.3 Service provider network equipment

The cable or satellite network service equipment used to provide live test signals for measurement shall be capable of providing the highest data rate and resolution specified by the manufacturer of the UUT. It shall be calibrated to conform with the accuracy required in 6.4.

The manufacturer, model and configuration of the service provider network equipment used shall be provided in the test report.

6.2.4 Audio signal generator

The equipment used to generate the sine-wave signals shall be capable of providing test signals as specified in 4.1.5. The accuracy may be confirmed with an oscilloscope, waveform monitor, vector scope or other appropriate measuring device.

The manufacturer, the model and essential settings of the equipment used as the audio signal generator shall be provided in the test report.

6.3 Interfaces

6.3.1 USB

The USB port recommended in the instruction manual for video file playback with the highest data rate specified (e.g. USB 3.0 supports higher data rates than USB 2.0) shall be selected.

If the HDMI® port and the USB port have different default picture settings, then either test with test signals from external audio-visual equipment (6.2) or select the USB input and manually ensure that the UUT is set to the default picture setting or the pre-set picture setting associated with the HDMI® input during all on-mode tests.

The version of the media available in the IEC online repository (see 5.1) for the purposes of this document and its related parts shall be installed on a USB stick. The USB stick shall be compatible with the USB terminal of the UUT or the external audio-visual equipment used for media provision. Testers shall confirm that the USB terminal used during testing supports the codecs necessary to play the corresponding downloaded media.

6.3.2 HDMI®

The version of any HDMI® source and HDMI® cable used for the purposes of this document and its related parts shall be compatible with the HDMI® terminal of the UUT. It is recommended that the source device support the latest available version of HDMI® compatible with the UUT. Testers shall confirm that the UUT's or the media player's HDMI® terminal used during testing supports the codecs necessary to play the corresponding downloaded media.

~~NOTE At the time of preparation of this standard, the current version of HDMI® is HDMI Specification Ver. 2.0, which is backward compatible with all previous versions of the HDMI® specification.~~

6.3.3 DisplayPort

The version of any DisplayPort source and DisplayPort cable used for the purposes of this document and its related parts shall be compatible with the DisplayPort terminal of the UUT. It is recommended that the source device supports the latest available version of DisplayPort compatible with the UUT. Testers shall confirm that the UUT's or the media player's DisplayPort terminal used during testing supports the codecs necessary to play the corresponding downloaded media.

6.3.4 Component analogue video

Any component analogue video source and component analogue video cable used for the purposes of this document and its related parts shall be compatible with the component analogue video terminal of the UUT.

NOTE This interface can be used for SD video signals in SDR and is not suitable for use with video signals in HD, UHD or in HDR.

6.3.5 S-Video

Any S-Video source and S-Video cable used for the purposes of this document and its related parts shall be compatible with the S-Video terminal of the UUT. It is recommended that the source device support the latest available version of S-Video compatible with the UUT.

NOTE This interface can be used for SD video signals in SDR and is not suitable for use with video signals in HD, UHD or in HDR.

6.3.6 Composite analogue video

Any composite analogue video source and composite analogue video cable used for the purposes of this document and its related parts shall be compatible with the composite analogue video terminal of the UUT.

NOTE This interface can be used for SD video signals in SDR and is not suitable for use with video signals in HD, UHD or in HDR.

6.3.7 Analogue terrestrial interface

If the UUT is being tested with an analogue terrestrial RF input signal, the signals used shall conform to IEC 60107-1:1997, 3.3, and shall have the input signal level set at −39 dB(mW) when terminated with a 75 Ω resistor or at a level to provide a perceptually noise-free and error-free picture.

NOTE −39 dB(mW) corresponds to 70 dB(μV).

6.3.8 Cable television interface

If the UUT is being tested with a cable television RF input signal, the signals used shall conform to the cable television specifications for the region and shall have the input signal level set at −49 dB(mW) when terminated with a 75 Ω resistor for digital signals or at a level to provide a better picture than the picture failure point (PF) as defined in IEC 62216 for digital signals or a perceptually noise-free and error-free picture for analogue signals.

NOTE −49 dB(mW) corresponds to 60 dB(μV).

6.3.9 Digital terrestrial interface

If the UUT is being tested with a digital terrestrial RF input signal, the signals used shall conform to the broadcast specifications for the region and shall have the input signal level set at −49 dB(mW) when terminated with a 75 Ω resistor or at a level to provide a better picture than the picture failure point (PF) as defined in IEC 62216~~:2009~~ or a perceptually noise-free picture.

6.3.10 Satellite interface

~~6.2.9.1 General~~

If the UUT is being tested with a satellite input, the input signal level shall be set at −49 dB(mW) when terminated with a 75 Ω resistor or at a level to provide a better picture than the picture failure point (PF) as defined in IEC 62216:2009 for digital signals or a perceptually noise free and error free picture for analogue signals.

6.3.11 Network interfaces

If the UUT is being tested with a network (LAN) interface, the LAN shall support the capabilities of the UUT's network connection as selected per IEC 62087-3:2023, 6.2.10 "Network connection selection" and other parts of the IEC 62087 series where applicable.

6.3.12 Other interfaces

Signals provided to other input terminals of the UUT shall conform to the specifications for those inputs.

6.4 Accuracy of video signal levels

Analogue video signals provided by the ~~signal generating device~~ audio-visual equipment shall be accurate to within 2 % of the full range of the video signal when terminated with a 75 Ω load. The accuracy of the black and white levels shall be confirmed with the three-bar video signal specified in 4.1.2.5. The accuracy of the colour levels shall be confirmed with the full-field colour bar video signal specified in 4.1.2.4. The accuracy may be confirmed with an oscilloscope, waveform monitor, vector scope or other appropriate measuring device.

Digital input signal levels shall be accurate to within the resolution of the signal source equipment used.

NOTE In addition to the three-bar and full-field colour bar signals, the 60 Hz ~~DVD and 60 Hz BD include the~~ SMPTE colour bar signal (SMPTE EG 1:1990) is included for the user's convenience.

Annex A
(normative)

Video signals used for the determination of power consumption

A.1 Source of test media (video signals)

In previous versions of this document, the test media was provided on a set of two DVDs and two Blu-ray discs. That test media included the common standard dynamic range (SDR) video formats for both standard definition (SD) and high definition (HD) in 16:9 aspect ratio for NTSC and PAL frame rates and common resolutions of 720 × 480, 720 × 576 and 1920 × 1080. Some of the prior test media was provided in interlaced format and some was in progressive format.

Beginning with this version of IEC 62087-2, new test media was necessary for the measurement of energy consumption by television sets capable of the new "static metadata" high dynamic range (HDR) content and the new ultra-high definition (UHD) video format of 3840 × 2160. Both the older SDR test media as well as the new HDR and UHD test media is available via download from an online repository (see Clause A.2) and is provided in progressive format to reduce the otherwise large number of downloads needed as well as reducing test time and test burden.

For more information on the characteristics of the test media included with this version, see Annex B, which includes details of both the original SDR test media metrics as well as the new HDR test media.

A.2 Test media (video signals) available for download from the IEC 62087-2 online repository

Table A.1 to Table A.6 show the video signals referenced by this document. All of the test media in these tables is downloadable from the publicly accessible online repository. For specific details on downloading the test media, see 5.1.

IMPORTANT: Use the appropriate test media BY FILE NAME from the table for the particular frame rate, SDR or HDR format and resolution that matches the capabilities of the UUT and any applicable regional regulatory testing requirements.

IMPORTANT: Use the latest version of the video signals as provided in the online repository described in 5.1. Table A.1 to Table A.6 below do not show the version of the test media.

NOTE The clip frame rate is compatible with, but does not always exactly match, the regional broadcast standard frame rate.

Table A.1 – 50p (50Hz) SDR SD video signals used for the determination of power consumption

Regional broadcast standard frame rate	SDR / HDR	RES	Test media description	IEC 62087-2 references	Downloadable test media file name	Downloadable test media specifications (as reported by MediaInfo[a] app)	Media duration (min)	Estimated download file size (MB)
50p (50Hz)	SDR	SD	Black level pattern (static)	4.1.2.1, 4.1.2.2	IEC_Black_SD_25p_SDR_HEVC_AAC.MP4	720 × 576 (16:9) 25p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	3,3
			White level pattern (static)	4.1.2.1, 4.1.2.3	IEC_White_SD_25p_SDR_HEVC_AAC.MP4	720 × 576 (16:9) 25p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	3,3
			Full field colour bar pattern (static)	4.1.2.1, 4.1.2.4	IEC_ColourBars_SD_25p_SDR_HEVC_AAC.MP4	720 × 576 (16:9) 25p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	3,4
			Three bar pattern (static)	4.1.2.1, 4.1.2.5, 4.2.2.1	IEC_ThreeBar_SD_25p_SDR_HEVC_AAC.MP4	720 × 576 (16:9) 25p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	3,3
			Broadcast video signal (dynamic)	4.1.3, 4.1.3.1, 4.1.3.2	IEC_Broadcast_SD_25p_SDR_HEVC_AAC.MP4	720 × 576 (16:9) 25p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	15 m 20 s	324,9
			Internet video signal (dynamic))	4.1.4	IEC_Internet_SD_25p_SDR_HEVC_AAC.MP4	720 × 576 (16:9) 25p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	15 m 20 s	68,7
			L20 Box/outline pattern (dynamic)	4.2.2.2	IEC_L20PeakLumMotion_SD_25p_SDR_HEVC_AAC.MP4	720 × 576 (16:9) 25p HEVC (High@L3.1) 6,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	40 s	1,6
			L40 Box/outline pattern (dynamic)	4.2.2.2	IEC_L40PeakLumMotion_SD_25p_SDR_HEVC_AAC.MP4	720 × 576 (16:9) 25p HEVC (High@L3.1) 6,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	40 s	1,5

a MediaInfo is a free, cross-platform and open-source program that displays technical information about media files, as well as tag information for many audio and video files [https://mediaarea.net/en/MediaInfo].

Table A.2 – 50p (50Hz) SDR HD and UHD video signals used for the determination of power consumption

Regional broadcast standard frame rate	SDR / HDR	RES	Test media description	IEC 62087-2 references	Downloadable test media file name	Downloadable test media specifications (as reported by MediaInfo app)	Media duration (min)	Estimated download file size (MB)
50p (50Hz)	SDR	HD	Black level pattern (static)	4.1.2.1, 4.1.2.2	IEC_Black_HD_50p_SDR_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	6,5
			White level pattern (static)	4.1.2.1, 4.1.2.3	IEC_White_HD_50p_SDR_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	5,7
			Full field colour bar pattern (static)	4.1.2.1, 4.1.2.4	IEC_ColourBars_HD_50p_SDR_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	7,3
			Three bar pattern (static)	4.1.2.1, 4.1.2.5, 4.2.2.1	IEC_ThreeBar_HD_50p_SDR_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	7,4
			Broadcast video signal (dynamic)	4.1.3, 4.1.3.1, 4.1.3.2	IEC_Broadcast_HD_50p_SDR_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (Main@High) 25/30 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	15 m 20 s	419
			Internet video signal (dynamic))	4.1.4	IEC_Internet_HD_50p_SDR_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (Main@High) 25/308 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	15 m 20 s	854,1
			L20 Box/outline pattern (dynamic)	4.2.2.2	IEC_L20PeakLumMotion_HD_50p_SDR_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (High@L4) 17 Mb/s YUV 4:2:0 8 bit; AAC LC 384 kbps 48 kHz 2-ch	40s	2,5
			L40 Box/outline pattern (dynamic)	4.2.2.2	IEC_L40PeakLumMotion_HD_50p_SDR_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (High@L4) 17 Mb/s YUV 4:2:0 8 bit; AAC LC 384 kbps 48 kHz 2-ch	40s	2,6
		UHD	L20 Box/outline pattern (dynamic)	4.2.2.2	IEC_L20PeakLumMotion_UHD_50p_SDR_HEVC_AAC.MP4	3840 × 2160 (16:9) 50p HEVC (High@L5.1) 75 Mb/s YUV 4:2:0 8 bit; AAC LC 384 kbps 48 kHz 2-ch	40s	3,8
			L40 Box/outline pattern (dynamic)	4.2.2.2	IEC_L40PeakLumMotion_UHD_50p_SDR_HEVC_AAC.MP4	3840 × 2160 (16:9) 50p HEVC (High@L5.1) 75 Mb/s YUV 4:2:0 8 bit; AAC LC 384 kbps 48 kHz 2-ch	40s	3,8

Table A.3 – 50p (50Hz) HDR HD and UHD video signals used for the determination of power consumption

Regional broadcast standard frame rate	SDR / HDR	RES	Test media description	IEC 62087-2 references	Downloadable test media file name	Downloadable test media specifications (as reported by MediaInfo app)	Media duration (min)	Estimated download file size (MB)
50p (50Hz)	HDR	HD	Broadcast video signal – 25Hz – HDR10	4.1.3.3	IEC_Broadcast_HD_25p_HDR10_HEVC_AAC.MP4	1920 × 1080 (16:9) 25p HEVC (Main10@L5.1) PQ 16,7 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	683
			Broadcast video signal – 25Hz – HLG	4.1.3.3	IEC_Broadcast_HD_25p_HLG_HEVC_AAC.MP4	1920 × 1080 (16:9) 25p HEVC (Main10@L5.1) HLG 17,3 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	705,4
			Broadcast video signal – 50Hz – HDR10	4.1.3.3	IEC_Broadcast_HD_50p_HDR10_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (Main10@L5.1) PQ 16,5 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	673,6
			Broadcast video signal – 50Hz – HLG	4.1.3.3	IEC_Broadcast_HD_50p_HLG_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (Main10@L5.1) HLG 16,5 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	670,7
		UHD	Broadcast video signal – 50Hz – HDR10	4.1.3.3	IEC_Broadcast_UHD_50p_HDR10_HEVC_AAC.MP4	3840 × 1080 (16:9) 50p HEVC (Main10@L5.1) PQ 26,2 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	1 070
			Broadcast video signal – 50Hz – HLG	4.1.3.3	IEC_Broadcast_UHD_50p_HLG_HEVC_AAC.MP4	3840 × 1080 (16:9) 50p HEVC (Main10@L5.1) HLG 26,7 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	1 080

Table A.4 – 59,94p (60Hz) SDR SD video signals used for the determination of power consumption

Regional broadcast standard frame rate	SDR / HDR	RES	Test media description	IEC 62087-2 References	Downloadable test media file name	Downloadable test media specifications (as reported by MediaInfo app)	Media duration (min)	Estimated download file size (MB)
59,94p (60Hz)	SDR	SD	60Hz colour bar pattern (static)	4.1.2.1, 4.1.2.4	IEC_NTSC-Bars_SD_5994p_SDR_HEVC_AAC.MP4	720 × 480 (16:9) 59,94p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48kHz 2-ch	3 m 10 s	4,5
			Black level pattern (static)	4.1.2.1, 4.1.2.2	IEC_Black_SD_5994p_SDR_HEVC _AAC.MP4	720 × 480 (16:9) 59,94p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8bit; AAC LC 128 kb/s 48 kHz 2-ch	3 m 10 s	3,6
			White level pattern (static)	4.1.2.1, 4.1.2.3	IEC_White_SD_5994p_SDR_HEVC _AAC.MP4	720 × 480 (16:9) 59,94p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8bit; AAC LC 128 kb/s 48 kHz 2-ch	3 m 10 s	3,6
			Full field colour bar pattern (static)	4.1.2.1, 4.1.2.4	IEC_ColourBars_SD_5994p_SDR_HEVC _AAC.MP4	720 × 480 (16:9) 59,94p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	3 m 10 s	3,8
			Three bar pattern (static)	4.1.2.1, 4.1.2.5, 4.2.2.1	IEC_ThreeBar_SD_5994p_SDR_HEVC _AAC.MP4	720 × 480 (16:9) 59,94p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	3 m 10 s	3,6
			Broadcast video signal (dynamic)	4.1.3, 4.1.3.1, 4.1.3.2	IEC_Broadcast_SD_5994p_SDR_HEVC _AAC.MP4	720 × 480 (16:9) 59,94p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	15 m 20 s	553
			Internet video signal (dynamic))	4.1.4	IEC_Internet_SD_5994p_SDR_HEVC _AAC.MP4	720 × 480 (16:9) 59,94p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	15 m 20 s	89,5
			L20 Box/outline pattern (dynamic)	4.2.2.2	IEC_L20PeakLumMotion_SD_5994p_SDR _HEVC_AAC.MP4	720 × 480 (16:9) 59,94p HEVC (Main@L4) 433 kb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	40s	2,3
			L40 Box/outline pattern (dynamic)	4.2.2.2	IEC_L40PeakLumMotion_SD_5994p_SDR_ HEVC_AAC.MP4	720 × 480 (16:9) 59,94p HEVC (Main@L4) 428 kb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	40s	2,3

Table A.5 – 59,94p (60Hz) SDR HD and UHD video signals used for the determination of power consumption

Regional broadcast standard frame rate	SDR / HDR	RES	Test media description	IEC 62087-2 references	Downloadable test media file name	Downloadable test media specifications (as reported by MediaInfo app)	Media duration (min)	Estimated download file size (MB)
59,94p (60Hz)	SDR	HD	60Hz colour bar pattern (static)	4.1.2.1, 4.1.2.4	IEC_NTSC-Bars_HD_5994p_SDR_HEVC _AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	8,5
			Black level pattern (static)	4.1.2.1, 4.1.2.2	IEC_Black_HD_5994p_SDR_HEVC _AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	7,2
			White level pattern (static)	4.1.2.1, 4.1.2.3	IEC_White_HD_5994p_SDR_HEVC _AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	6,2
			Full field colour bar pattern (static)	4.1.2.1, 4.1.2.4	IEC_ColourBars_HD_5994p_SDR_HEVC _AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	7,4
			Three bar pattern (static)	4.1.2.1, 4.1.2.5, 4.2.2.1	IEC_ThreeBar_HD_5994p_SDR_HEVC _AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	8,1
			Broadcast video signal (dynamic)	4.1.3, 4.1.3.1, 4.1.3.2	IEC_Broadcast_HD_5994_SDR_HEVC _AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	15 m 20 s	939,7
			Internet video signal (dynamic)	4.1.4	IEC_Internet_HD_5994p_SDR_HEVC _AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	15 m 20 s	341,8
			L20 Box/outline pattern (dynamic)	4.2.2.2	IEC_L20PeakLumMotion_HD_5994p_SDR _HEVC_AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main@L5.1) 552 kb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	40s	2,8
			L40 Box/outline pattern (dynamic)	4.2.2.2	IEC_L40PeakLumMotion_HD_5994p_SDR _HEVC_AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main@L5.1) 577 kb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	40s	2,9
		UHD	L20 Box/outline pattern (dynamic)	4.2.2.2	IEC_L20PeakLumMotion_UHD_5994p_SDR _HEVC_AAC.MP4	3840 × 2160 (16:9) 59,94p HEVC (Main@L5.1) 778 kb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	40s	3,9
			L40 Box/outline pattern (dynamic)	4.2.2.2	IEC_L40PeakLumMotion_UHD_5994p_SDR _HEVC_AAC.MP4	3840 × 2160 (16:9) 59,94p HEVC (Main@L5.1) 824 kb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	40s	4,1

Table A.6 – 59,94p (60Hz) HDR HD and UHD video signals used for the determination of power consumption

Regional broadcast standard frame rate	SDR / HDR	RES	Test media description	IEC 62087-2 references	Downloadable test media file name	Downloadable test media specifications (as reported by MediaInfo app)	Media duration (min)	Estimated download file size (MB)
59,94p (60Hz)	HDR	HD	Broadcast video signal – 59.94P – HDR10	4.1.3.3	IEC_Broadcast_HD_5994p_HDR10_HEVC_AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main10@L5.1) PQ 14,6 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	597,9
			Broadcast video signal – 59.94P – HLG	4.1.3.3	IEC_Broadcast_HD_5994p_HLG_HEVC_AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main10@L5.1) HLG 14,3 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	586
			Broadcast video signal – 23.976P – HDR10	4.1.3.3	IEC_Broadcast_HD_23976p_HDR10_HEVC_AAC.MP4	1920 × 1080 (16:9) 23,976p HEVC (Main10@L5.1) PQ 16,8 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	683,4
			Broadcast video signal – 23.976P – HLG	4.1.3.3	IEC_Broadcast_HD_23976p_HLG_HEVC_AAC.MP4	1920 × 1080 (16:9) 23,976p HEVC (Main10@L5.1) HLG 17,3 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	706,4
		UHD	Broadcast video signal – 59.94P – HDR10	4.1.3.3	IEC_Broadcast_UHD_5994p_HDR10_HEVC_AAC.MP4	3840 × 2160 (16:9) 59,94p HEVC (Main10@L5.1) PQ 23,4 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48kHz 2-ch	10 m 13 s	953,5
			Broadcast video signal – 59.94P – HLG	4.1.3.3	IEC_Broadcast_UHD_5994p_HLG_HEVC_AAC.MP4	3840 × 2160 (16:9) 59,94p HEVC (Main10@L5.1) HLG 23,0 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48kHz 2-ch	10 m 13 s	938,3

~~Annex A~~Annex B
(informative)

Description of video signals used for the determination of power consumption

B.1 General

Power consumption of some equipment, such as television sets, ~~may~~ can vary depending on the APL′ of the displayed images.

Three video signal categories are available. These include:

– static video signals (4.1.2).
– dynamic broadcast-content video signals in various formats including SDR and HDR (4.1.3).
– Internet-content video signals (4.1.4).

Either the static video signals or the dynamic broadcast-content video signals are intended to be used when determining power consumption of equipment that typically uses broadcast-type video content, such as television sets. ~~The Internet-content video signal is intended to emulate static, non-video content from the Internet.~~

NOTE The Internet-content video signal is not intended to emulate dynamic video material that is often downloaded or streamed from the Internet. Dynamic video is best represented by the dynamic broadcast-content video signal specified in 4.1.3.

B.2 Static video signals

The static video signal method was initially developed by JEITA in Japan for determining television set power consumption.

Measurement of power consumption based on the static video signals ~~might~~ can be chosen for the simplicity of the test. The static signals ~~may~~ can also be appropriate for use with equipment that typically does not have a video input or is typically not capable of playing video streams.

Power consumption measurements using static signals can often be performed directly by means of a wattmeter.

B.3 Dynamic broadcast-content video signals (SDR)

The APL′ of the SDR dynamic broadcast-content video signal was chosen to best emulate the actual APL′ determined ~~internationally~~ by analysing content from all over the world. During development of IEC 62087:2008, the project members measured at least 40 h of typical broadcast content (all SDR content at the time), including a variety of genres from a variety of broadcast stations in Australia, Japan, the Netherlands, the United Kingdom and the United States. The ~~captured~~ global APL′ curves captured from each content piece were averaged to create a target APL′ curve, known as the master histogram.

The mean of the APL′ histogram is 34 %.

The project members acquired video content that was donated to the IEC by the content owners. A computer program was used to randomly select scenes that best matched the SDR master histogram.

Figure B.1 shows the APL′ histograms of the SDR test disc and the SDR master video. The data is described in Clause B.5.

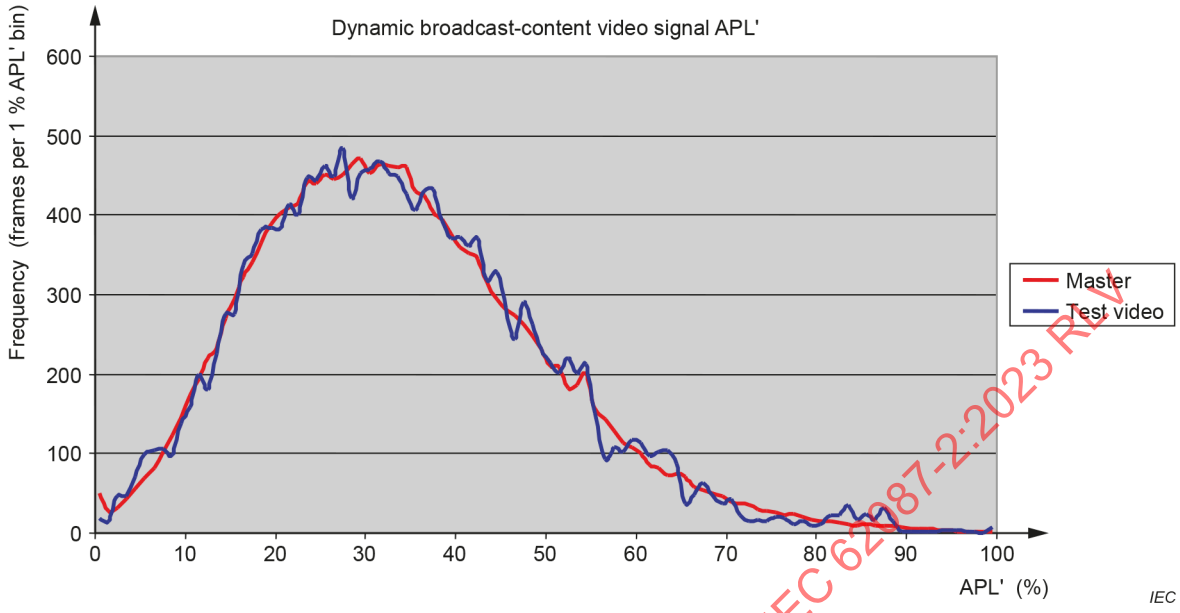


Figure B.1 – SDR Dynamic broadcast-content video signal APL′

HDR dynamic broadcast-content data and further details are provided in IEC TR 63274.

B.4 Internet-content video signals

The APL′ of the Internet-content video signal was chosen to best emulate the actual APL′ of popular web pages.

During development of IEC 62087:2008, the project members acquired screen shots of web-pages from United States Government websites, including that of EPA ENERGY STAR®, because according to United States Code Title 17, Section 105, "copyright protection is not provided for any work produced by the United States Government". The test images were chosen to best match the APL′ of the most popular 100 web pages as determined during development of the document.

The project members chose test images that were believed to be inoffensive. However, in order to ensure 100 % acceptability across all cultures internationally, some images were scrambled. Tests have confirmed that the scrambling has an inconsequential effect on the power consumed.

Figure B.2 shows the APL′ histograms of the Top-100 web pages and test images, with a mean APL' of 81 %. In this figure, the solid line shows that the APL' histogram approximates an inverse chi-square distribution.

NOTE The Internet-content video signal is not intended to emulate dynamic video material that is often downloaded or streamed from the Internet. Dynamic video is best represented by the dynamic broadcast-content video signal specified in 4.1.3.

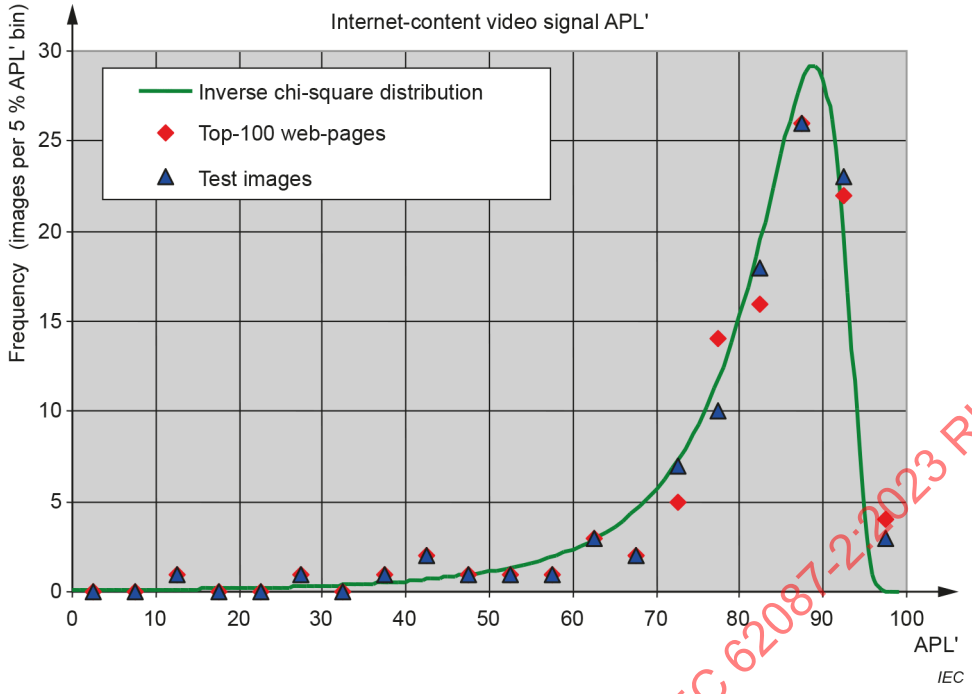


Figure B.2 – Internet-content video signal APL′

B.5 Dynamic broadcast-content data (SDR)

Table B.1 shows the frequency of frames in the SDR test video and the SDR master video in 1 % APL′ bins. The percentage of SDR master video frames in each bin is also shown. The scenes in the SDR test video were chosen to best match the master video histogram.

Table B.1 – SDR Dynamic broadcast-content data

APL′ bin %	Test video frequency	Master video frequency	Master video %
0,5	18	51,0	0,28
1,5	15	27,9	0,16
2,5	47	31,0	0,17
3,5	46	42,9	0,24
4,5	71	56,3	0,31
5,5	98	69,3	0,39
6,5	105	81,3	0,45
7,5	107	102,6	0,57
8,5	98	122,6	0,68
9,5	137	144,8	0,81
10,5	159	173,4	0,96
11,5	199	193,7	1,08
12,5	180	220,0	1,22
13,5	225	233,8	1,30
14,5	275	270,7	1,51
15,5	276	294,3	1,64
16,5	338	322,1	1,79
17,5	352	340,2	1,89
18,5	382	365,9	2,03
19,5	383	389,3	2,16

APL' bin %	Test video frequency	Master video frequency	Master video %
20,5	384	402,9	2,24
21,5	413	410,8	2,28
22,5	400	415,6	2,31
23,5	447	441,8	2,46
24,5	443	439,7	2,44
25,5	462	450,3	2,50
26,5	449	445,4	2,48
27,5	485	451,4	2,51
28,5	421	463,7	2,58
29,5	453	471,1	2,62
30,5	458	453,3	2,52
31,5	468	464,0	2,58
32,5	452	462,1	2,57
33,5	450	460,2	2,56
34,5	426	460,4	2,56
35,5	406	431,0	2,40
36,5	430	424,8	2,36
37,5	432	403,9	2,25
38,5	394	394,2	2,19
39,5	371	375,5	2,09
40,5	372	359,7	2,00
41,5	362	352,5	1,96
42,5	370	345,1	1,92
43,5	319	315,9	1,76
44,5	328	294,4	1,64
45,5	283	280,6	1,56
46,5	244	274,7	1,53
47,5	291	262,6	1,46
48,5	262	247,9	1,38
49,5	231	231,3	1,29
50,5	214	209,7	1,17
51,5	202	209,2	1,16
52,5	219	182,8	1,02
53,5	201	185,9	1,03
54,5	212	200,9	1,12
55,5	151	156,9	0,87
56,5	94	143,6	0,80
57,5	109	128,8	0,72
58,5	102	113,7	0,63
59,5	118	108,1	0,60
60,5	114	100,0	0,56
61,5	96	86,1	0,48
62,5	103	81,5	0,45
63,5	104	73,2	0,41
64,5	87	75,0	0,42
65,5	37	70,0	0,39
66,5	48	58,6	0,33
67,5	63	54,0	0,30
68,5	48	51,0	0,28
69,5	37	46,6	0,26

APL′ bin %	Test video frequency	Master video frequency	Master video %
70,5	43	39,8	0,22
71,5	22	38,2	0,21
72,5	14	35,2	0,20
73,5	16	30,5	0,17
74,5	15	27,6	0,15
75,5	21	26,6	0,15
76,5	19	22,7	0,13
77,5	11	23,9	0,13
78,5	14	20,9	0,12
79,5	10	17,5	0,10
80,5	12	14,6	0,08
81,5	23	14,4	0,08
82,5	23	14,0	0,08
83,5	35	11,7	0,06
84,5	16	9,9	0,06
85,5	25	10,6	0,06
86,5	17	9,1	0,05
87,5	31	8,9	0,05
88,5	15	8,4	0,05
89,5	1	8,0	0,04
90,5	2	5,9	0,03
91,5	2	5,3	0,03
92,5	1	5,5	0,03
93,5	1	4,5	0,03
94,5	3	3,4	0,02
95,5	3	2,4	0,01
96,5	1	1,6	0,01
97,5	2	1,9	0,01
98,5	0	1,9	0,01
99,5	8	1,7	0,01
Frequency is the number of frames per 1 % APL′ bin.			

HDR dynamic broadcast-content data and further details are provided in IEC TR 63274.

B.6 Internet-content data

Table B.2 shows the frequency of the test images and the "Top 100" images in 5 % APL′ bins. The scenes in the test images were chosen to best match the "Top 100" histogram.

Table B.2 – Internet-content data

APL' bin %	Top 100 frequency	Test images frequency
2,5	0	0
7,5	0	0
12,5	1	1
17,5	0	0
22,5	0	0
27,5	1	1
32,5	0	0
37,5	1	1
42,5	2	2
47,5	1	1
52,5	1	1
57,5	1	1
62,5	3	3
67,5	2	2
72,5	5	7
77,5	14	10
82,5	16	18
87,5	26	26
92,5	22	23
97,5	4	3
Frequency is the number of frames per 5 % APL' bin.		

B.7 Dynamic broadcast-content video signals (HDR)

The dynamic broadcast-content video signals using static metadata HDR formats HLG and HDR10 were created by adapting the study, testing and vetting of similar video content already in the consumer market from various sources. The details, results and recommendations of that team are publicly available in IEC TR 63274.

~~Annex B~~Annex C
(informative)

Description of video signals used for the determination of the peak luminance ratio

C.1 General

When choosing the signal to be used for the determination of the peak luminance ratio, the APL of the signal should be considered. Emissive display technologies are known to employ power limiting circuits that reduce display luminance under high APL conditions. Backlit display technologies ~~may~~ can also vary their output based on signal APL, especially if they are using a spatially modulated backlight unit.

For each of these signals, a single measurement in the centre of the display is recommended for determining luminance in each picture setting of interest.

C.2 Three-bar video signal

The ENERGY STAR® program and some North American regulations use the three-bar video signal described in 4.2.2.1 (and 4.1.2.5) for determining the peak luminance ratio. This signal has a relatively high APL and is likely to trigger power limiting ~~circuits~~ in the display. IEC 62087:2008 made this signal available for determination of power consumption, so it has been convenient to use for determination of peak luminance values as well.

C.3 Dynamic box and outline video signal

The dynamic box and outline video signals described in 4.2.2.2 are introduced in this edition of this document and are intended to ~~eliminate~~ qualify the effects of power limiting ~~circuits~~. However, no single applicable video signal can guarantee the absence of power ~~limiting~~ limitations for all models of equipment.

~~NOTE The box and outline video signal is likely to be used in Europe for measuring the peak luminance ratio related to energy labelling and ecodesign requirements for televisions.~~

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6 Withdrawn. This former edition of IEC 62087 is given for the sake of backwards traceability, and because it is referred to in this edition.

7 Withdrawn. This former edition of IEC 62087 is given for the sake of backwards traceability, and because it is referred to in this edition.

~~8 To be published.~~

ITU-R BT.709-6 (06/2015), *Parameter values for the HDTV standards for production and international programme exchange* https://www.itu.int/rec/R-REC-BT.709/en

ITU-R BT.1886 (03/2011), *Reference electro-optical transfer function for flat panel displays used in HDTV studio production* https://www.itu.int/rec/R-REC-BT.1886-0-201103-I/en

ITU-R BT.2111, *Specification of colour bar test pattern for high dynamic range television systems*, available at https://www.itu.int/rec/R-REC-BT.2111/en

~~CEA-770.3-E, *High Definition TV Analog Component Video Interface, http://www.ce.org/Standards/Standard-Listings.aspx*~~

CTA-770.3-E R-2017, *High Definition TV Analog Component Video Interface,* available at https://shop.cta.tech/products/high-definition-tv-analog-component-video-interface

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~~HDMI – Wikipedia, the free encyclopedia, *http://en.wikipedia.org/wiki/HDMI*~~

IDMS (Information Display Measurements Standard) Version 1.1a:2022-03, *available from the Society for Information Display (SID) https://www.sid.org/Standards/ICDM#8271483-idms-download*

SMPTE EG 1:1990, *Alignment Color Bar Test Signal for Television Picture Monitors, http://standards.smpte.org*

SMPTE ST 170M:2004, *For Television – Composite Analog Video Signal – NTSC for Studio Applications, http://standards.smpte.org*

SMPTE ST 2084:2014, *High Dynamic Range Electro-Optical Transfer Function of Mastering Reference Displays*

ETSI EN 300 401, *Radio Broadcasting Systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers*

ETSI TS 102 563, *Digital Audio Broadcasting (DAB); Transport of Advanced Audio Coding (AAC) audio*

MediaInfo, *https://mediaarea.net/en/MediaInfo*

IEC 62087-2

Edition 2.0 2023-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Audio, video, and related equipment – Determination of power consumption – Part 2: Signals and media

Appareils audio, vidéo et matériel connexe – Détermination de la consommation de puissance –
Partie 2: Signaux et supports

IEC 62087-2:2023-02(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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AUDIO, VIDEO, AND RELATED EQUIPMENT – DETERMINATION OF POWER CONSUMPTION –

Part 2: Signals and media

FOREWORD

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IEC 62087-2 has been prepared by technical area 19: Environmental and energy aspects for multimedia systems and equipment, of IEC technical committee 100: Audio, video and multimedia systems and equipment. It is an International Standard.

This second edition cancels and replaces the first edition published in 2015. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) HDR and UHD video test signals have been added;
b) dynamic box and outline test signals have been added, replacing the static box and outline test signals;
c) all test signals are provided as media files for download from a specified IEC online repository, which replaces previous DVD and Blu-ray media.

The text of this International Standard is based on the following documents:

Draft	Report on voting
100/3771/CDV	100/3848/RVC

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

A list of all parts in the IEC 62087 series, published under the general title *Audio, video, and related equipment – Determination of power consumption*, can be found on the IEC website.

This publication contains multiple test signals downloadable from a specified IEC online repository, available at https://www.iec.ch/tc100/supportingdocuments. These files form an integral part of this standard.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

This document identifies test signals to be used to determine power consumption and related characteristics specified in some other parts of the IEC 62087 series.

IEC 62087:2008[1] (second edition) added methods for measuring On (average) mode power consumption of television sets, based on three video signal sets. These include static signals, dynamic broadcast content signals, and Internet content signals.

IEC 62087:2011[2] (third edition) revised methods for measuring power consumption of set-top boxes. The signals and media were not changed in this third edition.

IEC 62087-2:2015[3] (first edition) separates signals and media that are to be used for determining power consumption and related characteristics into a dedicated part. The three original video signal sets (static, dynamic broadcast-content, and Internet-content) are not changed. This edition adds signals for the purpose of determining the peak luminance ratio that is sometimes associated with television set power consumption measurement programs.

This second edition of IEC 62087-2 adds HDR and UHD video test signals and dynamic box and outline test signals for TV power consumption testing. All test signals are available from a specified IEC online repository for download, replacing the former physical media distribution.

IEC 62087 series currently consists of the following published parts:

– Part 1: General
– Part 2: Signals and media
– Part 3: Television sets
– Part 4: Video recording equipment
– Part 5: Set-top boxes
– Part 6: Audio equipment
– Part 7: Computer monitors

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1 IEC 62087:2008, *Methods of measurement for the power consumption of audio, video and related equipment*

2 IEC 62087:2011, *Methods of measurement for the power consumption of audio, video and related equipment*

3 IEC 62087-2:2015, *Audio, video, and related equipment – Determination of power consumption, Part 2: Signals and media*

AUDIO, VIDEO, AND RELATED EQUIPMENT – DETERMINATION OF POWER CONSUMPTION –

Part 2: Signals and media

1 Scope

This part of IEC 62087 specifies the signals used to determine the power consumption of audio, video, and related equipment, such as television sets and computer monitors. It also specifies signals for determining the peak luminance ratio that is sometimes associated with television set power consumption measurement programs. In addition, this part specifies equipment, interfaces, and accuracy related to signal generation.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60107-1:1997, *Methods of measurement on receivers for television broadcast transmissions – Part 1: General conditions – Measurements at radio and video frequencies*

IEC 60268-1, *Sound system equipment – Part 1: General*

IEC 60315-1:1988, *Methods of measurement on radio receivers for various classes of emission. Part 1: General considerations and methods of measurement, including audio-frequency measurements*

IEC 60315-3, *Methods of measurement on radio receivers for various classes of emission – Part 3: Receivers for amplitude-modulated sound-broadcasting emissions*

IEC 60315-4:1997, *Methods of measurement on radio receivers for various classes of emission – Part 4: Receivers for frequency-modulated sound broadcasting emissions*

IEC 60958-1, *Digital audio interface – Part 1: General*

IEC 60958-3, *Digital audio interface – Part 3: Consumer applications*

IEC 61938, *Multimedia systems – Guide to the recommended characteristics of analogue interfaces to achieve interoperability (GMT)*

IEC 62087-1, *Audio, video, and related equipment – Determination of power consumption – Part 1: General*

IEC 62216, *Digital terrestrial television receivers for the DVB-T system*

Recommendation ITU-R BT.2100-2, *Image parameter values for high dynamic range television for use in production and international programme exchange*

3 Terms, definitions, and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62087-1 as well as in the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1.1
average picture level
APL
average level of all the pixels of a single video signal frame or a group thereof in the linear luminance domain

EXAMPLE Display equipment such as television sets or computer monitors that internally use linear encoding after undoing the non-linearity of the input signal.

Note 1 to entry: This note applies to the French language only.

3.1.2
backlit display
display that generates light from a source behind the display panel

EXAMPLE Liquid-crystal display (LCD)

3.1.3
component analogue video
baseband analogue video interface that carries a standard or high-definition colour video signal over three signal lines

Note 1 to entry: See CTA-770.3-E R-2017.

3.1.4
composite analogue video
baseband analogue video interface that carries a standard-definition colour video signal over a single signal line

Note 1 to entry: See SMPTE ST 170M:2004 for the 59,94 Hz version and ITU-R BT.470-5 for the 50 Hz version.

3.1.5
digital visual interface
DVI
video interface that can carry analogue or digital uncompressed video

Note 1 to entry: This note applies to the French language only.

3.1.6
DisplayPort
digital display interface developed by the Video Electronics Standards Association

3.1.7
emissive display
display that generates light directly from each sub-pixel

EXAMPLE PDP or OLED displays

3.1.8
average picture level based on non-linear input signal
APL′
average level of all pixels of a single video signal frame or a group thereof in the non-linear luminance domain

EXAMPLE Display equipment such as television sets or computer monitor receive input signals that encode luminance or brightness in a non-linear way. Examples for such non-linear encoding are PQ (absolute luminance) or HLG (brightness) EOTFs (ITU-R BT.2100-2).

Note 1 to entry: APL′ is defined as a percentage of the range between reference black and reference white level.

Note 2 to entry: This is not a measure of the linear signal that might be available inside of some display equipment and delivered to the display device. The properties and their differences of the external and internal video signals are shown in Figure 1.

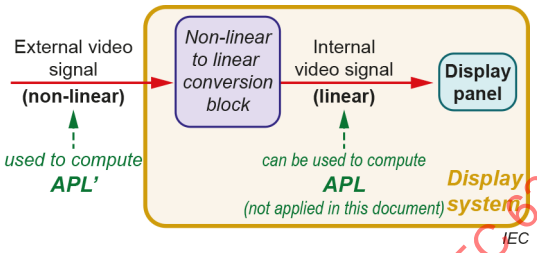

Figure 1 – Occurrence of linear and non-linear signal encodings in context of a typical display processing pipeline for computing APL and APL'

3.1.9
hybrid log-gamma
HLG
one set of transfer functions offering a degree of backwards compatibility by more closely matching the previously established television transfer curves

Note 1 to entry: Sets of transfer functions related to HDR signals are specified in Rec. ITU-R BT.2100-2.

Note 2 to entry: HLG is used both as a description of a dedicated transfer function and as a video format name.

3.1.10
high dynamic range video
HDR video
capability of components in a video pipeline to capture, process, transport or display luminance levels and tone gradations that exceed capabilities of conventional SDR imaging pipelines components

EXAMPLE An HDR video signal typically uses a greater bit depth, luminance and colour volume than standard dynamic range (SDR) video. It also typically utilizes different tone curves such as perceptual quantizer (PQ) or hybrid log gamma (HLG) as specified in ITU-R BT.2100 instead of gamma, as used with SDR. When the HDR video signal is rendered on an HDR display, it is possible to see greater luminance ranges and wider colour gamut

Note 1 to entry: HDR video can provide an enhanced viewer experience and can more accurately reproduce scenes that include, within the same image, deep dark areas, and bright highlights, such as emissive light sources and reflections.

Note 2 to entry: This note applies to the French language only.

3.1.11
high definition
HD
spatial video resolution ranging from 1 280 × 720 to 1 920 × 1 080

3.1.12
ultra-high definition
UHD
Ultra HD
spatial video resolution above 1 920 × 1 080

3.1.13
Universal Serial Bus
USB
digital interface that can be used to connect storage media and peripherals to digital devices like computers and TVs

Note 1 to entry: See USB specification.

Note 2 to entry: This note applies to the French language only.

3.1.14
High-Definition Multimedia Interface
HDMI®
audio-visual interface that is capable of carrying uncompressed video data, compressed or uncompressed digital audio data, and other information

Note 1 to entry: See HDMI® specification.

Note 2 to entry: This note applies to the French language only.

3.1.15
standard dynamic range video
SDR video
capability of components in a video pipeline to capture, process, transport or display luminance levels and tone gradations that can be characterized by the dynamic range, colour rendering and tone gradation capabilities essentially compatible with cathode ray tube (CRT) displays

EXAMPLE BT.709/BT.1886 and IEC 62966-2-1 (sRGB)

Note 1 to entry: This note applies to the French language only.

3.1.16
S-video
baseband analogue video interface that carries a standard definition colour video signal using two signal lines

Note 1 to entry: See IEC 60933-5.

3.2 Abbreviated terms

′	prime (noting that the signal is non-linear, for example APL')
AM	amplitude modulation
AV	audio-visual
BD	Blu-ray Disc™[4]
BER	bit error ratio
C/N	carrier-to-noise ratio
DAB	digital audio broadcast
dB	decibel

[4] Blu-ray Disc™ is a trademark of the Blu-ray Disc Association. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

DVD	digital versatile disc
EMF	electromotive force
EPA	Environmental Protection Agency
FM	frequency modulation
Hz	hertz
HDMI®	High Definition Multimedia Interface
JEITA	Japan Electronics and Information Technology industries Association
kb/s	kilo bits per second
LCD	liquid crystal display
LAN	local area network
Mb/s	Mega bits per second
NTSC	National Television Standards Committee
OLED	organic light-emitting diode
OOI	acoustic onset of impairment
PAL	phase alternating line
PDP	plasma display panel
RF	radio frequency
RMS	root mean square
SECAM	séquentiel couleur à mémoire (Sequential colour with memory)
SMPTE	Society of Motion Picture and Television Engineers
USB	Universal Serial Bus
UUT	unit under test

NOTE Other terminology used is device under test (DUT) or equipment under test (EUT).

4 Signals

4.1 Audio-visual signals used for the determination of power consumption

4.1.1 Overview

For general information on SDR video signals, see 4.1.2, 4.1.3.2 and 4.1.4. For general information on HDR signals, see 4.1.3.3. The HDR video format HLG uses sets of transfer functions (EOTF) specified in Rec. ITU-R BT.2100-2 while the HDR video format HDR10 applies those transfer functions (EOTF) of SMPTE ST 2084 (see also 4.1.3.1 and 4.1.3.3).

In this document, all references to '60 Hz media' technically refer to 59,94 Hz coded video content; similarly, '24 Hz media' refers to 23,976 Hz media (see also Table A.1 to Table A.6).

A general description of the video signals is provided in Annex A and Annex B.

4.1.2 Static video signals

4.1.2.1 General

The media includes five static video signals: black, white, full field colour bar and three bar video signals; see Table 1. All are SDR format. Additional information is available in Clause B.2.

Table 1 – Static video signals overview

Static video signal	Resolution	Dynamic range (format)
Black level video signal	SD	SDR
White level video signal	SD	SDR
SDR 50 Hz full-field colour bar video signal	SD, HD	SDR
SDR 60 Hz colour bar video signal	SD, HD	SDR
Three-bar video signal	SD, HD	SDR

The static video signals shall be downloaded from the specified IEC online repository, see 5.1 and Annex A.

4.1.2.2 Black level video signal

The entire part of the signal representing the active picture shall be black (0 %), as defined in IEC 60107-1:1997, 3.2.1.5. This is an SDR signal. Reference to the signal online repository is provided in 5.1 and Annex A.

4.1.2.3 White level video signal

The entire part of the signal representing the active picture shall be white (100 %), as defined in IEC 60107-1:1997, 3.2.1.5. This is an SDR signal. Reference to the signal online repository is provided in 5.1 and Annex A.

4.1.2.4 SDR 50 Hz full field and 60 Hz colour bar video signals

The active part of the signal shall be a full field colour bar SDR signal. For 50 Hz systems, the (100/0/75/0) colour bar signal for PAL and SECAM receivers as defined in IEC 60107-1:1997, 3.2.1.2 shall be used. In the case of a 60 Hz system, the top section of the (75/0/75/0) colour bar signal for NTSC defined in IEC 60107-1:1997, 3.2.1.2 shall be used and shall cover the full field of the display. Reference to the signal online repository is provided in 5.1 and Annex A.

NOTE The 50 Hz signal has eight bars (including black), and the 60 Hz signal has seven bars (white, yellow, cyan, green, magenta, red and blue, in this order).

4.1.2.5 Three-bar video signal

The active picture area of the signal shall be three bars of white (100 %) over a black (0 %) background as defined in IEC 60107-1:1997, 3.2.1.3. This is an SDR signal. Reference to the signal online repository is provided in 5.1 and Annex A.

4.1.3 Dynamic broadcast-content video signal

4.1.3.1 General

The media includes dynamic broadcast-content video signals in different progressive scan formats, resolutions, and dynamic ranges; see Table 2. Additional information is available in Clause A.2.

Table 2 – Dynamic broadcast-content video signals overview

Progressive scan formats	Dynamic range (format)
SD 50 Hz	SDR
SD 60 Hz	SDR
HD (1 920 × 1 080 p) 25 Hz	HDR (HLG, HDR10)
HD (1 920 × 1 080 p) 24 Hz	HDR (HLG, HDR10)
HD (1 920 × 1 080 p) 50 Hz	SDR, HDR (HLG, HDR10)
HD (1 920 × 1 080 p) 60 Hz	SDR, HDR (HLG, HDR10)
UHD (3 840 × 2 160 p) 50 Hz	HDR (HLG, HDR10)
UHD (3 840 × 2 160 p) 60 Hz	HDR (HLG, HDR10)

4.1.3.2 Standard dynamic range dynamic video signals

For the generations of CRT, early TFT (with 'always on' backlight) and plasma-based displays, generally very little difference between the display capabilities amongst TVs was assumed and the SDR signal specifications of, for example, ITU-R BT.709 and BT.1886 were deemed sufficient for content delivery, and consequently for power consumption measurement of television sets. For SDR-only capable television sets, suitable SDR test media are available in appropriate resolutions and progressive scan formats. The duration of the SDR audio-visual signal is 10 min.

The standard dynamic range dynamic video signals shall be downloaded from the specified IEC online repository; see 5.1 and Annex A.

4.1.3.3 High dynamic range dynamic video signals

High dynamic range (HDR) video has gained increasing importance throughout the entire video ecosystem from capture, production and processing, through to distribution and presentation. HDR television sets potentially have higher peak luminance level capabilities in comparison to SDR TVs or SDR TV modes. For HDR-capable television sets, suitable HDR test media are available in appropriate codecs, resolutions, and progressive scan formats. All HDR video signals in HDR10 format contain static metadata. The duration of the HDR audio-visual signal in both HLG and HDR10 formats is 5 min.

The high dynamic range dynamic video signals shall be downloaded from the specified IEC online repository; see 5.1 and Annex A.

4.1.4 Internet-content video signal

The media includes an Internet-content video signal. This is an SDR signal. Reference to the signal online repository is provided in 5.1 and Annex A.

Additional information is available in Clause B.4.

4.1.5 Audio signal associated with video signals

Sine-wave signals at a frequency of 1 kHz or, if 1 kHz cannot be used, signals at the centre frequency of the transfer range specified by the manufacturer of the UUT shall be used. For digital inputs, the level of the signal shall be 18 dB below full scale. For analogue inputs, the signal shall be 20 dB below the reference level or greater with a suggested signal level of 500 mV RMS.

The video signals described in 4.1.2, 4.1.3, and 4.1.4 are encoded with an accompanying 1 kHz tone with a level of 18 dB below full scale.

4.2 Video signals used for the determination of the peak luminance ratio

4.2.1 General

The use of signals defined in 4.2.2 shall be limited to determining the peak luminance ratio between SDR picture settings and should not be used for determining absolute screen luminance.

NOTE 1 Such luminance comparisons are sometimes associated with TV energy efficiency programmes.

NOTE 2 For more information about choosing the signal for determining the peak luminance ratio, see Annex C.

4.2.2 Video signals

4.2.2.1 Three-bar video signal

The three-bar video signal is specified in 4.1.2.5. This is an SDR signal. Reference to the signal online repository is provided in 5.1 and Annex A.

4.2.2.2 Dynamic box and outline video signals

The set of two box and outline dynamic video signals includes a white (100 %) rectangle on a grey (34 %) background, with a black (0 %) border near the outer part of the picture. This border includes a moving pattern comprising black (0 %) and white (100 %) segments. Each corner contains a 1 % coverage full-field colour bar pattern. The dimensions of the central white (100 %) rectangle of the two signals correspond to the defined L20 and L40 static test patterns [IDMS v1.1a, Appendix A12]. The signal with the corresponding larger white rectangle may be used when measuring smaller screens in order to provide sufficient white coverage as required by screen luminance contact probes. An example of L20PeakLumMotion is shown in Figure 2.

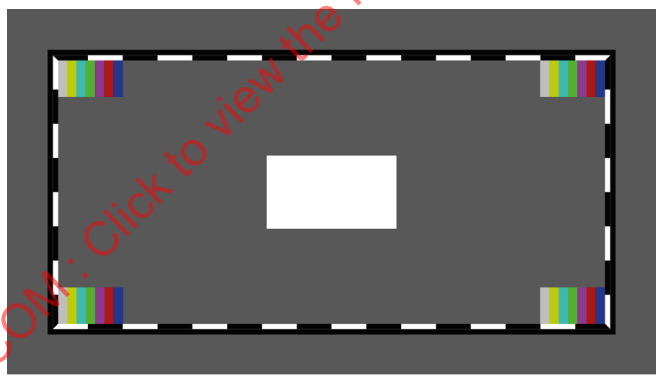

Figure 2 – Dynamic box and outline video signal (L20PeakLumMotion)

The two dynamic video signals as listed in Table 3 below are in SDR, rendered in SD, HD and UHD formats and are available in 50Hz (50p) and 59,94Hz (5994p). The selection of signal format shall be based on the one which most closely resembles the highest supported screen resolution of the UUT. The central white area in L40PeakLumMotion is greater than that in L20PeakLumMotion. Reference to the signal online repository is provided in 5.1 and Annex A.

Table 3 – Dynamic box and outline video signal naming

SD	HD	UHD
L20PeakLumMotionSD50p	L20PeakLumMotionHD50p	L20PeakLumMotionUHD50p
L40PeakLumMotionSD50p	L40PeakLumMotionHD50p	L40PeakLumMotionUHD50p
L20PeakLumMotionSD5994p	L20PeakLumMotionHD5994p	L20PeakLumMotionUHD5994p
L40PeakLumMotionSD5994p	L40PeakLumMotionHD5994p	L40PeakLumMotionUHD5994p

4.3 Audio signals used for determination of audio power consumption

4.3.1 Audio signals

4.3.1.1 Sine wave signal

The signal shall be a sine-wave at a frequency of 1 kHz or, if 1 kHz cannot be used, the sine wave frequency shall be at the centre of the frequency range specified by the manufacturer.

The analogue and digital 1 kHz sine wave signals are not included in the media supplied in Clause 5.

4.3.1.2 Simulated programme signal

A simulated programme signal shall have a mean power spectral density that closely resembles the average of mean power spectral densities of a wide range of programme material, in accordance with IEC 60268-1.

Such a signal may be obtained from pink noise, band-limited by a filter whose response conforms to that given in IEC 60268-1. The crest factor of a noise source should fall between 3 and 4 to avoid clipping of amplifiers.

The simulated programme signal is not included in the media supplied in Clause 5.

4.3.2 Signal levels

4.3.2.1 Audio signal level, analogue

For baseband analogue inputs, the input signal shall be at a level of 500 mV RMS, according to the rated source EMF of IEC 61938.

4.3.2.2 Audio signal level, digital

For digital inputs, the input signal shall be at a level of 12 dB below reference full scale, in accordance with IEC 61938, IEC 60958-1 and IEC 60958-3.

4.3.2.3 Audio signal level, RF

For FM radio tuners, the input signal shall be applied to an aerial input terminal at a level of 40 dB (pW). The deviation shall be 40 kHz.

For AM radio tuners with an antenna input terminal, the input signal shall be an EMF of 1 mV from a 50 Ω source. The modulation factor shall be 30 %.

For non-detachable antennas (rod antennas for FM and magnetic antennas for AM), the RF signal level for FM and AM shall be large enough to produce an audio signal-to-noise ratio of 36 dB for FM at 75 kHz deviation and 26 dB for AM at 30 % modulation. Signal-to-noise ratios shall be measured as specified in IEC 60315-1:1988, 6.1.

For AM receivers, the method of measurement with an analogue electromagnetic field generator is described in IEC 60315-3 and IEC 60315-1.

For FM receivers with rod antennas, refer to IEC 60315-4:1997, Clause 7.

For DAB and DAB+, the OOI point is sharply defined as the receiver's C/N (carrier-to-noise ratio) degrades and BER increases, so this may be used as a means to assess the signal requirement of the receiver. The OOI method may be implemented so that it is equivalent to a

BER of 10^{-4}. The method involves monitoring (by a human observer or, if available, automated equipment) of an encoded 1 kHz audio sinewave from the audio output source (speaker, headphone, etc) and setting the RF signal level where the onset of audio defects (dropouts, burbles, "chirps", etc.) can just be heard in the sinewave in a 10-second listening period. This RF level is the OOI threshold for sensitivity.

In the case of a non-detachable aerial antenna, the RF signal level shall be high enough to reproduce an audibly defect-free audio signal for DAB and DAB+.

The AM, FM and DAB test signals are not included in the media supplied in Clause 5.

NOTE ETSI EN 300 401, Clause 7 and ETSI TS 102 563 provide additional information about DAB and DAB+.

5 Media

5.1 Online repository

All the SDR and HDR video signals referenced by this document can be downloaded from the publicly accessible IEC online repository at https://www.iec.ch/tc100/supportingdocuments. The test media can be downloaded individually.

NOTE For file download, you might have to use specific download functions or windows in your browser.

Table A.1 to Table A.6 list all the video signals used for the determination of power consumption with specific file name and media specification, grouped by frame rate, dynamic range and resolution.

The test media shall be downloaded and provided for the test as described in Clause 6. The test media may be updated and only the version of the video signals provided in the online repository shall be used. The notation for minor and major revisions of the test media made available in the IEC online repository is as follows:

a) Major revision (substantial update or change to the respective test media): part of a maintenance action resulting in a new edition of IEC 62087-2. A major revision of a test media shall be indicated by a new major version number. The original test media has the major version number one preceded with 'v' (v1-0).

   EXAMPLE 1 IEC_Broadcast_UHD_50p_HLG_HEVC_AAC_v1-0.MP4

b) Minor revision (small or editorial update or change to the respective test media): maintenance action of MT 62087 independently of a new edition of the standard. A minor revision of a test media shall be indicated by an increase of the minor version number. The original test media has the minor version number zero preceded by a hyphen (v1-0).

   EXAMPLE 2 IEC_Broadcast_UHD_50p_HLG_HEVC_AAC_v1-1.MP4

c) Change log: for the traceability of the history of revisions, a description of the change, the reason, and the date of the release of a new (sub-)version of a test media will be recorded in the overview document of IEC 62087-2 video signals in the IEC online repository.

5.2 Compatibility of test signals with previous packaged media

Test signals from physical media distributed for previous editions of this document shall not be used for this document.

6 Signal provision

6.1 General

The parts specific to product categories of the IEC 62087 series provide the requirements on the hierarchy of selection of test equipment and of the interfaces (input ports) to be used for the provision of test signals described in Chapter 4 during the measurements.

In 6.2, four categories of equipment that may be used to feed the test signals are described, while in 6.3 the possible interfaces with associated requirements are provided. The accuracy of video signal levels is addressed in 6.4.

6.2 Signal provision equipment

6.2.1 USB stick media inserted in a USB port of the UUT

A single USB stick of at least 32 GB that supports the chosen USB port's peak data rate and holds all the test media shall be inserted directly into the UUT's USB port. The USB stick should be formatted in either the FAT32 or ExFAT format. The UUTs native file player shall be used to play test files located on the USB stick. Before testing, confirm that the UUT remains in the same preset picture setting when switching from HDMI® input to USB input.

The manufacturer, model and storage size of the USB stick used shall be provided in the test report.

6.2.2 External audio-visual equipment

The audio-visual equipment used as a media player during the test shall be capable of playing the media specified in this document and shall be calibrated to conform with the accuracy required in 6.4. Depending on the input terminals to the UUT used during the measurement procedure, the audio-visual equipment shall provide the signals via interfaces as specified in 6.3.

If connecting a particular model of audio-visual equipment to the UUT causes any settings of the UUT to change, an alternate model shall be used during the measuring procedure. The steps below outline how to confirm and correct should a particular model of audio-visual equipment cause anomalous UUT power consumption readings during testing.

Some video sources with HDMI® outputs have been shown to offset the image rendering settings of the UUT, which in turn will likely lead to anomalous television set power consumption readings. Two possible causes have been identified: miscommunication between source and sink, and proprietary communications between source and sink. If a Blu-ray player is used as the source device, a Blu-ray player model that has a video setting which performs no additional processing (e.g. noise reduction, upscaling, or adjustment of colour, hue, contrast, or brightness) of the IEC test signals as delivered to the UUT shall be used.

To reduce the possibility of miscommunication, multiple models of audio-visual equipment may be connected, and a spot check of the power consumption may be performed with a static image. A model of audio-visual equipment that produces anomalous results shall not be used.

To reduce the likelihood of unwanted proprietary communications, audio-visual equipment from a different manufacturer than that of the UUT should be used. It is also recommended to verify correct signal communication by using a signal analyser in-between sink and source devices. Example properties to verify include but are not limited to the image size and frame rate, the chroma subsampling, signal range, any image manipulating metadata.

If a USB stick is used to provide the test media to the external audio-visual equipment, that USB stick shall meet the requirements specified in 6.2.1 and shall be inserted into the USB port on the external audio-visual equipment that is recommended by the manufacturer for media playback.

The manufacturer, model and configuration of the external audio-visual equipment shall be provided in the test report.

6.2.3 Service provider network equipment

The cable or satellite network service equipment used to provide live test signals for measurement shall be capable of providing the highest data rate and resolution specified by the manufacturer of the UUT. It shall be calibrated to conform with the accuracy required in 6.4.

The manufacturer, model and configuration of the service provider network equipment used shall be provided in the test report.

6.2.4 Audio signal generator

The equipment used to generate the sine-wave signals shall be capable of providing test signals as specified in 4.1.5. The accuracy may be confirmed with an oscilloscope, waveform monitor, vector scope or other appropriate measuring device.

The manufacturer, the model and essential settings of the equipment used as the audio signal generator shall be provided in the test report.

6.3 Interfaces

6.3.1 USB

The USB port recommended in the instruction manual for video file playback with the highest data rate specified (e.g. USB 3.0 supports higher data rates than USB 2.0) shall be selected.

If the HDMI® port and the USB port have different default picture settings, then either test with test signals from external audio-visual equipment (6.2) or select the USB input and manually ensure that the UUT is set to the default picture setting or the pre-set picture setting associated with the HDMI® input during all on-mode tests.

The version of the media available in the IEC online repository (see 5.1) for the purposes of this document and its related parts shall be installed on a USB stick. The USB stick shall be compatible with the USB terminal of the UUT or the external audio-visual equipment used for media provision. Testers shall confirm that the USB terminal used during testing supports the codecs necessary to play the corresponding downloaded media.

6.3.2 HDMI®

The version of any HDMI® source and HDMI® cable used for the purposes of this document and its related parts shall be compatible with the HDMI® terminal of the UUT. It is recommended that the source device support the latest available version of HDMI® compatible with the UUT. Testers shall confirm that the UUT's or the media player's HDMI® terminal used during testing supports the codecs necessary to play the corresponding downloaded media.

6.3.3 DisplayPort

The version of any DisplayPort source and DisplayPort cable used for the purposes of this document and its related parts shall be compatible with the DisplayPort terminal of the UUT. It is recommended that the source device supports the latest available version of DisplayPort compatible with the UUT. Testers shall confirm that the UUT's or the media player's DisplayPort terminal used during testing supports the codecs necessary to play the corresponding downloaded media.

6.3.4 Component analogue video

Any component analogue video source and component analogue video cable used for the purposes of this document and its related parts shall be compatible with the component analogue video terminal of the UUT.

NOTE This interface can be used for SD video signals in SDR and is not suitable for use with video signals in HD, UHD or in HDR.

6.3.5 S-Video

Any S-Video source and S-Video cable used for the purposes of this document and its related parts shall be compatible with the S-Video terminal of the UUT. It is recommended that the source device support the latest available version of S-Video compatible with the UUT.

NOTE This interface can be used for SD video signals in SDR and is not suitable for use with video signals in HD, UHD or in HDR.

6.3.6 Composite analogue video

Any composite analogue video source and composite analogue video cable used for the purposes of this document and its related parts shall be compatible with the composite analogue video terminal of the UUT.

NOTE This interface can be used for SD video signals in SDR and is not suitable for use with video signals in HD, UHD or in HDR.

6.3.7 Analogue terrestrial interface

If the UUT is being tested with an analogue terrestrial RF input signal, the signals used shall conform to IEC 60107-1:1997, 3.3, and shall have the input signal level set at −39 dB(mW) when terminated with a 75 Ω resistor or at a level to provide a perceptually noise-free and error-free picture.

NOTE −39 dB(mW) corresponds to 70 dB(μV).

6.3.8 Cable television interface

If the UUT is being tested with a cable television RF input signal, the signals used shall conform to the cable television specifications for the region and shall have the input signal level set at −49 dB(mW) when terminated with a 75 Ω resistor for digital signals or at a level to provide a better picture than the picture failure point (PF) as defined in IEC 62216 for digital signals or a perceptually noise-free and error-free picture for analogue signals.

NOTE −49 dB(mW) corresponds to 60 dB(μV).

6.3.9 Digital terrestrial interface

If the UUT is being tested with a digital terrestrial RF input signal, the signals used shall conform to the broadcast specifications for the region and shall have the input signal level set at −49 dB(mW) when terminated with a 75 Ω resistor or at a level to provide a better picture than the picture failure point (PF) as defined in IEC 62216 or a perceptually noise-free picture.

6.3.10 Satellite interface

If the UUT is being tested with a satellite input, the input signal level shall be set at −49 dB(mW) when terminated with a 75 Ω resistor or at a level to provide a better picture than the picture failure point (PF) as defined in IEC 62216:2009 for digital signals or a perceptually noise free and error free picture for analogue signals.

6.3.11 Network interfaces

If the UUT is being tested with a network (LAN) interface, the LAN shall support the capabilities of the UUT's network connection as selected per IEC 62087-3:2023, 6.2.10 "Network connection selection" and other parts of the IEC 62087 series where applicable.

6.3.12 Other interfaces

Signals provided to other input terminals of the UUT shall conform to the specifications for those inputs.

6.4 Accuracy of video signal levels

Analogue video signals provided by the audio-visual equipment shall be accurate to within 2 % of the full range of the video signal when terminated with a 75 Ω load. The accuracy of the black and white levels shall be confirmed with the three-bar video signal specified in 4.1.2.5. The accuracy of the colour levels shall be confirmed with the full-field colour bar video signal specified in 4.1.2.4. The accuracy may be confirmed with an oscilloscope, waveform monitor, vector scope or other appropriate measuring device.

Digital input signal levels shall be accurate to within the resolution of the signal source equipment used.

NOTE In addition to the three-bar and full-field colour bar signals, the 60 Hz SMPTE colour bar signal (SMPTE EG 1:1990) is included for the user's convenience.

Annex A
(normative)

Video signals used for the determination of power consumption

A.1 Source of test media (video signals)

In previous versions of this document, the test media was provided on a set of two DVDs and two Blu-ray discs. That test media included the common standard dynamic range (SDR) video formats for both standard definition (SD) and high definition (HD) in 16:9 aspect ratio for NTSC and PAL frame rates and common resolutions of 720 × 480, 720 × 576 and 1920 × 1080. Some of the prior test media was provided in interlaced format and some was in progressive format.

Beginning with this version of IEC 62087-2, new test media was necessary for the measurement of energy consumption by television sets capable of the new "static metadata" high dynamic range (HDR) content and the new ultra-high definition (UHD) video format of 3840 × 2160. Both the older SDR test media as well as the new HDR and UHD test media is available via download from an online repository (see Clause A.2) and is provided in progressive format to reduce the otherwise large number of downloads needed as well as reducing test time and test burden.

For more information on the characteristics of the test media included with this version, see Annex B, which includes details of both the original SDR test media metrics as well as the new HDR test media.

A.2 Test media (video signals) available for download from the IEC 62087-2 online repository

Table A.1 to Table A.6 show the video signals referenced by this document. All of the test media in these tables is downloadable from the publicly accessible online repository. For specific details on downloading the test media, see 5.1.

IMPORTANT: Use the appropriate test media BY FILE NAME from the table for the particular frame rate, SDR or HDR format and resolution that matches the capabilities of the UUT and any applicable regional regulatory testing requirements.

IMPORTANT: Use the latest version of the video signals as provided in the online repository described in 5.1. Table A.1 to Table A.6 below do not show the version of the test media.

NOTE The clip frame rate is compatible with, but does not always exactly match, the regional broadcast standard frame rate.

Table A.1 – 50p (50Hz) SDR SD video signals used for the determination of power consumption

Regional broadcast standard frame rate	SDR / HDR	RES	Test media description	IEC 62087-2 references	Downloadable test media file name	Downloadable test media specifications (as reported by MediaInfo[a] app)	Media duration (min)	Estimated download file size (MB)
50p (50Hz)	SDR	SD	Black level pattern (static)	4.1.2.1, 4.1.2.2	IEC_Black_SD_25p_SDR_HEVC_AAC.MP4	720 × 576 (16:9) 25p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	3,3
			White level pattern (static)	4.1.2.1, 4.1.2.3	IEC_White_SD_25p_SDR_HEVC_AAC.MP4	720 × 576 (16:9) 25p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	3,3
			Full field colour bar pattern (static)	4.1.2.1, 4.1.2.4	IEC_ColourBars_SD_25p_SDR_HEVC_AAC.MP4	720 × 576 (16:9) 25p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	3,4
			Three bar pattern (static)	4.1.2.1, 4.1.2.5, 4.2.2.1	IEC_ThreeBar_SD_25p_SDR_HEVC_AAC.MP4	720 × 576 (16:9) 25p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	3,3
			Broadcast video signal (dynamic)	4.1.3, 4.1.3.1, 4.1.3.2	IEC_Broadcast_SD_25p_SDR_HEVC_AAC.MP4	720 × 576 (16:9) 25p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	15 m 20 s	324,9
			Internet video signal (dynamic))	4.1.4	IEC_Internet_SD_25p_SDR_HEVC_AAC.MP4	720 × 576 (16:9) 25p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	15 m 20 s	68,7
			L20 Box/outline pattern (dynamic)	4.2.2.2	IEC_L20PeakLumMotion_SD_25p_SDR_HEVC_AAC.MP4	720 × 576 (16:9) 25p HEVC (High@L3.1) 6,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	40 s	1,6
			L40 Box/outline pattern (dynamic)	4.2.2.2	IEC_L40PeakLumMotion_SD_25p_SDR_HEVC_AAC.MP4	720 × 576 (16:9) 25p HEVC (High@L3.1) 6,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	40 s	1,5

a MediaInfo is a free, cross-platform and open-source program that displays technical information about media files, as well as tag information for many audio and video files [https://mediaarea.net/en/MediaInfo].

Table A.2 – 50p (50Hz) SDR HD and UHD video signals used for the determination of power consumption

Regional broadcast standard frame rate	SDR / HDR	RES	Test media description	IEC 62087-2 references	Downloadable test media file name	Downloadable test media specifications (as reported by MediaInfo app)	Media duration (min)	Estimated download file size (MB)
50p (50Hz)	SDR	HD	Black level pattern (static)	4.1.2.1, 4.1.2.2	IEC_Black_HD_50p_SDR_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	6,5
			White level pattern (static)	4.1.2.1, 4.1.2.3	IEC_White_HD_50p_SDR_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	5,7
			Full field colour bar pattern (static)	4.1.2.1, 4.1.2.4	IEC_ColourBars_HD_50p_SDR_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	7,3
			Three bar pattern (static)	4.1.2.1, 4.1.2.5, 4.2.2.1	IEC_ThreeBar_HD_50p_SDR_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	7,4
			Broadcast video signal (dynamic)	4.1.3, 4.1.3.1, 4.1.3.2	IEC_Broadcast_HD_50p_SDR_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (Main@High) 25/30 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	15 m 20 s	419
			Internet video signal (dynamic))	4.1.4	IEC_Internet_HD_50p_SDR_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (Main@High) 25/308 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	15 m 20 s	854,1
			L20 Box/outline pattern (dynamic)	4.2.2.2	IEC_L20PeakLumMotion_HD_50p_SDR_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (High@L4) 17 Mb/s YUV 4:2:0 8 bit; AAC LC 384 kbps 48 kHz 2-ch	40s	2,5
			L40 Box/outline pattern (dynamic)	4.2.2.2	IEC_L40PeakLumMotion_HD_50p_SDR_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (High@L4) 17 Mb/s YUV 4:2:0 8 bit; AAC LC 384 kbps 48 kHz 2-ch	40s	2,6
		UHD	L20 Box/outline pattern (dynamic)	4.2.2.2	IEC_L20PeakLumMotion_UHD_50p_SDR_HEVC_AAC.MP4	3840 × 2160 (16:9) 50p HEVC (High@L5.1) 75 Mb/s YUV 4:2:0 8 bit; AAC LC 384 kbps 48 kHz 2-ch	40s	3,8
			L40 Box/outline pattern (dynamic)	4.2.2.2	IEC_L40PeakLumMotion_UHD_50p_SDR_HEVC_AAC.MP4	3840 × 2160 (16:9) 50p HEVC (High@L5.1) 75 Mb/s YUV 4:2:0 8 bit; AAC LC 384 kbps 48 kHz 2-ch	40s	3,8

Table A.3 – 50p (50Hz) HDR HD and UHD video signals used for the determination of power consumption

Regional broadcast standard frame rate	SDR / HDR	RES	Test media description	IEC 62087-2 references	Downloadable test media file name	Downloadable test media specifications (as reported by MediaInfo app)	Media duration (min)	Estimated download file size (MB)
50p (50Hz)	HDR	HD	Broadcast video signal – 25Hz – HDR10	4.1.3.3	IEC_Broadcast_HD_25p_HDR10_HEVC_AAC.MP4	1920 × 1080 (16:9) 25p HEVC (Main10@L5.1) PQ 16,7 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	683
			Broadcast video signal – 25Hz – HLG	4.1.3.3	IEC_Broadcast_HD_25p_HLG_HEVC_AAC.MP4	1920 × 1080 (16:9) 25p HEVC (Main10@L5.1) HLG 17,3 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	705,4
			Broadcast video signal – 50Hz – HDR10	4.1.3.3	IEC_Broadcast_HD_50p_HDR10_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (Main10@L5.1) PQ 16,5 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	673,6
			Broadcast video signal – 50Hz – HLG	4.1.3.3	IEC_Broadcast_HD_50p_HLG_HEVC_AAC.MP4	1920 × 1080 (16:9) 50p HEVC (Main10@L5.1) HLG 16,5 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	670,7
		UHD	Broadcast video signal – 50Hz – HDR10	4.1.3.3	IEC_Broadcast_UHD_50p_HDR10_HEVC_AAC.MP4	3840 × 1080 (16:9) 50p HEVC (Main10@L5.1) PQ 26,2 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	1 070
			Broadcast video signal – 50Hz – HLG	4.1.3.3	IEC_Broadcast_UHD_50p_HLG_HEVC_AAC.MP4	3840 × 1080 (16:9) 50p HEVC (Main10@L5.1) HLG 26,7 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	1 080

Table A.4 – 59,94p (60Hz) SDR SD video signals used for the determination of power consumption

Regional broadcast standard frame rate	SDR / HDR	RES	Test media description	IEC 62087-2 References	Downloadable test media file name	Downloadable test media specifications (as reported by MediaInfo app)	Media duration (min)	Estimated download file size (MB)
59,94p (60Hz)	**SDR**	**SD**	60Hz colour bar pattern (static)	4.1.2.1, 4.1.2.4	IEC_NTSC-Bars_SD_5994p_SDR_HEVC_AAC.MP4	720 × 480 (16:9) 59,94p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48kHz 2-ch	3 m 10 s	4,5
			Black level pattern (static)	4.1.2.1, 4.1.2.2	IEC_Black_SD_5994p_SDR_HEVC _AAC.MP4	720 × 480 (16:9) 59,94p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8bit; AAC LC 128 kb/s 48 kHz 2-ch	3 m 10 s	3,6
			White level pattern (static)	4.1.2.1, 4.1.2.3	IEC_White_SD_5994p_SDR_HEVC _AAC.MP4	720 × 480 (16:9) 59,94p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8bit; AAC LC 128 kb/s 48 kHz 2-ch	3 m 10 s	3,6
			Full field colour bar pattern (static)	4.1.2.1, 4.1.2.4	IEC_ColourBars_SD_5994p_SDR_HEVC _AAC.MP4	720 × 480 (16:9) 59,94p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	3 m 10 s	3,8
			Three bar pattern (static)	4.1.2.1, 4.1.2.5, 4.2.2.1	IEC_ThreeBar_SD_5994p_SDR_HEVC _AAC.MP4	720 × 480 (16:9) 59,94p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	3 m 10 s	3,6
			Broadcast video signal (dynamic)	4.1.3, 4.1.3.1, 4.1.3.2	IEC_Broadcast_SD_5994p_SDR_HEVC _AAC.MP4	720 × 480 (16:9) 59,94p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	15 m 20 s	553
			Internet video signal (dynamic))	4.1.4	IEC_Internet_SD_5994p_SDR_HEVC _AAC.MP4	720 × 480 (16:9) 59,94p HEVC (Main@Main) 9,5 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	15 m 20 s	89,5
			L20 Box/outline pattern (dynamic)	4.2.2.2	IEC_L20PeakLumMotion_SD_5994p_SDR _HEVC_AAC.MP4	720 × 480 (16:9) 59,94p HEVC (Main@L4) 433 kb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	40s	2,3
			L40 Box/outline pattern (dynamic)	4.2.2.2	IEC_L40PeakLumMotion_SD_5994p_SDR_ HEVC_AAC.MP4	720 × 480 (16:9) 59,94p HEVC (Main@L4) 428 kb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	40s	2,3

Table A.5 – 59,94p (60Hz) SDR HD and UHD video signals used for the determination of power consumption

Regional broadcast standard frame rate	SDR / HDR	RES	Test media description	IEC 62087-2 references	Downloadable test media file name	Downloadable test media specifications (as reported by MediaInfo app)	Media duration (min)	Estimated download file size (MB)
59,94p (60Hz)	SDR	HD	60Hz colour bar pattern (static)	4.1.2.1, 4.1.2.4	IEC_NTSC-Bars_HD_5994p_SDR_HEVC _AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	8,5
			Black level pattern (static)	4.1.2.1, 4.1.2.2	IEC_Black_HD_5994p_SDR_HEVC _AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	7,2
			White level pattern (static)	4.1.2.1, 4.1.2.3	IEC_White_HD_5994p_SDR_HEVC _AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	6,2
			Full field colour bar pattern (static)	4.1.2.1, 4.1.2.4	IEC_ColourBars_HD_5994p_SDR_HEVC _AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	7,4
			Three bar pattern (static)	4.1.2.1, 4.1.2.5, 4.2.2.1	IEC_ThreeBar_HD_5994p_SDR_HEVC _AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	3 m 10 s	8,1
			Broadcast video signal (dynamic)	4.1.3, 4.1.3.1, 4.1.3.2	IEC_Broadcast_HD_5994_SDR_HEVC _AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	15 m 20 s	939,7
			Internet video signal (dynamic)	4.1.4	IEC_Internet_HD_5994p_SDR_HEVC _AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main@High) 18 Mb/s YUV 4:2:0 8 bit; AAC LC 128 kbps 48 kHz 2-ch	15 m 20 s	341,8
			L20 Box/outline pattern (dynamic)	4.2.2.2	IEC_L20PeakLumMotion_HD_5994p_SDR _HEVC_AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main@L5.1) 552 kb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	40s	2,8
			L40 Box/outline pattern (dynamic)	4.2.2.2	IEC_L40PeakLumMotion_HD_5994p_SDR _HEVC_AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main@L5.1) 577 kb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	40s	2,9
		UHD	L20 Box/outline pattern (dynamic)	4.2.2.2	IEC_L20PeakLumMotion_UHD_5994p_SDR _HEVC_AAC.MP4	3840 × 2160 (16:9) 59,94p HEVC (Main@L5.1) 778 kb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	40s	3,9
			L40 Box/outline pattern (dynamic)	4.2.2.2	IEC_L40PeakLumMotion_UHD_5994p_SDR _HEVC_AAC.MP4	3840 × 2160 (16:9) 59,94p HEVC (Main@L5.1) 824 kb/s YUV 4:2:0 8 bit; AAC LC 128 kb/s 48 kHz 2-ch	40s	4,1

Table A.6 – 59,94p (60Hz) HDR HD and UHD video signals used for the determination of power consumption

Regional broadcast standard frame rate	SDR / HDR	RES	Test media description	IEC 62087-2 references	Downloadable test media file name	Downloadable test media specifications (as reported by MediaInfo app)	Media duration (min)	Estimated download file size (MB)
59,94p (60Hz)	HDR	HD	Broadcast video signal – 59.94P – HDR10	4.1.3.3	IEC_Broadcast_HD_5994p_HDR10_HEVC_AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main10@L5.1) PQ 14,6 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	597,9
			Broadcast video signal – 59.94P – HLG	4.1.3.3	IEC_Broadcast_HD_5994p_HLG_HEVC_AAC.MP4	1920 × 1080 (16:9) 59,94p HEVC (Main10@L5.1) HLG 14,3 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	586
			Broadcast video signal – 23.976P – HDR10	4.1.3.3	IEC_Broadcast_HD_23976p_HDR10_HEVC_AAC.MP4	1920 × 1080 (16:9) 23,976p HEVC (Main10@L5.1) PQ 16,8 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	683,4
			Broadcast video signal – 23.976P – HLG	4.1.3.3	IEC_Broadcast_HD_23976p_HLG_HEVC_AAC.MP4	1920 × 1080 (16:9) 23,976p HEVC (Main10@L5.1) HLG 17,3 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48 kHz 2-ch	10 m 13 s	706,4
		UHD	Broadcast video signal – 59.94P – HDR10	4.1.3.3	IEC_Broadcast_UHD_5994p_HDR10_HEVC_AAC.MP4	3840 × 2160 (16:9) 59,94p HEVC (Main10@L5.1) PQ 23,4 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48kHz 2-ch	10 m 13 s	953,5
			Broadcast video signal – 59.94P – HLG	4.1.3.3	IEC_Broadcast_UHD_5994p_HLG_HEVC_AAC.MP4	3840 × 2160 (16:9) 59,94p HEVC (Main10@L5.1) HLG 23,0 Mb/s YUV 4:2:0 10 bit; AAC LC 192 kb/s 48kHz 2-ch	10 m 13 s	938,3

Annex B
(informative)

Description of video signals used for the determination of power consumption

B.1 General

Power consumption of some equipment, such as television sets, can vary depending on the APL′ of the displayed images.

Three video signal categories are available. These include:

– static video signals (4.1.2).
– dynamic broadcast-content video signals in various formats including SDR and HDR (4.1.3).
– Internet-content video signals (4.1.4).

Either the static video signals or the dynamic broadcast-content video signals are intended to be used when determining power consumption of equipment that typically uses broadcast-type video content, such as television sets.

NOTE The Internet-content video signal is not intended to emulate dynamic video material that is often downloaded or streamed from the Internet. Dynamic video is best represented by the dynamic broadcast-content video signal specified in 4.1.3.

B.2 Static video signals

The static video signal method was initially developed by JEITA in Japan for determining television set power consumption.

Measurement of power consumption based on the static video signals can be chosen for the simplicity of the test. The static signals can also be appropriate for use with equipment that typically does not have a video input or is typically not capable of playing video streams.

Power consumption measurements using static signals can often be performed directly by means of a wattmeter.

B.3 Dynamic broadcast-content video signals (SDR)

The APL′ of the SDR dynamic broadcast-content video signal was chosen to best emulate the actual APL′ determined by analysing content from all over the world. During development of IEC 62087:2008, the project members measured at least 40 h of typical broadcast content (all SDR content at the time), including a variety of genres from a variety of broadcast stations in Australia, Japan, the Netherlands, the United Kingdom and the United States. The global APL′ curves captured from each content piece were averaged to create a target APL′ curve, known as the master histogram.

The mean of the APL′ histogram is 34 %.

The project members acquired video content that was donated to the IEC by the content owners. A computer program was used to randomly select scenes that best matched the SDR master histogram.

Figure B.1 shows the APL′ histograms of the SDR test disc and the SDR master video. The data is described in Clause B.5.

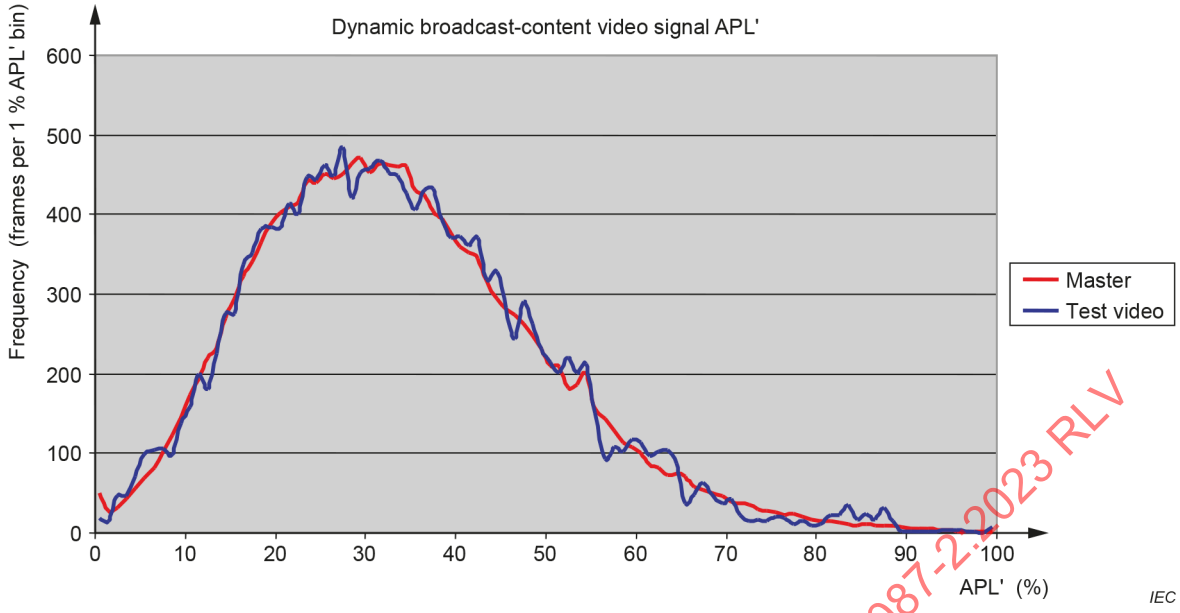

Figure B.1 – SDR Dynamic broadcast-content video signal APL′

HDR dynamic broadcast-content data and further details are provided in IEC TR 63274.

B.4 Internet-content video signals

The APL′ of the Internet-content video signal was chosen to best emulate the actual APL′ of popular web pages.

During development of IEC 62087:2008, the project members acquired screen shots of web-pages from United States Government websites, including that of EPA ENERGY STAR®, because according to United States Code Title 17, Section 105, "copyright protection is not provided for any work produced by the United States Government". The test images were chosen to best match the APL′ of the most popular 100 web pages as determined during development of the document.

The project members chose test images that were believed to be inoffensive. However, in order to ensure 100 % acceptability across all cultures internationally, some images were scrambled. Tests have confirmed that the scrambling has an inconsequential effect on the power consumed.

Figure B.2 shows the APL′ histograms of the Top-100 web pages and test images, with a mean APL' of 81 %. In this figure, the solid line shows that the APL' histogram approximates an inverse chi-square distribution.

NOTE The Internet-content video signal is not intended to emulate dynamic video material that is often downloaded or streamed from the Internet. Dynamic video is best represented by the dynamic broadcast-content video signal specified in 4.1.3.

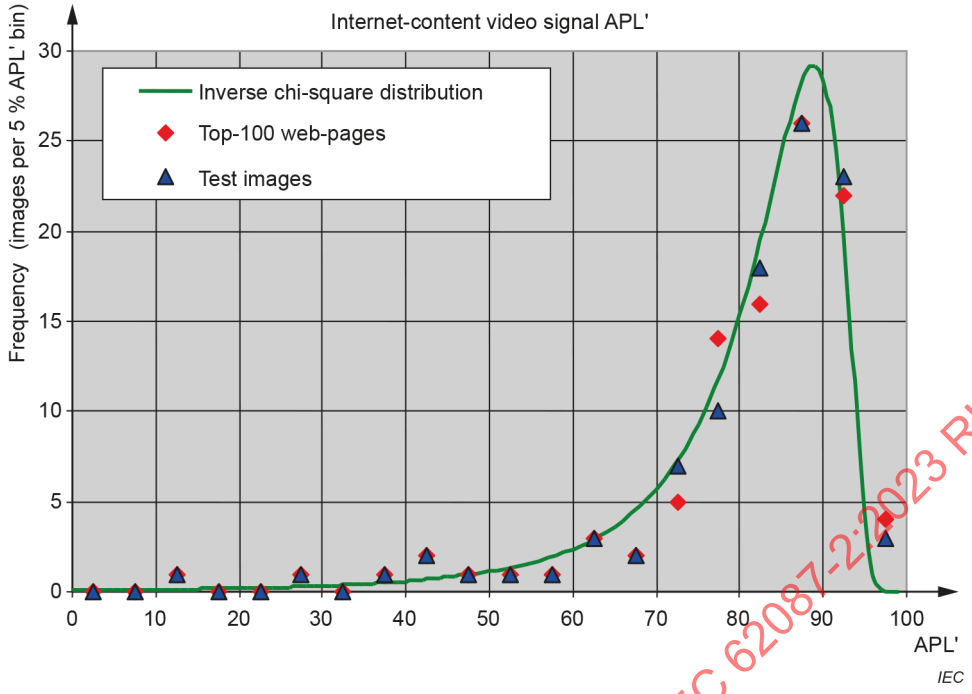

Figure B.2 – Internet-content video signal APL′

B.5 Dynamic broadcast-content data (SDR)

Table B.1 shows the frequency of frames in the SDR test video and the SDR master video in 1 % APL′ bins. The percentage of SDR master video frames in each bin is also shown. The scenes in the SDR test video were chosen to best match the master video histogram.

Table B.1 – SDR Dynamic broadcast-content data

APL′ bin %	Test video frequency	Master video frequency	Master video %
0,5	18	51,0	0,28
1,5	15	27,9	0,16
2,5	47	31,0	0,17
3,5	46	42,9	0,24
4,5	71	56,3	0,31
5,5	98	69,3	0,39
6,5	105	81,3	0,45
7,5	107	102,6	0,57
8,5	98	122,6	0,68
9,5	137	144,8	0,81
10,5	159	173,4	0,96
11,5	199	193,7	1,08
12,5	180	220,0	1,22
13,5	225	233,8	1,30
14,5	275	270,7	1,51
15,5	276	294,3	1,64
16,5	338	322,1	1,79
17,5	352	340,2	1,89
18,5	382	365,9	2,03
19,5	383	389,3	2,16

APL' bin %	Test video frequency	Master video frequency	Master video %
20,5	384	402,9	2,24
21,5	413	410,8	2,28
22,5	400	415,6	2,31
23,5	447	441,8	2,46
24,5	443	439,7	2,44
25,5	462	450,3	2,50
26,5	449	445,4	2,48
27,5	485	451,4	2,51
28,5	421	463,7	2,58
29,5	453	471,1	2,62
30,5	458	453,3	2,52
31,5	468	464,0	2,58
32,5	452	462,1	2,57
33,5	450	460,2	2,56
34,5	426	460,4	2,56
35,5	406	431,0	2,40
36,5	430	424,8	2,36
37,5	432	403,9	2,25
38,5	394	394,2	2,19
39,5	371	375,5	2,09
40,5	372	359,7	2,00
41,5	362	352,5	1,96
42,5	370	345,1	1,92
43,5	319	315,9	1,76
44,5	328	294,4	1,64
45,5	283	280,6	1,56
46,5	244	274,7	1,53
47,5	291	262,6	1,46
48,5	262	247,9	1,38
49,5	231	231,3	1,29
50,5	214	209,7	1,17
51,5	202	209,2	1,16
52,5	219	182,8	1,02
53,5	201	185,9	1,03
54,5	212	200,9	1,12
55,5	151	156,9	0,87
56,5	94	143,6	0,80
57,5	109	128,8	0,72
58,5	102	113,7	0,63
59,5	118	108,1	0,60
60,5	114	100,0	0,56
61,5	96	86,1	0,48
62,5	103	81,5	0,45
63,5	104	73,2	0,41
64,5	87	75,0	0,42
65,5	37	70,0	0,39
66,5	48	58,6	0,33
67,5	63	54,0	0,30
68,5	48	51,0	0,28
69,5	37	46,6	0,26

APL′ bin %	Test video frequency	Master video frequency	Master video %
70,5	43	39,8	0,22
71,5	22	38,2	0,21
72,5	14	35,2	0,20
73,5	16	30,5	0,17
74,5	15	27,6	0,15
75,5	21	26,6	0,15
76,5	19	22,7	0,13
77,5	11	23,9	0,13
78,5	14	20,9	0,12
79,5	10	17,5	0,10
80,5	12	14,6	0,08
81,5	23	14,4	0,08
82,5	23	14,0	0,08
83,5	35	11,7	0,06
84,5	16	9,9	0,06
85,5	25	10,6	0,06
86,5	17	9,1	0,05
87,5	31	8,9	0,05
88,5	15	8,4	0,05
89,5	1	8,0	0,04
90,5	2	5,9	0,03
91,5	2	5,3	0,03
92,5	1	5,5	0,03
93,5	1	4,5	0,03
94,5	3	3,4	0,02
95,5	3	2,4	0,01
96,5	1	1,6	0,01
97,5	2	1,9	0,01
98,5	0	1,9	0,01
99,5	8	1,7	0,01
Frequency is the number of frames per 1 % APL′ bin.			

HDR dynamic broadcast-content data and further details are provided in IEC TR 63274.

B.6 Internet-content data

Table B.2 shows the frequency of the test images and the "Top 100" images in 5 % APL′ bins. The scenes in the test images were chosen to best match the "Top 100" histogram.

Table B.2 – Internet-content data

APL' bin %	Top 100 frequency	Test images frequency
2,5	0	0
7,5	0	0
12,5	1	1
17,5	0	0
22,5	0	0
27,5	1	1
32,5	0	0
37,5	1	1
42,5	2	2
47,5	1	1
52,5	1	1
57,5	1	1
62,5	3	3
67,5	2	2
72,5	5	7
77,5	14	10
82,5	16	18
87,5	26	26
92,5	22	23
97,5	4	3
Frequency is the number of frames per 5 % APL' bin.		

B.7 Dynamic broadcast-content video signals (HDR)

The dynamic broadcast-content video signals using static metadata HDR formats HLG and HDR10 were created by adapting the study, testing and vetting of similar video content already in the consumer market from various sources. The details, results and recommendations of that team are publicly available in IEC TR 63274.

Annex C
(informative)

Description of video signals used for the determination of the peak luminance ratio

C.1 General

When choosing the signal to be used for the determination of the peak luminance ratio, the APL of the signal should be considered. Emissive display technologies are known to employ power limiting circuits that reduce display luminance under high APL conditions. Backlit display technologies can also vary their output based on signal APL, especially if they are using a spatially modulated backlight unit.

For each of these signals, a single measurement in the centre of the display is recommended for determining luminance in each picture setting of interest.

C.2 Three-bar video signal

The ENERGY STAR® program and some North American regulations use the three-bar video signal described in 4.2.2.1 (and 4.1.2.5) for determining the peak luminance ratio. This signal has a relatively high APL and is likely to trigger power limiting in the display. IEC 62087:2008 made this signal available for determination of power consumption, so it has been convenient to use for determination of peak luminance values as well.

C.3 Dynamic box and outline video signal

The dynamic box and outline video signals described in 4.2.2.2 are introduced in this edition of this document and are intended to qualify the effects of power limiting. However, no single applicable video signal can guarantee the absence of power limitations for all models of equipment.

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5 Withdrawn. This former edition of IEC 62087 is given for the sake of backwards traceability, and because it is referred to in this edition.

6 Withdrawn. This former edition of IEC 62087 is given for the sake of backwards traceability, and because it is referred to in this edition.

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SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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APPAREILS AUDIO, VIDÉO ET MATÉRIEL CONNEXE – DÉTERMINATION DE LA CONSOMMATION DE PUISSANCE –

Partie 2: Signaux et supports

AVANT-PROPOS

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Cette deuxième édition annule et remplace la première édition parue en 2015. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) ajout des signaux d'essai vidéo HDR et UHD;

b) ajout des signaux d'essai de boîte et de contour dynamiques, qui remplacent les signaux d'essai de boîte et de contour statiques;

c) mise à disposition de l'ensemble des signaux d'essai sous forme de fichiers multimédias à télécharger à partir d'un référentiel en ligne spécifié de l'IEC, qui remplace les supports DVD et Blu-ray précédents.

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
100/3771/CDV	100/3848/RVC

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Une liste de toutes les parties de la série IEC 62087, publiées sous le titre général *Appareils audio, vidéo et matériel connexe – Détermination de la consommation de puissance*, se trouve sur le site web de l'IEC.

Cette publication contient plusieurs signaux d'essai téléchargeables à partir d'un référentiel en ligne spécifié de l'IEC, disponibles à l'adresse https://www.iec.ch/tc100/supportingdocuments. Ces fichiers font partie intégrante de la présente norme.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/publications.

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INTRODUCTION

Le présent document identifie les signaux d'essai à utiliser pour déterminer la consommation de puissance, ainsi que les caractéristiques associées qui sont spécifiées dans d'autres parties de la série IEC 62087.

Dans l'IEC 62087:2008[1] (deuxième édition), des méthodes ont été ajoutées pour le mesurage de la consommation de puissance en mode marche (moyenne) des téléviseurs; elles reposent sur trois jeux de signaux vidéo. Ces signaux comportent des signaux statiques, des signaux de contenu de radiodiffusion dynamique et des signaux de contenu Internet.

L'IEC 62087:2011[2] (troisième édition) a révisé les méthodes de mesure de la consommation de puissance des boîtiers décodeurs. Les signaux et supports n'ont pas été modifiés dans cette troisième édition.

L'IEC 62087-2:2015[3] (première édition) décrit les signaux et supports à utiliser pour déterminer la consommation de puissance, ainsi que les caractéristiques associées, dans une partie spécifique. Les trois jeux de signaux vidéo d'origine (statiques, contenu de radiodiffusion dynamique et contenu Internet) ne sont pas modifiés. La présente édition ajoute des signaux pour déterminer le rapport de luminance de crête qui est parfois associé aux programmes de mesurage de la consommation de puissance des téléviseurs.

Cette deuxième édition de l'IEC 62087-2 ajoute les signaux d'essai vidéo HDR et UHD, ainsi que les signaux d'essai de boîte et de contour dynamiques pour les essais de consommation de puissance des téléviseurs. Tous les signaux d'essai sont disponibles en téléchargement à partir d'un référentiel en ligne spécifié de l'IEC, qui remplace la distribution de supports physiques précédente.

La série IEC 62087 contient actuellement les parties publiées suivantes:

– Partie 1: Généralités;
– Partie 2: Signaux et supports;
– Partie 3: Téléviseurs;
– Partie 4: Video recording equipment (disponible en anglais seulement);
– Partie 5: Set-top boxes (disponible en anglais seulement);
– Partie 6: Matériel audio;
– Partie 7: Moniteurs d'ordinateurs.

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1 IEC 62087:2008, *Méthodes de mesure de la consommation de puissance des appareils audio, vidéo et du matériel connexe*

2 IEC 62087:2011, *Méthodes de mesure de la consommation de puissance des appareils audio, vidéo et du matériel connexe*

3 IEC 62087-2:2015, *Appareils audio, vidéo et matériel connexe – Détermination de la consommation de puissance – Partie 2: Signaux et supports*

APPAREILS AUDIO, VIDÉO ET MATÉRIEL CONNEXE – DÉTERMINATION DE LA CONSOMMATION DE PUISSANCE –

Partie 2: Signaux et supports

1 Domaine d'application

La présente partie de l'IEC 62087 spécifie les signaux utilisés pour déterminer la consommation de puissance des appareils audio, vidéo et du matériel connexe, tels que les téléviseurs et les moniteurs d'ordinateurs. Elle spécifie également des signaux pour déterminer le rapport de luminance de crête qui est parfois associé aux programmes de mesurage de la consommation de puissance des téléviseurs. En outre, la présente partie spécifie le matériel, les interfaces ainsi que l'exactitude associés à la génération de ces signaux.

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60107-1:1997, *Méthodes de mesures applicables aux récepteurs de télévision – Partie 1: Considérations générales – Mesures aux domaines radiofréquences et vidéofréquences*

IEC 60268-1, *Equipements pour systèmes électroacoustiques – Première partie: Généralités*

IEC 60315-1:1988, *Méthodes de mesure applicables aux récepteurs radioélectriques pour diverses classes d'émission – Première partie: Considérations générales et méthodes de mesure, y compris mesures aux fréquences audioélectriques*

IEC 60315-3:1997, *Méthodes de mesure applicables aux récepteurs radioélectriques pour diverses classes d'émission – Troisième partie: Récepteurs pour émissions de radiodiffusion à modulation d'amplitude*

IEC 60315-4:1997, *Méthodes de mesure applicables aux récepteurs radioélectriques pour diverses classes d'émission – Partie 4: Récepteurs pour émissions de radiodiffusion en modulation de fréquence*

IEC 60958-1, *Interface audionumérique – Partie 1: Généralités*

IEC 60958-3, *Interface audionumérique – Partie 3: Applications grand public*

IEC 61938, *Systèmes multimédia – Guide des caractéristiques recommandées des interfaces analogiques permettant d'obtenir l'interopérabilité*

IEC 62087-1, *Appareils audio, vidéo et matériel connexe – Détermination de la consommation de puissance – Partie 1: Généralités*

IEC 62216, *Récepteurs de télévision numérique terrestre pour le système DVB-T*

Recommandation UIT-R BT.2100-2, *Valeurs des paramètres de l'image dans le cas de systèmes de télévision à grande plage dynamique à utiliser pour la production et l'échange international de programmes*

3 Termes, définitions et abréviations

3.1 Termes et définitions

Pour les besoins du présent document, les termes et définitions de l'IEC 62087-1 ainsi que les suivants s'appliquent.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse https://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse https://www.iso.org/obp

3.1.1
niveau moyen d'image
APL
niveau moyen de tous les pixels d'une seule trame de signal vidéo ou de l'un de ses groupes dans le domaine de la luminance linéaire

EXEMPLE Équipements d'affichage tel que les téléviseurs ou les moniteurs d'ordinateurs qui utilisent le codage linéaire de manière interne après avoir éliminé la non-linéarité du signal d'entrée.

Note 1 à l'article: L'abréviation "APL" est dérivée du terme anglais développé correspondant "average picture level".

3.1.2
afficheur rétroéclairé
afficheur qui restitue la lumière émise par une source placée derrière le panneau d'affichage

EXEMPLE Affichage à cristaux liquides (LCD)

3.1.3
vidéo analogique en composantes
interface vidéo analogique en bande de base qui achemine un signal vidéo couleur de définition normale ou à haute définition sur trois lignes de signaux

Note 1 à l'article: Voir la CTA-770.3-E R-2017.

3.1.4
vidéo analogique composite
interface vidéo analogique en bande de base qui achemine un signal vidéo couleur de définition normale sur une seule ligne de signal

Note 1 à l'article: Voir la SMPTE ST 170M:2004 pour la version 59,94 Hz et l'UIT-R BT.470-5 pour la version 50 Hz.

3.1.5
interface visuelle numérique
DVI
interface vidéo qui peut acheminer une vidéo analogique ou numérique non compressée

Note 1 à l'article: L'abréviation "DVI" est dérivée du terme anglais développé correspondant "digital visual interface".

3.1.6
DisplayPort
interface d'affichage numérique élaborée par la Video Electronics Standards Association

3.1.7
afficheur émissif
afficheur qui restitue directement la lumière de chaque sous-pixel

EXEMPLE Affichages PDP ou OLED

3.1.8
niveau moyen d'image fondé sur un signal d'entrée non linéaire
APL′
niveau moyen de tous les pixels d'une seule trame de signal vidéo ou de l'un de ses groupes dans le domaine de la luminance non linéaire

EXEMPLE Les équipements d'affichage tels que les téléviseurs ou les moniteurs d'ordinateurs reçoivent des signaux d'entrée qui codent la luminance ou la luminosité de manière non linéaire. Les fonctions de transfert électrooptique (EOTF, *Electro-Optical Transfer Function*) (UIT-R BT.2100-2) PQ (luminance absolue) et HLG (luminosité) constituent des exemples de ce type de codage non linéaire.

Note 1 à l'article: L'APL′ est défini comme le pourcentage de la plage entre le niveau de noir de référence et le niveau de blanc de référence.

Note 2 à l'article: L'APL′ n'est pas une mesure du signal linéaire qui peut être disponible dans certains équipements d'affichage et fourni au dispositif d'affichage. Les propriétés des signaux vidéo externes et internes ainsi que les différences entre celles-ci sont représentées à la Figure 1.

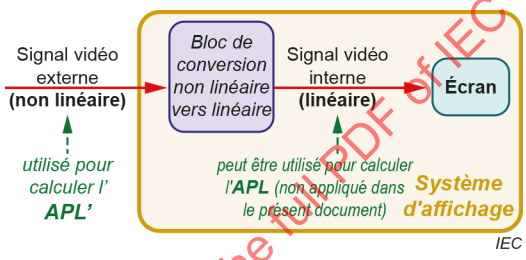

Figure 1 – Occurrence des codages de signaux linéaire et non linéaire dans le contexte d'un pipeline de traitement d'affichage type pour calculer l'APL et l'APL'

3.1.9
hybrid log-gamma
HLG
ensemble de fonctions de transfert qui offre un certain degré de rétrocompatibilité en raison de sa correspondance plus étroite avec les courbes de transfert de téléviseurs précédemment établies

Note 1 à l'article: Des ensembles de fonctions de transfert liés aux signaux HDR sont spécifiés dans la Recommandation UIT-R BT.2100-2.

Note 2 à l'article: HLG décrit une fonction de transfert spécifique et désigne d'autre part un nom de format vidéo.

3.1.10
vidéo à grande plage dynamique
vidéo HDR
capacité des éléments d'un pipeline vidéo à recueillir, traiter, acheminer ou afficher des niveaux de luminance et des dégradés de teintes qui dépassent les capacités des éléments de pipelines d'imagerie SDR conventionnels

EXEMPLE Un signal vidéo HDR utilise habituellement une profondeur de bit, une luminance et un volume de couleurs plus importants que la vidéo à plage dynamique standard (SDR). Il utilise aussi généralement différentes courbes de teintes, telles que les courbes PQ et HLG spécifiées dans l'UIT-R BT.2100, plutôt que le gamma qui est utilisé avec la SDR. Lorsque le signal vidéo HDR est rendu sur un affichage HDR, des plages de luminance et une gamme de couleurs plus étendues peuvent être observées

Note 1 à l'article: La vidéo HDR peut offrir une expérience améliorée au spectateur et peut représenter plus fidèlement des scènes qui contiennent, dans une même image, des zones très sombres et des zones très lumineuses, créées par exemple par des sources de lumière et des réflexions.

Note 2 à l'article: L'abréviation "HDR" est dérivée du terme anglais développé correspondant "high dynamic range".

3.1.11
haute définition
HD
résolution vidéo spatiale comprise entre 1 280 × 720 et 1 920 × 1 080

3.1.12
ultra-haute définition
UHD
Ultra HD
résolution vidéo spatiale supérieure à 1 920 × 1 080

3.1.13
bus universel en série
USB
interface numérique qui peut être utilisée pour connecter des supports de stockage et des périphériques à des appareils numériques tels que des ordinateurs et des téléviseurs

Note 1 à l'article: Voir la spécification USB.

Note 2 à l'article: L'abréviation "USB" est dérivée du terme anglais développé correspondant "universal serial bus".

3.1.14
interface multimédia haute définition
HDMI®
interface audiovisuelle qui est capable d'acheminer des données vidéo non compressées, des données audionumériques compressées ou non compressées, ainsi que d'autres informations

Note 1 à l'article: Voir la spécification HDMI®.

Note 2 à l'article: L'abréviation "HDMI" est dérivée du terme anglais développé correspondant "high definition multimedia interface".

3.1.15
vidéo à plage dynamique standard
vidéo SDR
capacité des éléments d'un pipeline vidéo à recueillir, traiter, acheminer ou afficher des niveaux de luminance et des dégradés de teintes qui peuvent être caractérisés par les capacités de plage dynamique, de rendu des couleurs et de dégradés de teintes fondamentalement compatibles avec les afficheurs à tube cathodique (CRT, *Cathode Ray Tube*)

EXEMPLE BT.709/BT.1886 et IEC 62966-2-1 (sRVB)

Note 1 à l'article: L'abréviation "SDR" est dérivée du terme anglais développé correspondant "standard dynamic range".

3.1.16
S-video
interface vidéo analogique en bande de base qui achemine un signal vidéo couleur de définition normale en utilisant deux lignes de signaux

Note 1 à l'article: Voir l'IEC 60933-5.

3.2 Abréviations

′	Prime (indique que le signal n'est pas linéaire, par exemple APL')
AM (Amplitude Modulation)	Modulation d'amplitude
AV	Audiovisuel

BD	Blu-ray Disc™[4]
BER (Bit Error Ratio)	Taux d'erreur binaire
C/N (Carrier To Noise Ratio)	Rapport porteuse sur bruit
DAB (Digital Audio Broadcast	Radiodiffusion audionumérique
dB	Décibel
DVD (Digital Versatile Disc)	Disque numérique polyvalent
f.é.m	Force électromotrice
EPA (Environmental Protection Agency)	Agence pour la protection de l'environnement
FM (Frequency Modulation)	Modulation de fréquence
Hz	Hertz
HDMI® (High Definition Multimedia Interface)	Interface multimédia haute définition
JEITA	Japan Electronics and Information Technology industries Association
kb/s	Kilobits par seconde
LCD (Liquid Crystal Display)	Affichage à cristaux liquides
LAN (Local Area Network)	Réseau local
Mb/s	Mégabits par seconde
NTSC	National Television Standards Committee
OLED (Organic Light-Emitting Diode)	Diode électroluminescente organique
OOI (Acoustic Onset Of Impairment)	Seuil acoustique de dégradation
PAL (Phase Alternating Line)	Ligne à phase alternée
PDP (Plasma Display Panel)	Panneau d'affichage à plasma
RF	Radiofréquence
efficace	valeur efficace
SECAM	Séquentiel couleur à mémoire
SMPTE	Society of Motion Picture and Television Engineers
USB (Universal Serial Bus)	Bus universel en série
UUT (Unit Under Test)	Unité en essai

NOTE Les termes dispositif en essai (DUT, *Device Under Test*) et équipement en essai (EUT, *Equipment Under Test*) sont également employés.

4 Signaux

4.1 Signaux audiovisuels utilisés pour déterminer la consommation de puissance

4.1.1 Vue d'ensemble

Pour les informations générales sur les signaux SDR, voir les 4.1.2, 4.1.3.2 et 4.1.4. Pour les informations générales sur les signaux HDR, voir le 4.1.3.3. Le format vidéo HDR HLG utilise des ensembles de fonctions de transfert (EOTF) spécifiés dans la Recommandation

[4] Blu-ray Disc™ est une appellation commerciale de Blu-ray Disc Association. Cette information est donnée à l'intention des utilisateurs du présent document et ne signifie nullement que l'IEC approuve l'emploi du produit ainsi désigné. Des produits équivalents peuvent être utilisés s'il est démontré qu'ils aboutissent aux mêmes résultats.

UIT-R BT.2100-2 tandis que le format vidéo HDR HDR10 applique les fonctions de transfert (EOTF) de la SMPTE ST 2084 (voir aussi les 4.1.3.1 et 4.1.3.3).

Dans le présent document, toutes les mentions aux "supports 60 Hz" font techniquement référence à du contenu vidéo codé en 59.94 Hz et, de la même manière, les "supports 24 Hz" font référence aux supports 23,976 Hz (voir aussi les Tableaux A.1 à A.6).

Une description générale des signaux vidéo est fournie à l'Annexe A et à l'Annexe B.

4.1.2 Signaux vidéo statiques

4.1.2.1 Généralités

Les supports comprennent cinq signaux vidéo statiques: noir, blanc, à barres de couleur pleine trame et à trois barres (voir le Tableau 1). Tous les signaux sont au format SDR. Des informations supplémentaires sont fournies à l'Article B.2.

Tableau 1 – Vue d'ensemble des signaux vidéo statiques

Signal vidéo statique	Résolution	Plage dynamique (format)
Signal vidéo du niveau de noir	SD	SDR
Signal vidéo du niveau de blanc	SD	SDR
Signal vidéo SDR 50 Hz à barres de couleur pleine trame	SD, HD	SDR
Signal vidéo SDR 60 Hz à barres de couleur	SD, HD	SDR
Signal vidéo à trois barres	SD, HD	SDR

Les signaux vidéo statiques doivent être téléchargés à partir du référentiel en ligne spécifié de l'IEC (voir le 5.1 et l'Annexe A).

4.1.2.2 Signal vidéo du niveau de noir

L'intégralité de la partie du signal qui représente l'image active doit être noire (0 %), comme cela est défini dans l'IEC 60107-1:1997, 3.2.1.5. Il s'agit d'un signal SDR. Le référentiel en ligne des signaux est cité au 5.1 et à l'Annexe A.

4.1.2.3 Signal vidéo du niveau de blanc

L'intégralité de la partie du signal qui représente l'image active doit être blanche (100 %), comme cela est défini dans l'IEC 60107-1:1997, 3.2.1.5. Il s'agit d'un signal SDR. Le référentiel en ligne des signaux est cité au 5.1 et à l'Annexe A.

4.1.2.4 Signaux vidéo SDR 50 Hz à barres de couleur pleine trame et 60 Hz à barres de couleur

La partie active du signal doit être un signal SDR à barres de couleur pleine trame. Pour les systèmes 50 Hz, le signal à barres de couleur (100/0/75/0) pour les récepteurs PAL et SECAM, défini dans l'IEC 60107-1:1997, 3.2.1.2, doit être utilisé. Dans le cas d'un système 60 Hz, la partie supérieure du signal à barres de couleur (75/0/75/0) pour NTSC, défini dans l'IEC 60107-1:1997, 3.2.1.2, doit être utilisée. Elle doit couvrir tout le champ de l'afficheur. Le référentiel en ligne des signaux est cité au 5.1 et à l'Annexe A.

NOTE Le signal de 50 Hz comporte huit barres (y compris le noir) et le signal de 60 Hz comporte sept barres (blanc, jaune, cyan, vert, magenta, rouge et bleu, dans cet ordre).

4.1.2.5 Signal vidéo à trois barres

La zone d'image active du signal doit comporter trois barres de blanc (100 %) sur un fond noir (0 %), comme cela est défini dans l'IEC 60107-1:1997, 3.2.1.3. Il s'agit d'un signal SDR. Le référentiel en ligne des signaux est cité au 5.1 et à l'Annexe A.

4.1.3 Signal vidéo de contenu de radiodiffusion dynamique

4.1.3.1 Généralités

Les supports comprennent des signaux vidéo de contenu de radiodiffusion dynamique dans des formats de balayage progressif, des résolutions et des plages dynamiques différents (voir le Tableau 2). Des informations supplémentaires sont fournies à l'Article A.2.

Tableau 2 – Vue d'ensemble des signaux vidéo de contenu de radiodiffusion dynamique

Formats de balayage progressif	Plage dynamique (format)
SD 50 Hz	SDR
SD 60 Hz	SDR
HD (1 920 × 1 080 p) 25 Hz	HDR (HLG, HDR10)
HD (1 920 × 1 080 p) 24 Hz	HDR (HLG, HDR10)
HD (1 920 × 1 080 p) 50 Hz	SDR, HDR (HLG, HDR10)
HD (1 920 × 1 080 p) 60 Hz	SDR, HDR (HLG, HDR10)
UHD (3 840 × 2 160 p) 50 Hz	HDR (HLG, HDR10)
UHD (3 840 × 2 160 p) 60 Hz	HDR (HLG, HDR10)

4.1.3.2 Signaux vidéo dynamiques SDR

En ce qui concerne la génération des afficheurs à tube cathodique, celle des premiers afficheurs TFT (avec rétroéclairage "permanent") et celle des afficheurs à plasma, il a été admis par hypothèse que les capacités d'affichage entre les téléviseurs variaient très peu en règle générale, et les spécifications des signaux SDR de l'UIT-R BT.709 et de l'UIT-R BT.1886, par exemple, ont été jugées suffisantes pour la diffusion de contenus et par conséquent pour le mesurage de la consommation de puissance des téléviseurs. Pour les téléviseurs qui ne prennent en charge que le format SDR, des supports d'essai SDR adaptés sont disponibles dans des résolutions et des formats de balayage progressif appropriés. La durée du signal audiovisuel SDR est de 10 min.

Les signaux vidéo dynamiques SDR doivent être téléchargés à partir du référentiel en ligne spécifié de l'IEC (voir le 5.1 et l'Annexe A).

4.1.3.3 Signaux vidéo dynamiques HDR

La technologie vidéo HDR s'est largement développée dans tout l'écosystème vidéo, notamment en matière d'enregistrement, de production et de traitement, mais aussi de diffusion et de présentation de contenu. Les téléviseurs HDR bénéficient potentiellement de capacités supérieures en matière de niveau de luminance de crête par rapport aux téléviseurs SDR ou aux modes de téléviseur SDR. Pour les téléviseurs qui prennent en charge le format HDR, des supports d'essai HDR adaptés sont disponibles dans des codecs, des résolutions et des formats de balayage progressif appropriés. Tous les signaux vidéo HDR au format HDR10 contiennent des métadonnées statiques. La durée du signal audiovisuel HDR aux formats HLG et HDR10 est de 5 min.

Les signaux vidéo dynamiques HDR doivent être téléchargés à partir du référentiel en ligne spécifié de l'IEC (voir le 5.1 et l'Annexe A).

4.1.4 Signal vidéo de contenu Internet

Les supports comportent un signal vidéo de contenu Internet. Il s'agit d'un signal SDR. Le référentiel en ligne des signaux est cité au 5.1 et à l'Annexe A.

Des informations supplémentaires sont fournies à l'Article B.4.

4.1.5 Signal audio associé à des signaux vidéo

Des signaux sinusoïdaux d'une fréquence de 1 kHz ou, si la fréquence de 1 kHz ne peut pas être utilisée, des signaux à la fréquence centrale de la plage de transfert spécifiée par le fabricant de l'UUT doivent être utilisés. Pour les entrées numériques, le niveau du signal doit être inférieur de 18 dB à la valeur pleine échelle. Pour les entrées analogiques, le signal doit être inférieur de 20 dB au niveau de référence ou être supérieur à celui-ci avec un niveau de signal suggéré de 500 mV en valeur efficace.

Les signaux vidéo décrits aux 4.1.2, 4.1.3 et 4.1.4 sont codés avec une tonalité d'accompagnement de 1 kHz d'un niveau inférieur de 18 dB à la valeur pleine échelle.

4.2 Signaux vidéo utilisés pour déterminer le rapport de luminance de crête

4.2.1 Généralités

L'emploi des signaux définis au 4.2.2 doit être limité aux besoins de la détermination du rapport de luminance de crête entre les réglages d'image SDR, et il convient de ne pas utiliser ces signaux pour déterminer la luminance absolue de l'écran.

NOTE 1 Ces comparaisons de luminance sont parfois associées aux programmes d'économie d'énergie pour les téléviseurs.

NOTE 2 Pour plus d'informations sur le choix du signal utilisé pour déterminer le rapport de luminance de crête, voir l'Annexe C.

4.2.2 Signaux vidéo

4.2.2.1 Signal vidéo à trois barres

Les signaux vidéo à trois barres sont spécifiés au 4.1.2.5. Il s'agit d'un signal SDR. Le référentiel en ligne des signaux est cité au 5.1 et à l'Annexe A.

4.2.2.2 Signaux vidéo de boîte et de contour dynamiques

L'ensemble des signaux vidéo de boîte et de contour dynamiques comporte un rectangle blanc (100 %) sur un fond gris (34 %), avec une bordure noire (0 %) près de la partie extérieure de l'image. Cette bordure contient une mire mobile qui comprend des segments noirs (0 %) et des segments blancs (100 %). Chaque angle contient une mire de barres de couleur pleine trame avec une couverture de 1 %. Les dimensions du rectangle blanc (100 %) central des deux signaux correspondent aux mires d'essai statiques L20 et L40 définies [IDMS v1.1a, Appendice A12]. Le signal avec le rectangle blanc de taille supérieure correspondant peut être utilisé lors du mesurage d'écrans de plus petite taille afin d'assurer une couverture du blanc suffisante comme cela est exigé par les sondes à contact de mesure de la luminance de l'écran. Un exemple de signal L20PeakLumMotion est représenté à la Figure 2.

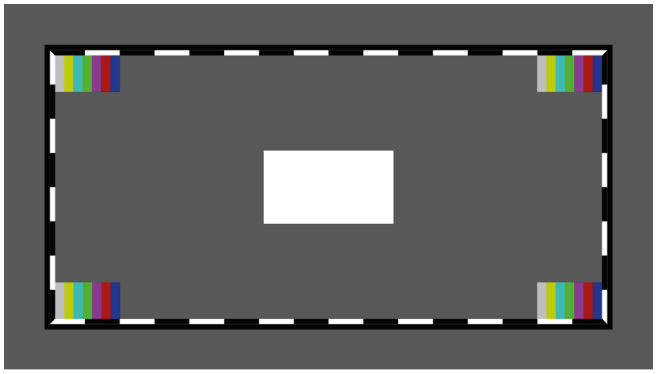

Figure 2 – Signal vidéo de boîte et de contour dynamique (L20PeakLumMotion)

Les deux signaux vidéo dynamiques répertoriés dans le Tableau 3 ci-dessous sont des signaux SDR rendus aux formats SD, HD et UHD, et sont disponibles en 50 Hz (50p) et en 59,94 Hz (5994p). Le format des signaux doit être choisi en fonction de celui qui se rapproche le plus de la résolution d'écran la plus élevée prise en charge par l'UUT. La zone blanche centrale en L40PeakLumMotion est d'une taille supérieure à celle en L20PeakLumMotion. Le référentiel en ligne des signaux est cité au 5.1 et à l'Annexe A.

Tableau 3 – Dénomination des signaux vidéo de boîte et de contour dynamiques

SD	HD	UHD
L20PeakLumMotionSD50p	L20PeakLumMotionHD50p	L20PeakLumMotionUHD50p
L40PeakLumMotionSD50p	L40PeakLumMotionHD50p	L40PeakLumMotionUHD50p
L20PeakLumMotionSD5994p	L20PeakLumMotionHD5994p	L20PeakLumMotionUHD5994p
L40PeakLumMotionSD5994p	L40PeakLumMotionHD5994p	L40PeakLumMotionUHD5994p

4.3 Signaux audio utilisés pour déterminer la consommation de puissance audio

4.3.1 Signaux audio

4.3.1.1 Signal sinusoïdal

Ce signal doit être un signal sinusoïdal d'une fréquence de 1 kHz ou, si la fréquence de 1 kHz ne peut pas être utilisée, la fréquence sinusoïdale doit se situer au centre de la plage de fréquences spécifiée par le fabricant.

Les signaux sinusoïdaux analogiques et numériques de 1 kHz ne sont pas inclus dans les supports fournis à l'Article 5.

4.3.1.2 Signal utilisé pour la simulation de programme

Le signal utilisé pour la simulation de programme doit avoir une densité spectrale de puissance moyenne qui est très proche de la moyenne des densités spectrales de puissance moyennes d'une large plage de programmes, conformément à l'IEC 60268-1.

Un tel signal peut être obtenu à partir d'un bruit rose dont la bande est limitée par un filtre et dont la réponse est conforme à celle indiquée dans l'IEC 60268-1. Il convient que le facteur de crête d'une source de bruit soit compris entre 3 et 4 pour éviter un écrêtage des amplificateurs.

Le signal utilisé pour la simulation de programme n'est pas inclus dans les supports fournis à l'Article 5.

4.3.2 Niveaux des signaux

4.3.2.1 Niveau de signal audio analogique

Pour les entrées analogiques en bande de base, le signal d'entrée doit se situer à un niveau de 500 mV en valeur efficace conformément à la force électromotrice émise par une source assignée selon l'IEC 61938.

4.3.2.2 Niveau de signal audionumérique

Pour les entrées numériques, le signal d'entrée doit se situer à un niveau inférieur de 12 dB à la valeur pleine échelle de référence, conformément à l'IEC 61938, l'IEC 60958-1 et l'IEC 60958-3.

4.3.2.3 Niveau de signal audio RF

Pour les récepteurs radioélectriques FM, le signal d'entrée doit être appliqué à un connecteur d'entrée d'antenne à un niveau de 40 dB (pW). L'écart doit être de 40 kHz.

Pour les récepteurs radioélectriques AM avec un connecteur d'entrée d'antenne, le signal d'entrée doit être une force électromotrice de 1 mV émise par une source de 50 Ω. Le facteur de modulation doit être de 30 %.

En ce qui concerne les antennes non amovibles (antennes tiges pour les fréquences FM et antennes magnétiques pour les fréquences AM), le niveau des signaux RF pour les fréquences FM et AM doit être suffisamment important pour donner un rapport signal sur bruit audio de 36 dB pour les fréquences FM avec un écart de 75 kHz et de 26 dB pour les fréquences AM avec une modulation de 30 %. Les rapports signal sur bruit doivent être mesurés comme cela est spécifié dans l'IEC 60315-1:1988, 6.1.

Pour les récepteurs AM, la méthode de mesure avec un générateur de champ électromagnétique analogique est décrite dans l'IEC 60315-3 et l'IEC 60315-1.

Pour les récepteurs FM avec des antennes tiges, voir l'IEC 60315-4:1997, Article 7.

Pour la DAB et la DAB+, le point OOI est clairement défini lorsque le rapport porteuse sur bruit (C/N) du récepteur se dégrade et que le BER augmente. Par conséquent, celui-ci peut être utilisé pour évaluer l'exigence de signal du récepteur. La méthode OOI peut être mise en œuvre de manière à obtenir un résultat équivalent à un BER de 10^{-4}. La méthode inclut le contrôle (par un observateur humain ou, le cas échéant, par un matériel automatisé) d'une onde sinusoïdale audio codée de 1 kHz émise par la source de sortie audio (haut-parleur, casque, etc.) et le réglage du niveau de signal RF jusqu'au seuil où les défauts audio (pertes de niveau, ronflements, "fluctuations", etc.) peuvent être perçus uniquement dans l'onde sinusoïdale pendant une durée d'écoute de 10 s. Ce niveau RF correspond au seuil OOI de sensibilité.

Dans le cas d'une antenne non amovible, le niveau de signal RF doit être suffisamment élevé pour reproduire un signal audio exempt de défauts audibles pour la DAB et la DAB+.

Les signaux d'essai AM, FM et DAB ne sont pas inclus dans les supports fournis à l'Article 5.

NOTE L'ETSI EN 300 401, Article 7, et l'ETSI TS 102 563 fournissent des informations supplémentaires sur la DAB et la DAB+.