

# INTERNATIONAL STANDARD



**Audio, video, and related equipment – Determination of power consumption –  
Part 3: Television sets**

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# INTERNATIONAL STANDARD



**Audio, video, and related equipment – Determination of power consumption –  
Part 3: Television sets**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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**AUDIO, VIDEO, AND RELATED EQUIPMENT –  
DETERMINATION OF POWER CONSUMPTION –****Part 3: Television sets**

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IEC 62087-3 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) it introduces measuring procedures for the determination of power consumption in the On mode while viewing static metadata HDR video content;
- b) all tests for On mode power determination are performed with MDD disabled;
- c) only progressive video signals are used for testing;
- d) a dimmable LED reflector lamp is used as a light source for illuminating the ABC sensor to achieve specific illuminance levels;
- e) a dynamic box and outline video signal is used for determining the ratio of peak luminance.

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

Draft	Report on voting
100/3772/CDV	100/3849/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 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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

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## INTRODUCTION

This document specifies the determination of the power consumption of television sets for consumer use. ~~It is used in conjunction with IEC 62087-2:2015, which specifies signals and media.~~

This document includes measuring procedures for the determination of power consumption in the On (operation) mode, which was identified as "On (average) mode" in previous editions of IEC 62087. Additionally, it specifies measuring procedures for the determination of power consumption in the Off mode and Partial On mode. This document also defines the determination of the peak luminance ratio for use associated with television set power consumption evaluation as well as the power factor. It also defines measuring procedures for the determination of power consumption in the On mode while viewing representative static metadata HDR video content.

A verification procedure to assess product compliance is described in Annex A of IEC 62087-1:2015.

The IEC 62087 series consists of the following planned or 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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# AUDIO, VIDEO, AND RELATED EQUIPMENT – DETERMINATION OF POWER CONSUMPTION –

## Part 3: Television sets

### 1 Scope

This part of IEC 62087 specifies the determination of the power consumption and related characteristics of television sets. Television sets include, but are not limited to, those with ~~CRT~~, LCD, ~~PDP~~, OLED, or projection technologies.

The operating modes and functions, as they specifically apply to television sets, are defined in detail in this part of IEC 62087.

This document is limited to television sets that can be connected to an external power source. Television sets that include a non-removable, main battery are not covered by this document. Television sets ~~may~~ can include any number of auxiliary batteries.

The measuring conditions in this document represent the normal use of the equipment and ~~may~~ can differ from specific conditions, for example as specified in safety standards.

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

IEC 62087-2:~~2015~~2023, *Audio, video, and related equipment – Determination of power consumption – Part 2: Signals and media*

IEC 62301:~~2014~~, *Household electrical appliances – Measurement of standby power*

### 3 Terms, definitions, and abbreviated terms

For the purposes of this document, the terms and definitions given in IEC 62087-1:2015, IEC 62087-2:~~2015~~2023 and 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 Terms and definitions

### 3.1.1

#### television set

##### TV

equipment for the reception and display of television broadcast and similar services for terrestrial, cable, satellite and broadband network transmission of analogue and/or digital signals

Note 1 to entry: A television set ~~may~~ can include additional functions that are not required for its ~~basic operation~~ primary function.

### 3.1.2

#### forced menu

~~configuration selection required of the user when a television set is turned on for the first time that forces the user to choose between the home configuration and the retail configuration~~

on-screen menu that requires the user to choose a configuration option when a television set is first setup or after a factory reset

Note 1 to entry: For example, a forced menu can offer the user the option to select either "Normal"/"Home" or "Retail"/"Store" configuration.

Note 2 to entry: See Figure 1.

### 3.1.3

#### normal configuration

setting intended to be chosen for home use from the forced menu

Note 1 to entry: Subclause 4.2.2 describes the selection of normal configuration from the forced menu. This configuration selection is generally named "normal", "home", "standard", or equivalent.

Note 2 to entry: See Figure 1 and 3.1.16.

### 3.1.4

#### default configuration

~~configuration for television sets without a forced menu~~

manufacturer's preset configuration for television sets without a forced menu

Note 1 to entry: See Figure 1.

### 3.1.5

#### retail configuration

forced menu selection ~~most likely to be chosen~~ intended for use in a retail environment

Note 1 to entry: Subclause 4.2.3 describes the selection of retail configuration from the forced menu. This configuration selection is generally recommended by the manufacturer for presentation in a public space when the television set is offered for sale and might be named "retail", "store", "shop", or equivalent.

Note 2 to entry: See Figure 1.

### 3.1.6

#### preset picture setting

common set of manufacturer-defined parameters which differ in their settings

Note 1 to entry: Examples of parameters of preset picture settings are brightness, contrast, colour space, chroma control.

### 3.1.7

#### selectable preset picture setting

TV picture setting that is selectable by a user from a set of manufacturer-defined picture settings

Note 1 to entry: See Figure 1.

### 3.1.8 default picture setting

~~out of the box~~ picture setting for television sets in the ~~home~~ normal or default configuration that is highlighted, or if none is highlighted, the picture setting first available for user selection

Note 1 to entry: See Figure 1. The HDR default picture setting (if different than the default picture setting) is the one that the TV enters when HDR video is played from the starting point of the SDR default picture setting.

### 3.1.9 brightest selectable preset picture setting

user selectable, preset picture setting that produces the highest luminance picture in the ~~home~~ normal or default configuration

Note 1 to entry: See Figure 1.

### 3.1.10 overall brightest preset picture setting

~~either the~~ retail picture setting or the brightest selectable preset picture setting, whichever produces the highest luminance picture

Note 1 to entry: See Figure 1.

### 3.1.11 retail picture setting

~~out of the box picture setting for television sets with a forced menu in the retail configuration~~  
selectable preset picture setting intended for use in a retail environment

Note 1 to entry: See Figure 1.

### 3.1.12 motion-based dynamic dimming MDD

television feature that adjusts luminance in response to amount of motion in the displayed image

### 3.1.13 special function

function that is related to, but not required for, the ~~basic operation~~ primary function of the device

Note 1 to entry: Examples of special functions include, but are not limited to, special sound processing and power-saving functions (e.g. automatic brightness control).

Note 2 to entry: Refer to the definition of television set (TV) (3.1.1) for primary function.

### 3.1.14 conditional access

encryption, decryption, and authorization techniques employed to protect content from unauthorized viewing

### 3.1.15 conditional access module

plug-in module that enables conditional access

### 3.1.16 plug-in module

device that plugs into television sets to provide additional functionality

### 3.1.17 point of deployment module

conditional access module for digital signal reception

**3.1.18****CAT5e****category 5e cable**

twisted pair cable used for computer networks

Note 1 to entry: See IEC 61156-5 and IEC 61156-6.

**3.1.19****neutral density filter****ND filter**

optical device that ~~reduces the light intensity in the visible wavelength region~~ is designed to reduce the light intensity equally over the range of visible wavelengths

**3.1.20****quick-start**

~~feature that, when enabled, presents sound and picture quickly when switching from Partial On mode to On mode~~

function that reduces the television set's resume time from Partial On mode to On mode

Note 1 to entry: Resume time is measured in accordance with 6.6.1.

**3.1.21****colour rendering index****CRI**

measure of the degree to which the psychophysical colour of an object illuminated by the test illuminant conforms to that of the same object illuminated by the reference illuminant, suitable allowance having been made for the state of chromatic adaptation

Note 1 to entry: See also CIE 13, Method of Measuring and Specifying Colour Rendering of Light Sources.

[SOURCE: IEV 845-22-109, modified – Note 2 to entry and Note 3 to entry removed]

**3.1.1****additional functions**

~~functions that are not required for the basic operation of the device~~

~~Note 1 to entry: Examples of additional functions include, but are not limited to, a VCR unit, a DVD unit, an HDD unit, an FM-radio unit, a memory card reader unit, or an ambient lighting unit.~~

**3.1.9****home configuration**

~~forced menu selection most likely to be chosen for home use~~

~~Note 1 to entry: Subclause 4.2.2 describes the selection of home configuration from the forced menu. This configuration selection is generally named "home", "standard", or equivalent.~~

~~Note 2 to entry: See Figure 1.~~

**3.2 Abbreviated terms**

ABC automatic brightness control

AV audio-visual

BD Blu-ray Disc™<sup>1</sup>

~~CRT Cathode Ray Tube~~

DVD digital versatile disc

<sup>1</sup> Blu-ray Disc™ is a trade mark 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.

DHCP	dynamic host configuration protocol
DVI	Digital Visual Interface
EMC	electromagnetic compatibility
FM	frequency modulation
HDD	hard disk drive
HDMI <sup>2</sup>	High Definition Multimedia Interface
HDR	high dynamic range
HLG	hybrid log-gamma
IP	internet protocol
LAN	local area network
LED	light-emitting diode
LCD	liquid-crystal display
LMD	<del>Luminance</del> light measuring device
LNB	low-noise block
MDD	motion-based dynamic dimming
NAT	network address translation
ND	neutral density
OLED	organic light-emitting diode
PC	personal computer
<del>PDP</del>	<del>Plasma Display Panel</del>
PQ	perceptual quantizer
RF	radio frequency
SCR	silicon-controlled rectifier
SDR	standard dynamic range
STB	set-top box
SSID	service set identifier
TV	television set
USB <sup>3</sup>	Universal Serial Bus
UUT	unit under test
<del>VCR</del>	<del>Video Cassette Recorder</del>
VGA	Video Graphics Array
WAN	wide area network
WCG	wide colour gamut
WLAN	wireless local area network
WOL	wake-on-LAN
WoWLAN	wake on wireless LAN
WPA	Wi-Fi protected access

<sup>2</sup> HDMI® and HDMI® High-Definition Multimedia Interface are registered trademarks of HDMI Licensing, ~~LLC~~, Administrator, Inc.. 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.

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WPA2      Wi-Fi protected access 2

## **4 Specification of operating modes and functions**

### **4.1 Table of operating modes and functions**

Table 1 describes the various operating modes and functions for television sets.

For all modes, main batteries, if any, shall be removed for the duration of the measurement procedure (see IEC 62087-1:2015, 5.1.1.1.)

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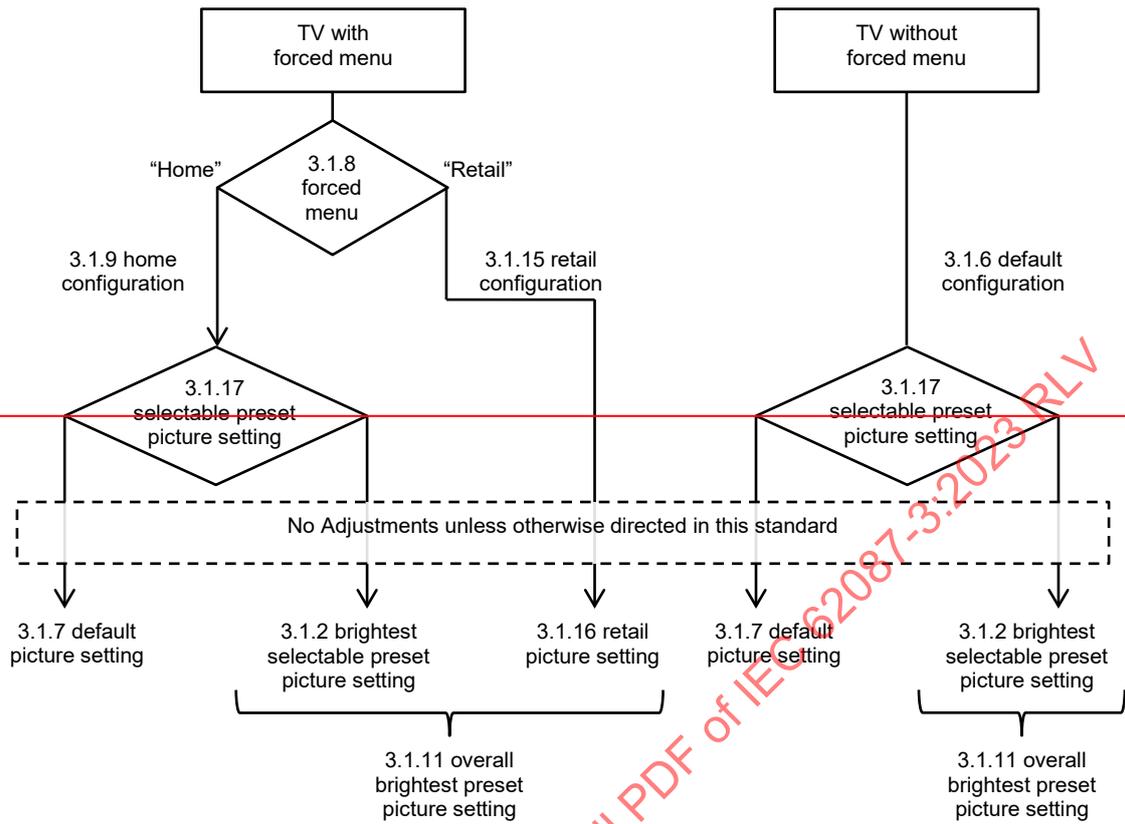
**Table 1 – Operating modes and functions**

Power	Mode	Sub-mode	Function(s)	Functional description for TV
0 W	Disconnected	Disconnected	– Disconnected from power source	The television set is disconnected or galvanically isolated from all external power sources.
≥ 0 W	Off	Off	– Off	The television set is connected to an external power source and does not produce picture or sound and does not provide any other function that depends on an external power source. The television set cannot be switched into any other mode with the remote control unit, or an external or internal signal. <del>Note that</del> Some power may be consumed if an EMC filter or other components exist on the source side of the power switch.
> 0 W	Partial On	Standby-passive	– Wake on <ul style="list-style-type: none"> <li>• remote control</li> <li>• internal signal</li> </ul>	The television set is connected to an external power source and does not provide picture or sound. The television set can be switched into another mode with the remote control unit or an internal signal, but not with an external signal.
		Standby-active, low	– Wake on <ul style="list-style-type: none"> <li>• remote control</li> <li>• internal signal</li> <li>• external signal</li> </ul>	The television set is connected to an external power source and does not provide picture or sound. The television set can be switched into another mode with the remote control unit or an internal signal and can additionally be switched into another mode with an external signal.  NOTE 1 When in Standby-active, low mode, a television set may be able to be switched into the On mode, the Off mode, the Standby-passive, or the Standby-active, high mode.  NOTE 2 A network-enabled TV is considered to be in Standby-active low when its presence on a local area network can be detected and there is minimal data communication beyond network maintenance.
		Standby-active, high	– Wake on <ul style="list-style-type: none"> <li>• remote control</li> <li>• internal signal</li> <li>• external signal</li> </ul> – Data communications	The television set is connected to an external power source and does not provide picture or sound. The television set can be switched into another mode with the remote control unit, an internal signal, or an external signal. Additionally, the television set is exchanging/ receiving data with/from an external source.  Determination of power consumption in this sub-mode is not specified by this document.
	On	Operation	– Operation	The television set is connected to an external power source and provides picture and, if possible, sound.

**4.2 Configurations and picture settings**

**4.2.1 Conceptual framework**

Figure 1 shows a conceptual framework that includes the various configurations and picture settings for television sets.



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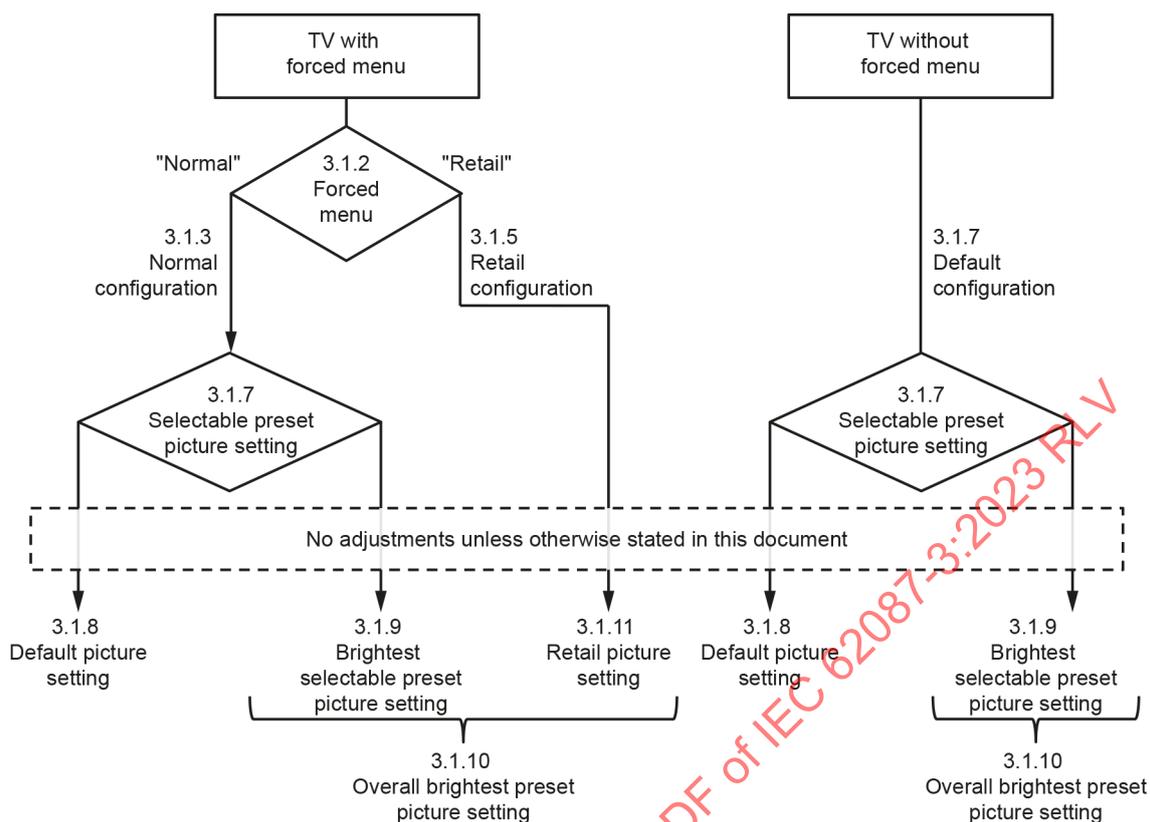


Figure 1 – Configurations and picture settings, conceptual framework

4.2.2 Selection of ~~home~~ normal configuration

When directed in this document, the ~~home~~ normal configuration shall be selected from the forced menu by choosing the configuration that is recommended for normal home use and, if not clearly defined, ~~it shall be selected by choosing the first configuration listed in the forced menu~~ the default picture setting from the forced menu shall be selected: either the manufacturer's indicated option from the forced menu or, if no preference is indicated, the first option listed.

If the UUT has no forced menu, it shall remain in the default configuration.

NOTE A factory reset ~~might~~ can be required in order to enter the ~~home~~ normal configuration after the retail configuration has been previously selected.

4.2.3 Selection of retail configuration

When directed in this document, retail configuration shall be selected from the forced menu by choosing the configuration that, without any other adjustments, results in the highest display luminance.

If the UUT has no forced menu, it shall remain in the default configuration.

NOTE A factory reset ~~might~~ can be required in order to enter the retail configuration after the ~~home~~ normal configuration has been previously selected.

## 5 Measurement conditions

### 5.1 General

The measurement conditions clause specifies requirements that are independent of the equipment to be evaluated. When setting up a test laboratory, these requirements shall be taken into account.

The requirements of this clause apply to the procedures specified in Clause 6.

### 5.2 Power source

Defined in IEC 62087-1:2015, 5.1.1.

### 5.3 Environmental conditions

Defined in IEC 62087-1:2015, 5.1.2.

### 5.4 Ambient light conditions

For determining On mode power consumption for television sets with ABC enabled,  $\leq 1$  lx shall be confirmed at the surface of the ABC sensor assembly with the light sources (5.6.4, 5.6.5) off and the UUT in the Off or Disconnected mode.

For determining the peak luminance ratio (6.5.1.1) with a non-contact LMD,  $\leq 5$  lx shall be confirmed at the nominal centre of the display area of the UUT in Off or Disconnected mode. This requirement applies whether or not a light source (5.6.5) is applied to disable the ABC feature.

A dark room and/or shroud ~~may~~ can be necessary in order to achieve the required ambient light conditions.

### 5.5 Measuring equipment

#### 5.5.1 Power measuring instrument

Defined in IEC 62087-1:2015, 5.1.5. and IEC 62087-1:2015, 5.1.6.

#### 5.5.2 Luminance measuring device

Defined in IEC 62087-1:2015, 5.1.7.

#### 5.5.3 Illuminance measuring instrument

Defined in IEC 62087-1:2015, 5.1.8.

### 5.6 Signal generation

#### 5.6.1 Equipment

Defined in IEC 62087-2:2015, 6.1 and IEC 62087-2:2023, 6.2.

#### 5.6.2 Interfaces

Defined in IEC 62087-2:2015, 6.3.

#### 5.6.3 Accuracy

~~Defined in IEC 62087-2:2015, 6.3.~~

Accuracy of video signal levels is defined in IEC 62087-2:2023, 6.4.

#### 5.6.4 Light source for specific illuminance levels

The light source used for illuminating the ABC sensor to specific illuminance levels shall use a dimmable ~~halogen lamp in a sealed~~ LED reflector lamp and shall have a diameter of ~~120 mm or less~~ 90 mm  $\pm$  5mm. The rated beam angle of the lamp shall be  $40^\circ \pm 5^\circ$ . The rated correlated colour temperature (CCT) of the light source shall be ~~2 800~~ 2 700 K  $\pm$  300 K at its rated voltage. The rated CRI shall be  $80 \pm 3$ . The front surface of the lamp shall be clear (i.e., not coloured or coated with a spectrum modifying material) and may have a smooth or granular front surface; when shined against a uniform white surface, the diffusion pattern should appear smooth to the naked eye. The lamp assembly shall not modify the spectrum of the ~~halogen~~ LED source, including the IR and UV bands.

~~The lamp shall be capable of providing the highest illumination level chosen in 6.2.8 within the range of 70 % to 110 % of its rated voltage when configured as specified in 6.3.8.~~

~~For luminance levels below 10 lx, a 2-stop ND filter (3.1.10) shall be used. No ND filter shall be used for luminance levels at or above 10 lx. The ND filter shall be of the absorptive type and shall be large enough to cover the entire light acceptance area of the ABC sensor assembly with a margin of at least 5 mm on all sides. The ND filter shall have an average transmission of  $25 \% \pm 2,5 \%$  within the visible range, which is 400 nm to 700 nm, without selectively absorbing light at specific wavelengths.~~

To reach the illumination levels specified in 6.2.8, the lamp shall be wired with a compatible dimming switch capable of dimming it to the lowest level required in 6.2.8. The lamp shall be capable of providing the highest illumination level when wired with the dimming switch. For luminance levels below 10 lx, a 2-stop ND filter (3.1.19) may be used if the lowest setting of the lamp and dimmer combination does not reach the required level below 10 lx. No ND filter shall be used for luminance levels at or above 10 lx. The ND filter shall be large enough to cover the entire surface of the diffusion area of the lamp. The ND filter shall have an average transmission of  $25 \% \pm 2,5 \%$  within the visible range, which is 400 nm to 700 nm, without selectively absorbing light at specific wavelengths.

Caution: the lamp shall be compatible with leading-edge or forward-phase dimmers (i.e. the lamp luminance does not vary with voltage).

Specific illuminance levels shall be obtained by ~~controlling the voltage and/or duty cycle to the above light source~~ adjusting the dimming switch.

The model of the lamp and dimmer (and versions thereof if available) used for illuminating the ABC sensor to specific illuminance levels shall be reported.

~~Some lighting controllers, such as those with SCR-based circuits, may introduce current spikes into the power source. Such controllers should be avoided or otherwise isolated from the power source for the UUT.~~

The lamp should be stabilized before testing by setting it to deliver the maximum tested lux to the ABC sensor in accordance with 6.4.2 and maintaining that light level for 10 minutes. Stabilisation may be carried out during the setting up of the light source (see 6.3.7).

#### 5.6.5 Light source for disabling the ABC feature

~~The light source used for disabling the ABC feature shall use a dimmable halogen lamp in a sealed reflector and shall have a diameter of 120 mm or less. The rated correlated colour temperature shall be 2 800 K  $\pm$  300 K at its rated voltage. The front surface of the lamp shall be clear (i.e., not coloured or coated with a spectrum modifying material) and may have a smooth or granular front surface. The lamp assembly shall not modify the spectrum of the~~

~~halogen source, including the IR and UV bands. The light source shall be capable of providing 300 lx or greater when applied directly to the ABC sensor assembly.~~

~~The model of the lamp used for disabling the ABC feature shall be reported.~~

The same light source as that used in 5.6.4 may be used to override the ABC feature by reducing the distance between the light source and the TV's ABC sensor.

The manufacturer, model and version of the LED bulb used to override the ABC feature shall be reported.

### **5.6.6 Networking equipment**

~~For wireless connectivity, a Wi-Fi wireless access point that is compatible with IEEE 802.11-2007 shall be used.~~

~~For wired connectivity, a category 5e or better cable and an Ethernet switch or router that supports IEEE 802.3 shall be used. If the UUT supports Energy Efficient Ethernet (IEEE 802.3az-2010), the Ethernet router shall also support IEEE 802.3az-2010. The networking equipment shall support the highest and lowest data speeds of the UUT's network function.~~

~~The networking equipment shall not be connected to a wide area network (WAN).~~

### **5.6.6 Test table surface material**

The table used to hold the UUT shall be covered with black, minimally reflective cloth and shall have the area immediately in front of and underneath the UUT's ABC sensor, as shown in Figure 4, covered with material having a gloss measurement of 15 GU as measured by a 60° gloss meter. The material shall not alter visible light in the 400 nm to 700 nm range that arrives on, or is reflected by, the material. The thickness of the ABC sensor table surface material shall be 4 mm or less and shall be at least 203 mm wide by 177 mm deep; it shall be printed with a matte finish, with a colour adhering to the M1 lighting standard having CMYK values of (43, 53, 84, 84) ± 2. The card shall not polarize light reflected off its surface.

NOTE See Annex D for further information.

## **6 Procedures**

### **6.1 Order of activities**

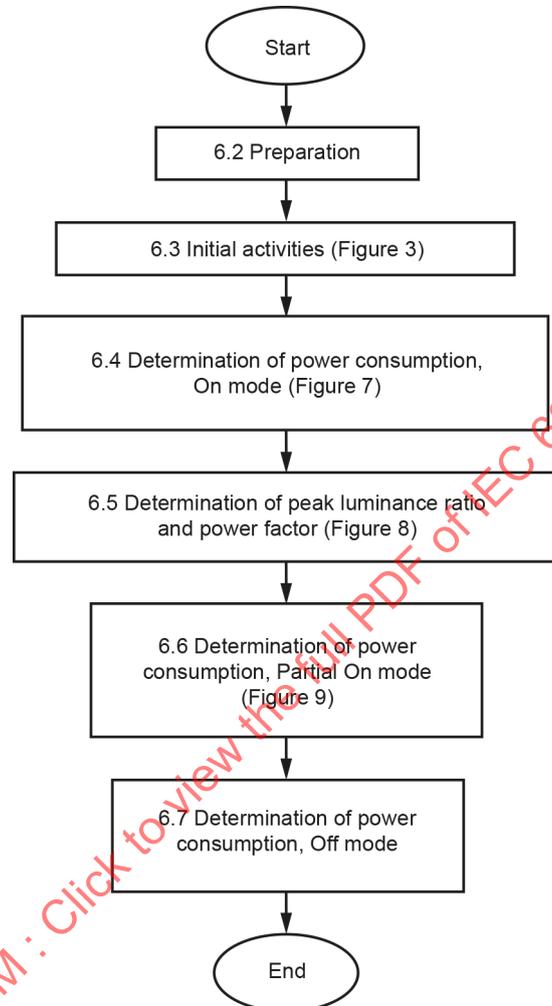
The following order of activities is recommended (also represented in Figure 2):

- preparation (6.2),
- initial activities (6.3),
- determination of power consumption, On mode (6.4),
- determination of peak luminance ratio and power factor (6.4.5.5),
- determination of power consumption, Partial On mode (6.6),
- determination of power consumption, Off mode (6.7).

The above order is chosen to ensure proper stabilization prior to the taking of each measurement. The technician performing the activities may vary the order as needed. However, the stabilization process prior to the taking of each measurement shall effectively be the same as if the recommended order had been followed.

A flowchart with the comprehensive measurement process is provided in Annex E, Figure E.1.

Countdown timers and 50 % grey field endings have been added to most of the video signal test clips referenced by this document to allow test personnel to easily maintain a UUT's stabilization while moving from one measurement method to the next. It is easy to inspect a given test's power consumption log to note when the test both started and ended. Test personnel are encouraged to familiarize themselves with each video signal test clip prior to using them for actual testing.



IEC

**Figure 2 – Recommended order of activities**

## 6.2 Preparation

### 6.2.1 Measuring plan

Before the UUT has been installed, a measuring plan should be developed based on the specifications of the UUT and the region in which the results are to be reported. The measuring plan is based on the decision points in 6.2.2 through 6.2.9. These decision points include:

- power source voltage and frequency (6.2.2),
- input terminals (6.2.3),
- video signal, On mode power consumption procedure (6.2.4),
- video signal, peak luminance ratio procedure (6.2.5),
- video format (6.2.6),
- automatic brightness control capabilities (6.2.7),
- automatic brightness control levels (6.2.8),

- motion-based dynamic dimming (6.2.9),
- network connection ~~capabilities~~ selection (6.2.10).

When these decisions have been taken, the following activities can be expected to be deterministic.

A comprehensive list of items which shall be reported (test report) is provided in Annex B. Annex C shows an example test report template.

### 6.2.2 Power source voltage and frequency

Whether the UUT is to be powered by an included external power supply (IEC 62087-1:2015, 5.1.1.2), mains power (IEC 62087-1:2015, 5.1.1.3), and/or power from other than the mains (IEC 62087-1:2015, 5.1.1.4) shall be determined and shall be described in the report.

The voltage and frequency of the power source shall be reported.

### 6.2.3 Test signal input terminals

The following selection hierarchy for the test signal input terminal shall be used:

- USB (single USB stick directly inserted to the USB port of the UUT, the USB port recommended in the instruction manual for video file playback with the highest data rate specified shall be used),
- HDMI® (using a media player to play test media stored on a single USB stick),
- component analogue (using a media player to play test media stored on a single USB stick),
- S-Video (using a media player to play test media stored on a single USB stick),
- composite analogue (using a media player to play test media stored on a single USB stick),
- other AV or RF input.

DVI, VGA, and other inputs that are primarily used for connections with computers (as compared to AV equipment) shall not be used.

~~A single set of input terminals~~ One type of input terminal shall be selected for use during the procedure. If the power consumption of the UUT is to be determined with multiple video input terminal types for comparison purposes, the entire procedure should be performed multiple times, each time with a single set of input terminals selected, to ensure proper stability under each condition.

~~If available, an HDMI input shall be selected. Selection of the video input terminal shall be prioritized in the following order: HDMI, component analogue, S-Video, composite analogue, other AV or RF input. DVI, VGA, and other inputs that are primarily used for connections with computers (as compared to AV equipment) shall not be used.~~

~~For HDMI inputs, only inputs intended for standard AV sources, such as STBs or BD players shall be used. HDMI inputs intended for other sources, such as “PC” or “Game”, shall not be used.~~

The selected input terminals and used signal provision equipment shall be reported.

### 6.2.4 Video signal, On mode power consumption procedure

A video signal shall be selected for use during the On mode power consumption determination procedure. ~~The selection shall be made from one of the three following signals:~~ The dynamic broadcast-content video signals (SDR and HDR as applicable) noted below shall be used unless regional regulatory requirements mandate the use of the static video signals and/or Internet-content video signals referenced below.

- SDR dynamic broadcast-content video signal (IEC 62087-2:2023, 4.1.3.2),
- HDR dynamic broadcast-content video signal (IEC 62087-2:20152023, 4.1.3.3),
- static video signals (IEC 62087-2:20152023, 4.1.2),
- Internet-content video signal (IEC 62087-2:20152023, 4.1.4).

The video signal selected for determining On mode power consumption shall be reported.

NOTE Information regarding the selection of the video signal for the On mode power consumption measurement is available in IEC 62087-2:20152023, Annex B.

### 6.2.5 Video signal, peak luminance ratio determination

A video signal shall be selected for use during the peak luminance ratio procedure. ~~The selection shall be made from one of the following signals:~~ One of the dynamic box and outline video signals noted below shall be used unless regional regulatory requirements mandate the three-bar video signal be used, also referenced below:

- dynamic box and outline video signals (IEC 62087-2:20152023, 4.2.2.2),
- three-bar video signal (IEC 62087-2: 20152023, 4.2.2.1).

The selection of the appropriate dynamic box and outline video signal is given in 6.5.2.5. The selected video signal for determining the peak luminance ratio shall be reported.

NOTE Information regarding the selection of the video signal for the determination of the peak luminance ratio is available in IEC 62087-2:20152023, Annex C.

### 6.2.6 Video format

#### 6.2.6.1 SDR

The SDR video resolution and frame rate of the signals applied to the UUT during the procedure shall be selected. The selected resolution and frame rate shall be compatible with the input terminal selected in 6.2.3.

The priority order of video resolutions shall be:

- ~~— 1 920 × 1 080 interlaced,~~
- ~~— 1 920 × 1 080 progressive,~~
- ~~— 1 280 × 720 progressive,~~
- ~~— standard definition interlaced,~~
- ~~— standard definition progressive.~~
- high definition 1 920 × 1 080 progressive;
- standard definition 720 x 576 or 720 x 480 progressive.

The maximum resolution of the SDR video signal applied to the UUT shall be 1 920 pixels by 1 080 pixels. If a standard definition video signal is used, it shall be at the standard broadcasting video resolution of the country or region in which the power consumption measurement is to be reported.

The video frame rate used during the measurements shall be at the standard broadcasting vertical frequency of the country or region in which the power consumption measurement is to be reported.

The selected resolution and frame rate of the SDR input signals shall be reported.

~~NOTE 1 In the US and Japan a 59,94 Hz frame rate is used; in Europe and Australia a 50 Hz frame rate is used.~~

NOTE-2 1 Video with a 59,94 Hz frame rate is often casually referred to as "60 Hz".

NOTE 3 2—~~Because~~ Technologies for the distribution of content with a resolution of more than 1 920 pixels × 1 080 pixels are ~~just now emerging~~ prevalent. However, the SDR media available in IEC 62087-2:2015 is available in standard and high definition only. By limiting the video source resolution to 1 920 × 1 080 pixels, this document ensures that the associated signals will be up-converted by the UUT, avoiding the possibility of varying results from various external up-converters (see 6.3.10.6).

#### 6.2.6.2 HDR

The HDR EOTF, video resolution and frame rate of the signals applied to the UUT during the procedure shall be selected from the IEC test signals provided. The selected resolution and frame rate shall be compatible with the input terminal selected in 6.2.3.

The priority order of video resolutions shall be:

- 3 480 × 2 160 progressive
- 1 920 × 1 080 progressive

The maximum resolution of the HDR video signal applied to the UUT shall be 3 480 pixels by 2 160 pixels.

The HDR EOTF (either HDR10 or HLG) from the IEC supplied test signals used during the measurements shall match the standard HDR EOTF used in the country or region in which the power consumption measurement is to be reported.

The video frame rate used during the measurements shall be at the standard broadcasting vertical frequency of the country or region in which the power consumption measurement is to be reported.

The selected resolution, HDR EOTF and frame rate of the HDR input signals shall be reported.

#### 6.2.7 Automatic brightness control capabilities

There are three types of television sets with respect to ABC:

- television sets that do not have an ABC feature;
- television sets that have an ABC feature that is not enabled by default;
- television sets that have an ABC feature that is enabled by default.

The presence of an ABC feature and whether or not the ABC feature is enabled by default (in both SDR and HDR default pre-set picture settings) shall be reported.

#### 6.2.8 Automatic brightness control levels

The On mode power consumption of television sets with the automatic brightness control disabled by default in the SDR or HDR default picture setting shall be determined with the ABC feature disabled.

For television sets with the ABC feature enabled by default in the default SDR or HDR picture setting, the On mode power consumption shall be determined with the ABC feature enabled and/or manually disabled. If the ABC feature is enabled, the On mode power consumption shall be determined over a minimum of one and a maximum of four different illuminance ~~conditions~~ levels with respect to the ABC feature.

The state(s) of the ABC feature and the illuminance levels selected to be applied to the ABC sensor shall be reported along with exact illuminance meter readings prior to conducting each test.

NOTE Information for selecting the illuminance levels at the ABC sensor and the states of the ABC feature is available in Clause A.2.

### 6.2.9 Motion-based Dynamic Dimming

All tests for SDR or HDR On mode power determination in accordance with 6.4 shall be performed with MDD disabled. If MDD cannot be disabled, the unit shall be tested in the brightest selectable SDR or HDR preset picture settings as determined in 6.5.1.5 and 6.5.2.4.

Preset picture settings used for testing shall exclude the following:

- picture settings labelled "PC" or "Computer" or otherwise intended for the use case where the television set is to be used as a monitor connected to a computer;
- picture settings labelled "Game" or "Gaming" or otherwise intended for low-latency use when the television set is connected to a gaming console;
- picture settings labelled "Accessibility" or "Low Vision" or otherwise intended to produce high-contrast pictures explicitly for use by viewers with limited vision capabilities.

The state of the MDD feature during testing shall be reported.

### 6.2.10 Network connection ~~capabilities~~ selection

Network connections should be listed in the user manual ~~of the UUT~~. If no connections are specified in the user manual, verify that the TV does not have network capabilities by checking for the absence of physical connections ~~or~~ and the absence of network settings in the menu. ~~If additional equipment, such as an USB adapter, is required to enable network connectivity, the UUT is considered to be network capable only if that additional equipment is provided with the UUT by default.~~ If the TV has the capability to be connected to a network but was not shipped with a required piece of hardware (e.g. wireless adapter) excluding any external cables, that connection type shall not be tested.

If the TV is network enabled, connect it to a LAN in On mode and prior to being placed into Standby mode. The LAN shall allow devices to ping other devices on the network but will not allow access to a WAN. If the TV has multiple network connections (e.g. Wi-Fi and Ethernet), the TV shall be configured and connected to a single network source in accordance with the hierarchy of connections listed in Table 2.

**Table 2 – Network Connection Hierarchy**

Priority	Network connection type
1	Wi-Fi (Institution of Electrical and Electronics Engineers—IEEE 802.11-2007)
2	Ethernet (IEEE 802.3). If the TV supports Energy Efficient Ethernet (IEEE 802.3az-2010), then it shall be connected to a device that also supports IEEE 802.3az.
3	Bluetooth®

For wireless Wi-Fi connectivity, a Wi-Fi wireless access point that is compatible with the maximum performance specifications (e.g. the maximum speed or data rate supported by the Wi-Fi port of the UUT) shall be used.

For wireless Bluetooth® connectivity, an edge device that is compatible with the UUT's Bluetooth® implementation shall be used. For wired connectivity, a CAT5e or better cable and an Ethernet switch or router that supports the maximum performance specifications (e.g. the maximum speed or data rate supported by the Ethernet port of the UUT) shall be used. If the UUT supports Energy Efficient Ethernet, the Ethernet router shall also be compatible with the same version of Energy Efficient Ethernet.

The networking equipment shall not be connected to a wide area network (WAN).

Wireless networking equipment and the UUT shall be located in the same room within 1 m to 5 m of each other with no interfering objects in between.

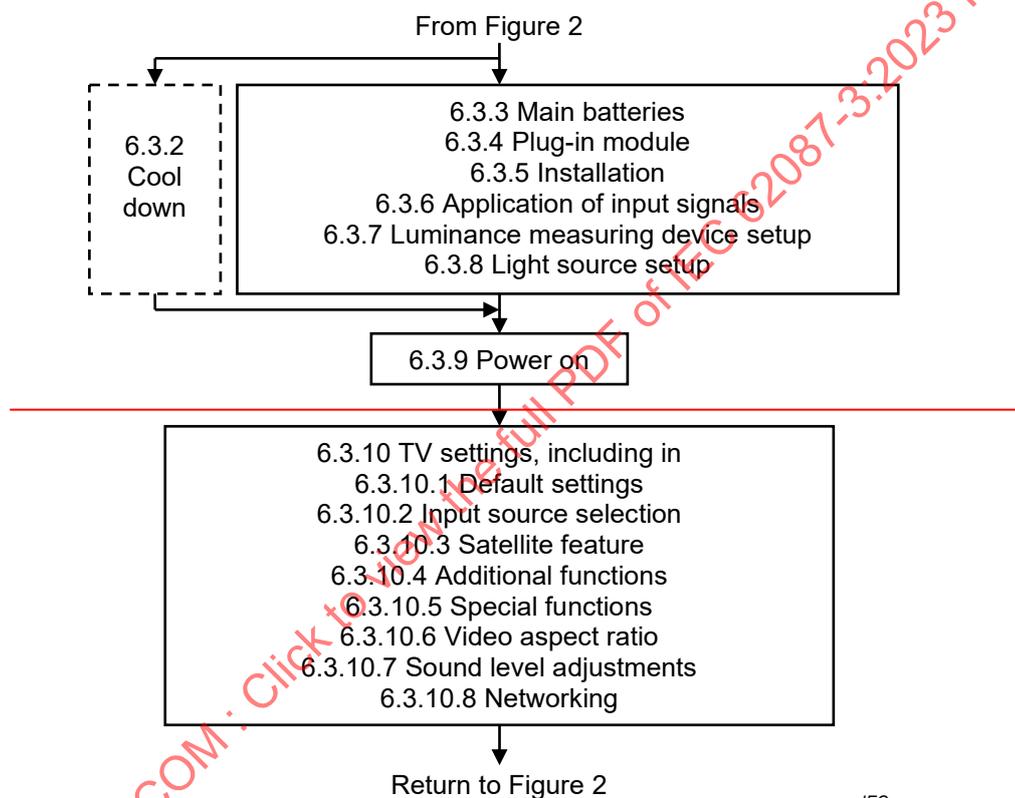
The presence of Wi-Fi (~~IEEE 802.11~~), Ethernet (~~IEEE 802.3~~), and Energy Efficient Ethernet (~~IEEE 802.3az~~) in the UUT shall be reported.

NOTE Devices that are supplied as part of the UUT that are capable of reactivating the UUT, for example an IR, RF, Wi-Fi or Bluetooth® remote control are not considered to be networking equipment. Devices or applications not supplied with the UUT, for example Wi-Fi connected sub-woofers, downloadable applications, that are capable of reactivating the UUT via IR, RF, Bluetooth® or Wi-Fi, for example an optional accessory or mobile phone, are considered to be networking equipment.

## 6.3 Initial activities

### 6.3.1 Order of initial activities

Figure 3 shows the order in which the initial activities shall be performed.



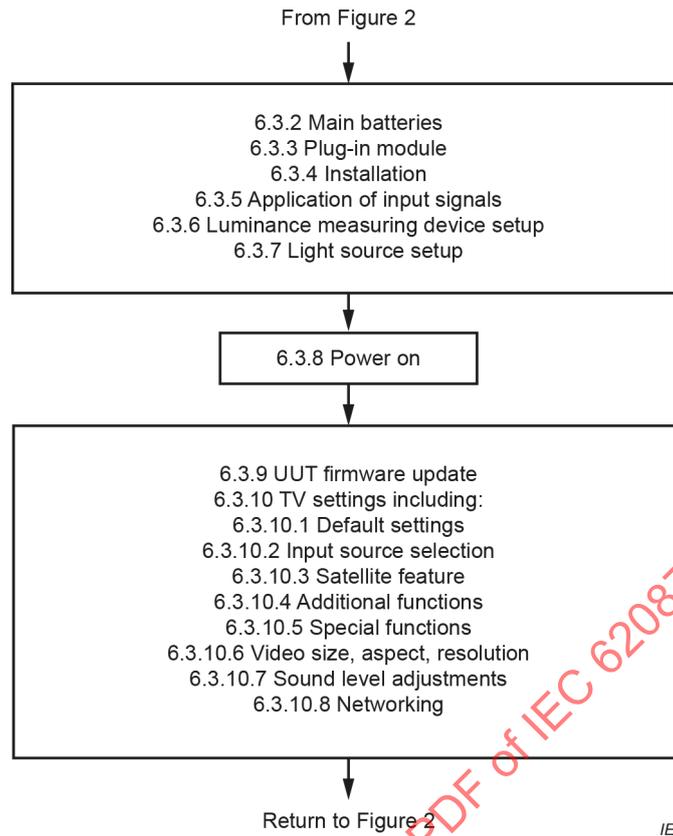


Figure 3 – Order of initial activities

~~6.3.2 Cool down~~

~~The UUT shall be in the Off or Disconnected mode for a minimum of one hour before the UUT is powered on. To optimise the initial activities, 6.3.3 through 6.3.8 may be performed during the cool down period as indicated in Figure 3.~~

**6.3.2 Main batteries**

Main batteries, if any, shall be removed for the duration of the measurement procedure.

**6.3.3 Plug-in module**

No user-removable plug-in module, such as a conditional access module ~~or~~, a point of deployment module, a USB or HDMI® stick or an external media storage unit, shall be connected to the UUT during the measurement procedure, unless it is installed in the UUT ~~is~~ as shipped to the end customer ~~already connected to an included plug-in module. In that case, the plug-in module shall remain connected during the measurement.~~ If the UUT is shipped to the end customer with a user-removable plug-in module which is described in the user manual as necessary for the product’s primary out-of-box functionalities, that user-removable module shall be connected during the measurement procedure.

A USB stick that contains media files (video, image, audio) for testing as specified in this document may be connected to the UUT as a test media source during a given measurement procedure.

**6.3.4 Installation**

The UUT shall be installed in accordance with the manufacturer’s instructions.

In order to simplify alignment of the light source, all four corners of the face of the UUT should be equidistant from a vertical reference plane (e.g. a wall) and the bottom two corners of the face of the UUT should be equidistant from a horizontal reference plane (e.g. the floor). See 6.3.7 and Figure 4 for the exact test environment setup.

The environmental conditions (5.3) and ambient light conditions (5.4) shall be confirmed. If a non-contact LMD is to be used and the ABC feature of the UUT cannot be manually disabled via the on-screen menus of the UUT, ambient light conditions at the nominal centre of the display area shall be confirmed with the UUT in ~~the~~ its Off or Disconnected mode ~~with~~ and the light source of 5.6.5 is applied to the UUT.

### 6.3.5 Application of input signals

The video input signal selected in 6.2.4 and the audio signal described in IEC 62087-2:2015/2022, 4.1.5 shall be applied to the respective input terminal(s) selected in 6.2.3. The video signal shall be in the format selected in 6.2.6. In the case of measurement with the static video signals, the full field colour bar video signal shall initially be used.

### 6.3.6 Luminance measuring device setup

The LMD (5.5.2) shall be aligned perpendicular to the centre of the display area.

- If a non-contact LMD is being used for testing, the LMD shall be at a distance capable of achieving the accuracy required in 5.5.2.
- If a contact LMD is being used, especially with smaller display sizes, it shall be ensured that the display area measured has a diameter at least as large as the LMD sensor area and that the sensor of the contact LMD can be positioned without overlap to neighbouring areas, otherwise a non-contact LMD shall be used.

### 6.3.7 Light source setup

The lamp shall be positioned to meet the following requirements:

- $X = K \times Y \pm 5 \text{ cm}$   
where  
 $X$  equals the horizontal distance between the UUT front panel and the lamp front centre point  
 $Y$  equals the vertical distance between the ABC sensor window of the UUT and the lamp front centre point  
 $K$  is the tangent of the angle between  $X$  and  $Y$
- $1 \text{ m} \leq X \leq 3 \text{ m}$
- $0,576 < K < 1,732$  (results in  $30^\circ$  to  $60^\circ$  reported lamp angle) where  $K$  is specified by manufacturer.

The centre of the beam shall be directed at the location on the bezel closest to the ABC sensor  $\pm 10 \text{ cm}$  orthogonal to the centre of the beam at the sensor. This tolerance can be ensured by moving the lamp until the maximum lux level is observed on a illuminance meter and by running a string from the ABC sensor up to the lamp to visually check alignment. The  $X$  and  $Y$  positions of the centre of the beam and the illuminance meter's position relative to nearest corner of the TV (or associated device containing ABC sensor like sound bar) shall be recorded.

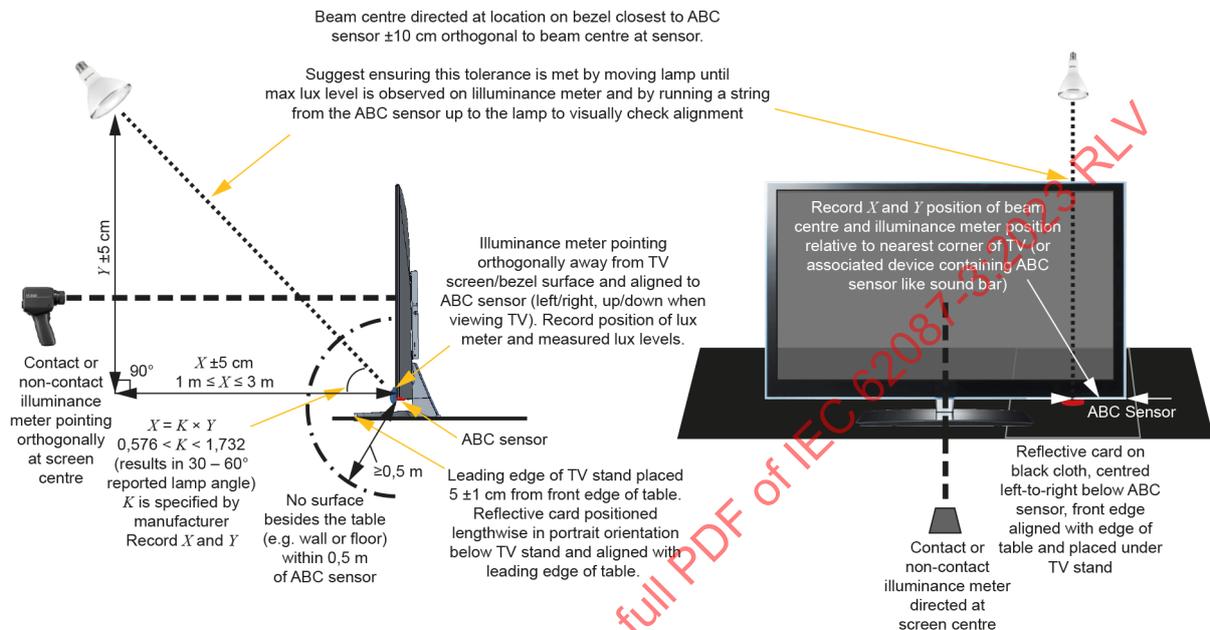
The illuminance meter shall be pointed orthogonally away from the surface of the TV screen/bezel and aligned with the ABC sensor (left/right, up/down when viewing TV). The measured lux levels shall be recorded.

A contact or non-contact luminance meter shall be pointed orthogonally at the centre of the screen.

The leading edge of the TV stand shall be placed 5 cm ± 1 cm from front edge of table. The reflective card shall be positioned lengthwise in portrait orientation, centred left-to-right below the ABC sensor, below the TV stand, and aligned with the leading edge of the table.

No surface besides the table (e.g. a wall or the floor) shall be within 0,5 m of the ABC sensor.

The light source setup is illustrated in Figure 4.



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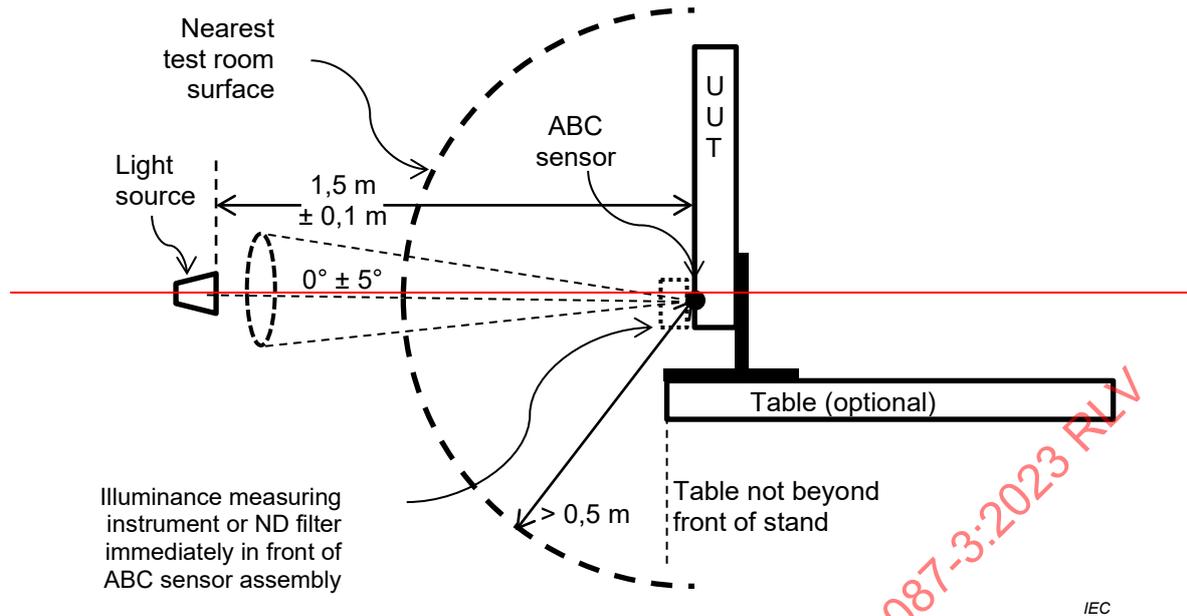
Figure 4 – Light source configuration

Aside from the possible use of a 2-stop ND filter when applying low illuminance levels to the ABC sensor assembly of the UUT, there shall be no obstructions (e.g. diffusing media, IR filters, UV filters, etc.) between the lamp illuminating light source and the UUT’s automatic brightness control (ABC) sensor assembly during power measurements.

~~The centre of the light source shall be aligned at a horizontal and vertical angle of  $0^\circ \pm 5^\circ$  with respect to the surface of the ABC sensor assembly. The distance between the front of the light source and the surface of the ABC sensor assembly shall be  $1,5\text{ m} \pm 0,1\text{ m}$ .~~

The ND filter, when used, shall be positioned immediately in front of the ~~ABC sensor~~ illumination light source assembly with care to not exceed the filter’s operating temperature range. The illuminance levels shall be verified with the illuminance measuring instrument positioned immediately in front of the ABC sensor assembly ~~or immediately in front of the ND filter~~, parallel with the unit’s front frame regardless of the orientation of the ABC sensor (i.e. forward facing or downward facing), as shown in Figure 4.

No test room surface (i.e. floor, ceiling, and wall) shall be within a 0,5 m hemisphere in front of the centre of the UUT’s ABC sensor. ~~However, if the UUT ships with or has a built-in table stand, the UUT may be set upon a table, provided that table does not extend beyond the front edge of the UUT/stand assembly (see Figure 4.) The table should be covered with black felt material.~~ If the UUT ships with or has a built-in table stand, the UUT shall be setup on a table as shown in Figure 4. The table in front of the UUT’s ABC sensor should be covered with test table surface material, as specified in 5.6.6.



**Figure 4 – Light source configuration**

~~The illuminance level shall be varied by changing the voltage, and/or duty cycle of the light source.~~

To improve test repeatability, it is suggested that the illuminance meter be hung over the top of TV with string and a counterweight placed behind the TV, or that it be rested on an object on the surface of the table for improved placement accuracy.

~~In the case of~~ When measuring relative peak luminance with a non-contact LMD and simultaneously illuminating the ABC sensor, a black tube or shroud may be used to shield the screen from the light source described in 5.6.5 as long as the shadow of the tube or shroud does not interrupt in any way the path between the light source and the reflective card.

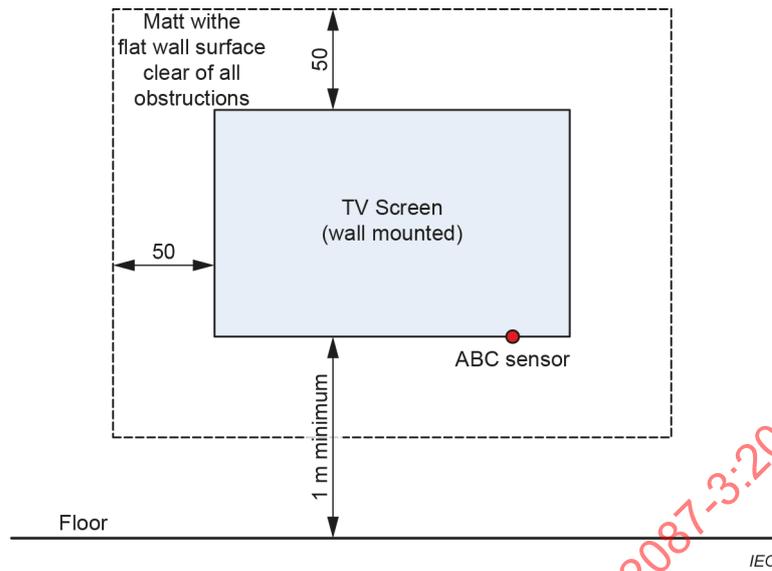
~~If the UUT includes multiple ABC sensors, each sensor shall be illuminated to the same level, within the rated tolerance limits, and multiple light sources may be used.~~

For TVs/displays that are not capable of being positioned on a tabletop, for example TVs without a stand, they should be tested as close as possible to their intended configuration:

- a) For wall-mounted TVs that include the ABC sensor (Figure 5) within the display enclosure, the TV should be mounted on a matt white wall at least 1 m above floor level with no other objects on the wall within 50 cm of all screen edges.

NOTE A pure white wall colour called 'brilliant white' or matt white that gives a matt (non-glossy) surface is readily available.

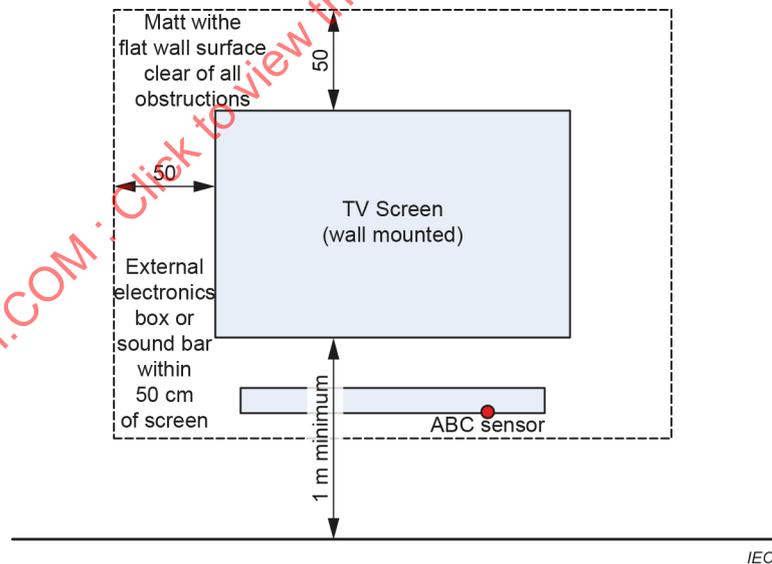
Dimensions in centimetres



**Figure 5 – Wall-mounted TV with built-in ABC sensor**

- b) In addition, for wall-mounted TVs where the ABC sensor is located externally to the display (Figure 6) (e.g. in an external electronics box enclosure or sound bar), the ABC sensor enclosure should be positioned in the same vertical plane as the screen (e.g. fixed to the same wall) at no further than 50 cm away. The ABC sensor enclosure should be fixed with or placed on (right-angled) brackets and not on a shelf.

Dimensions in centimetres



**Figure 6 – Wall Mounted TV with External ABC Sensor**

- c) For all other TV designs that do fit within the above guidance, for example a rollable display integrated into a furniture-stand supplied by the TV manufacturer, the TV should be tested with all such furniture on a floor covered with black felt material to a distance of at least 1 m away from all such furniture.

The UUT mounting configuration used in Figure 4, Figure 5 or Figure 6 during testing shall be reported, including details of the exact light source configuration used.

This document cannot consider every variation of consumer (or laboratory) test environment (e.g. exact ambient lighting colour temperature; lighting angle of incidence with respect to the UUT's ABC sensor; wall, floor, ceiling paint colour, texture, reflectivity; specific UUT mounting configuration). Therefore, this document provides the two methods most representative of consumer use, i.e. on an entertainment stand/table or wall-mounted/manufacturer-supplied furniture stand.

### 6.3.8 Power on

The UUT shall be connected to an external power source and shall be set in the On mode. The requirements specified in IEC 62087-1:2015, 5.1.1.5 (On mode) apply.

### 6.3.9 UUT firmware update

If a firmware update for the UUT is available, it shall be updated in accordance with the manufacturer's instructions, for example via a USB stick or the UUT's network connection by temporarily connecting it to the Internet. Upon completing any firmware update, disconnect the USB stick containing the firmware update files or Internet connection from the UUT.

The firmware version of the UUT as tested shall be reported.

Software applications that are optional for user installation shall not be installed.

### 6.3.10 TV settings

#### 6.3.10.1 Default setting

The UUT shall remain or be set as originally shipped ~~in~~ by the manufacturer ~~default settings~~ unless the television set provides a forced or normal configuration, which shall then be selected. ~~For television sets with a forced menu, home configuration shall be selected.~~ The UUT shall remain in the default picture setting as selected above throughout the procedure except when this document directs otherwise.

Within the context of the ~~home~~ normal configuration, if the user is prompted by the forced menu to enable or disable the quick-start feature, the power consumption in Standby-passive (6.6.4) shall be determined with quick-start disabled. The power consumption in Standby-passive may be determined again with quick-start enabled via the on-screen menus. If the quick-start feature is not offered in the forced menu, the quick-start feature shall remain in the default setting throughout the procedure.

Also, within the context of the ~~home~~ normal configuration, if the user is prompted by the forced menu to enable or disable the ABC feature, the power consumption in On mode (6.4) shall be determined with ABC disabled. The power consumption in On mode may be determined again with ABC enabled via the forced menu selection. If the ABC feature is not prompted in the forced menu, it shall remain in the default setting throughout the procedure, except where otherwise directed.

The selection(s) made within the forced menu, if it exists, shall be reported.

#### 6.3.10.2 Input source selection

The input terminals chosen in 6.2.3 shall be selected as the active source of picture and sound generated by the UUT.

#### 6.3.10.3 Satellite feature

If the UUT includes a satellite dish LNB power supply, it shall be turned off, if possible, during the measurement process to eliminate the power drawn by the LNB in the measurements. If this is not possible, then this shall be reported.

#### 6.3.10.4 Additional functions

**Additional functions** Capabilities not required for the primary function of the UUT, such as a VCR unit, a DVD unit, an HDD unit, an FM-radio unit, a memory card-reader unit, or an ambient lighting unit shall be turned off during the measurement process in the cases that those functions can be turned on and off by the end user.

#### 6.3.10.5 Special functions

Special functions not otherwise mentioned in this clause shall be in the position adjusted by the manufacturer for shipment to the end user.

#### 6.3.10.6 Video size, aspect ratio, and resolution

The UUT shall be set in such a manner that the active area of the video input signal fills the entire display area.

If the UUT has a display with a resolution higher than 1 920 pixels by 1 080 pixels and the UUT cannot be adjusted in such a manner that the video input signal fills the entire display area, an external player with an up-conversion function should be used in order to fill the entire display area.

If any setting of the UUT is changed from the default in order to fill the entire display area, the changed settings shall be reported. The player used and its related settings shall be reported.

#### 6.3.10.7 Sound level adjustments

The volume control shall be adjusted to a level at which the sound output is just audible. If audibility cannot be confirmed, visual indication of the volume level on the on-screen-display shall be set within 8 % and 12 % of its maximum.

NOTE The intent of the above requirement is to ensure that the sound circuitry in the UUT is active while keeping sound pressure levels from the UUT low.

#### 6.3.10.8 Networking

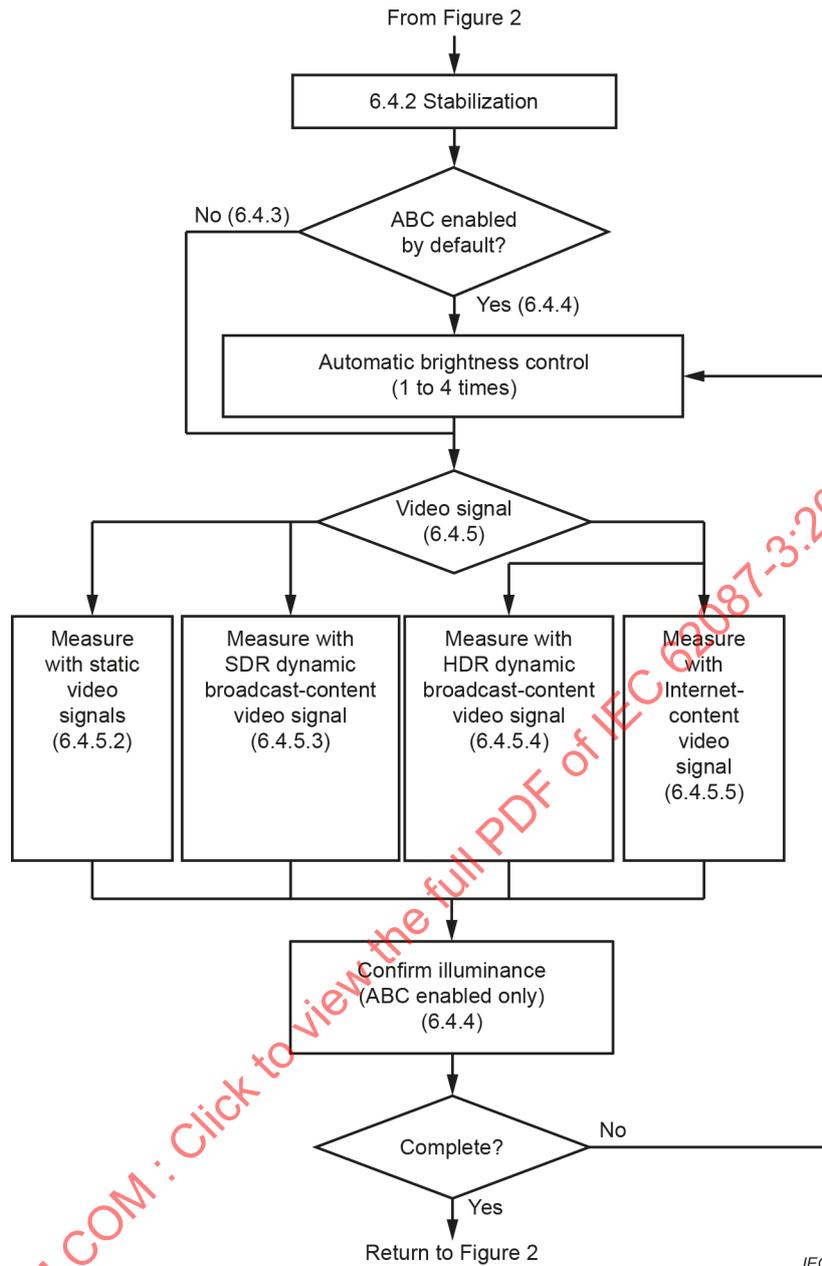
All Ethernet terminals, Wi-Fi and Bluetooth® adapters shall remain disconnected from the UUT ~~throughout the procedure~~ except when otherwise directed. Networking functions in the UUT shall be disabled ~~throughout the procedure~~ except when otherwise directed.

### 6.4 Determination of power consumption, On mode

#### 6.4.1 Order of activities

To determine power consumption in the On mode, the order of activities shown in Figure 7 shall be followed.

Within the context of the ~~home~~ normal configuration, if the user is prompted by the forced menu to enable or disable the ABC feature (6.3.10.1), the procedure in 6.4 shall be performed once as if the ABC feature were disabled by default (6.4.3) and may be performed again as if the ABC feature were enabled by default (6.4.4). For the optional second application of the procedure of 6.4, stabilization (6.4.2) does not need to be repeated.



**Figure 7 – Order of activities for determining power consumption, On mode**

### 6.4.2 Stabilization

If ABC is disabled ~~by default~~ in the default picture setting, ABC shall be disabled for the stabilization period. If ABC is enabled ~~by default~~ in the default picture setting, ABC shall remain enabled and 300 lx or greater shall be applied directly to the ABC sensor using the light source of 5.6.5 for the duration of the stabilization period.

After the steps 6.3.8 to 6.3.10.8 have been completed, the measurements shall be made after the UUT has been in the On mode for a minimum stabilization period of one hour and shall be completed before a maximum of three hours in the On mode. The video signal selected in 6.2.4 shall be displayed during the entire duration of the stabilization period and On mode power measurement (6.2.5). For television sets that are known to stabilize within one hour, these durations may be reduced if the resulting measurement can be shown to be within 2 % of the results that would otherwise be achieved using the durations described herein.

A USB stick that contains media files (video, image, audio) for testing as specified in this document may be connected to the UUT as a test media source during a given measurement procedure. The UUT's 'Replay' feature commonly provided for consumers to repeatedly play a media file from a USB input may be used to loop an appropriate test signal as specified in this document during any required stabilization period. To avoid pattern burn on a UUT, it is recommended that an appropriate broadcast test signal be used during the stabilization period.

#### 6.4.3 Television sets without automatic brightness control enabled by default

For television sets that do not have an automatic brightness control feature, or that have automatic brightness control that is disabled by default, the power measurement (6.4.5) shall be made once with the ABC feature disabled for the entire duration of the measurement.

#### 6.4.4 Television sets with automatic brightness control enabled by default

For television sets with automatic brightness control enabled by default, the power measurement (6.4.5) shall be performed as selected in 6.2.8. If the ABC conditions include the case that the ABC feature is to be manually disabled, that case shall come first in the order. Disabling ABC shall be done from the on-screen menu system. If not possible, ABC shall be disabled by applying 300 lx or greater at the ABC sensor assembly. The conditions with ABC enabled shall be applied in descending order with the highest level of illuminance applied first and the lowest level of illuminance applied last.

The light source setup shall comply with 6.3.7. Illuminance levels shall be determined with the illuminance measuring instrument (5.5.3) positioned immediately in front of the ABC sensor assembly of the UUT ~~and manually aimed directly at the light source~~ (it is acceptable if the instrument covers the ABC sensor for this step) and ensure the illuminance meter is flush with the surface of the UUT pointing perpendicularly outwards such that the meter does not swing or change position once positioned. For illuminance levels of less than 10 lx, the illuminance ~~shall~~ may be set to four times the intended illuminance and a 2-stop ND filter (5.6.4) ~~shall be placed~~ used immediately in front of the ABC sensor assembly of the UUT during the power measurement. The illuminance measuring instrument shall be moved away from the ABC sensor during the power measurement so that the light from the reference light source can reach the ABC sensor uninterrupted.

The lamp should be stabilized before testing by setting it to deliver the maximum tested lux to the ABC sensor and maintaining that light level for 10 minutes.

For each illuminance level, the illuminance shall be set within the required tolerance prior to the power measurement and shall be confirmed to be within tolerance after the power measurement.

NOTE See Annex A for more information regarding selection of ABC lighting conditions and weighting factors.

### 6.4.5 Power measurement

#### 6.4.5.1 General

Depending on the video signal type selected in 6.2.4, one of the following procedures (6.4.5.2, 6.4.5.3, 6.4.5.4 or 6.4.5.5) shall be performed. If the dynamic broadcast content video signal is chosen, testing shall include both SDR (6.4.5.3) and HDR (6.4.5.4) for devices capable of both formats.

The ABC conditions and corresponding On mode power consumption shall be reported.

#### 6.4.5.2 Measurements using static video signals

In the case that the static signals were selected in 6.2.4, On mode power consumption shall be determined using the four static test signals described in IEC 62087-2:2015/2023, 4.1.2.

For the static video signal case, the On mode power consumption of the UUT shall be determined as follows:

$$P_{o\_static} = ((P_b + P_w) / 2 + P_c + P_t) / 3$$

where

- $P_{o\_static}$  is the On mode power consumption using static signals (W);
- $P_b$  is the power measured using the black video signal (W);
- $P_w$  is the power measured using the white video signal (W);
- $P_c$  is the power measured using the full-field colour bar video signal (W);
- $P_t$  is the power measured using the three-bar video signal (W).

Depending on the state and illuminance level at the ABC sensor, the  $P_{o\_static}$  values shall be recorded as follows:

$P_{o\_static\_ABC\_Off}$ : ABC feature disabled;

$P_{o\_static\_ABC\_x}$ : ABC feature enabled, where  $x$  indicates the illuminance level in lux.

#### 6.4.5.3 Measurements using the SDR dynamic broadcast-content video signal

If SDR dynamic broadcast-content video signal was selected in 6.2.4, On mode power consumption shall be determined using the SDR dynamic broadcast-content video signal described in IEC 62087-2:2015/2023, 4.1.3. The signal shall be generated from one of the video content sources available from the IEC online repository in a format compatible with the input terminal type under test.

The average power consumption measured over the full, 10 min duration of the SDR dynamic broadcast-content video signal shall be integrated over ten consecutive minutes to determine

$P_{o\_broadcast\_SDR}$ : On mode power consumption using SDR dynamic broadcast-content video signal (W).

Depending on the state and illuminance level at the ABC sensor, the  $P_{o\_broadcast\_SDR}$  values shall be measured and integrated as above and then recorded as follows:

$P_{o\_broadcast\_SDR\_ABC\_Off}$ : ABC feature disabled;

$P_{o\_broadcast\_SDR\_ABC\_x}$ : ABC feature enabled, where  $x$  indicates the illuminance level in lux.

#### 6.4.5.4 Measurements using the HDR dynamic broadcast-content video signal

In the case that the HDR dynamic broadcast-content video signal was selected in 6.2.4, On mode power consumption shall be determined using the HDR dynamic broadcast-content video signal described in IEC 62087-2:2023, 4.1.3.3. The signal shall be generated from one of the video content sources available from the IEC online repository in a format compatible with the input terminal type under test.

The average power consumed over the full, 10-5-min duration of the HDR dynamic broadcast-content video signal shall be measured over ~~ten~~ five consecutive minutes to determine

$P_{o\_broadcast\_HDR}$ : On mode power consumption using HDR dynamic broadcast-content video signal (W).

Depending on the state and illuminance level at the ABC sensor, the  $P_{o\_broadcast\_HDR}$  values shall be recorded as follows:

$P_{o\_broadcast\_HDR\_ABC\_Off}$ : ABC feature disabled;

$P_{o\_broadcast\_HDR\_ABC\_x}$ : ABC feature enabled, where  $x$  indicates the illuminance level in lux.

#### 6.4.5.5 Measurements using the Internet-content video signal

If the Internet-content video signal was selected in 6.2.4, On mode power consumption shall be determined using the Internet-content video signal described in IEC 62087-2:2015/2023, 4.1.4.

The full duration of the Internet-content video signal is used for measuring TV power consumption when the UUT is used for viewing Internet content. The measurement shall be the average power consumed over ten consecutive minutes.

The Internet-content video signal shall be generated from video content available from the IEC online repository in a format compatible with the input terminal type under test. There are 100 images. The images shall be displayed at a rate of 6 s per image for a total duration of 10 min.

The Internet-content video signal images should be scaled as necessary to cover the entire display area without cropping.

$P_{o\_Internet}$ : On mode power consumption using Internet-content video signal (W)

Depending on the state and illuminance level at the ABC sensor, the  $P_{o\_Internet}$  values shall be recorded as follows:

$P_{o\_Internet\_ABC\_Off}$ : ABC feature disabled;

$P_{o\_Internet\_ABC\_x}$ : ABC feature enabled, where  $x$  indicates the illuminance level in lux.

### 6.5 Determination of peak luminance ratio and power factor

#### 6.5.1 General

##### 6.5.1.1 Introductory remark

The ratio of peak luminance produced between the default SDR picture setting and the overall brightest SDR preset picture setting shall be determined. The related methods in 6.4.5.5 shall be limited to determining the peak luminance ratio between SDR picture settings and should not be used for determining absolute screen luminance.

The peak luminance determination procedure shall be started within 10 min after determination of On mode power consumption (6.4.5) ~~or within 10 min after the stabilization period specified in 6.4.2.~~

##### 6.5.1.2 Automatic brightness control

The ABC feature shall be in the disabled state throughout 6.5.1.3, 6.5.1.4, 6.5.1.5, and 6.5.2.3.

If the ABC feature is not disabled by default in the selected picture setting, ABC shall be disabled manually by means of the on-screen-menu of the UUT. If it is not possible to manually disable the ABC feature, it shall be disabled by applying the light source of 5.6.5 with an illuminance of 300 lux or greater at the ABC sensor assembly while meeting the ambient light condition requirements (see 5.4).

##### 6.5.1.3 Stabilization

Stabilization shall be performed in the picture setting to be evaluated with the ABC feature disabled for a minimum of 10 min while displaying the SDR dynamic broadcast-content video signal (IEC 62087-2:2015/2023, 4.1.3).

#### **6.5.1.4 Normal measurement**

The video signal selected in 6.2.5 shall be applied to the UUT within 30 s after stabilization (6.5.1.3). Peak luminance at the nominal centre of the display area shall be measured  $30\text{ s} \pm 5\text{ s}$  after the video signal is initially displayed using the luminance measuring device as specified in 6.3.6.

#### **6.5.1.5 Quick measurement**

The quick measurement method is used when determining which configuration and picture setting produces pictures with the highest peak luminance. The video signal selected in 6.2.5 shall be applied to the UUT. The stabilization procedure in 6.5.1.3 shall not be performed between measurements in the various configurations and picture settings.

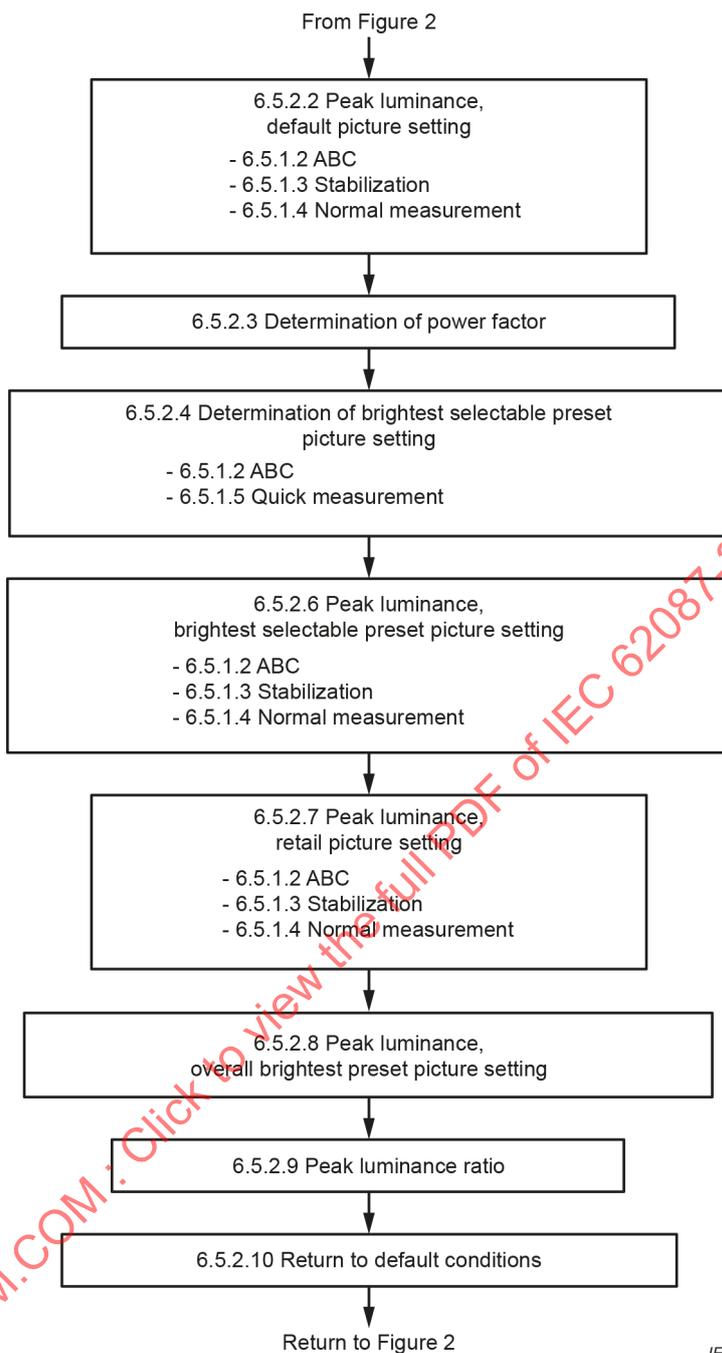
Peak luminance at the nominal centre of the display area shall be measured using the luminance measurement device as specified in 6.3.6 during the interval from 5 s to 30 s after the configuration or picture setting becomes effective.

### **6.5.2 Activities for peak luminance ratio and power factor determination**

#### **6.5.2.1 Order of activities**

Figure 8 shows the order in which the activities for determining the peak luminance ratio shall be performed.

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**Figure 8 – Order of activities for determining peak luminance ratio and power factor**

**6.5.2.2 Peak luminance, default picture setting**

The UUT shall be in the default picture setting. The ABC feature shall be disabled (6.5.1.2). The UUT shall be stabilized (6.5.1.3). The peak luminance in the default picture setting,  $L_{default}$ , shall be measured (6.5.1.4).

**6.5.2.3 Determination of the power factor**

The video signal selected in 6.2.5 shall remain applied to the UUT. The UUT shall remain in the default picture setting. The ABC feature shall remain disabled (6.5.1.2). The power factor shall be measured. ~~The value, Power\_factor, shall be~~ and reported as a percentage with an accuracy of 1 decimal point, i.e. xx,x %.

#### 6.5.2.4 Determination of brightest selectable preset picture setting

If the UUT includes selectable preset picture settings, the UUT shall be switched into a selectable preset picture setting other than the default picture setting. The ABC feature shall be disabled (6.5.1.2). Peak luminance at the nominal centre of the display area shall be measured using the quick measurement method (6.5.1.5).

The process in the above paragraph shall be repeated for all selectable preset picture settings. The picture setting associated with the highest peak luminance value shall be known as the brightest selectable preset picture setting.

The manufacturer's name or label associated with the brightest selectable preset picture setting shall be reported.

#### 6.5.2.5 Selection of the test signal for measurement of peak luminance

One of the dynamic box and outline video signals (6.2.5) shall be used unless regional regulatory requirements mandate the use of the three-bar video signal. The selection of signal format (SD, HD or UHD) shall be based on the one which most closely resembles the highest supported screen resolution of the UUT.

For the use of the dynamic box and outline video signal, the following requirements shall apply: For displays equal to or greater than 15,24 cm (6 inches) and less than 30,48 cm (12 inches) diagonally, the L40PeakLumMotion signal shall be used. For displays greater than or equal to 30,48 cm (12 inches) diagonally, the L20PeakLumMotion signal shall be used.

#### 6.5.2.6 Measurement of peak luminance, brightest selectable preset picture setting

The UUT shall be in the brightest selectable preset picture setting. The ABC feature shall be disabled (6.5.1.2). The UUT shall be stabilized (6.5.1.3). The peak luminance in the brightest selectable preset picture setting,  $L_{\text{brightest\_selectable}}$ , shall be measured (6.5.1.4).

#### 6.5.2.7 Measurement of Peak Luminance, retail picture setting

The measurement of peak luminance in retail picture setting is not required by this document.

If the determination of peak luminance in the retail picture setting,  $L_{\text{retail}}$ , is required by regional regulation, the following process shall be followed:

If the UUT can enter the retail picture setting, the UUT shall be in the retail picture setting. This might require a factory reset. If a factory reset was applied, the UUT shall be configured to comply with the settings in 6.3.10.2 to 6.3.10.8.

The ABC feature shall be disabled (6.5.1.2). The UUT shall be stabilized (6.5.1.3). The peak luminance in the retail picture setting,  $L_{\text{retail}}$ , shall be measured (6.5.1.4).

If the UUT ~~cannot enter the~~ does not provide a retail picture setting as part of the forced menu or among the selectable preset picture settings,  $L_{\text{retail}}$  shall be zero.

#### 6.5.2.8 Peak luminance, overall brightest preset picture setting

$L_{\text{brightest}}$  shall have a value equal to that of  $L_{\text{brightest\_selectable}}$  or  $L_{\text{retail}}$ , whichever is greater. If 6.5.2.7 was omitted,  $L_{\text{brightest}}$  shall have a value equal to that of  $L_{\text{brightest\_selectable}}$ .

Whether  $L_{\text{brightest\_selectable}}$  or  $L_{\text{retail}}$  is greater shall be reported.

**6.5.2.9 Peak luminance ratio**

The peak luminance ratio is calculated as follows:

$$L_{ratio} = (L_{default} / L_{brightest}) \times 100$$

The peak luminance ratio ( $L_{ratio}$ ) shall be reported as a percentage with an accuracy of 1 decimal point, i.e. xx,x %.

**6.5.2.10 Return to default conditions**

If the UUT was set in the retail configuration during 6.5.2.7, the UUT shall be set in the ~~home~~ **normal** configuration and the activities in 6.3.10.1 to 6.3.10.8 shall be applied.

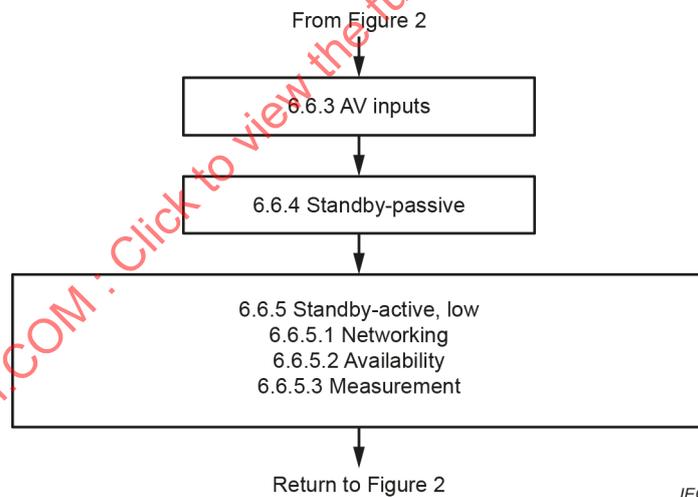
**6.6 Determination of power consumption, Partial On mode**

**6.6.1 General**

Power consumption in the Partial On sub-modes shall be determined as specified in IEC 62301:2011 ~~except as prescribed~~ **unless** stated otherwise in this document. The power source shall comply with the requirements of IEC 62087-1:2015, 5.1.1.6.

**6.6.2 Order of activities**

Figure 9 shows the order in which the activities for determining the power consumption in the Partial On sub-modes shall be performed.



**Figure 9 – Order of activities for determining the power consumption, Partial On mode**

**6.6.3 AV inputs**

All cables to AV input terminals shall be disconnected from the UUT.

**6.6.4 Standby-passive**

**6.6.4.1 Power consumption in standby-passive mode**

The UUT shall be in the default conditions (6.5.2.10). The UUT shall be switched into the Standby-passive sub-mode. Networking functions shall remain disabled (6.3.10.8) while measuring the power consumption in the Standby-passive sub-mode.

Power consumption in the Standby-passive sub-mode ( $P_{\text{standby-passive}}$ ) shall be measured and reported.

Within the context of the ~~home~~ normal configuration, if the user is prompted by the forced menu to enable or disable the quick-start feature (6.3.10.1), quick-start may be enabled via the on-screen menu selection and a second value, ( $P_{\text{standby-passive\_quick-start}}$ ), may be measured and reported. If this optional measurement is performed, the quick-start feature shall be disabled after completion of the measurement.

#### 6.6.4.2 Resume time to display SDR broadcast content

To measure the length of time required for a UUT to display content when switching from Standby-passive sub-mode to On mode, follow steps 1 through 4 below. If the UUT's selected input is USB, another input shall be used for this test only; it is necessary to use another input to support step 2's requirement for continuous playback of the SDR test content. It is suggested to use the UUT's HDMI® input in place of the USB input during this test as support for HDMI® is typically available on television sets.

- 1) Play SDR broadcast content appropriate for the UUT's selected input and confirm the content is correctly displayed.
- 2) Switch the UUT into Standby-passive via its remote control but leave the content continuously playing.
- 3) Wait at least 5 minutes to allow background processes in the UUT to complete.
- 4) Turn on the UUT using its remote control and simultaneously start a timer.
- 5) Note the time taken for the selected SDR broadcast content to be displayed by the UUT.

#### 6.6.5 Standby-active, low

##### 6.6.5.1 Networking

If the UUT has Wi-Fi capabilities, the UUT shall be in the vicinity of a Wi-Fi wireless access point, the Wi-Fi networking feature shall be enabled, and the initial connection shall be established through the TV's menu system. The Wi-Fi access point should be configured with an SSID named randomly with 4 text characters; the so-named SSID should be secured via a 13-character, randomly assigned WPA2 pre-shared key passcode and run over a mixed g/n/ac network running on both 5 GHz and 2,4 GHz frequency bands with the channel selection set to auto or randomly chosen. If auto is not available. Choose default options ~~otherwise~~ for any other required setting in the wireless access point.

If the UUT has Ethernet capabilities but no Wi-Fi capabilities, the UUT shall be connected to an Ethernet switch or router, the Ethernet port and networking feature shall be enabled, and the initial connection shall be established.

The address layer of the protocol shall be configured to complete the connection to the wireless local area network (WLAN) or wired local area network (LAN). The network shall not be connected to a wide area network (WAN). Note the following:

- Internet Protocol (IP) v4 and Internet Protocol (IP) v6 have IP/neighbour discovery and will generally configure a limited, non-routable connection automatically.
- The IP address may be configured using auto IP, dynamic host configuration protocol (DHCP), or manually, using an address in the 192.168.1.x network address translation (NAT) address space.

The network shall be configured to support the NAT address space and/or auto IP.

### 6.6.5.2 Availability

The availability of Standby-active, low shall be verified by either one of the following methods.

- a) Switch the UUT to Standby-active, low. Confirm that the UUT IP address layer is configured to establish the connection to the WLAN or LAN using a network scanner application or other software application. The scanner of choice shall confirm the IP address is associated with the unit under test and is active during the time the TV is in Standby-active, low.

EXAMPLE 1 The Fing<sup>4</sup> application (iOS or Android) is an example network scanner mobile application which will satisfy this requirement.

- b) Switch the UUT to Standby-active, low. Confirm that the UUT can be switched into the On mode with a Wake-on-LAN (WOL) or Wake on Wireless LAN (WoWLAN) network signal.

EXAMPLE 2 The Magic Packet<sup>TM5</sup> is a network signal often used for the Wake-on-LAN function.

The availability of the Standby-active, low sub-mode in the UUT shall be reported.

NOTE If additional network traffic exists, the UUT ~~may~~ can be in the Standby-active, high sub-mode.

### 6.6.5.3 Measurement

If Standby-active, low is available, the UUT shall be switched into the Standby-active, low sub-mode, and power consumption in the Standby-active, low sub-mode ( $P_{\text{standby-active, low}}$ ) shall be measured and reported.

NOTE Not all television sets are guaranteed to allow Standby-active, low to be explicitly enabled from the menus. Though television sets may have their networking connected and enabled in the On mode, it is not guaranteed that the manual or user interface will explicitly or accurately describe the network state when in the Partial On mode.

## 6.7 Determination of power consumption, Off mode

### 6.7.1 Connections and networking

If the UUT is capable of being set in the Off mode, all electrical connections to the UUT except the power cable shall be disconnected and networking features shall be disabled.

### 6.7.2 Availability

The UUT shall be switched into the Off mode. Off mode shall be confirmed by attempting to switch the UUT into another mode using the remote control. If the UUT does not switch into another mode, it is Off mode capable.

The availability of Off mode in the UUT shall be reported.

### 6.7.3 Measurement

If Off mode is available, the UUT shall be switched into the Off mode. Power consumption in the Off mode ( $P_{\text{off}}$ ) shall be determined as specified in IEC 62087-1:2015, Clause 6. The power source shall comply with the requirements of IEC 62087-1:2015, 5.1.1.6.  $P_{\text{off}}$  shall be reported.

<sup>4</sup> Fing is a trademark of Fing Limited. This information is given for the convenience of users of this standard 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.

<sup>5</sup> Magic Packet<sup>TM</sup> is a trademark of Advanced Micro Devices, Inc. This information is given for the convenience of users of this standard 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.

## Annex A (informative)

### Considerations for On mode television set power measurements

#### A.1 General

This annex applies only to the measurement of television set On mode power consumption.

#### ~~A.2 Illuminance levels for automatic brightness control~~

~~In IEC 62087:2008 and IEC 62087:2011, automatic brightness control was evaluated at 0 lx and  $\geq 300$  lx. The maintenance team has determined that measurement at only these two points may not be adequate for predicting real world power consumption.~~

~~Measurements with the ABC feature disabled or at  $\geq 300$  lx with the ABC feature enabled are effective at predicting worst case power consumption levels in the default picture setting.~~

~~Measurements with ABC enabled with 0 lx at the sensor are simple. This emulates viewing in dark conditions.~~

~~According to the CEA Home Luminance Study (CEA TR 1), CEA found that the most likely viewing condition in the US is around 12 lx, which emulates prime time viewing. A measurement at 35 lx might also be effective for emulating daytime viewing under moderately bright conditions.~~

~~Typical home illuminance may vary in different regions of the globe.~~

#### A.2 Weighting of automatic brightness control levels

In IEC 62087:2008 and IEC 62087:2011, the approach was to measure power with ABC disabled (if it was not possible to manually disable ABC, the ABC sensor was effectively disabled with by applying  $\geq 300$  lx to the ABC sensor assembly), and then with ABC enabled and 0 lx applied. The power savings between ABC disabled and enabled with 0 lx was scaled and subtracted from the power measured with ABC disabled.

$$P_{ABC} = P_{ABC\_Off} - (P_{ABC\_Off} - P_{ABC\_0}) \times A_a$$

where

$P_{ABC}$  is the On mode power consumption with power saving functions (W);

$P_{ABC\_Off}$  is the On mode power consumption with ABC disabled or effectively disabled (W);

$P_{ABC\_0}$  is the On mode power consumption with ABC enabled with 0 lx applied (W);

$A_a$  is the power saving functions weighting factor.

The need for measuring with ABC disabled is questionable as it does not reflect an out-of-the-box condition. Such a measurement made sense for IEC 62087:2008 and IEC 62087:2011 as those standards allowed for savings due to either ABC or some "other" power savings function, whichever was greater, to reduce the overall power consumption number of the television set. In this document, the savings for the "other" power savings function has been eliminated, so measuring with ABC disabled ~~may~~ might no longer be needed. The possibility of measuring with ABC disabled is retained for backward compatibility.

### A.3 Calculating On mode power consumption

In the case of television sets with ABC disabled by default in the default picture setting,

$$P_{os\_static} = P_{o\_static\_ABC\_Off}$$

$$P_{os\_broadcast} = P_{o\_broadcast\_ABC\_Off}$$

$$P_{os\_Internet} = P_{o\_Internet\_ABC\_Off}$$

In the case of television sets with ABC enabled by default in the default picture setting,

$$P_{os\_static} = P_{o\_static\_ABC\_x1} \times A_{ABC\_x1} +$$

$$P_{o\_static\_ABC\_x2} \times A_{ABC\_x2} +$$

$$P_{o\_static\_ABC\_x3} \times A_{ABC\_x3} +$$

$$P_{o\_static\_ABC\_x4} \times A_{ABC\_x4}.$$

$$P_{os\_broadcast} = P_{o\_broadcast\_ABC\_x1} \times A_{ABC\_x1} +$$

$$P_{o\_broadcast\_ABC\_x2} \times A_{ABC\_x2} +$$

$$P_{o\_broadcast\_ABC\_x3} \times A_{ABC\_x3} +$$

$$P_{o\_broadcast\_ABC\_x4} \times A_{ABC\_x4}.$$

$$P_{os\_Internet} = P_{o\_Internet\_ABC\_x1} \times A_{ABC\_x1} +$$

$$P_{o\_Internet\_ABC\_x2} \times A_{ABC\_x2} +$$

$$P_{o\_Internet\_ABC\_x3} \times A_{ABC\_x3} +$$

$$P_{o\_Internet\_ABC\_x4} \times A_{ABC\_x4}.$$

where

$P_{os\_static}$  is the On mode power consumption with ABC power saving functions, using static signals (W);

$P_{os\_broadcast}$  is the On mode power consumption with ABC power saving functions, using SDR or HDR dynamic broadcast-content video signal (W);

$P_{os\_Internet}$  is the On mode power consumption with ABC power saving functions, using the Internet-content video signal (W);

$P_{o\_static\_ABC\_x}$  is the On mode power consumption measured with ABC in the related  $x$  conditions, using static signals (W);

$P_{o\_broadcast\_ABC\_x}$  is the On mode power consumption measured with ABC in the related  $x$  conditions, using SDR or HDR dynamic broadcast-content video signal (W);

$P_{o\_Internet\_ABC\_x}$  is the On mode power consumption measured with ABC in the related  $x$  conditions, using the Internet-content video signal (W);

$A_{ABC\_x}$  is the weighting factor with ABC in the related  $x$  condition.

To ensure proper weighting, the sum of  $A_{ABC\_x1}$ ,  $A_{ABC\_x2}$ ,  $A_{ABC\_x3}$ , and  $A_{ABC\_x4}$  should equal unity.

NOTE 1 "x1", "x2", "x3" and "x4" embedded in the variable names above represent the various ABC lighting conditions in lux.

NOTE 2 In the US, On mode power is determined with ABC at 100 lx, 35 lx, 12 lx, and 3 lx. Equal weighting of  $A_{ABC\_100}$ ,  $A_{ABC\_35}$ ,  $A_{ABC\_12}$ ,  $A_{ABC\_3}$  is used, based on the results of the CEA CTA Home Luminance Study (CEACTA-TR-1). Appropriate illuminance levels and weighting factors ~~may~~ can vary in other regions, depending on typical lighting and viewing habits.

#### A.4 Picture level adjustments

Manufacturers are recommended to allow the end user of the television set to easily restore the picture level adjustments and other settings into the out-of-the-box condition.

Manufacturers are encouraged to configure the picture level adjustments in the default picture setting to provide a comfortable viewing experience as intended for the normal home environment.

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## Annex B (normative)

### Test report

The following items shall be reported when applicable:

- 1) description/identification of the UUT including manufacturer, model, firmware version;
- 2) the date and location of the measurements;
- 3) the name of the person/people who executed the measurements;
- 4) the ambient temperature (IEC 62087-1:2015, 5.1.2);
- 5) model of luminance measuring device (5.5.2);
- 6) model of illuminance measuring instrument (5.5.3);
- 7) the manufacturer, model and version of the ~~lamp~~ illuminating light source used for illuminating the ABC sensor to specific illuminance levels (5.6.4);
- 8) the manufacturer, model and version of the ~~lamp~~ illuminating light source used for disabling the ABC feature (5.6.5);
- 9) the power source used (included external power supply, mains power, and or power from other than the mains) (6.2.2);
- 10) the voltage and frequency of the power source (6.2.2);
- 11) the selected input terminals and used signal provision equipment (6.2.3);
- 12) the selected SDR and where applicable HDR video signals for measuring On mode power consumption (6.2.4);
- 13) if the satellite dish LNB power supply cannot be turned off (6.3.10.3);
- 14) the selected video signal for measuring the peak luminance ratio (6.2.5);
- 15) the selected resolution and frame rate of the input signals (6.2.6);
- 16) the presence of an ABC feature and whether or not the ABC feature is enabled by default (6.2.7);
- 17) the X and Y physical location of the ABC sensor window with respect to a suitable reference point (e.g., frame corner) on the UUT in cm (6.3.7, Figure 4);
- 18) the state(s) of the automatic brightness control feature and the illuminance levels selected to be applied to the ABC sensor (6.2.8);
- 19) the exact lux levels measured before and after each ABC test (6.2.8);
- 20) the presence of a Motion-based dynamic dimming (MDD) feature and its state (enabled or disabled) during testing (6.2.9);
- 21) the presence of Wi-Fi (IEEE 802.11), Ethernet (IEEE 802.3), and Energy Efficient Ethernet (IEEE 802.3az-2010) (6.2.10);
- 22) the light source configuration and any deviations (Figure 4, Figure 5, or Figure 6);
- 23) the position of the illuminance measuring device relative to the nearest corner of the UUT (6.3.7);
- 24) the position and angle of the light source relative to the location of the ABC sensor (6.3.7);
- 25) the selection(s) made within the forced menu, if it exists (6.3.10.1);
- 26) if any setting of the UUT is changed from the default in order to fill the entire display area, the changed settings shall be reported (6.3.10.6);
- 27) the ~~player~~ test signal playback device used in the assessment (manufacturer, model and version) and its related settings shall be reported (6.2.3 or 6.3.10.6);
- 28) the SDR and where applicable HDR On mode power consumption per illumination level (6.4.5.1), with an accuracy as specified in IEC 62087-1:2015, 5.2;

- 29) Power factor as a percentage with an accuracy of 1 decimal point (6.5.2.3);
- 30) the manufacturer's name or label associated with the brightest selectable preset picture setting (6.5.2.4);
- 31) whether  $L_{\text{brightest\_selectable}}$  or  $L_{\text{retail}}$  is greater (6.5.2.8);
- 32) the peak luminance ratio,  $L_{\text{ratio}}$  as a percentage with an accuracy of 1 decimal point (6.5.2.9);
- 33) the power consumption in the Standby-passive sub-mode,  $P_{\text{standby-passive}}$  (6.6.4), with an accuracy as specified in IEC 62087-1:2015, 5.2;
- 34) the availability of a quick-start mode and if measured the power consumption  $P_{\text{standby-passive\_quick-start}}$  (6.6.4) with an accuracy as specified in IEC 62087-1:2015, 5.2;
- 35) the availability of the Standby-active, low sub-mode (6.6.5.2);
- 36) if available, power consumption in the Standby-active, low sub-mode,  $P_{\text{standby-active, low}}$  (6.6.5.3), with an accuracy as specified in IEC 62087-1:2015, 5.2;
- 37) the availability of Off mode (6.7.2);
- 38) if available, power consumption in the Off mode,  $P_{\text{off}}$  (6.7.3), with an accuracy as specified in IEC 62087-1:2015, 5.2.

NOTE Informative Annex ZA (Test report template) in European standard EN 50564:2011 can be used for reporting purposes in Europe.

**Annex C**  
(informative)

**Example test report template**

The following form is for guidance. Use of this reporting format is not compulsory.

Product under test				
Brand name, as identified on product				
Organisation taking responsibility for the product		Name	Address	
Product description				
Model identification				
Version or serial number				
Firmware or software version				
Test Laboratory Details				
Name of test laboratory				
Address of test laboratory				
Certification body (if appropriate)				
Test report number		Test date		
Prepared by		Approved by		
Applicant/Client Details				
Name of applicant/client				
Address of applicant/client				
Regulatory reference				
Test Equipment				
Test equipment	Manufacturer of Test Instrument	Model designation	Serial Number	Calibration Due Date
Light source used for illuminating the ABC sensor to specific illuminance levels				
Light source used for disabling the ABC feature				
Luminance measuring device				
Illuminance measuring instrument				
Power supply / Voltage source				
Player / Source(s) for test signals				
Instrument used for measuring power consumption				
Wi-Fi access point (IEEE 802.11-2007)				
Ethernet switch / router (IEEE 802.3 or IEEE 802.3az-2010)				

Test Conditions					
Ambient temperature (°C)					
Description of test set-up used at each test condition					
Test supply voltage (V)		Fluctuation [max. ±2 %] (%)			
Test frequency (Hz)		Fluctuation [max. ±2 %] (%)			
Total harmonic distortion of supply voltage waveform [max. ±5 %] (%)					
Input terminal selected at UUT					
SDR video signal selected for measuring On mode power consumption		Resolution and frame rate selected		Settings changed from default in order to fill entire display area	Signal source: UUT:
HDR video signal selected for measuring On mode power consumption		Resolution and frame rate selected		Settings changed from default in order to fill entire display area	Signal source: UUT:
SDR video signal selected for measuring the peak luminance ratio		Resolution and frame rate selected		Settings changed from default in order to fill entire display area	Signal source: UUT:
Test Results					
TV settings selected		Forced menu, <del>home</del> normal configuration <input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> n.a.		Manufacturer default settings <input type="checkbox"/> yes <input type="checkbox"/> no	
		Quick-start feature selectable at home configuration menu?		<input type="checkbox"/> yes <input type="checkbox"/> no	
SDR On mode					
Presence of MDD feature <input type="checkbox"/> yes <input type="checkbox"/> no		MDD feature during testing		<input type="checkbox"/> enabled <input type="checkbox"/> disabled <input type="checkbox"/> n.a.	
Presence of ABC feature <input type="checkbox"/> yes <input type="checkbox"/> no		ABC feature enabled by default		<input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> n.a.	
ABC feature disabled		enabled			
Illuminance level applied (measured at ABC sensor) (lux)		1	2	3	4
On mode power consumption (W, accuracy)					
Power factor [ABC feature disabled] (% with accuracy of 1 decimal point)					
Brightest selectable preset picture setting (manufacturer name or label)		Is $L_{\text{brightest\_selectable}}$ greater than $L_{\text{retail}}$ ?		<input type="checkbox"/> yes <input type="checkbox"/> no	
Peak luminance (cd/m <sup>2</sup> ) (optional)		Default picture setting	Brightest selectable preset picture setting	Retail picture setting	
Peak luminance ratio (% accuracy of 1 decimal point)					

HDR On mode						
Presence of MDD feature	<input type="checkbox"/> yes <input type="checkbox"/> no		MDD feature during testing		<input type="checkbox"/> enabled <input type="checkbox"/> disabled <input type="checkbox"/> n.a.	
Presence of ABC feature	<input type="checkbox"/> yes <input type="checkbox"/> no		ABC feature enabled by default		<input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> n.a.	
ABC feature	disabled		enabled			
Illuminance level applied (measured at ABC sensor) (lux)			1	2	3	4
On mode power consumption (W, accuracy)						
Power factor [ABC feature disabled] (% with accuracy of 1 decimal point)						
Partial On and Off Modes						
Standby-passive power consumption [default or quick-start feature disabled] (W, accuracy)				Standby-passive power consumption [Quick-start enabled], optional (W, accuracy)		
Availability of network connectivity	Wi-Fi (IEEE 802.11)	<input type="checkbox"/> yes <input type="checkbox"/> no		Ethernet (IEEE 802.3)	<input type="checkbox"/> yes <input type="checkbox"/> no	
					Energy Efficient Ethernet (IEEE 802.3az-2010)	<input type="checkbox"/> yes <input type="checkbox"/> no
Availability of Standby-active, low sub-mode	<input type="checkbox"/> yes <input type="checkbox"/> no		Standby-active, low power consumption (W, accuracy)			
Availability of Standby-passive-quick-start, low sub-mode	<input type="checkbox"/> yes <input type="checkbox"/> no		Standby-passive-quick-start, low power consumption (W, accuracy)			
Availability of Off mode	<input type="checkbox"/> yes <input type="checkbox"/> no		Off mode power consumption (W, accuracy)			

Tester's reference notes/diagrams (e.g. to document test setup in accordance with 6.3.7) or for items not included in above table:

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## Annex D (informative)

### Representative test tools

The following items, while not required by implementers of this document, met this document's specifications and measurement accuracies as used by the IEC 62087 maintenance team to confirm the utility and repeatability of this document. 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.

- Pantone Black 2C Super Swatch (5.6.6 for test table ABC sensor material); <https://www.pantone.com/pantone-super-swatch>
- Photo Research PR650 / PR655 Spectroradiometer (for characterizing LED bulb specifications). <https://www.jadaktech.com/products/photo-research/spectrascan-pr-655/>
- PCE-GM 60Plus Gloss Meter (60 degree); [https://www.pce-instruments.com/us/measuring-instruments/test-meters/gloss-meter-gloss-tester-pce-instruments-gloss-meter-pce-gm-60plus-det\\_5126093.htm?\\_list=qr.art&\\_listpos=19](https://www.pce-instruments.com/us/measuring-instruments/test-meters/gloss-meter-gloss-tester-pce-instruments-gloss-meter-pce-gm-60plus-det_5126093.htm?_list=qr.art&_listpos=19)
- Fing network scanner application (for mobile devices); <https://www.fing.com/products/fing-app> (free download)
- Magic Packet™ network signal used for Wake-on-LAN functions; <https://www.microsoft.com/en-us/p/wake-on-lan-magic-packet/9nblggh51pb3?activetab=pivot:overviewtab> (free download)

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## **Annex E** (normative)

### **Measurement process overview**

A flowchart of the comprehensive measurement process as described in Clause 6 is shown in Figure E.1, which comprises Figure 2, Figure 3, Figure 5, Figure 6 and Figure 7.

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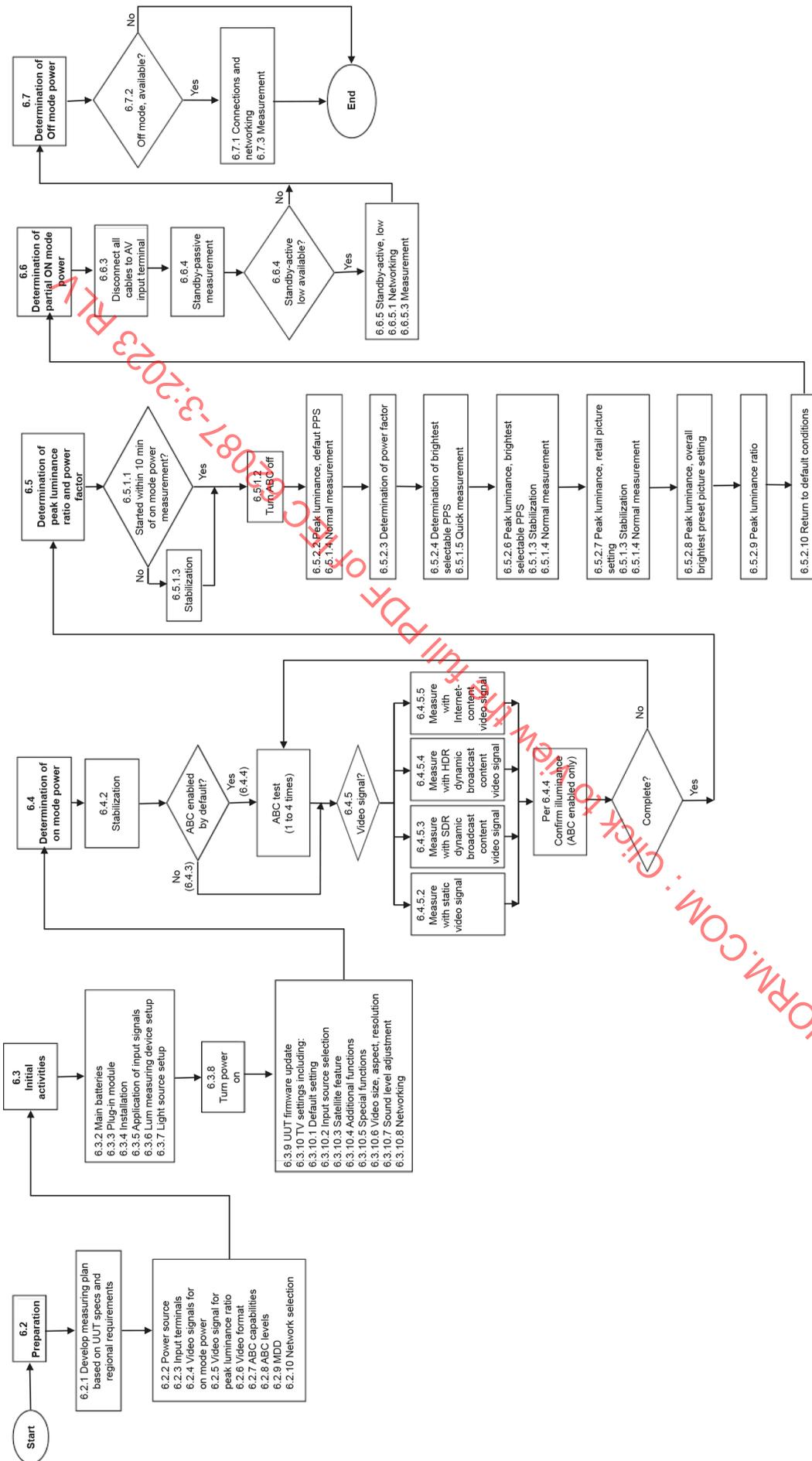


Figure E.1 – Comprehensive measurement process flow chart

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IEC 61156-6, *Multicore and symmetrical pair/quad cables for digital communications – Part 6: Symmetrical pair/quad cables with transmission characteristics up to 1 000 MHz – Work area wiring – Sectional specification*

IEC 62087:2008 (second edition), *Methods of measurement for the power consumption of audio, video and related equipment*<sup>6</sup>

IEC 62087:2011 (third edition), *Methods of measurement for the power consumption of audio, video and related equipment*<sup>7</sup>

~~IEC 62087 (all parts), Audio, video, and related equipment – Determination of power consumption~~

IEC 62087-4, *Audio, video, and related equipment – Determination of power consumption – Part 4: Video recording equipment*

IEC 62087-5, *Audio, video, and related equipment – Determination of power consumption – Part 5: Set-top-boxes*

IEC 62087-6, *Audio, video, and related equipment – Determination of power consumption – Part 6: Audio equipment*

IEC 62542:2013, *Environmental standardization for electrical and electronic products and systems – Glossary of terms*

EN 50564:2011, *Electrical and electronic household and office equipment – Measurement of low power consumption*

~~CEA-2037-A~~ CTA-2037-G, *Determination of Television Average Power Consumption*

~~CEA~~CTA-TR-1, *Home Luminance Study, June 2012*

NOTE ~~CEA~~CTA standards are available from ~~<http://www.ce.org/Standards/Standard-Listings.aspx>~~  
<https://cta.tech/Resources/Standards>

U.S. Department of Energy, *Analysis of room illuminance and televisions with automatic brightness control: Energy efficiency program for consumer products: Television Sets, March 2012*

NOTE The Department of Energy Analysis is available at  
[https://www1.eere.energy.gov/buildings/appliance\\_standards/pdfs/tv\\_tpnopr\\_room\\_illuminance\\_abc\\_031912.pdf](https://www1.eere.energy.gov/buildings/appliance_standards/pdfs/tv_tpnopr_room_illuminance_abc_031912.pdf)

IEEE 802.11-2007, *IEEE Standard for Information Technology – Telecommunications and Information Exchange Between Systems – Local and Metropolitan Area Networks – Specific Requirements – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications*

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

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

IEEE 802.3az-2010, *IEEE Standard for Information technology – Local and metropolitan area networks – Specific requirements – Part 3: CSMA/CD Access Method and Physical Layer Specifications, Amendment 5: Media Access Control Parameters, Physical Layers, and Management Parameters for Energy-Efficient Ethernet*

NOTE IEEE standards are available from <http://www.techstreet.com/ieeegate.html>

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# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Audio, video, and related equipment – Determination of power consumption –  
Part 3: Television sets**

**Appareils audio, vidéo et matériel connexe – Détermination de la consommation  
de puissance –  
Partie 3: Téléviseurs**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**AUDIO, VIDEO, AND RELATED EQUIPMENT –  
DETERMINATION OF POWER CONSUMPTION –****Part 3: Television sets**

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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IEC 62087-3 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) it introduces measuring procedures for the determination of power consumption in the On mode while viewing static metadata HDR video content;
- b) all tests for On mode power determination are performed with MDD disabled;
- c) only progressive video signals are used for testing;
- d) a dimmable LED reflector lamp is used as a light source for illuminating the ABC sensor to achieve specific illuminance levels;

e) a dynamic box and outline video signal is used for determining the ratio of peak luminance.

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

Draft	Report on voting
100/3772/CDV	100/3849/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 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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

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

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## INTRODUCTION

This document specifies the determination of the power consumption of television sets for consumer use.

This document includes measuring procedures for the determination of power consumption in the On (operation) mode, which was identified as "On (average) mode" in previous editions of IEC 62087. Additionally, it specifies measuring procedures for the determination of power consumption in the Off mode and Partial On mode. This document also defines the determination of the peak luminance ratio for use associated with television set power consumption evaluation as well as the power factor. It also defines measuring procedures for the determination of power consumption in the On mode while viewing representative static metadata HDR video content.

A verification procedure to assess product compliance is described in Annex A of IEC 62087-1:2015.

The IEC 62087 series consists of the following planned or 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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# AUDIO, VIDEO, AND RELATED EQUIPMENT – DETERMINATION OF POWER CONSUMPTION –

## Part 3: Television sets

### 1 Scope

This part of IEC 62087 specifies the determination of the power consumption and related characteristics of television sets. Television sets include, but are not limited to, those with LCD, OLED, or projection technologies.

The operating modes and functions, as they specifically apply to television sets, are defined in detail in this part of IEC 62087.

This document is limited to television sets that can be connected to an external power source. Television sets that include a non-removable, main battery are not covered by this document. Television sets can include any number of auxiliary batteries.

The measuring conditions in this document represent the normal use of the equipment and can differ from specific conditions, for example as specified in safety standards.

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

IEC 62087-2:2023, *Audio, video, and related equipment – Determination of power consumption – Part 2: Signals and media*

IEC 62301, *Household electrical appliances – Measurement of standby power*

### 3 Terms, definitions, and abbreviated terms

For the purposes of this document, the terms and definitions given in IEC 62087-1:2015, IEC 62087-2:2023 and 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 Terms and definitions

#### 3.1.1

##### **television set**

##### **TV**

equipment for the reception and display of television broadcast and similar services for terrestrial, cable, satellite and broadband network transmission of analogue and/or digital signals

Note 1 to entry: A television set can include additional functions that are not required for its primary function.

#### 3.1.2

##### **forced menu**

on-screen menu that requires the user to choose a configuration option when a television set is first setup or after a factory reset

Note 1 to entry: For example, a forced menu can offer the user the option to select either "Normal"/"Home" or "Retail"/"Store" configuration.

Note 2 to entry: See Figure 1.

#### 3.1.3

##### **normal configuration**

setting intended to be chosen for home use from the forced menu

Note 1 to entry: Subclause 4.2.2 describes the selection of normal configuration from the forced menu. This configuration selection is generally named "normal", "home", "standard", or equivalent.

Note 2 to entry: See Figure 1 and 3.1.16.

#### 3.1.4

##### **default configuration**

manufacturer's preset configuration for television sets without a forced menu

Note 1 to entry: See Figure 1.

#### 3.1.5

##### **retail configuration**

forced menu selection intended for use in a retail environment

Note 1 to entry: Subclause 4.2.3 describes the selection of retail configuration from the forced menu. This configuration selection is generally recommended by the manufacturer for presentation in a public space when the television set is offered for sale and might be named "retail", "store", "shop", or equivalent.

Note 2 to entry: See Figure 1.

#### 3.1.6

##### **preset picture setting**

common set of manufacturer-defined parameters which differ in their settings

Note 1 to entry: Examples of parameters of preset picture settings are brightness, contrast, colour space, chroma control.

#### 3.1.7

##### **selectable preset picture setting**

TV picture setting that is selectable by a user from a set of manufacturer-defined picture settings

Note 1 to entry: See Figure 1.

#### 3.1.8

##### **default picture setting**

picture setting for television sets in the normal or default configuration that is highlighted, or if none is highlighted, the picture setting first available for user selection

Note 1 to entry: See Figure 1. The HDR default picture setting (if different than the default picture setting) is the one that the TV enters when HDR video is played from the starting point of the SDR default picture setting.

### 3.1.9

#### **brightest selectable preset picture setting**

user selectable, preset picture setting that produces the highest luminance picture in the normal or default configuration

Note 1 to entry: See Figure 1.

### 3.1.10

#### **overall brightest preset picture setting**

retail picture setting or the brightest selectable preset picture setting, whichever produces the highest luminance picture

Note 1 to entry: See Figure 1.

### 3.1.11

#### **retail picture setting**

selectable preset picture setting intended for use in a retail environment

Note 1 to entry: See Figure 1.

### 3.1.12

#### **motion-based dynamic dimming**

##### **MDD**

television feature that adjusts luminance in response to amount of motion in the displayed image

### 3.1.13

#### **special function**

function that is related to, but not required for, the primary function of the device

Note 1 to entry: Examples of special functions include, but are not limited to, special sound processing and power-saving functions (e.g. automatic brightness control).

Note 2 to entry: Refer to the definition of television set (TV) (3.1.1) for primary function.

### 3.1.14

#### **conditional access**

encryption, decryption, and authorization techniques employed to protect content from unauthorized viewing

### 3.1.15

#### **conditional access module**

plug-in module that enables conditional access

### 3.1.16

#### **plug-in module**

device that plugs into television sets to provide additional functionality

### 3.1.17

#### **point of deployment module**

conditional access module for digital signal reception

### 3.1.18

#### **CAT5e**

#### **category 5e cable**

twisted pair cable used for computer networks

Note 1 to entry: See IEC 61156-5 and IEC 61156-6.

**3.1.19**  
**neutral density filter**  
**ND filter**

optical device that is designed to reduce the light intensity equally over the range of visible wavelengths

**3.1.20**  
**quick-start**

function that reduces the television set's resume time from Partial On mode to On mode

Note 1 to entry: Resume time is measured in accordance with 6.6.1.

**3.1.21**  
**colour rendering index**  
**CRI**

measure of the degree to which the psychophysical colour of an object illuminated by the test illuminant conforms to that of the same object illuminated by the reference illuminant, suitable allowance having been made for the state of chromatic adaptation

Note 1 to entry: See also CIE 13, Method of Measuring and Specifying Colour Rendering of Light Sources.

[SOURCE: IEV 845-22-109, modified – Note 2 to entry and Note 3 to entry removed]

**3.2 Abbreviated terms**

ABC	automatic brightness control
AV	audio-visual
BD	Blu-ray Disc™ <sup>1</sup>
DVD	digital versatile disc
DHCP	dynamic host configuration protocol
DVI	Digital Visual Interface
EMC	electromagnetic compatibility
FM	frequency modulation
HDD	hard disk drive
HDMI® <sup>2</sup>	High Definition Multimedia Interface
HDR	high dynamic range
HLG	hybrid log-gamma
IP	internet protocol
LAN	local area network
LED	light-emitting diode
LCD	liquid-crystal display
LMD	light measuring device
LNB	low-noise block
MDD	motion-based dynamic dimming
NAT	network address translation

<sup>1</sup> Blu-ray Disc™ is a trade mark 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.

<sup>2</sup> HDMI® and HDMI® High-Definition Multimedia Interface are registered trademarks of HDMI Licensing Administrator, Inc.. 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.

ND	neutral density
OLED	organic light-emitting diode
PC	personal computer
PQ	perceptual quantizer
RF	radio frequency
SCR	silicon-controlled rectifier
SDR	standard dynamic range
STB	set-top box
SSID	service set identifier
TV	television set
USB <sup>3</sup>	Universal Serial Bus
UUT	unit under test
VGA	Video Graphics Array
WAN	wide area network
WCG	wide colour gamut
WLAN	wireless local area network
WOL	wake-on-LAN
WoWLAN	wake on wireless LAN
WPA	Wi-Fi protected access
WPA2	Wi-Fi protected access 2

## 4 Specification of operating modes and functions

### 4.1 Table of operating modes and functions

Table 1 describes the various operating modes and functions for television sets.

For all modes, main batteries, if any, shall be removed for the duration of the measurement procedure (see IEC 62087-1:2015, 5.1.1.1.)

<sup>3</sup> USB Implementers Forum, Inc. takes the position that the terms "USB" and "Universal Serial Bus" are generic terms. 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.

**Table 1 – Operating modes and functions**

Power	Mode	Sub-mode	Function(s)	Functional description for TV
0 W	Disconnected	Disconnected	– Disconnected from power source	The television set is disconnected or galvanically isolated from all external power sources.
$\geq 0$ W	Off	Off	– Off	The television set is connected to an external power source and does not produce picture or sound and does not provide any other function that depends on an external power source. The television set cannot be switched into any other mode with the remote control unit, or an external or internal signal. Some power may be consumed if an EMC filter or other components exist on the source side of the power switch.
$> 0$ W	Partial On	Standby-passive	– Wake on <ul style="list-style-type: none"> <li>• remote control</li> <li>• internal signal</li> </ul>	The television set is connected to an external power source and does not provide picture or sound. The television set can be switched into another mode with the remote control unit or an internal signal, but not with an external signal.
		Standby-active, low	– Wake on <ul style="list-style-type: none"> <li>• remote control</li> <li>• internal signal</li> <li>• external signal</li> </ul>	The television set is connected to an external power source and does not provide picture or sound. The television set can be switched into another mode with the remote control unit or an internal signal and can additionally be switched into another mode with an external signal.  NOTE 1 When in Standby-active, low mode, a television set may be able to be switched into the On mode, the Off mode, the Standby-passive, or the Standby-active, high mode.  NOTE 2 A network-enabled TV is considered to be in Standby-active low when its presence on a local area network can be detected and there is minimal data communication beyond network maintenance.
		Standby-active, high	– Wake on <ul style="list-style-type: none"> <li>• remote control</li> <li>• internal signal</li> <li>• external signal</li> </ul> – Data communications	The television set is connected to an external power source and does not provide picture or sound. The television set can be switched into another mode with the remote control unit, an internal signal, or an external signal. Additionally, the television set is exchanging/ receiving data with/from an external source.  Determination of power consumption in this sub-mode is not specified by this document.
	On	Operation	– Operation	The television set is connected to an external power source and provides picture and, if possible, sound.

## 4.2 Configurations and picture settings

### 4.2.1 Conceptual framework

Figure 1 shows a conceptual framework that includes the various configurations and picture settings for television sets.

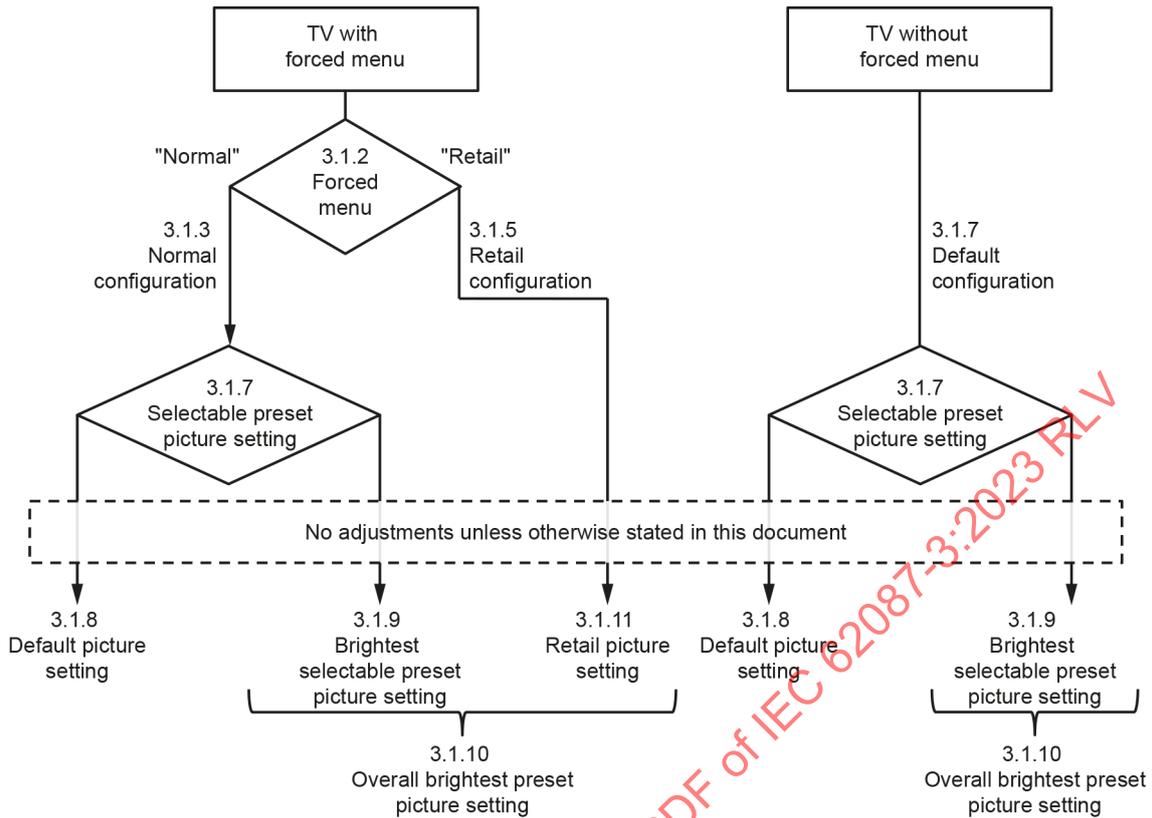


Figure 1 – Configurations and picture settings, conceptual framework

**4.2.2 Selection of normal configuration**

When directed in this document, the normal configuration shall be selected from the forced menu by choosing the configuration that is recommended for normal home use and, if not clearly defined, the default picture setting from the forced menu shall be selected: either the manufacturer's indicated option from the forced menu or, if no preference is indicated, the first option listed.

If the UUT has no forced menu, it shall remain in the default configuration.

NOTE A factory reset can be required in order to enter the normal configuration after the retail configuration has been previously selected.

**4.2.3 Selection of retail configuration**

When directed in this document, retail configuration shall be selected from the forced menu by choosing the configuration that, without any other adjustments, results in the highest display luminance.

If the UUT has no forced menu, it shall remain in the default configuration.

NOTE A factory reset can be required in order to enter the retail configuration after the normal configuration has been previously selected.

## 5 Measurement conditions

### 5.1 General

The measurement conditions clause specifies requirements that are independent of the equipment to be evaluated. When setting up a test laboratory, these requirements shall be taken into account.

The requirements of this clause apply to the procedures specified in Clause 6.

### 5.2 Power source

Defined in IEC 62087-1:2015, 5.1.1.

### 5.3 Environmental conditions

Defined in IEC 62087-1:2015, 5.1.2.

### 5.4 Ambient light conditions

For determining On mode power consumption for television sets with ABC enabled,  $\leq 1$  lx shall be confirmed at the surface of the ABC sensor assembly with the light sources (5.6.4, 5.6.5) off and the UUT in the Off or Disconnected mode.

For determining the peak luminance ratio (6.5.1.1) with a non-contact LMD,  $\leq 5$  lx shall be confirmed at the nominal centre of the display area of the UUT in Off or Disconnected mode. This requirement applies whether or not a light source (5.6.5) is applied to disable the ABC feature.

A dark room and/or shroud can be necessary in order to achieve the required ambient light conditions.

### 5.5 Measuring equipment

#### 5.5.1 Power measuring instrument

Defined in IEC 62087-1:2015, 5.1.5. and IEC 62087-1:2015, 5.1.6.

#### 5.5.2 Luminance measuring device

Defined in IEC 62087-1:2015, 5.1.7.

#### 5.5.3 Illuminance measuring instrument

Defined in IEC 62087-1:2015, 5.1.8.

### 5.6 Signal generation

#### 5.6.1 Equipment

Defined in IEC 62087-2:2023, 6.1 and IEC 62087-2:2023, 6.2.

#### 5.6.2 Interfaces

Defined in IEC 62087-2:2023, 6.3.

#### 5.6.3 Accuracy

Accuracy of video signal levels is defined in IEC 62087-2:2023, 6.4.

#### 5.6.4 Light source for specific illuminance levels

The light source used for illuminating the ABC sensor to specific illuminance levels shall use a dimmable LED reflector lamp and shall have a diameter of  $90 \text{ mm} \pm 5 \text{ mm}$ . The rated beam angle of the lamp shall be  $40^\circ \pm 5^\circ$ . The rated correlated colour temperature (CCT) of the light source shall be  $2\,700 \text{ K} \pm 300 \text{ K}$  at its rated voltage. The rated CRI shall be  $80 \pm 3$ . The front surface of the lamp shall be clear (i.e., not coloured or coated with a spectrum modifying material) and may have a smooth or granular front surface; when shined against a uniform white surface, the diffusion pattern should appear smooth to the naked eye. The lamp assembly shall not modify the spectrum of the LED source, including the IR and UV bands.

To reach the illumination levels specified in 6.2.8, the lamp shall be wired with a compatible dimming switch capable of dimming it to the lowest level required in 6.2.8. The lamp shall be capable of providing the highest illumination level when wired with the dimming switch. For luminance levels below 10 lx, a 2-stop ND filter (3.1.19) may be used if the lowest setting of the lamp and dimmer combination does not reach the required level below 10 lx. No ND filter shall be used for luminance levels at or above 10 lx. The ND filter shall be large enough to cover the entire surface of the diffusion area of the lamp. The ND filter shall have an average transmission of  $25\% \pm 2,5\%$  within the visible range, which is 400 nm to 700 nm, without selectively absorbing light at specific wavelengths.

Caution: the lamp shall be compatible with leading-edge or forward-phase dimmers (i.e. the lamp luminance does not vary with voltage).

Specific illuminance levels shall be obtained by adjusting the dimming switch.

The model of the lamp and dimmer (and versions thereof if available) used for illuminating the ABC sensor to specific illuminance levels shall be reported.

The lamp should be stabilized before testing by setting it to deliver the maximum tested lux to the ABC sensor in accordance with 6.4.2 and maintaining that light level for 10 minutes. Stabilisation may be carried out during the setting up of the light source (see 6.3.7).

#### 5.6.5 Light source for disabling the ABC feature

The same light source as that used in 5.6.4 may be used to override the ABC feature by reducing the distance between the light source and the TV's ABC sensor.

The manufacturer, model and version of the LED bulb used to override the ABC feature shall be reported.

#### 5.6.6 Test table surface material

The table used to hold the UUT shall be covered with black, minimally reflective cloth and shall have the area immediately in front of and underneath the UUT's ABC sensor, as shown in Figure 4, covered with material having a gloss measurement of 15 GU as measured by a  $60^\circ$  gloss meter. The material shall not alter visible light in the 400 nm to 700 nm range that arrives on, or is reflected by, the material. The thickness of the ABC sensor table surface material shall be 4 mm or less and shall be at least 203 mm wide by 177 mm deep; it shall be printed with a matte finish, with a colour adhering to the M1 lighting standard having CMYK values of (43, 53, 84, 84)  $\pm 2$ . The card shall not polarize light reflected off its surface.

NOTE See Annex D for further information.

## 6 Procedures

### 6.1 Order of activities

The following order of activities is recommended (also represented in Figure 2):

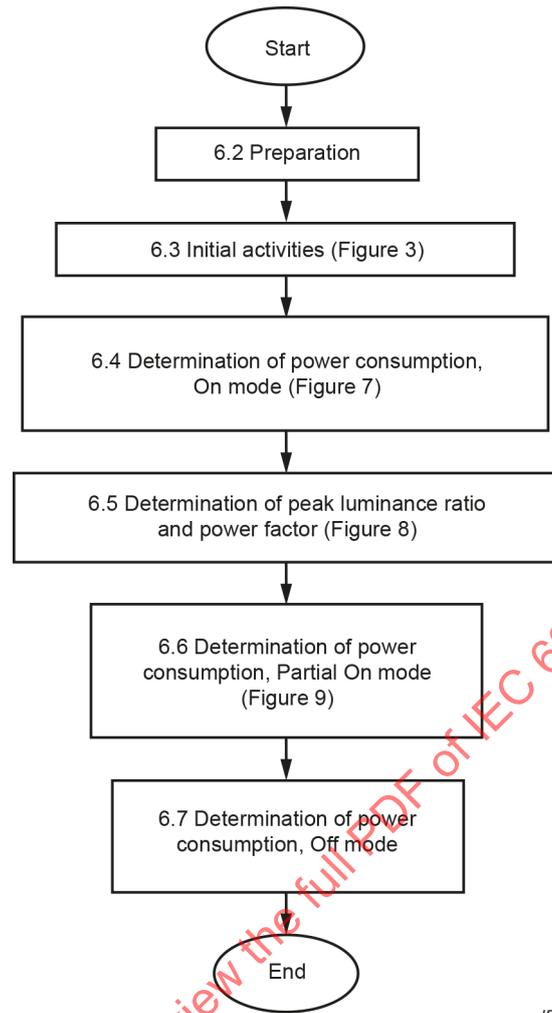
- preparation (6.2),
- initial activities (6.3),
- determination of power consumption, On mode (6.4),
- determination of peak luminance ratio and power factor (6.4.5.5),
- determination of power consumption, Partial On mode (6.6),
- determination of power consumption, Off mode (6.7).

The above order is chosen to ensure proper stabilization prior to the taking of each measurement. The technician performing the activities may vary the order as needed. However, the stabilization process prior to the taking of each measurement shall effectively be the same as if the recommended order had been followed.

A flowchart with the comprehensive measurement process is provided in Annex E, Figure E.1.

Countdown timers and 50 % grey field endings have been added to most of the video signal test clips referenced by this document to allow test personnel to easily maintain a UUT's stabilization while moving from one measurement method to the next. It is easy to inspect a given test's power consumption log to note when the test both started and ended. Test personnel are encouraged to familiarize themselves with each video signal test clip prior to using them for actual testing.

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**Figure 2 – Recommended order of activities**

## 6.2 Preparation

### 6.2.1 Measuring plan

Before the UUT has been installed, a measuring plan should be developed based on the specifications of the UUT and the region in which the results are to be reported. The measuring plan is based on the decision points in 6.2.2 through 6.2.9. These decision points include:

- power source voltage and frequency (6.2.2),
- input terminals (6.2.3),
- video signal, On mode power consumption procedure (6.2.4),
- video signal, peak luminance ratio procedure (6.2.5),
- video format (6.2.6),
- automatic brightness control capabilities (6.2.7),
- automatic brightness control levels (6.2.8),
- motion-based dynamic dimming (6.2.9),
- network connection selection (6.2.10).

When these decisions have been taken, the following activities can be expected to be deterministic.

A comprehensive list of items which shall be reported (test report) is provided in Annex B. Annex C shows an example test report template.

### 6.2.2 Power source voltage and frequency

Whether the UUT is to be powered by an included external power supply (IEC 62087-1:2015, 5.1.1.2), mains power (IEC 62087-1:2015, 5.1.1.3), and/or power from other than the mains (IEC 62087-1:2015, 5.1.1.4) shall be determined and shall be described in the report.

The voltage and frequency of the power source shall be reported.

### 6.2.3 Test signal input terminals

The following selection hierarchy for the test signal input terminal shall be used:

- USB (single USB stick directly inserted to the USB port of the UUT, the USB port recommended in the instruction manual for video file playback with the highest data rate specified shall be used),
- HDMI® (using a media player to play test media stored on a single USB stick),
- component analogue (using a media player to play test media stored on a single USB stick),
- S-Video (using a media player to play test media stored on a single USB stick),
- composite analogue (using a media player to play test media stored on a single USB stick),
- other AV or RF input.

DVI, VGA, and other inputs that are primarily used for connections with computers (as compared to AV equipment) shall not be used.

One type of input terminal shall be selected for use during the procedure. If the power consumption of the UUT is to be determined with multiple video input terminal types for comparison purposes, the entire procedure should be performed multiple times, each time with a single set of input terminals selected, to ensure proper stability under each condition.

The selected input terminals and used signal provision equipment shall be reported.

### 6.2.4 Video signal, On mode power consumption procedure

A video signal shall be selected for use during the On mode power consumption determination procedure. The dynamic broadcast-content video signals (SDR and HDR as applicable) noted below shall be used unless regional regulatory requirements mandate the use of the static video signals and/or Internet-content video signals referenced below.

- SDR dynamic broadcast-content video signal (IEC 62087-2:2023, 4.1.3.2),
- HDR dynamic broadcast-content video signal (IEC 62087-2:2023, 4.1.3.3),
- static video signals (IEC 62087-2:2023, 4.1.2),
- Internet-content video signal (IEC 62087-2:2023, 4.1.4).

The video signal selected for determining On mode power consumption shall be reported.

NOTE Information regarding the selection of the video signal for the On mode power consumption measurement is available in IEC 62087-2:2023, Annex B.

### 6.2.5 Video signal, peak luminance ratio determination

A video signal shall be selected for use during the peak luminance ratio procedure. One of the dynamic box and outline video signals noted below shall be used unless regional regulatory requirements mandate the three-bar video signal be used, also referenced below:

- dynamic box and outline video signals (IEC 62087-2:2023, 4.2.2.2),
- three-bar video signal (IEC 62087-2:2023, 4.2.2.1).

The selection of the appropriate dynamic box and outline video signal is given in 6.5.2.5. The selected video signal for determining the peak luminance ratio shall be reported.

NOTE Information regarding the selection of the video signal for the determination of the peak luminance ratio is available in IEC 62087-2:2023, Annex C.

## 6.2.6 Video format

### 6.2.6.1 SDR

The SDR video resolution and frame rate of the signals applied to the UUT during the procedure shall be selected. The selected resolution and frame rate shall be compatible with the input terminal selected in 6.2.3.

The priority order of video resolutions shall be:

- high definition 1 920 × 1 080 progressive;
- standard definition 720 x 576 or 720 x 480 progressive.

The maximum resolution of the SDR video signal applied to the UUT shall be 1 920 pixels by 1 080 pixels. If a standard definition video signal is used, it shall be at the standard broadcasting video resolution of the country or region in which the power consumption measurement is to be reported.

The video frame rate used during the measurements shall be at the standard broadcasting vertical frequency of the country or region in which the power consumption measurement is to be reported.

The selected resolution and frame rate of the SDR input signals shall be reported.

NOTE 1 Video with a 59,94 Hz frame rate is often casually referred to as "60 Hz".

NOTE 2 Technologies for the distribution of content with a resolution of more than 1 920 pixels × 1 080 pixels are prevalent. However, the SDR media available in IEC 62087-2:2023 is available in standard and high definition only. By limiting the video source resolution to 1 920 × 1 080 pixels, this document ensures that the associated signals will be up-converted by the UUT, avoiding the possibility of varying results from various external up-converters (see 6.3.10.6).

### 6.2.6.2 HDR

The HDR EOTF, video resolution and frame rate of the signals applied to the UUT during the procedure shall be selected from the IEC test signals provided. The selected resolution and frame rate shall be compatible with the input terminal selected in 6.2.3.

The priority order of video resolutions shall be:

- 3 480 × 2 160 progressive
- 1 920 × 1 080 progressive

The maximum resolution of the HDR video signal applied to the UUT shall be 3 480 pixels by 2 160 pixels.

The HDR EOTF (either HDR10 or HLG) from the IEC supplied test signals used during the measurements shall match the standard HDR EOTF used in the country or region in which the power consumption measurement is to be reported.

The video frame rate used during the measurements shall be at the standard broadcasting vertical frequency of the country or region in which the power consumption measurement is to be reported.

The selected resolution, HDR EOTF and frame rate of the HDR input signals shall be reported.

### 6.2.7 Automatic brightness control capabilities

There are three types of television sets with respect to ABC:

- television sets that do not have an ABC feature;
- television sets that have an ABC feature that is not enabled by default;
- television sets that have an ABC feature that is enabled by default.

The presence of an ABC feature and whether or not the ABC feature is enabled by default (in both SDR and HDR default pre-set picture settings) shall be reported.

### 6.2.8 Automatic brightness control levels

The On mode power consumption of television sets with the automatic brightness control disabled by default in the SDR or HDR default picture setting shall be determined with the ABC feature disabled.

For television sets with the ABC feature enabled by default in the default SDR or HDR picture setting, the On mode power consumption shall be determined with the ABC feature enabled and/or manually disabled. If the ABC feature is enabled, the On mode power consumption shall be determined over a minimum of one and a maximum of four different illuminance levels with respect to the ABC feature.

The state(s) of the ABC feature and the illuminance levels selected to be applied to the ABC sensor shall be reported along with exact illuminance meter readings prior to conducting each test.

NOTE Information for selecting the illuminance levels at the ABC sensor and the states of the ABC feature is available in Clause A.2.

### 6.2.9 Motion-based Dynamic Dimming

All tests for SDR or HDR On mode power determination in accordance with 6.4 shall be performed with MDD disabled. If MDD cannot be disabled, the unit shall be tested in the brightest selectable SDR or HDR preset picture settings as determined in 6.5.1.5 and 6.5.2.4.

Preset picture settings used for testing shall exclude the following:

- picture settings labelled "PC" or "Computer" or otherwise intended for the use case where the television set is to be used as a monitor connected to a computer;
- picture settings labelled "Game" or "Gaming" or otherwise intended for low-latency use when the television set is connected to a gaming console;
- picture settings labelled "Accessibility" or "Low Vision" or otherwise intended to produce high-contrast pictures explicitly for use by viewers with limited vision capabilities.

The state of the MDD feature during testing shall be reported.

### 6.2.10 Network connection selection

Network connections should be listed in the user manual. If no connections are specified in the user manual, verify that the TV does not have network capabilities by checking for the absence of physical connections and the absence of network settings in the menu. If the TV has the

capability to be connected to a network but was not shipped with a required piece of hardware (e.g. wireless adapter) excluding any external cables, that connection type shall not be tested.

If the TV is network enabled, connect it to a LAN in On mode and prior to being placed into Standby mode. The LAN shall allow devices to ping other devices on the network but will not allow access to a WAN. If the TV has multiple network connections (e.g. Wi-Fi and Ethernet), the TV shall be configured and connected to a single network source in accordance with the hierarchy of connections listed in Table 2.

**Table 2 – Network Connection Hierarchy**

Priority	Network connection type
1	Wi-Fi (Institution of Electrical and Electronics Engineers—IEEE 802.11-2007)
2	Ethernet (IEEE 802.3). If the TV supports Energy Efficient Ethernet (IEEE 802.3az-2010), then it shall be connected to a device that also supports IEEE 802.3az.
3	Bluetooth®

For wireless Wi-Fi connectivity, a Wi-Fi wireless access point that is compatible with the maximum performance specifications (e.g. the maximum speed or data rate supported by the Wi-Fi port of the UUT) shall be used.

For wireless Bluetooth® connectivity, an edge device that is compatible with the UUT's Bluetooth® implementation shall be used. For wired connectivity, a CAT5e or better cable and an Ethernet switch or router that supports the maximum performance specifications (e.g. the maximum speed or data rate supported by the Ethernet port of the UUT) shall be used. If the UUT supports Energy Efficient Ethernet, the Ethernet router shall also be compatible with the same version of Energy Efficient Ethernet.

The networking equipment shall not be connected to a wide area network (WAN).

Wireless networking equipment and the UUT shall be located in the same room within 1 m to 5 m of each other with no interfering objects in between.

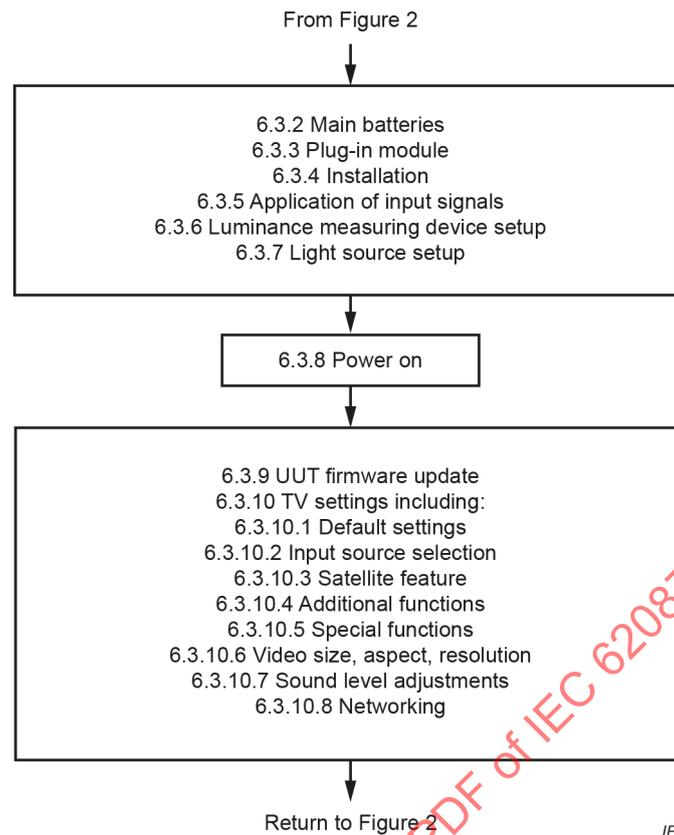
The presence of Wi-Fi, Ethernet, and Energy Efficient Ethernet in the UUT shall be reported.

NOTE Devices that are supplied as part of the UUT that are capable of reactivating the UUT, for example an IR, RF, Wi-Fi or Bluetooth® remote control are not considered to be networking equipment. Devices or applications not supplied with the UUT, for example Wi-Fi connected sub-woofers, downloadable applications, that are capable of reactivating the UUT via IR, RF, Bluetooth® or Wi-Fi, for example an optional accessory or mobile phone, are considered to be networking equipment.

### 6.3 Initial activities

#### 6.3.1 Order of initial activities

Figure 3 shows the order in which the initial activities shall be performed.



**Figure 3 – Order of initial activities**

### 6.3.2 Main batteries

Main batteries, if any, shall be removed for the duration of the measurement procedure.

### 6.3.3 Plug-in module

No user-removable plug-in module, such as a conditional access module, a point of deployment module, a USB or HDMI stick or an external media storage unit, shall be connected to the UUT during the measurement procedure, unless it is installed in the UUT as shipped to the end customer. If the UUT is shipped to the end customer with a user-removable plug-in module which is described in the user manual as necessary for the product's primary out-of-box functionalities, that user-removable module shall be connected during the measurement procedure.

A USB stick that contains media files (video, image, audio) for testing as specified in this document may be connected to the UUT as a test media source during a given measurement procedure.

### 6.3.4 Installation

The UUT shall be installed in accordance with the manufacturer's instructions.

In order to simplify alignment of the light source, all four corners of the face of the UUT should be equidistant from a vertical reference plane (e.g. a wall) and the bottom two corners of the face of the UUT should be equidistant from a horizontal reference plane (e.g. the floor). See 6.3.7 and Figure 4 for the exact test environment setup.

The environmental conditions (5.3) and ambient light conditions (5.4) shall be confirmed. If a non-contact LMD is to be used and the ABC feature of the UUT cannot be manually disabled via the on-screen menus of the UUT, ambient light conditions at the nominal centre of the

display area shall be confirmed with the UUT in its Off or Disconnected mode and the light source of 5.6.5 is applied to the UUT.

### 6.3.5 Application of input signals

The video input signal selected in 6.2.4 and the audio signal described in IEC 62087-2:2022, 4.1.5 shall be applied to the respective input terminal(s) selected in 6.2.3. The video signal shall be in the format selected in 6.2.6. In the case of measurement with the static video signals, the full field colour bar video signal shall initially be used.

### 6.3.6 Luminance measuring device setup

The LMD (5.5.2) shall be aligned perpendicular to the centre of the display area.

- If a non-contact LMD is being used for testing, the LMD shall be at a distance capable of achieving the accuracy required in 5.5.2.
- If a contact LMD is being used, especially with smaller display sizes, it shall be ensured that the display area measured has a diameter at least as large as the LMD sensor area and that the sensor of the contact LMD can be positioned without overlap to neighbouring areas, otherwise a non-contact LMD shall be used.

### 6.3.7 Light source setup

The lamp shall be positioned to meet the following requirements:

- $X = K \times Y \pm 5 \text{ cm}$   
where  
 $X$  equals the horizontal distance between the UUT front panel and the lamp front centre point  
 $Y$  equals the vertical distance between the ABC sensor window of the UUT and the lamp front centre point  
 $K$  is the tangent of the angle between  $X$  and  $Y$
- $1 \text{ m} \leq X \leq 3 \text{ m}$
- $0,576 < K < 1,732$  (results in  $30^\circ$  to  $60^\circ$  reported lamp angle) where  $K$  is specified by manufacturer.

The centre of the beam shall be directed at the location on the bezel closest to the ABC sensor  $\pm 10 \text{ cm}$  orthogonal to the centre of the beam at the sensor. This tolerance can be ensured by moving the lamp until the maximum lux level is observed on a illuminance meter and by running a string from the ABC sensor up to the lamp to visually check alignment. The  $X$  and  $Y$  positions of the centre of the beam and the illuminance meter's position relative to nearest corner of the TV (or associated device containing ABC sensor like sound bar) shall be recorded.

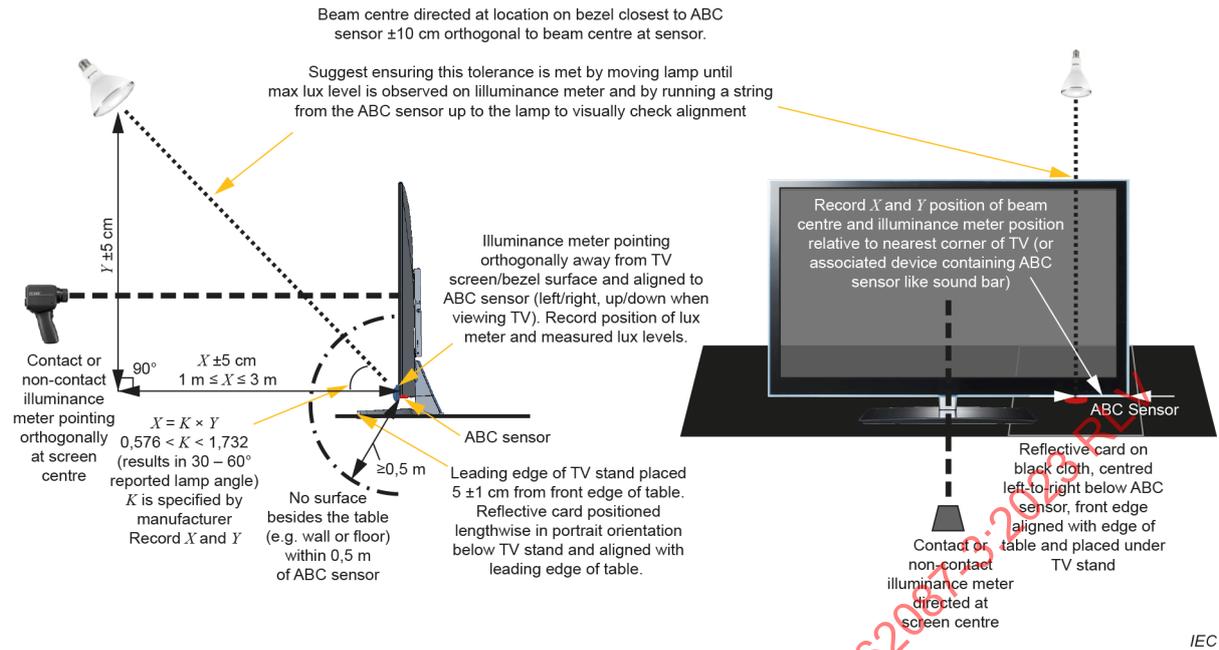
The illuminance meter shall be pointed orthogonally away from the surface of the TV screen/bezel and aligned with the ABC sensor (left/right, up/down when viewing TV). The measured lux levels shall be recorded.

A contact or non-contact luminance meter shall be pointed orthogonally at the centre of the screen.

The leading edge of the TV stand shall be placed  $5 \text{ cm} \pm 1 \text{ cm}$  from front edge of table. The reflective card shall be positioned lengthwise in portrait orientation, centred left-to-right below the ABC sensor, below the TV stand, and aligned with the leading edge of the table.

No surface besides the table (e.g. a wall or the floor) shall be within 0,5 m of the ABC sensor.

The light source setup is illustrated in Figure 4.



**Figure 4 – Light source configuration**

Aside from the possible use of a 2-stop ND filter when applying low illuminance levels to the ABC sensor assembly of the UUT, there shall be no obstructions (e.g. diffusing media, IR filters, UV filters) between the illuminating light source and the UUT's automatic brightness control (ABC) sensor assembly during power measurements.

The ND filter, when used, shall be positioned immediately in front of the illumination light source assembly with care to not exceed the filter's operating temperature range. The illumination levels shall be verified with the illuminance measuring instrument positioned immediately in front of the ABC sensor assembly, parallel with the unit's front frame regardless of the orientation of the ABC sensor (i.e. forward facing or downward facing), as shown in Figure 4.

No test room surface (i.e. floor, ceiling, and wall) shall be within a 0,5 m hemisphere in front of the centre of the UUT's ABC sensor. If the UUT ships with or has a built-in table stand, the UUT shall be setup on a table as shown in Figure 4. The table in front of the UUT's ABC sensor should be covered with test table surface material, as specified in 5.6.6.

To improve test repeatability, it is suggested that the illuminance meter be hung over the top of TV with string and a counterweight placed behind the TV, or that it be rested on an object on the surface of the table for improved placement accuracy.

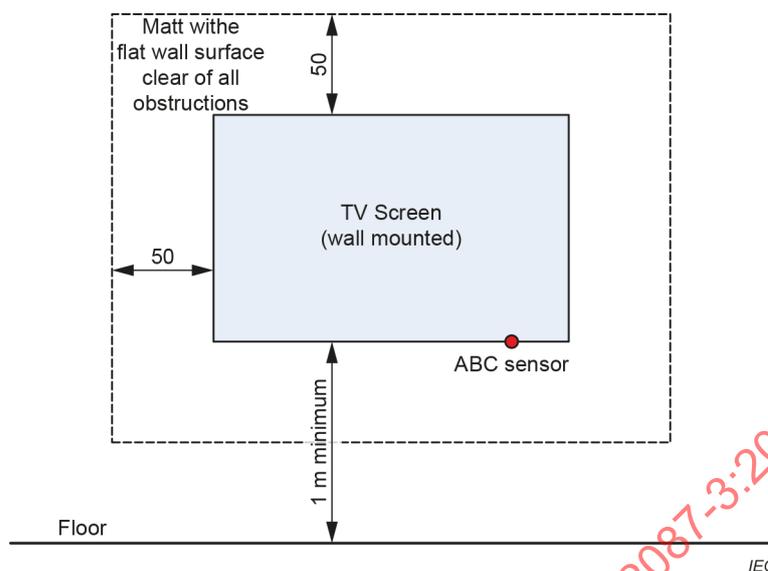
When measuring relative peak luminance with a non-contact LMD and simultaneously illuminating the ABC sensor, a black tube or shroud may be used to shield the screen from the light source described in 5.6.5 as long as the shadow of the tube or shroud does not interrupt in any way the path between the light source and the reflective card.

For TVs/displays that are not capable of being positioned on a tabletop, for example TVs without a stand, they should be tested as close as possible to their intended configuration:

- a) For wall-mounted TVs that include the ABC sensor (Figure 5) within the display enclosure, the TV should be mounted on a matt white wall at least 1 m above floor level with no other objects on the wall within 50 cm of all screen edges.

NOTE A pure white wall colour called 'brilliant white' or matt white that gives a matt (non-glossy) surface is readily available.

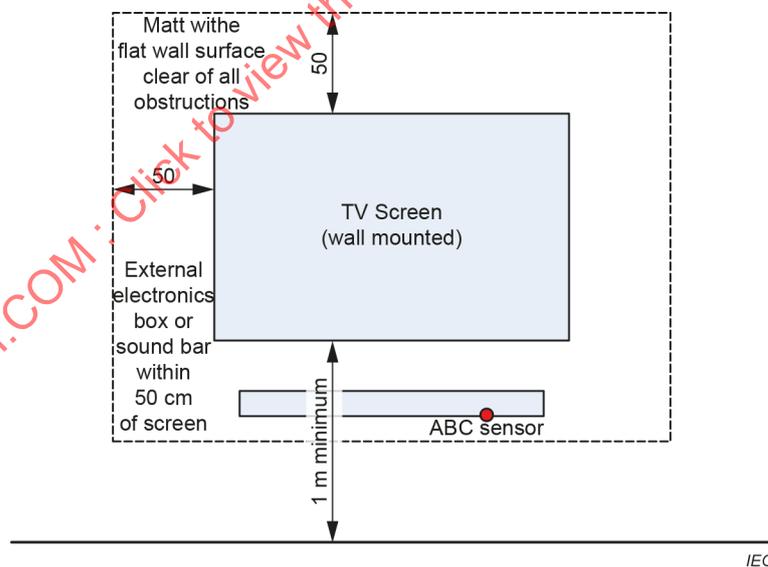
Dimensions in centimetres



**Figure 5 – Wall-mounted TV with built-in ABC sensor**

- b) In addition, for wall-mounted TVs where the ABC sensor is located externally to the display (Figure 6) (e.g. in an external electronics box enclosure or sound bar), the ABC sensor enclosure should be positioned in the same vertical plane as the screen (e.g. fixed to the same wall) at no further than 50 cm away. The ABC sensor enclosure should be fixed with or placed on (right-angled) brackets and not on a shelf.

Dimensions in centimetres



**Figure 6 – Wall Mounted TV with External ABC Sensor**

- c) For all other TV designs that do fit within the above guidance, for example a rollable display integrated into a furniture-stand supplied by the TV manufacturer, the TV should be tested with all such furniture on a floor covered with black felt material to a distance of at least 1 m away from all such furniture.

The UUT mounting configuration used in Figure 4, Figure 5 or Figure 6 during testing shall be reported, including details of the exact light source configuration used.

This document cannot consider every variation of consumer (or laboratory) test environment (e.g. exact ambient lighting colour temperature; lighting angle of incidence with respect to the UUT's ABC sensor; wall, floor, ceiling paint colour, texture, reflectivity; specific UUT mounting configuration). Therefore, this document provides the two methods most representative of consumer use, i.e. on an entertainment stand/table or wall-mounted/manufacturer-supplied furniture stand.

#### **6.3.8 Power on**

The UUT shall be connected to an external power source and shall be set in the On mode. The requirements specified in IEC 62087-1:2015, 5.1.1.5 (On mode) apply.

#### **6.3.9 UUT firmware update**

If a firmware update for the UUT is available, it shall be updated in accordance with the manufacturer's instructions, for example via a USB stick or the UUT's network connection by temporarily connecting it to the Internet. Upon completing any firmware update, disconnect the USB stick containing the firmware update files or Internet connection from the UUT.

The firmware version of the UUT as tested shall be reported.

Software applications that are optional for user installation shall not be installed.

#### **6.3.10 TV settings**

##### **6.3.10.1 Default setting**

The UUT shall remain or be set as originally shipped by the manufacturer unless the television set provides a forced or normal configuration, which shall then be selected. The UUT shall remain in the default picture setting as selected above throughout the procedure except when this document directs otherwise.

Within the context of the normal configuration, if the user is prompted by the forced menu to enable or disable the quick-start feature, the power consumption in Standby-passive (6.6.4) shall be determined with quick-start disabled. The power consumption in Standby-passive may be determined again with quick-start enabled via the on-screen menus. If the quick-start feature is not offered in the forced menu, the quick-start feature shall remain in the default setting throughout the procedure.

Also, within the context of the normal configuration, if the user is prompted by the forced menu to enable or disable the ABC feature, the power consumption in On mode (6.4) shall be determined with ABC disabled. The power consumption in On mode may be determined again with ABC enabled via the forced menu selection. If the ABC feature is not prompted in the forced menu, it shall remain in the default setting throughout the procedure, except where otherwise directed.

The selection(s) made within the forced menu, if it exists, shall be reported.

##### **6.3.10.2 Input source selection**

The input terminals chosen in 6.2.3 shall be selected as the active source of picture and sound generated by the UUT.

##### **6.3.10.3 Satellite feature**

If the UUT includes a satellite dish LNB power supply, it shall be turned off, if possible, during the measurement process to eliminate the power drawn by the LNB in the measurements. If this is not possible, then this shall be reported.

#### **6.3.10.4 Additional functions**

Capabilities not required for the primary function of the UUT, such as a VCR unit, a DVD unit, an HDD unit, an FM-radio unit, a memory card-reader unit, or an ambient lighting unit shall be turned off during the measurement process in the cases that those functions can be turned on and off by the end user.

#### **6.3.10.5 Special functions**

Special functions not otherwise mentioned in this clause shall be in the position adjusted by the manufacturer for shipment to the end user.

#### **6.3.10.6 Video size, aspect ratio, and resolution**

The UUT shall be set in such a manner that the active area of the video input signal fills the entire display area.

If the UUT has a display with a resolution higher than 1 920 pixels by 1 080 pixels and the UUT cannot be adjusted in such a manner that the video input signal fills the entire display area, an external player with an up-conversion function should be used in order to fill the entire display area.

If any setting of the UUT is changed from the default in order to fill the entire display area, the changed settings shall be reported. The player used and its related settings shall be reported.

#### **6.3.10.7 Sound level adjustments**

The volume control shall be adjusted to a level at which the sound output is just audible. If audibility cannot be confirmed, visual indication of the volume level on the on-screen-display shall be set within 8 % and 12 % of its maximum.

NOTE The intent of the above requirement is to ensure that the sound circuitry in the UUT is active while keeping sound pressure levels from the UUT low.

#### **6.3.10.8 Networking**

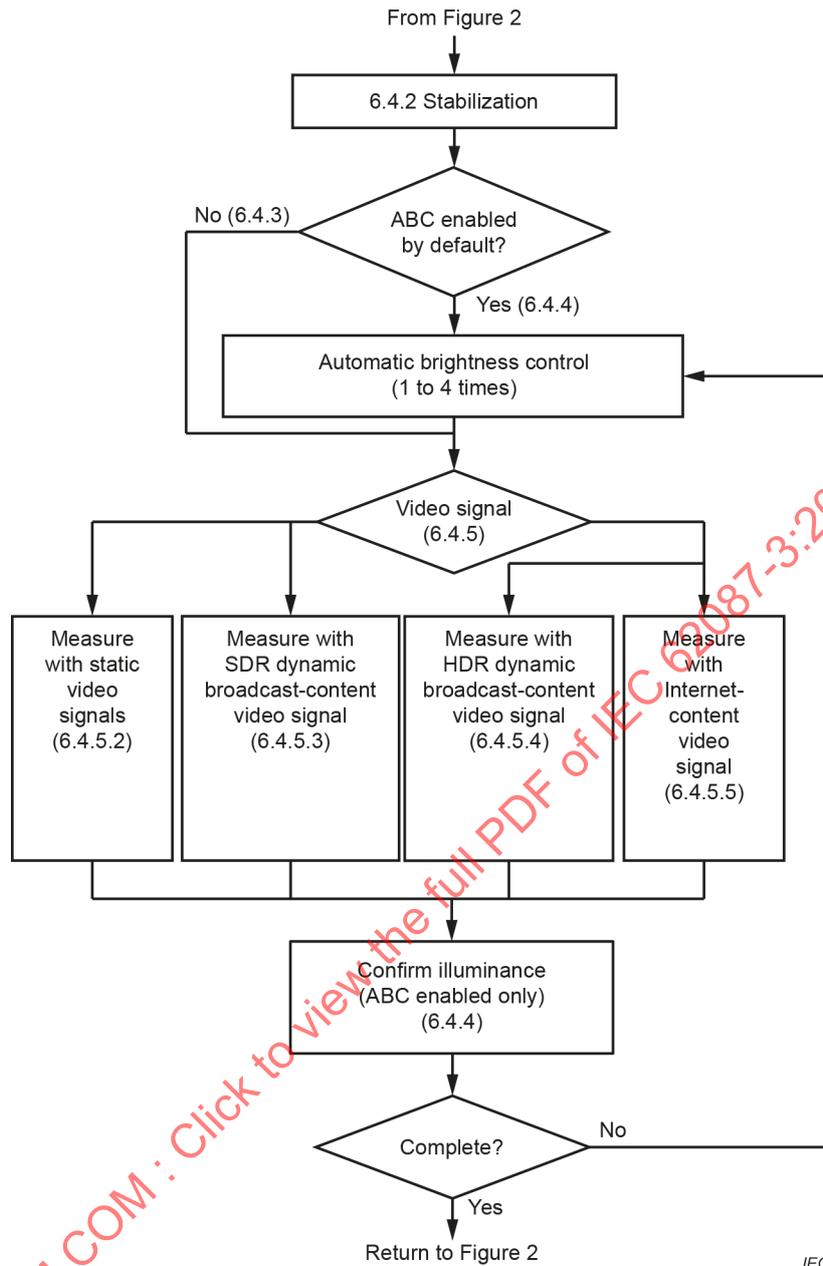
All Ethernet terminals, Wi-Fi and Bluetooth® adapters shall remain disconnected from the UUT except when otherwise directed. Networking functions in the UUT shall be disabled except when otherwise directed.

### **6.4 Determination of power consumption, On mode**

#### **6.4.1 Order of activities**

To determine power consumption in the On mode, the order of activities shown in Figure 7 shall be followed.

Within the context of the normal configuration, if the user is prompted by the forced menu to enable or disable the ABC feature (6.3.10.1), the procedure in 6.4 shall be performed once as if the ABC feature were disabled by default (6.4.3) and may be performed again as if the ABC feature were enabled by default (6.4.4). For the optional second application of the procedure of 6.4, stabilization (6.4.2) does not need to be repeated.



**Figure 7 – Order of activities for determining power consumption, On mode**

#### 6.4.2 Stabilization

If ABC is disabled in the default picture setting, ABC shall be disabled for the stabilization period. If ABC is enabled in the default picture setting, ABC shall remain enabled and 300 lx or greater shall be applied directly to the ABC sensor using the light source of 5.6.5 for the duration of the stabilization period.

After the steps 6.3.8 to 6.3.10.8 have been completed, the measurements shall be made after the UUT has been in the On mode for a minimum stabilization period of one hour and shall be completed before a maximum of three hours in the On mode. The video signal selected in 6.2.4 shall be displayed during the entire duration of the stabilization period and On mode power measurement (6.2.5). For television sets that are known to stabilize within one hour, these durations may be reduced if the resulting measurement can be shown to be within 2 % of the results that would otherwise be achieved using the durations described herein.

A USB stick that contains media files (video, image, audio) for testing as specified in this document may be connected to the UUT as a test media source during a given measurement procedure. The UUT's 'Replay' feature commonly provided for consumers to repeatedly play a media file from a USB input may be used to loop an appropriate test signal as specified in this document during any required stabilization period. To avoid pattern burn on a UUT, it is recommended that an appropriate broadcast test signal be used during the stabilization period.

#### **6.4.3 Television sets without automatic brightness control enabled by default**

For television sets that do not have an automatic brightness control feature, or that have automatic brightness control that is disabled by default, the power measurement (6.4.5) shall be made once with the ABC feature disabled for the entire duration of the measurement.

#### **6.4.4 Television sets with automatic brightness control enabled by default**

For television sets with automatic brightness control enabled by default, the power measurement (6.4.5) shall be performed as selected in 6.2.8. If the ABC conditions include the case that the ABC feature is to be manually disabled, that case shall come first in the order. Disabling ABC shall be done from the on-screen menu system. If not possible, ABC shall be disabled by applying 300 lx or greater at the ABC sensor assembly. The conditions with ABC enabled shall be applied in descending order with the highest level of illuminance applied first and the lowest level of illuminance applied last.

The light source setup shall comply with 6.3.7. Illuminance levels shall be determined with the illuminance measuring instrument (5.5.3) positioned immediately in front of the ABC sensor assembly of the UUT (it is acceptable if the instrument covers the ABC sensor for this step) and ensure the illuminance meter is flush with the surface of the UUT pointing perpendicularly outwards such that the meter does not swing or change position once positioned. For illuminance levels of less than 10 lx, the illuminance may be set to four times the intended illuminance and a 2-stop ND filter (5.6.4) used immediately in front of the ABC sensor assembly of the UUT during the power measurement. The illuminance measuring instrument shall be moved away from the ABC sensor during the power measurement so that the light from the reference light source can reach the ABC sensor uninterrupted.

The lamp should be stabilized before testing by setting it to deliver the maximum tested lux to the ABC sensor and maintaining that light level for 10 minutes.

For each illuminance level, the illuminance shall be set within the required tolerance prior to the power measurement and shall be confirmed to be within tolerance after the power measurement.

NOTE See Annex A for more information regarding selection of ABC lighting conditions and weighting factors.

#### **6.4.5 Power measurement**

##### **6.4.5.1 General**

Depending on the video signal type selected in 6.2.4, one of the following procedures (6.4.5.2, 6.4.5.3, 6.4.5.4 or 6.4.5.5) shall be performed. If the dynamic broadcast content video signal is chosen, testing shall include both SDR (6.4.5.3) and HDR (6.4.5.4) for devices capable of both formats.

The ABC conditions and corresponding On mode power consumption shall be reported.

##### **6.4.5.2 Measurements using static video signals**

In the case that the static signals were selected in 6.2.4, On mode power consumption shall be determined using the four static test signals described in IEC 62087-2:2023, 4.1.2.

For the static video signal case, the On mode power consumption of the UUT shall be determined as follows:

$$P_{o\_static} = ((P_b + P_w) / 2 + P_c + P_t) / 3$$

where

- $P_{o\_static}$  is the On mode power consumption using static signals (W);  
 $P_b$  is the power measured using the black video signal (W);  
 $P_w$  is the power measured using the white video signal (W);  
 $P_c$  is the power measured using the full-field colour bar video signal (W);  
 $P_t$  is the power measured using the three-bar video signal (W).

Depending on the state and illuminance level at the ABC sensor, the  $P_{o\_static}$  values shall be recorded as follows:

- $P_{o\_static\_ABC\_Off}$ : ABC feature disabled;  
 $P_{o\_static\_ABC\_x}$ : ABC feature enabled, where  $x$  indicates the illuminance level in lux.

#### 6.4.5.3 Measurements using the SDR dynamic broadcast-content video signal

If SDR dynamic broadcast-content video signal was selected in 6.2.4, On mode power consumption shall be determined using the SDR dynamic broadcast-content video signal described in IEC 62087-2:2023, 4.1.3. The signal shall be generated from one of the video content sources available from the IEC online repository in a format compatible with the input terminal type under test.

The average power consumption measured over the full, 10 min duration of the SDR dynamic broadcast-content video signal shall be integrated over ten consecutive minutes to determine

- $P_{o\_broadcast\_SDR}$ : On mode power consumption using SDR dynamic broadcast-content video signal (W)

Depending on the state and illuminance level at the ABC sensor, the  $P_{o\_broadcast\_SDR}$  values shall be measured and integrated as above and then recorded as follows:

- $P_{o\_broadcast\_SDR\_ABC\_Off}$ : ABC feature disabled;  
 $P_{o\_broadcast\_SDR\_ABC\_x}$ : ABC feature enabled, where  $x$  indicates the illuminance level in lux.

#### 6.4.5.4 Measurements using the HDR dynamic broadcast-content video signal

In the case that the HDR dynamic broadcast-content video signal was selected in 6.2.4, On mode power consumption shall be determined using the HDR dynamic broadcast-content video signal described in IEC 62087-2:2023, 4.1.3.3. The signal shall be generated from one of the video content sources available from the IEC online repository in a format compatible with the input terminal type under test.

The average power consumed over the full, 5-min duration of the HDR dynamic broadcast-content video signal shall be measured over five consecutive minutes to determine

- $P_{o\_broadcast\_HDR}$ : On mode power consumption using HDR dynamic broadcast-content video signal (W).

Depending on the state and illuminance level at the ABC sensor, the  $P_{o\_broadcast\_HDR}$  values shall be recorded as follows:

- $P_{o\_broadcast\_HDR\_ABC\_Off}$ : ABC feature disabled;  
 $P_{o\_broadcast\_HDR\_ABC\_x}$ : ABC feature enabled, where  $x$  indicates the illuminance level in lux.

#### 6.4.5.5 Measurements using the Internet-content video signal

If the Internet-content video signal was selected in 6.2.4, On mode power consumption shall be determined using the Internet-content video signal described in IEC 62087-2:2023, 4.1.4.

The full duration of the Internet-content video signal is used for measuring TV power consumption when the UUT is used for viewing Internet content. The measurement shall be the average power consumed over ten consecutive minutes.

The Internet-content video signal shall be generated from video content available from the IEC online repository in a format compatible with the input terminal type under test. There are 100 images. The images shall be displayed at a rate of 6 s per image for a total duration of 10 min.

The Internet-content video signal images should be scaled as necessary to cover the entire display area without cropping.

$P_{o\_Internet}$ : On mode power consumption using Internet-content video signal (W)

Depending on the state and illuminance level at the ABC sensor, the  $P_{o\_Internet}$  values shall be recorded as follows:

$P_{o\_Internet\_ABC\_Off}$ : ABC feature disabled;

$P_{o\_Internet\_ABC\_x}$ : ABC feature enabled, where  $x$  indicates the illuminance level in lux.

### 6.5 Determination of peak luminance ratio and power factor

#### 6.5.1 General

##### 6.5.1.1 Introductory remark

The ratio of peak luminance produced between the default SDR picture setting and the overall brightest SDR preset picture setting shall be determined. The related methods in 6.4.5.5 shall be limited to determining the peak luminance ratio between SDR picture settings and should not be used for determining absolute screen luminance.

The peak luminance determination procedure shall be started within 10 min after determination of On mode power consumption (6.4.5).

##### 6.5.1.2 Automatic brightness control

The ABC feature shall be in the disabled state throughout 6.5.1.3, 6.5.1.4, 6.5.1.5, and 6.5.2.3.

If the ABC feature is not disabled by default in the selected picture setting, ABC shall be disabled manually by means of the on-screen-menu of the UUT. If it is not possible to manually disable the ABC feature, it shall be disabled by applying the light source of 5.6.5 with an illuminance of 300 lux or greater at the ABC sensor assembly while meeting the ambient light condition requirements (see 5.4).

##### 6.5.1.3 Stabilization

Stabilization shall be performed in the picture setting to be evaluated with the ABC feature disabled for a minimum of 10 min while displaying the SDR dynamic broadcast-content video signal (IEC 62087-2:2023, 4.1.3).

##### 6.5.1.4 Normal measurement

The video signal selected in 6.2.5 shall be applied to the UUT within 30 s after stabilization (6.5.1.3). Peak luminance at the nominal centre of the display area shall be measured  $30\text{ s} \pm 5\text{ s}$

after the video signal is initially displayed using the luminance measuring device as specified in 6.3.6.

#### **6.5.1.5 Quick measurement**

The quick measurement method is used when determining which configuration and picture setting produces pictures with the highest peak luminance. The video signal selected in 6.2.5 shall be applied to the UUT. The stabilization procedure in 6.5.1.3 shall not be performed between measurements in the various configurations and picture settings.

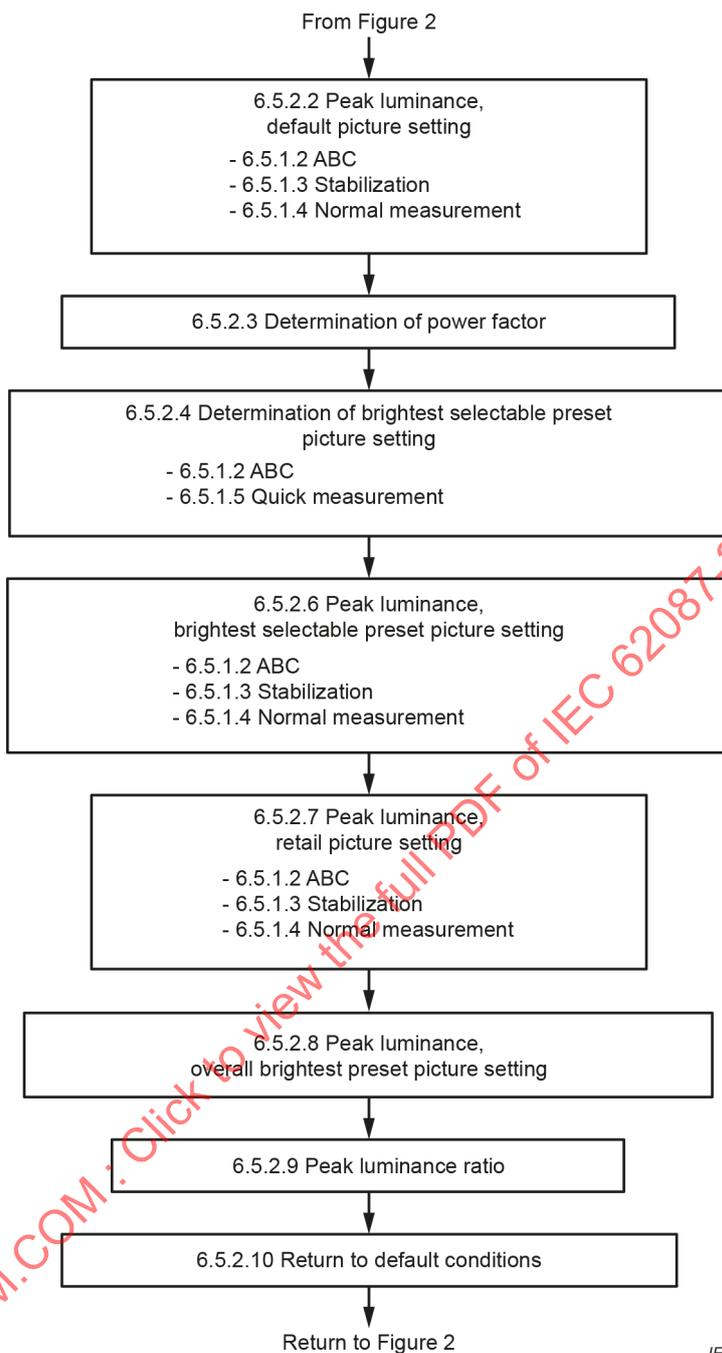
Peak luminance at the nominal centre of the display area shall be measured using the luminance measurement device as specified in 6.3.6 during the interval from 5 s to 30 s after the configuration or picture setting becomes effective.

#### **6.5.2 Activities for peak luminance ratio and power factor determination**

##### **6.5.2.1 Order of activities**

Figure 8 shows the order in which the activities for determining the peak luminance ratio shall be performed.

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**Figure 8 – Order of activities for determining peak luminance ratio and power factor**

**6.5.2.2 Peak luminance, default picture setting**

The UUT shall be in the default picture setting. The ABC feature shall be disabled (6.5.1.2). The UUT shall be stabilized (6.5.1.3). The peak luminance in the default picture setting,  $L_{default}$ , shall be measured (6.5.1.4).

**6.5.2.3 Determination of the power factor**

The video signal selected in 6.2.5 shall remain applied to the UUT. The UUT shall remain in the default picture setting. The ABC feature shall remain disabled (6.5.1.2). The power factor shall be measured and reported as a percentage with an accuracy of 1 decimal point, i.e. xx,x %.

#### 6.5.2.4 Determination of brightest selectable preset picture setting

If the UUT includes selectable preset picture settings, the UUT shall be switched into a selectable preset picture setting other than the default picture setting. The ABC feature shall be disabled (6.5.1.2). Peak luminance at the nominal centre of the display area shall be measured using the quick measurement method (6.5.1.5).

The process in the above paragraph shall be repeated for all selectable preset picture settings. The picture setting associated with the highest peak luminance value shall be known as the brightest selectable preset picture setting.

The manufacturer's name or label associated with the brightest selectable preset picture setting shall be reported.

#### 6.5.2.5 Selection of the test signal for measurement of peak luminance

One of the dynamic box and outline video signals (6.2.5) shall be used unless regional regulatory requirements mandate the use of the three-bar video signal. The selection of signal format (SD, HD or UHD) shall be based on the one which most closely resembles the highest supported screen resolution of the UUT.

For the use of the dynamic box and outline video signal, the following requirements shall apply: For displays equal to or greater than 15,24 cm (6 inches) and less than 30,48 cm (12 inches) diagonally, the L40PeakLumMotion signal shall be used. For displays greater than or equal to 30,48 cm (12 inches) diagonally, the L20PeakLumMotion signal shall be used.

#### 6.5.2.6 Measurement of peak luminance, brightest selectable preset picture setting

The UUT shall be in the brightest selectable preset picture setting. The ABC feature shall be disabled (6.5.1.2). The UUT shall be stabilized (6.5.1.3). The peak luminance in the brightest selectable preset picture setting,  $L_{\text{brightest\_selectable}}$ , shall be measured (6.5.1.4).

#### 6.5.2.7 Measurement of Peak Luminance, retail picture setting

The measurement of peak luminance in retail picture setting is not required by this document.

If the determination of peak luminance in the retail picture setting,  $L_{\text{retail}}$ , is required by regional regulation, the following process shall be followed:

If the UUT can enter the retail picture setting, the UUT shall be in the retail picture setting. This might require a factory reset. If a factory reset was applied, the UUT shall be configured to comply with the settings in 6.3.10.2 to 6.3.10.8.

The ABC feature shall be disabled (6.5.1.2). The UUT shall be stabilized (6.5.1.3). The peak luminance in the retail picture setting,  $L_{\text{retail}}$ , shall be measured (6.5.1.4).

If the UUT does not provide a retail picture setting as part of the forced menu or among the selectable preset picture settings,  $L_{\text{retail}}$  shall be zero.

#### 6.5.2.8 Peak luminance, overall brightest preset picture setting

$L_{\text{brightest}}$  shall have a value equal to that of  $L_{\text{brightest\_selectable}}$  or  $L_{\text{retail}}$ , whichever is greater. If 6.5.2.7 was omitted,  $L_{\text{brightest}}$  shall have a value equal to that of  $L_{\text{brightest\_selectable}}$ .

Whether  $L_{\text{brightest\_selectable}}$  or  $L_{\text{retail}}$  is greater shall be reported.

**6.5.2.9 Peak luminance ratio**

The peak luminance ratio is calculated as follows:

$$L_{ratio} = (L_{default} / L_{brightest}) \times 100$$

The peak luminance ratio ( $L_{ratio}$ ) shall be reported as a percentage with an accuracy of 1 decimal point, i.e. xx,x %.

**6.5.2.10 Return to default conditions**

If the UUT was set in the retail configuration during 6.5.2.7, the UUT shall be set in the normal configuration and the activities in 6.3.10.1 to 6.3.10.8 shall be applied.

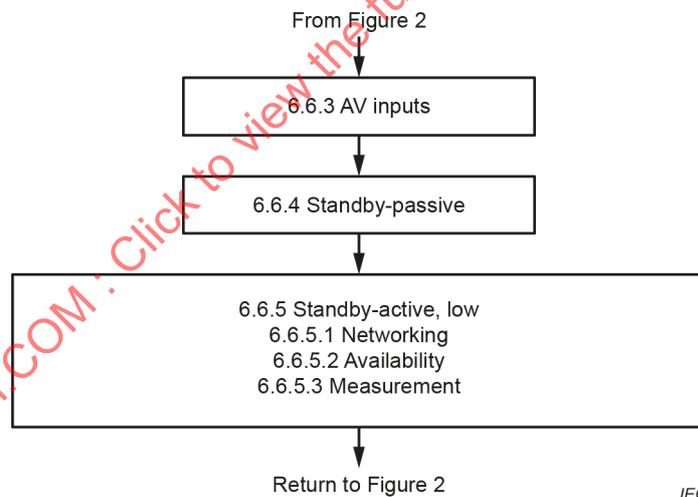
**6.6 Determination of power consumption, Partial On mode**

**6.6.1 General**

Power consumption in the Partial On sub-modes shall be determined as specified in IEC 62301 unless stated otherwise in this document. The power source shall comply with the requirements of IEC 62087-1:2015, 5.1.1.6.

**6.6.2 Order of activities**

Figure 9 shows the order in which the activities for determining the power consumption in the Partial On sub-modes shall be performed.



**Figure 9 – Order of activities for determining the power consumption, Partial On mode**

**6.6.3 AV inputs**

All cables to AV input terminals shall be disconnected from the UUT.

**6.6.4 Standby-passive**

**6.6.4.1 Power consumption in standby-passive mode**

The UUT shall be in the default conditions (6.5.2.10). The UUT shall be switched into the Standby-passive sub-mode. Networking functions shall remain disabled (6.3.10.8) while measuring the power consumption in the Standby-passive sub-mode.

Power consumption in the Standby-passive sub-mode ( $P_{\text{standby-passive}}$ ) shall be measured and reported.

Within the context of the normal configuration, if the user is prompted by the forced menu to enable or disable the quick-start feature (6.3.10.1), quick-start may be enabled via the on-screen menu selection and a second value, ( $P_{\text{standby-passive\_quick-start}}$ ), may be measured and reported. If this optional measurement is performed, the quick-start feature shall be disabled after completion of the measurement.

#### 6.6.4.2 Resume time to display SDR broadcast content

To measure the length of time required for a UUT to display content when switching from Standby-passive sub-mode to On mode, follow steps 1 through 4 below. If the UUT's selected input is USB, another input shall be used for this test only; it is necessary to use another input to support step 2's requirement for continuous playback of the SDR test content. It is suggested to use the UUT's HDMI® input in place of the USB input during this test as support for HDMI® is typically available on television sets.

- 1) Play SDR broadcast content appropriate for the UUT's selected input and confirm the content is correctly displayed.
- 2) Switch the UUT into Standby-passive via its remote control but leave the content continuously playing.
- 3) Wait at least 5 minutes to allow background processes in the UUT to complete.
- 4) Turn on the UUT using its remote control and simultaneously start a timer.
- 5) Note the time taken for the selected SDR broadcast content to be displayed by the UUT.

#### 6.6.5 Standby-active, low

##### 6.6.5.1 Networking

If the UUT has Wi-Fi capabilities, the UUT shall be in the vicinity of a Wi-Fi wireless access point, the Wi-Fi networking feature shall be enabled, and the initial connection shall be established through the TV's menu system. The Wi-Fi access point should be configured with an SSID named randomly with 4 text characters; the so-named SSID should be secured via a 13-character, randomly assigned WPA2 pre-shared key passcode and run over a mixed g/n/ac network running on both 5 GHz and 2,4 GHz frequency bands with the channel selection set to auto or randomly chosen if auto is not available. Choose default options for any other required setting in the wireless access point.

If the UUT has Ethernet capabilities but no Wi-Fi capabilities, the UUT shall be connected to an Ethernet switch or router, the Ethernet port and networking feature shall be enabled, and the initial connection shall be established.

The address layer of the protocol shall be configured to complete the connection to the wireless local area network (WLAN) or wired local area network (LAN). The network shall not be connected to a wide area network (WAN). Note the following:

- Internet Protocol (IP) v4 and Internet Protocol (IP) v6 have IP/neighbor discovery and will generally configure a limited, non-routable connection automatically.
- The IP address may be configured using auto IP, dynamic host configuration protocol (DHCP), or manually, using an address in the 192.168.1.x network address translation (NAT) address space.

The network shall be configured to support the NAT address space and/or auto IP.

### 6.6.5.2 Availability

The availability of Standby-active, low shall be verified by either one of the following methods.

- a) Switch the UUT to Standby-active, low. Confirm that the UUT IP address layer is configured to establish the connection to the WLAN or LAN using a network scanner application or other software application. The scanner of choice shall confirm the IP address is associated with the unit under test and is active during the time the TV is in Standby-active, low.

EXAMPLE 1 The Fing<sup>4</sup> application (iOS or Android) is an example network scanner mobile application which will satisfy this requirement.

- b) Switch the UUT to Standby-active, low. Confirm that the UUT can be switched into the On mode with a Wake-on-LAN (WOL) or Wake on Wireless LAN (WoWLAN) network signal.

EXAMPLE 2 The Magic Packet<sup>TM5</sup> is a network signal often used for the Wake-on-LAN function.

The availability of the Standby-active, low sub-mode in the UUT shall be reported.

NOTE If additional network traffic exists, the UUT can be in the Standby-active, high sub-mode.

### 6.6.5.3 Measurement

If Standby-active, low is available, the UUT shall be switched into the Standby-active, low sub-mode, and power consumption in the Standby-active, low sub-mode ( $P_{\text{standby-active, low}}$ ) shall be measured and reported.

NOTE Not all television sets are guaranteed to allow Standby-active, low to be explicitly enabled from the menus. Though television sets may have their networking connected and enabled in the On mode, it is not guaranteed that the manual or user interface will explicitly or accurately describe the network state when in the Partial On mode.

## 6.7 Determination of power consumption, Off mode

### 6.7.1 Connections and networking

If the UUT is capable of being set in the Off mode, all electrical connections to the UUT except the power cable shall be disconnected and networking features shall be disabled.

### 6.7.2 Availability

The UUT shall be switched into the Off mode. Off mode shall be confirmed by attempting to switch the UUT into another mode using the remote control. If the UUT does not switch into another mode, it is Off mode capable.

The availability of Off mode in the UUT shall be reported.

### 6.7.3 Measurement

If Off mode is available, the UUT shall be switched into the Off mode. Power consumption in the Off mode ( $P_{\text{off}}$ ) shall be determined as specified in IEC 62087-1:2015, Clause 6. The power source shall comply with the requirements of IEC 62087-1:2015, 5.1.1.6.  $P_{\text{off}}$  shall be reported.

<sup>4</sup> Fing is a trademark of Fing Limited. This information is given for the convenience of users of this standard 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.

<sup>5</sup> Magic Packet<sup>TM</sup> is a trademark of Advanced Micro Devices, Inc. This information is given for the convenience of users of this standard 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.

## Annex A (informative)

### Considerations for On mode television set power measurements

#### A.1 General

This annex applies only to the measurement of television set On mode power consumption.

#### A.2 Weighting of automatic brightness control levels

In IEC 62087:2008 and IEC 62087:2011, the approach was to measure power with ABC disabled (if it was not possible to manually disable ABC, the ABC sensor was effectively disabled with by applying  $\geq 300$  lx to the ABC sensor assembly), and then with ABC enabled and 0 lx applied. The power savings between ABC disabled and enabled with 0 lx was scaled and subtracted from the power measured with ABC disabled.

$$P_{ABC} = P_{ABC\_Off} - (P_{ABC\_Off} - P_{ABC\_0}) \times A_a$$

where

$P_{ABC}$  is the On mode power consumption with power saving functions (W);

$P_{ABC\_Off}$  is the On mode power consumption with ABC disabled or effectively disabled (W);

$P_{ABC\_0}$  is the On mode power consumption with ABC enabled with 0 lx applied (W);

$A_a$  is the power saving functions weighting factor.

The need for measuring with ABC disabled is questionable as it does not reflect an out-of-the-box condition. Such a measurement made sense for IEC 62087:2008 and IEC 62087:2011 as those standards allowed for savings due to either ABC or some "other" power savings function, whichever was greater, to reduce the overall power consumption number of the television set. In this document, the savings for the "other" power savings function has been eliminated, so measuring with ABC disabled might no longer be needed. The possibility of measuring with ABC disabled is retained for backward compatibility.

#### A.3 Calculating On mode power consumption

In the case of television sets with ABC disabled by default in the default picture setting,

$$P_{os\_static} = P_{o\_static\_ABC\_Off}$$

$$P_{os\_broadcast} = P_{o\_broadcast\_ABC\_Off}$$

$$P_{os\_Internet} = P_{o\_Internet\_ABC\_Off}$$

In the case of television sets with ABC enabled by default in the default picture setting,

$$P_{os\_static} = P_{o\_static\_ABC\_x1} \times A_{ABC\_x1} +$$

$$P_{o\_static\_ABC\_x2} \times A_{ABC\_x2} +$$

$$P_{o\_static\_ABC\_x3} \times A_{ABC\_x3} +$$

$$P_{o\_static\_ABC\_x4} \times A_{ABC\_x4}$$

$$P_{os\_broadcast} = P_{o\_broadcast\_ABC\_x1} \times A_{ABC\_x1} +$$

$$P_{o\_broadcast\_ABC\_x2} \times A_{ABC\_x2} +$$

$$P_{o\_broadcast\_ABC\_x3} \times A_{ABC\_x3} +$$

$$P_{o\_broadcast\_ABC\_x4} \times A_{ABC\_x4}$$

$$P_{os\_Internet} = P_{o\_Internet\_ABC\_x1} \times A_{ABC\_x1} +$$

$$P_{o\_Internet\_ABC\_x2} \times A_{ABC\_x2} +$$

$$P_{o\_Internet\_ABC\_x3} \times A_{ABC\_x3} +$$

$$P_{o\_Internet\_ABC\_x4} \times A_{ABC\_x4}$$

where

- $P_{os\_static}$  is the On mode power consumption with ABC power saving functions, using static signals (W);
- $P_{os\_broadcast}$  is the On mode power consumption with ABC power saving functions, using SDR or HDR dynamic broadcast-content video signal (W);
- $P_{os\_Internet}$  is the On mode power consumption with ABC power saving functions, using the Internet-content video signal (W);
- $P_{o\_static\_ABC\_x}$  is the On mode power consumption measured with ABC in the related  $x$  conditions, using static signals (W);
- $P_{o\_broadcast\_ABC\_x}$  is the On mode power consumption measured with ABC in the related  $x$  conditions, using SDR or HDR dynamic broadcast-content video signal (W);
- $P_{o\_Internet\_ABC\_x}$  is the On mode power consumption measured with ABC in the related  $x$  conditions, using the Internet-content video signal (W);
- $A_{ABC\_x}$  is the weighting factor with ABC in the related  $x$  condition.

To ensure proper weighting, the sum of  $A_{ABC\_x1}$ ,  $A_{ABC\_x2}$ ,  $A_{ABC\_x3}$ , and  $A_{ABC\_x4}$  should equal unity.

NOTE 1 "x1", "x2", "x3" and "x4" embedded in the variable "x" above represent the various ABC lighting conditions in lux.

NOTE 2 In the US, On mode power is determined with ABC at 100 lx, 35 lx, 12 lx, and 3 lx. Equal weighting of  $A_{ABC\_100}$ ,  $A_{ABC\_35}$ ,  $A_{ABC\_12}$ ,  $A_{ABC\_3}$ , is used, based on the results of the CTA Home Luminance Study (CTA-TR-1). Appropriate illuminance levels and weighting factors can vary in other regions, depending on typical lighting and viewing habits.

#### A.4 Picture level adjustments

Manufacturers are recommended to allow the end user of the television set to easily restore the picture level adjustments and other settings into the out-of-the-box condition.

Manufacturers are encouraged to configure the picture level adjustments in the default picture setting to provide a comfortable viewing experience as intended for the normal home environment.

## Annex B (normative)

### Test report

The following items shall be reported when applicable:

- 1) description/identification of the UUT including manufacturer, model, firmware version;
- 2) the date and location of the measurements;
- 3) the name of the person/people who executed the measurements;
- 4) the ambient temperature (IEC 62087-1:2015, 5.1.2);
- 5) model of luminance measuring device (5.5.2);
- 6) model of illuminance measuring instrument (5.5.3);
- 7) the manufacturer, model and version of the illuminating light source used for illuminating the ABC sensor to specific illuminance levels (5.6.4);
- 8) the manufacturer, model and version of the illuminating light source used for disabling the ABC feature (5.6.5);
- 9) the power source used (included external power supply, mains power, and or power from other than the mains) (6.2.2);
- 10) the voltage and frequency of the power source (6.2.2);
- 11) the selected input terminals and used signal provision equipment (6.2.3);
- 12) the selected SDR and where applicable HDR video signals for measuring On mode power consumption (6.2.4);
- 13) if the satellite dish LNB power supply cannot be turned off (6.3.10.3);
- 14) the selected video signal for measuring the peak luminance ratio (6.2.5);
- 15) the selected resolution and frame rate of the input signals (6.2.6);
- 16) the presence of an ABC feature and whether or not the ABC feature is enabled by default (6.2.7);
- 17) the X and Y physical location of the ABC sensor window with respect to a suitable reference point (e.g., frame corner) on the UUT in cm (6.3.7, Figure 4);
- 18) the state(s) of the automatic brightness control feature and the illuminance levels selected to be applied to the ABC sensor (6.2.8);
- 19) the exact lux levels measured before and after each ABC test (6.2.8);
- 20) the presence of a Motion-based dynamic dimming (MDD) feature and its state (enabled or disabled) during testing (6.2.9);
- 21) the presence of Wi-Fi (IEEE 802.11), Ethernet (IEEE 802.3), and Energy Efficient Ethernet (IEEE 802.3az-2010) (6.2.10);
- 22) the light source configuration and any deviations (Figure 4, Figure 5, or Figure 6);
- 23) the position of the illuminance measuring device relative to the nearest corner of the UUT (6.3.7);
- 24) the position and angle of the light source relative to the location of the ABC sensor (6.3.7);
- 25) the selection(s) made within the forced menu, if it exists (6.3.10.1);
- 26) if any setting of the UUT is changed from the default in order to fill the entire display area, the changed settings shall be reported (6.3.10.6);
- 27) the test signal playback device used in the assessment (manufacturer, model and version) and its related settings shall be reported (6.2.3 or 6.3.10.6);
- 28) the SDR and where applicable HDR On mode power consumption per illumination level (6.4.5.1), with an accuracy as specified in IEC 62087-1:2015, 5.2;

- 29) Power factor as a percentage with an accuracy of 1 decimal point (6.5.2.3);
- 30) the manufacturer's name or label associated with the brightest selectable preset picture setting (6.5.2.4);
- 31) whether  $L_{\text{brightest\_selectable}}$  or  $L_{\text{retail}}$  is greater (6.5.2.8);
- 32) the peak luminance ratio,  $L_{\text{ratio}}$  as a percentage with an accuracy of 1 decimal point (6.5.2.9);
- 33) the power consumption in the Standby-passive sub-mode,  $P_{\text{standby-passive}}$  (6.6.4), with an accuracy as specified in IEC 62087-1:2015, 5.2;
- 34) the availability of a quick-start mode and if measured the power consumption  $P_{\text{standby-passive\_quick-start}}$  (6.6.4) with an accuracy as specified in IEC 62087-1:2015, 5.2;
- 35) the availability of the Standby-active, low sub-mode (6.6.5.2);
- 36) if available, power consumption in the Standby-active, low sub-mode,  $P_{\text{standby-active, low}}$  (6.6.5.3), with an accuracy as specified in IEC 62087-1:2015, 5.2;
- 37) the availability of Off mode (6.7.2);
- 38) if available, power consumption in the Off mode,  $P_{\text{off}}$  (6.7.3), with an accuracy as specified in IEC 62087-1:2015, 5.2.

NOTE Informativ Annex ZA (Test report template) in European standard EN 50564:2011 can be used for reporting purposes in Europe.

## Annex C (informative)

### Example test report template

The following form is for guidance. Use of this reporting format is not compulsory.

Product under test				
Brand name, as identified on product				
Organisation taking responsibility for the product		Name	Address	
Product description				
Model identification				
Version or serial number				
Firmware or software version				
Test Laboratory Details				
Name of test laboratory				
Address of test laboratory				
Certification body (if appropriate)				
Test report number		Test date		
Prepared by		Approved by		
Applicant/Client Details				
Name of applicant/client				
Address of applicant/client				
Regulatory reference				
Test Equipment				
Test equipment	Manufacturer of Test Instrument	Model designation	Serial Number	Calibration Due Date
Light source used for illuminating the ABC sensor to specific illuminance levels				
Light source used for disabling the ABC feature				
Luminance measuring device				
Illuminance measuring instrument				
Power supply / Voltage source				
Player / Source(s) for test signals				
Instrument used for measuring power consumption				
Wi-Fi access point (IEEE 802.11-2007)				
Ethernet switch / router (IEEE 802.3 or IEEE 802.3az-2010)				

Test Conditions					
Ambient temperature (°C)					
Description of test set-up used at each test condition					
Test supply voltage (V)		Fluctuation [max. ±2 %] (%)			
Test frequency (Hz)		Fluctuation [max. ±2 %] (%)			
Total harmonic distortion of supply voltage waveform [max. ±5 %] (%)					
Input terminal selected at UUT					
SDR video signal selected for measuring On mode power consumption		Resolution and frame rate selected		Settings changed from default in order to fill entire display area	Signal source: UUT:
HDR video signal selected for measuring On mode power consumption		Resolution and frame rate selected		Settings changed from default in order to fill entire display area	Signal source: UUT:
SDR video signal selected for measuring the peak luminance ratio		Resolution and frame rate selected		Settings changed from default in order to fill entire display area	Signal source: UUT:
Test Results					
TV settings selected		Forced menu, normal configuration <input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> n.a.	Manufacturer default settings		<input type="checkbox"/> yes <input type="checkbox"/> no
Quick-start feature selectable at home configuration menu?					<input type="checkbox"/> yes <input type="checkbox"/> no
SDR On mode					
Presence of MDD feature		<input type="checkbox"/> yes <input type="checkbox"/> no	MDD feature during testing		<input type="checkbox"/> enabled <input type="checkbox"/> disabled <input type="checkbox"/> n.a.
Presence of ABC feature		<input type="checkbox"/> yes <input type="checkbox"/> no	ABC feature enabled by default		<input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> n.a.
ABC feature		disabled	enabled		
Illuminance level applied (measured at ABC sensor) (lux)			1	2	3
Illuminance level applied (measured at ABC sensor) (lux)					
On mode power consumption (W, accuracy)					
Power factor [ABC feature disabled] (% with accuracy of 1 decimal point)					
Brightest selectable preset picture setting (manufacturer name or label)		Is $L_{\text{brightest\_selectable}}$ greater than $L_{\text{retail}}$ ?		<input type="checkbox"/> yes <input type="checkbox"/> no	
Peak luminance (cd/m <sup>2</sup> ) (optional)		Default picture setting	Brightest selectable preset picture setting	Retail picture setting	
Peak luminance ratio (% accuracy of 1 decimal point)					

HDR On mode						
Presence of MDD feature	<input type="checkbox"/> yes <input type="checkbox"/> no		MDD feature during testing		<input type="checkbox"/> enabled <input type="checkbox"/> disabled <input type="checkbox"/> n.a.	
Presence of ABC feature	<input type="checkbox"/> yes <input type="checkbox"/> no		ABC feature enabled by default		<input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> n.a.	
ABC feature	disabled		enabled			
Illuminance level applied (measured at ABC sensor) (lux)			1	2	3	4
<b>On mode power consumption</b> (W, accuracy)						
Power factor [ABC feature disabled] (% with accuracy of 1 decimal point)						
Partial On and Off Modes						
<b>Standby-passive power consumption [default or quick-start feature disabled]</b> (W, accuracy)			<b>Standby-passive power consumption [Quick-start enabled], optional</b> (W, accuracy)			
Availability of network connectivity	Wi-Fi (IEEE 802.11)	<input type="checkbox"/> yes <input type="checkbox"/> no	Ethernet (IEEE 802.3)	<input type="checkbox"/> yes <input type="checkbox"/> no	Energy Efficient Ethernet (IEEE 802.3az-2010)	<input type="checkbox"/> yes <input type="checkbox"/> no
Availability of Standby-active, low sub-mode	<input type="checkbox"/> yes <input type="checkbox"/> no		<b>Standby-active, low power consumption</b> (W, accuracy)			
Availability of Standby-passive-quick-start, low sub-mode	<input type="checkbox"/> yes <input type="checkbox"/> no		<b>Standby-passive-quick-start, low power consumption</b> (W, accuracy)			
Availability of Off mode	<input type="checkbox"/> yes <input type="checkbox"/> no		<b>Off mode power consumption</b> (W, accuracy)			

Tester's reference notes/diagrams (e.g. to document test setup in accordance with 6.3.7) or for items not included in above table:

## Annex D (informative)

### Representative test tools

The following items, while not required by implementers of this document, met this document's specifications and measurement accuracies as used by the IEC 62087 maintenance team to confirm the utility and repeatability of this document. 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.

- Pantone Black 2C Super Swatch (5.6.6 for test table ABC sensor material); <https://www.pantone.com/pantone-super-swatch>
- Photo Research PR650 / PR655 Spectroradiometer (for characterizing LED bulb specifications). <https://www.jadaktech.com/products/photo-research/spectrascan-pr-655/>
- PCE-GM 60Plus Gloss Meter (60 degree); [https://www.pce-instruments.com/us/measuring-instruments/test-meters/gloss-meter-gloss-tester-pce-instruments-gloss-meter-pce-gm-60plus-det\\_5126093.htm?\\_list=qr.art&\\_listpos=19](https://www.pce-instruments.com/us/measuring-instruments/test-meters/gloss-meter-gloss-tester-pce-instruments-gloss-meter-pce-gm-60plus-det_5126093.htm?_list=qr.art&_listpos=19)
- Fing network scanner application (for mobile devices); <https://www.fing.com/products/fing-app> (free download)
- Magic Packet™ network signal used for Wake-on-LAN functions; <https://www.microsoft.com/en-us/p/wake-on-lan-magic-packet/9nblggh51pb3?activetab=pivot:overviewtab> (free download)

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## **Annex E** (normative)

### **Measurement process overview**

A flowchart of the comprehensive measurement process as described in Clause 6 is shown in Figure E.1, which comprises Figure 2, Figure 3, Figure 5, Figure 6 and Figure 7.

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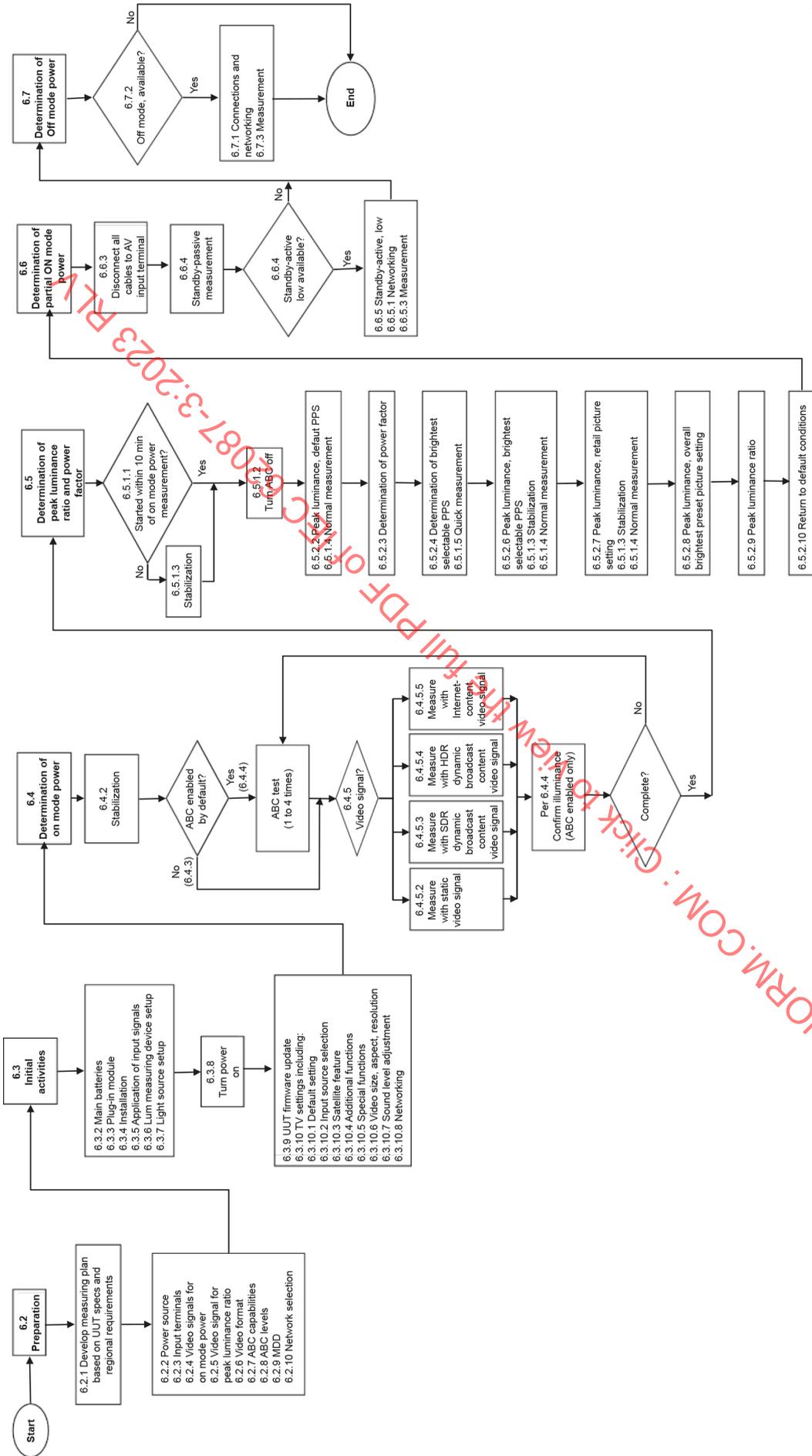


Figure E.1 – Comprehensive measurement process flow chart

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IEC 62087:2011 (third edition), *Methods of measurement for the power consumption of audio, video and related equipment*<sup>7</sup>

IEC 62087-4, *Audio, video, and related equipment – Determination of power consumption – Part 4: Video recording equipment*

IEC 62087-5, *Audio, video, and related equipment – Determination of power consumption – Part 5: Set-top-boxes*

IEC 62087-6, *Audio, video, and related equipment – Determination of power consumption – Part 6: Audio equipment*

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EN 50564:2011, *Electrical and electronic household and office equipment – Measurement of low power consumption*

CTA-2037-C, *Determination of Television Average Power Consumption*

CTA-TR-1, *Home Luminance Study, June 2012*

NOTE CTA standards are available from <https://cta.tech/Resources/Standards>

U.S. Department of Energy, *Analysis of room illuminance and televisions with automatic brightness control. Energy efficiency program for consumer products: Television Sets, March 2012*

NOTE The Department of Energy Analysis is available at [https://www1.eere.energy.gov/buildings/appliance\\_standards/pdfs/tv\\_tpnopr\\_room\\_illuminance\\_abc\\_031912.pdf](https://www1.eere.energy.gov/buildings/appliance_standards/pdfs/tv_tpnopr_room_illuminance_abc_031912.pdf)

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IEEE 802.3az-2010, *IEEE Standard for Information technology – Local and metropolitan area networks – Specific requirements – Part 3: CSMA/CD Access Method and Physical Layer*

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

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

*Specifications, Amendment 5: Media Access Control Parameters, Physical Layers, and Management Parameters for Energy-Efficient Ethernet*

NOTE IEEE standards are available from <http://www.techstreet.com/ieeegate.html>

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## COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

**APPAREILS AUDIO, VIDÉO ET MATÉRIEL CONNEXE –  
DÉTERMINATION DE LA CONSOMMATION DE PUISSANCE –****Partie 3: Téléviseurs****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) elle inclut des procédures de mesure pour déterminer la consommation de puissance en mode Marche lors du visionnage d'un contenu vidéo HDR qui utilise des métadonnées statiques;

- b) la fonction MDD est désactivée lors de tous les essais de détermination de la puissance en mode Marche;
- c) seuls des signaux vidéo progressifs sont utilisés pour les essais;
- d) une lampe à réflecteur LED à intensité réglable est utilisée comme source de lumière pour éclairer le capteur ABC afin d'obtenir des niveaux d'éclairage spécifiques;
- e) des signaux vidéo de boîte et de contour dynamiques sont utilisés pour déterminer le rapport de luminance de crête.

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

Projet	Rapport de vote
100/3772/CDV	100/3849/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.

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](http://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](http://www.iec.ch/publications).

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- amendé.

## INTRODUCTION

Le présent document spécifie la détermination de la consommation de puissance des téléviseurs pour le grand public.

Le présent document spécifie les procédures de mesure pour déterminer la consommation de puissance en mode Marche (fonctionnement), qui était identifié par "mode Marche (moyenne)" dans les éditions antérieures de l'IEC 62087. De plus, il spécifie les procédures de mesure pour déterminer la consommation de puissance en mode Arrêt et en mode Marche partielle. Le présent document définit également la détermination du rapport de luminance de crête à utiliser en association avec l'évaluation de la consommation de puissance d'un téléviseur ainsi que le facteur de puissance. Il définit en outre les procédures de mesure pour déterminer la consommation de puissance en mode Marche lors du visionnage d'un contenu vidéo HDR représentatif qui utilise des métadonnées statiques.

Une procédure de vérification pour évaluer la conformité du produit est décrite à l'Annexe A de l'IEC 62087-1:2015.

La série IEC 62087 contient les parties prévues ou 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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# APPAREILS AUDIO, VIDÉO ET MATÉRIEL CONNEXE – DÉTERMINATION DE LA CONSOMMATION DE PUISSANCE –

## Partie 3: Téléviseurs

### 1 Domaine d'application

La présente partie de l'IEC 62087 spécifie la détermination de la consommation de puissance et des caractéristiques associées des téléviseurs. Les téléviseurs comprennent notamment ceux qui utilisent les technologies LCD (Liquid-Crystal Display), OLED (Organic Light-Emitting Diode) ou de projection.

Les modes de fonctionnement et les fonctions, dans la mesure où ils s'appliquent de façon spécifique à des téléviseurs, sont définis en détail dans la présente partie de l'IEC 62087.

Le présent document est limité aux téléviseurs qui peuvent être connectés à une source d'alimentation externe. Les téléviseurs qui comportent une batterie principale non amovible ne sont pas couverts par le présent document. Les téléviseurs peuvent comporter un nombre quelconque de batteries auxiliaires.

Les conditions de mesure du présent document sont représentatives de l'usage normal du matériel et peuvent différer des conditions particulières, comme celles spécifiées dans les normes de sécurité.

### 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 62087-1:2015, *Appareils audio, vidéo et matériel connexe – Détermination de la consommation de puissance – Partie 1: Généralités*

IEC 62087-2:2023, *Appareils audio, vidéo et matériel connexe – Détermination de la consommation de puissance – Partie 2: Signaux et supports*

IEC 62301, *Appareils électrodomestiques – Mesure de la consommation en veille*

### 3 Termes, définitions et abréviations

Pour les besoins du présent document, les termes et définitions de l'IEC 62087-1:2015, de l'IEC 62087-2:2023 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 Termes et définitions

### 3.1.1

#### **téléviseur TV**

matériel destiné à la réception et à l'affichage de la télédiffusion et de services similaires sur des réseaux d'émission terrestre, des réseaux câblés, des réseaux par satellite et des réseaux à large bande, sous forme de signaux analogiques et/ou numériques

Note 1 à l'article: Un téléviseur peut inclure des fonctions supplémentaires qui ne sont pas exigées pour sa fonction primaire.

### 3.1.2

#### **menu imposé**

menu à l'écran qui demande à l'utilisateur de choisir une option de configuration lorsqu'un téléviseur est configuré pour la première fois ou après une réinitialisation aux valeurs d'usine

Note 1 à l'article: Par exemple, un menu imposé peut offrir à l'utilisateur la possibilité de choisir entre les configurations "Normale"/"Domicile" ou "Vente au détail"/"Magasin".

Note 2 à l'article: Voir la Figure 1.

### 3.1.3

#### **configuration normale**

réglage destiné à être choisi dans le menu imposé pour une utilisation domestique

Note 1 à l'article: Le 4.2.2 décrit le choix de la configuration normale dans le menu imposé. Ce choix de configuration est généralement désigné par les termes "domestique", "normale", "standard" ou un terme équivalent.

Note 2 à l'article: Voir la Figure 1 et le 3.1.16.

### 3.1.4

#### **configuration par défaut**

configuration des téléviseurs sans menu imposé prédéfinie par le fabricant

Note 1 à l'article: Voir la Figure 1.

### 3.1.5

#### **configuration de vente au détail**

choix de menu imposé destiné à une utilisation dans un environnement de vente au détail

Note 1 à l'article: Le 4.2.3 décrit le choix de la configuration de vente au détail dans le menu imposé. Ce choix de configuration est généralement recommandé par le fabricant pour une présentation dans un espace public, lorsque le téléviseur est proposé à la vente. Il peut être désigné par les termes "vente au détail", "magasin", "boutique" ou un terme équivalent.

Note 2 à l'article: Voir la Figure 1.

### 3.1.6

#### **réglage d'image prédéfini**

ensemble commun de paramètres définis par le fabricant, lesquels diffèrent au niveau de leurs réglages

Note 1 à l'article: La luminosité, le contraste, l'espace des couleurs et le contrôle de la chrominance sont des exemples de paramètres de réglages d'image prédéfinis.

### 3.1.7

#### **réglage d'image prédéfini sélectionnable**

réglage d'image d'un téléviseur qui peut être choisi par un utilisateur parmi un ensemble de réglages d'image définis par le fabricant

Note 1 à l'article: Voir la Figure 1.

### 3.1.8

#### **réglage d'image par défaut**

réglage d'image d'un téléviseur dans la configuration normale ou la configuration par défaut qui est affiché en surbrillance ou, si aucun réglage d'image n'est en surbrillance, premier réglage d'image disponible qui peut être choisi par l'utilisateur

Note 1 à l'article: Voir la Figure 1. Le réglage d'image HDR par défaut (s'il est différent du réglage d'image par défaut) est le réglage d'image auquel le téléviseur passe lorsqu'une vidéo HDR est lue dès le départ dans le réglage d'image SDR par défaut.

### 3.1.9

#### **réglage d'image la plus lumineuse prédéfini sélectionnable**

réglage d'image prédéfini au choix de l'utilisateur qui produit l'image avec la luminance la plus élevée dans la configuration normale ou la configuration par défaut

Note 1 à l'article: Voir la Figure 1.

### 3.1.10

#### **réglage global prédéfini d'image la plus lumineuse**

réglage d'image de vente au détail ou réglage d'image la plus lumineuse prédéfini sélectionnable, si ce dernier produit l'image avec la luminance la plus élevée

Note 1 à l'article: Voir la Figure 1.

### 3.1.11

#### **réglage d'image de vente au détail**

réglage d'image prédéfini sélectionnable destiné à une utilisation dans un environnement de vente au détail

Note 1 à l'article: Voir la Figure 1.

### 3.1.12

#### **motion-based dynamic dimming**

##### **MDD**

fonctionnalité d'un téléviseur qui règle la luminance par rapport au nombre de mouvements dans l'image affichée

### 3.1.13

#### **fonction particulière**

fonction qui est associée à la fonction primaire du dispositif, mais qui n'est pas exigée pour celle-ci

Note 1 à l'article: Le traitement particulier du son et les fonctions d'économie d'énergie (commande automatique de luminosité, par exemple) constituent, entre autres, des exemples de fonctions particulières.

Note 2 à l'article: Voir la définition d'un téléviseur (TV) (3.1.1) en ce qui concerne la fonction primaire.

### 3.1.14

#### **accès conditionnel**

techniques de chiffrement, de déchiffrement et d'autorisation utilisées pour protéger un contenu contre un visionnage non autorisé

### 3.1.15

#### **module d'accès conditionnel**

module enfichable qui permet l'accès conditionnel

### 3.1.16

#### **module enfichable**

dispositif qui se branche dans les téléviseurs afin de fournir une fonctionnalité supplémentaire

**3.1.17****module de point de déploiement**

module d'accès conditionnel pour la réception de signaux numériques

**3.1.18****CAT5e****câble de catégorie 5e**

câble à paire torsadée utilisé pour les réseaux informatiques

Note 1 à l'article: Voir l'IEC 61156-5 et l'IEC 61156-6.

**3.1.19****filtre de densité neutre****filtre ND**

dispositif optique conçu pour réduire l'intensité lumineuse dans le domaine des longueurs d'onde visibles

Note 1 à l'article: L'abréviation "ND" est dérivée du terme anglais développé correspondant "neutral density".

**3.1.20****démarrage rapide**

fonction qui réduit la durée de reprise du téléviseur au passage du mode Marche partielle au mode Marche

Note 1 à l'article: Le temps de reprise est mesuré conformément au 6.6.1.

**3.1.21****indice de rendu des couleurs****CRI**

évaluation quantitative du degré d'accord entre la couleur psychophysique d'un objet éclairé par l'illuminant en essai et celle du même objet éclairé par l'illuminant de référence, l'état d'adaptation chromatique ayant été correctement pris en compte

Note 1 à l'article: Voir aussi CIE 13, Method of Measuring and Specifying Colour Rendering of Light Sources.

Note 2 à l'article: L'abréviation "CRI" est dérivée du terme anglais développé correspondant "colour rendering index".

[SOURCE: IEV 845-22-109, modifié – La Note 2 à l'article et la Note 3 à l'article ont été supprimées.]

**3.2 Abréviations**

ABC (Automatic Brightness Control)	Commande automatique de luminosité
AV	Audiovisuel
BD	Blu-ray Disc™ <sup>1</sup>
DVD (Digital Versatile Disc)	Disque numérique polyvalent
DHCP (Dynamic Host Configuration Protocol)	Protocole de configuration dynamique des hôtes
DVI (Digital Visual Interface)	Interface visuelle numérique
CEM	Compatibilité électromagnétique
FM (Frequency Modulation)	Modulation de fréquence
HDD (Hard Disk Drive)	Disque dur

<sup>1</sup> 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.

HDMI <sup>2</sup> (High Definition Multimedia Interface)	Interface multimédia haute définition
HDR (High Dynamic Range)	Grande plage dynamique
HLG	Hybrid Log-Gamma
IP (Internet Protocol)	Protocole Internet
LAN (Local Area Network)	Réseau local
LED (Light Emitting Diode)	Diode électroluminescente
LCD (Liquid Crystal Display)	Affichage à cristaux liquides
LMD (Light Measurement Device)	Dispositif de mesure de la lumière
LNB (Low Noise Block)	Bloc à faible bruit
MDD	Motion-Based Dynamic Dimming
NAT (Network Address Translation)	Traduction d'adresse réseau
ND (Neutral Density)	Densité neutre
OLED (Organic Light-Emitting Diode)	Diode électroluminescente organique
PC (Personal Computer)	Ordinateur personnel
PQ	Perceptual Quantizer
RF	Radiofréquence
SCR (Silicon Controlled Rectifier)	Redresseur commandé par des éléments au silicium
SDR (Standard Dynamic Range)	Plage dynamique standard
STB (Set-Top Box)	Boîtier décodeur
SSID (Service Set Identifier)	Identifiant d'ensemble de services
TV	Téléviseur
USB <sup>3</sup> (Universal Serial Bus)	Bus universel en série
UUT (Unit Under Test)	Unité en essai
VGA (Video Graphics Array)	Carte vidéographique
WAN (Wide Area Network)	Réseau étendu
WCG (Wide Colour Gamut)	Gamme de couleurs étendue
WLAN (Wireless Local Area Network)	Réseau local sans fil
WOL	Wake-on-LAN
WoWLAN	Wake on Wireless LAN
WPA	Wi-Fi Protected Access
WPA2	Wi-Fi Protected Access 2

## 4 Spécification des modes de fonctionnement et des fonctions

### 4.1 Tableau des modes de fonctionnement et des fonctions

Le Tableau 1 décrit les différents modes de fonctionnement et fonctions des téléviseurs.

<sup>2</sup> HDMI® et HDMI® High-Definition Multimedia Interface sont des marques déposées de HDMI Licensing Administrator, Inc. 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.

<sup>3</sup> L'USB Implementers Forum, Inc. déclare que les termes "USB" et "Universal Serial Bus" sont des termes génériques. 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.

Pour tous les modes, les batteries principales, s'il y a lieu, doivent être enlevées pendant toute la durée de la procédure de mesure (voir l'IEC 62087-1:2015, 5.1.1.1).

**Tableau 1 – Modes de fonctionnement et fonctions**

Alimentation	Mode	Sous-mode	Fonction(s)	Description fonctionnelle pour téléviseur
0 W	Déconnecté	Déconnecté	– Déconnecté de la source d'alimentation	Le téléviseur est déconnecté ou galvaniquement isolé de toutes les sources d'alimentation externe.
$\geq 0$ W	Arrêt	Arrêt	– Arrêt	Le téléviseur est connecté à une source d'alimentation externe. Il ne produit pas d'image ni de son et n'exécute aucune autre fonction qui dépend d'une source d'alimentation externe. Le téléviseur ne peut être commuté dans aucun autre mode à l'aide de la télécommande ou d'un signal externe ou interne. Une partie de la puissance peut être consommée si un filtre de CEM ou d'autres composants se trouvent côté source de l'interrupteur de mise sous tension.
> 0 W	Marche partielle	Veille passive	– Réveil <ul style="list-style-type: none"> <li>• télécommande</li> <li>• signal interne</li> </ul>	Le téléviseur est connecté à une source d'alimentation externe et ne produit pas d'image ni de son. Le téléviseur peut être commuté dans un autre mode à l'aide de la télécommande ou d'un signal interne, mais pas à l'aide d'un signal externe.
		Veille active basse	– Réveil <ul style="list-style-type: none"> <li>• télécommande</li> <li>• signal interne</li> <li>• signal externe</li> </ul>	Le téléviseur est connecté à une source d'alimentation externe et ne produit pas d'image ni de son. Le téléviseur peut être commuté dans un autre mode à l'aide de la télécommande ou d'un signal interne, et peut également être commuté dans un autre mode à l'aide d'un signal externe. NOTE 1 En mode Veille active basse, un téléviseur peut être capable de passer au mode Marche, Arrêt, Veille passive ou Veille active haute. NOTE 2 Un téléviseur est présumé être en mode Veille active basse lorsque sa présence sur un réseau local peut être détectée et que la communication de données en dehors des opérations de maintenance du réseau est minime.
		Veille active haute	– Réveil <ul style="list-style-type: none"> <li>• télécommande</li> <li>• signal interne</li> <li>• signal externe</li> </ul> – Communications de données	Le téléviseur est connecté à une source d'alimentation externe et ne produit pas d'image ni de son. Le téléviseur peut être commuté dans un autre mode à l'aide de la télécommande, d'un signal interne ou d'un signal externe. De plus, le téléviseur échange/reçoit des données avec/depus une source externe. La détermination de la consommation de puissance dans ce sous-mode n'est pas spécifiée par le présent document.
	Marche	Fonctionnement	– Fonctionnement	Le téléviseur est connecté à une source d'alimentation externe et produit une image et, éventuellement, du son.

## 4.2 Configurations et réglages d'image

### 4.2.1 Cadre conceptuel

La Figure 1 représente un cadre conceptuel qui inclut les différentes configurations et les différents réglages d'image des téléviseurs.

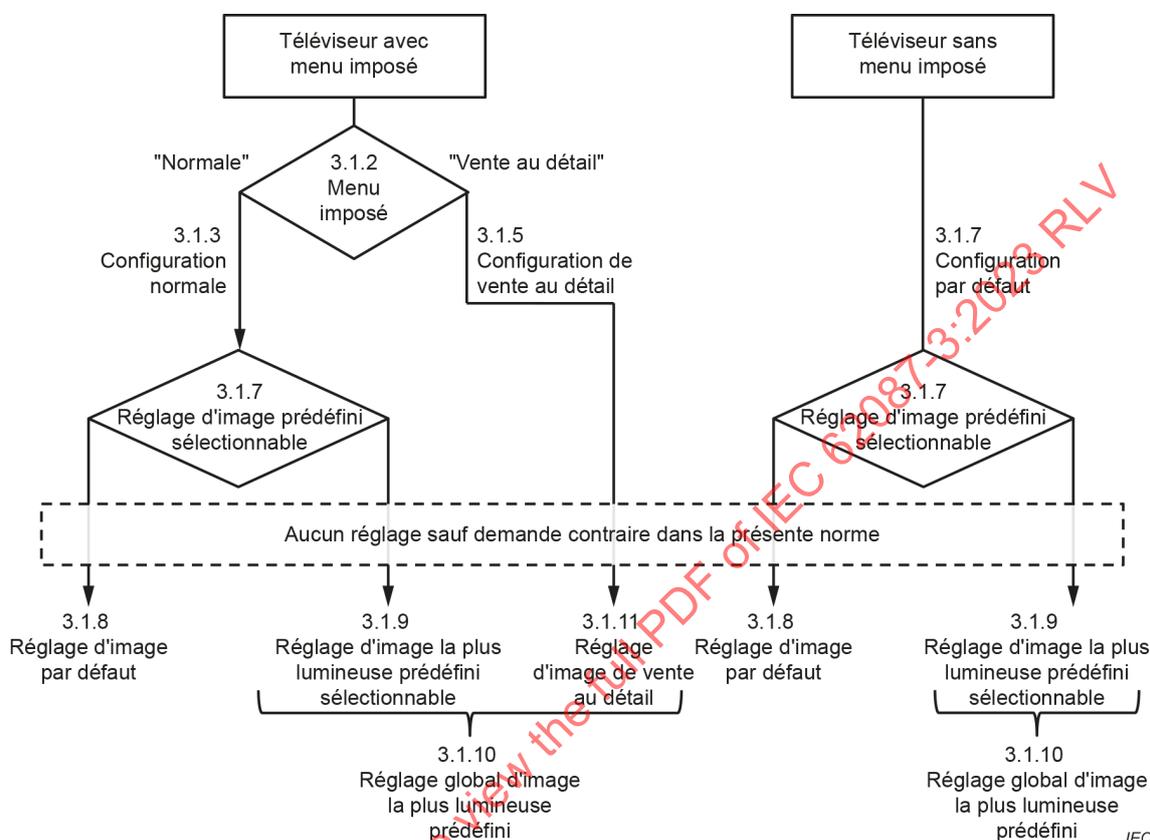


Figure 1 – Configurations et réglages d'image, cadre conceptuel

### 4.2.2 Choix de la configuration normale

Lorsque le présent document le demande, la configuration normale doit être sélectionnée dans le menu imposé en choisissant la configuration recommandée pour l'utilisation domestique normale et, si elle n'est pas clairement définie, le réglage d'image par défaut doit être choisi dans le menu imposé: le choix indiqué par le fabricant dans le menu imposé ou, si aucune préférence n'est indiquée, le premier choix affiché.

Si l'UUT ne comporte pas de menu imposé, elle doit rester dans la configuration par défaut.

NOTE Un rétablissement des valeurs d'usine peut être exigé pour entrer dans la configuration normale après avoir choisi la configuration de vente au détail.

### 4.2.3 Choix de la configuration de vente au détail

Lorsque le présent document le demande, la configuration de vente au détail doit être sélectionnée dans le menu imposé en choisissant la configuration qui, sans aucun autre réglage, produit la plus grande luminance d'affichage.

Si l'UUT ne comporte pas de menu imposé, elle doit rester dans la configuration par défaut.

NOTE Un rétablissement des valeurs d'usine peut être exigé pour entrer dans la configuration de vente au détail après avoir choisi la configuration normale.

## 5 Conditions de mesure

### 5.1 Généralités

L'article relatif aux conditions de mesure spécifie les exigences qui sont indépendantes du matériel à évaluer. Lors de la configuration d'un laboratoire d'essai, ces exigences doivent être prises en compte.

Les exigences du présent article s'appliquent aux procédures spécifiées à l'Article 6.

### 5.2 Source d'alimentation

Définie dans l'IEC 62087-1:2015, 5.1.1.

### 5.3 Conditions d'environnement

Définies dans l'IEC 62087-1:2015, 5.1.2.

### 5.4 Conditions d'éclairage ambiant

Pour déterminer la consommation de puissance en mode Marche des téléviseurs avec ABC activée, un éclairement  $\leq 1$  lx doit être confirmé à la surface de l'ensemble capteur ABC avec les sources de lumière (5.6.4, 5.6.5) éteintes et l'UUT dans le mode Arrêt ou Déconnecté.

Pour déterminer le rapport de luminance de crête (6.5.1.1) avec un LMD sans contact, un éclairement  $\leq 5$  lx doit être confirmé au centre nominal de la zone d'affichage de l'UUT en mode Arrêt ou Déconnecté. Cette exigence s'applique, qu'une source de lumière (5.6.5) soit ou non appliquée pour désactiver la fonction ABC.

Une pièce obscure et/ou un carénage peuvent être nécessaires pour obtenir les conditions d'éclairage ambiant exigées.

### 5.5 Matériel de mesure

#### 5.5.1 Appareil de mesure de puissance

Défini dans l'IEC 62087-1:2015, 5.1.5 et dans l'IEC 62087-1:2015, 5.1.6.

#### 5.5.2 Dispositif de mesure de la luminance

Défini dans l'IEC 62087-1:2015, 5.1.7.

#### 5.5.3 Appareil de mesure de l'éclairement

Défini dans l'IEC 62087-1:2015, 5.1.8.

### 5.6 Génération de signaux

#### 5.6.1 Matériel

Défini dans l'IEC 62087-2:2023, 6.1 et l'IEC 62087-2:2023, 6.2.

#### 5.6.2 Interfaces

Définies dans l'IEC 62087-2:2023, 6.3.

#### 5.6.3 Exactitude

L'exactitude des niveaux de signaux vidéo est définie dans l'IEC 62087-2:2023, 6.4.

#### 5.6.4 Source de lumière pour des niveaux d'éclairage spécifiques

La source de lumière employée pour exposer le capteur ABC à des niveaux d'éclairage spécifiques doit utiliser une lampe à réflecteur LED à intensité réglable et doit être d'un diamètre de  $90 \text{ mm} \pm 5 \text{ mm}$ . L'angle assigné du faisceau de la lampe doit être égal à  $40^\circ \pm 5^\circ$ . La température de couleur proximale (CCT, *Correlated Colour Temperature*) assignée de la source de lumière doit être de  $2\,700 \text{ K} \pm 300 \text{ K}$  à sa tension assignée. Le CRI assigné doit être de  $80 \pm 3$ . La surface avant de la lampe doit être transparente (c'est-à-dire qu'elle ne doit être ni colorée, ni recouverte d'un matériau qui modifie le spectre) et peut être lisse ou granulaire. Lorsqu'il est projeté sur une surface blanche uniforme, il convient que la mire de diffusion semble lisse à l'œil nu. L'assemblage de lampe ne doit pas modifier le spectre de la source LED, notamment les bandes IR et UV.

Pour atteindre les niveaux d'éclairage spécifiés au 6.2.8, la lampe doit être équipée d'un variateur d'intensité capable de la régler sur le niveau d'intensité le plus faible exigé au 6.2.8. La lampe doit être capable de fournir le niveau d'éclairage le plus élevé lorsqu'elle est équipée du variateur d'intensité. Pour les niveaux de luminance inférieurs à  $10 \text{ lx}$ , un filtre ND à 2 stops (3.1.19) peut être utilisé si le réglage le plus faible de la lampe combinée au variateur n'atteint pas le niveau inférieur à  $10 \text{ lx}$  exigé. Aucun filtre ND ne doit être utilisé pour des niveaux de luminance supérieurs ou égaux à  $10 \text{ lx}$ . Le filtre ND doit être suffisamment large pour couvrir l'intégralité de la surface de diffusion de la lampe. Le filtre ND doit avoir une transmission moyenne de  $25 \% \pm 2,5 \%$  dans le domaine visible, qui est compris entre  $400 \text{ nm}$  et  $700 \text{ nm}$ , sans absorber la lumière de manière sélective à des longueurs d'onde spécifiques.

Attention: La lampe doit être compatible avec des variateurs à coupure de phase en amont ou à phase directe (la luminance de la lampe ne varie pas en fonction de la tension, par exemple).

Des niveaux d'éclairage spécifiques doivent être obtenus en réglant le variateur d'intensité.

Les modèles de lampe et de variateur (ainsi que leurs versions, le cas échéant) utilisés pour exposer le capteur ABC à des niveaux d'éclairage spécifiques doivent être consignés.

Il convient de stabiliser la lampe avant les essais en la réglant de manière à exposer le capteur ABC au niveau de lux soumis à l'essai maximal conformément au 6.4.2 et en maintenant cette intensité lumineuse pendant 10 min. La stabilisation peut être effectuée pendant le réglage de la source de lumière (voir le 6.3.7).

#### 5.6.5 Source de lumière pour désactiver la fonction ABC

La même source de lumière que celle employée au 5.6.4 ci-dessus peut être utilisée pour contourner la fonction ABC en réduisant la distance entre la source de lumière et le capteur ABC du téléviseur.

Le fabricant, le modèle et la version de l'ampoule LED utilisée pour contourner la fonction ABC doivent être consignés.

#### 5.6.6 Matériau de surface de la table d'essai

La table utilisée pour maintenir l'UUT doit être recouverte de tissu noir très peu réfléchissant, et la zone de cette table située directement en face et au-dessous du capteur ABC de l'UUT, représentée à la Figure 4, doit être recouverte d'un matériau dont la brillance mesurée par un brillancemètre à angle de mesure de  $60^\circ$  est de 15 GU. Le matériau ne doit pas altérer la lumière visible qui est projetée sur le matériau ou qui est réfléchi par le matériau dans un rayon d'action de  $400 \text{ nm}$  à  $700 \text{ nm}$ . Le matériau de surface de la table d'essai du capteur ABC doit avoir une épaisseur de  $4 \text{ mm}$  ou moins, une largeur d'au moins  $203 \text{ mm}$  et une profondeur de  $177 \text{ mm}$ ; il doit avoir une finition mate et une couleur qui respecte la norme M1 et possède des valeurs CMJN égales à  $(43, 53, 84, 84) \pm 2$ . Le carton ne doit pas polariser la lumière réfléchi par sa surface.

NOTE Pour plus d'informations, voir l'Annexe D.

## 6 Procédures

### 6.1 Ordre des opérations

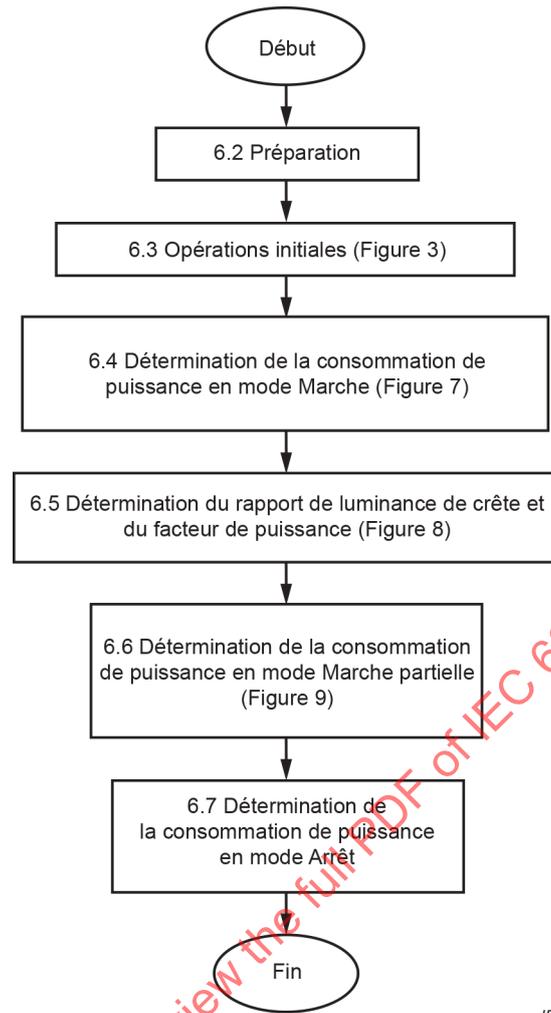
L'ordre des opérations suivant est recommandé (également représenté à la Figure 2):

- préparation (6.2);
- opérations initiales (6.3);
- détermination de la consommation de puissance en mode Marche (6.4);
- détermination du rapport de luminance de crête et du facteur de puissance (6.4.5.5);
- détermination de la consommation de puissance en mode Marche partielle (6.6);
- détermination de la consommation de puissance en mode Arrêt (6.7).

L'ordre suivant est choisi pour assurer une bonne stabilisation avant d'effectuer chaque mesurage. Le technicien qui exécute les opérations peut modifier l'ordre si nécessaire. Cependant, le processus de stabilisation avant chaque mesurage doit être identique à celui de l'ordre recommandé.

Un logigramme qui indique le processus de mesure complet est fourni à la Figure E.1.

Les comptes à rebours et les extrémités de champ à moitié grises ont été ajoutés à la plupart des clips d'essai des signaux vidéo référencés dans le présent document pour permettre au personnel responsable des essais de stabiliser facilement l'UUT au moment de passer à la méthode de mesure suivante. L'examen du registre de consommation de puissance d'un essai donné pour noter à quel moment l'essai a commencé et s'est terminé est simple. Le personnel responsable des essais est encouragé à se familiariser avec chaque clip d'essai des signaux vidéo avant de les utiliser pour les essais réels.



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**Figure 2 – Ordre recommandé des opérations**

## 6.2 Préparation

### 6.2.1 Plan de mesure

Avant d'installer l'UUT, il convient d'élaborer un plan de mesure en se fondant sur les spécifications de l'UUT et sur la région dans laquelle les résultats doivent être consignés. Le plan de mesure repose sur les points de décision du 6.2.2 jusqu'au 6.2.9. Ces points de décision incluent:

- la tension et la fréquence de la source d'alimentation (6.2.2);
- les connecteurs d'entrée (6.2.3);
- le signal vidéo, la procédure de consommation de puissance en mode Marche (6.2.4);
- le signal vidéo, la procédure du rapport de luminance de crête (6.2.5);
- le format vidéo (6.2.6);
- les fonctions de commande automatique de luminosité (6.2.7);
- les niveaux de commande automatique de luminosité (6.2.8);
- la fonction MDD (6.2.9);
- le choix de la connexion réseau (6.2.10).

Après avoir pris ces décisions, les opérations suivantes peuvent être considérées comme étant déterministes.

Une liste complète des points qui doivent être consignés (un rapport d'essai) est fournie à l'Annexe B. Un exemple de modèle de rapport d'essai est présenté dans l'Annexe C.

### 6.2.2 Tension et fréquence de la source d'alimentation

Le rapport doit indiquer si l'UUT doit être alimentée par une alimentation externe incluse (IEC 62087-1:2015, 5.1.1.2), par le réseau électrique (IEC 62087-1:2015, 5.1.1.3) et/ou par une alimentation autre que le réseau électrique (IEC 62087-1:2015, 5.1.1.4). Le rapport doit également décrire les détails de la procédure.

La tension et la fréquence de la source d'alimentation doivent être consignées.

### 6.2.3 Connecteurs d'entrée des signaux d'essai

La hiérarchie de choix suivante pour le connecteur d'entrée des signaux d'essai doit être utilisée:

- USB (une seule clé USB insérée directement dans le port USB de l'UUT, le port USB recommandé dans le manuel d'instructions pour la lecture des fichiers vidéo avec le débit de données le plus élevé doit être choisi);
- HDMI® (utilisation d'un lecteur de supports pour lire les supports d'essai stockés sur une seule clé USB);
- analogique en composantes (utilisation d'un lecteur de supports pour lire les supports d'essai stockés sur une seule clé USB);
- S-Video (utilisation d'un lecteur de supports pour lire les supports d'essai stockés sur une seule clé USB);
- analogique composite (utilisation d'un lecteur de supports pour lire les supports d'essai stockés sur une seule clé USB);
- autre entrée AV ou RF.

Les entrées DVI et VGA, ainsi que les autres entrées principalement utilisées pour des connexions à des ordinateurs (par opposition à un matériel AV) ne doivent pas être utilisées.

Un seul type de connecteur d'entrée doit être choisi pour être utilisé au cours de la procédure. Si la consommation de puissance de l'UUT doit être déterminée avec des types de connecteurs d'entrée vidéo multiples pour des besoins de comparaison, il convient d'exécuter la totalité de la procédure plusieurs fois, à chaque fois avec un même ensemble de connecteurs d'entrée choisis, pour assurer une bonne stabilité dans chaque condition.

Les connecteurs d'entrée choisis et le matériel de génération des signaux utilisé doivent être consignés.

### 6.2.4 Signal vidéo, procédure de consommation de puissance en mode Marche

Un signal vidéo doit être choisi pour être utilisé pendant la procédure de détermination de la consommation de puissance en mode Marche. Les signaux vidéo de radiodiffusion dynamique (SDR et HDR, selon le cas) indiqués ci-dessous doivent être utilisés, sauf si des exigences réglementaires régionales rendent obligatoire l'utilisation des signaux vidéo statiques et/ou des signaux vidéo de contenu Internet référencés ci-après.

- signal vidéo de contenu de radiodiffusion dynamique SDR (IEC 62087-2:2023, 4.1.3.2);
- signal vidéo de contenu de radiodiffusion dynamique HDR (IEC 62087-2:2023, 4.1.3.3);
- signaux vidéo statiques (IEC 62087-2:2023, 4.1.2);
- signal vidéo de contenu Internet (IEC 62087-2:2023, 4.1.4).

Le signal vidéo choisi pour déterminer la consommation de puissance en mode Marche doit être consigné.

NOTE Des informations concernant le choix du signal vidéo utilisé pour mesurer la consommation de puissance en mode Marche sont données à l'Annexe B de l'IEC 62087-2:2023.

### 6.2.5 Détermination du rapport de luminance de crête du signal vidéo

Un signal vidéo doit être choisi pour être utilisé pendant la procédure du rapport de luminance de crête. L'un des signaux vidéo de boîte et de contour dynamiques indiqués ci-dessous doit être utilisé, sauf si des exigences réglementaires régionales rendent obligatoire l'utilisation du signal vidéo à trois barres également référencé ci-après:

- signaux vidéo de boîte et de contour dynamiques (IEC 62087-2:2023, 4.2.2.2);
- signal vidéo à trois barres (IEC 62087-2:2023, 4.2.2.1).

Le choix des signaux vidéo de boîte et de contour dynamique appropriés est indiqué au 6.5.2.5. Le signal vidéo choisi pour déterminer le rapport de luminance de crête doit être consigné.

NOTE Des informations concernant le choix du signal vidéo utilisé pour déterminer le rapport de luminance de crête sont données à l'Annexe C de l'IEC 62087-2:2023.

### 6.2.6 Format vidéo

#### 6.2.6.1 SDR

La résolution vidéo et la fréquence image SDR des signaux appliqués à l'UUT pendant la procédure doivent être choisies. La résolution et la fréquence image choisies doivent être compatibles avec le connecteur d'entrée choisi au 6.2.3.

L'ordre de priorité des résolutions vidéo doit être le suivant:

- 1 920 × 1 080 progressif en haute définition;
- 720 × 576 ou 720 × 480 progressif en définition standard.

La résolution maximale du signal vidéo SDR appliqué à l'UUT doit être de 1 920 pixels sur 1 080 pixels. Un signal vidéo en définition standard doit être utilisé dans la résolution vidéo de radiodiffusion normale du pays ou de la région, où la mesure de consommation de puissance doit être consignée.

La fréquence image vidéo utilisée pendant les mesurages doit être la fréquence verticale de radiodiffusion normale du pays ou de la région dans laquelle la consommation de puissance mesurée doit être consignée.

La résolution et la fréquence image choisies pour les signaux d'entrée SDR doivent être consignées.

NOTE 1 Une vidéo dont la fréquence image est de 59,94 Hz est souvent indiquée comme étant de "60 Hz".

NOTE 2 Les technologies de diffusion de contenu dont la résolution est supérieure à 1 920 pixels × 1 080 prévalent. Toutefois, les supports SDR disponibles dans l'IEC 62087-2:2023 le sont uniquement en définition standard et en haute définition. En limitant la résolution de la source vidéo à 1 920 × 1 080 pixels, le présent document assure la conversion des signaux associés par l'UUT, ce qui évite d'éventuelles variations des résultats entre les différents convertisseurs externes (voir le 6.3.10.6).

#### 6.2.6.2 HDR

Les fonctions de transfert électrooptique (EOTF, *Electro-Optical Transfer Function*), la résolution vidéo et la fréquence image HDR des signaux appliqués à l'UUT pendant la procédure doivent être choisies parmi les signaux d'essai IEC fournis. La résolution et la fréquence image choisies doivent être compatibles avec le connecteur d'entrée choisi au 6.2.3.

L'ordre de priorité des résolutions vidéo doit être le suivant:

- 3 480 × 2 160 progressif;

- 1 920 × 1 080 progressif.

La résolution maximale du signal vidéo HDR appliqué à l'UUT doit être de 3 480 pixels sur 2 160 pixels.

Les fonctions EOTF HDR (HDR10 ou HLG) des signaux d'essai fournis par l'IEC qui sont utilisées pendant les mesurages doivent correspondre aux fonctions EOTF HDR normales utilisées dans le pays ou la région, où la mesure de la consommation de puissance doit être consignée.

La fréquence image vidéo utilisée pendant les mesurages doit être la fréquence verticale de radiodiffusion normale du pays ou de la région dans laquelle la consommation de puissance mesurée doit être consignée.

La résolution, les fonctions EOTF HDR et la fréquence image choisies pour les signaux d'entrée HDR doivent être consignées.

### 6.2.7 Fonctions de commande automatique de luminosité

En ce qui concerne la fonction ABC, il existe trois types de téléviseurs.

- les téléviseurs qui ne comportent pas de fonction ABC;
- les téléviseurs qui comportent une fonction ABC qui n'est pas activée par défaut;
- les téléviseurs qui comportent une fonction ABC qui est activée par défaut.

La présence d'une fonction ABC et le fait que la fonction ABC soit activée ou non par défaut (dans les réglages d'image SDR et HDR prédéfinis par défaut) doivent être consignés.

### 6.2.8 Niveaux de commande automatique de luminosité

La consommation de puissance en mode Marche des téléviseurs dont la commande automatique de luminosité est désactivée par défaut dans le réglage d'image SDR ou HDR par défaut doit être déterminée avec la fonction ABC désactivée.

Pour les téléviseurs dont la fonction ABC est activée par défaut dans le réglage d'image SDR ou HDR par défaut, la consommation de puissance en mode Marche doit être déterminée avec la fonction ABC activée et/ou manuellement désactivée. Si la fonction ABC est activée, la consommation de puissance en mode Marche doit être déterminée pour au minimum un niveau d'éclairement et au maximum quatre niveaux d'éclairement différents en ce qui concerne cette fonction.

L'état ou les états de la fonction ABC et les niveaux d'éclairement choisis à appliquer au capteur ABC accompagnés des valeurs exactes lues par le luxmètre doivent être consignés avant la réalisation de chaque essai.

NOTE Les informations qui permettent de choisir les niveaux d'éclairement du capteur ABC et les états de la fonction ABC sont indiqués à l'Article A.2.

### 6.2.9 Fonction MDD

La fonction MDD doit être désactivée lors de tous les essais de détermination de la puissance en mode Marche pour le réglage SDR ou HDR conformément au 6.4. Si la fonction MDD ne peut pas être désactivée, l'unité doit être soumise à l'essai avec les réglages d'image SDR ou HDR la plus lumineuse prédéfinis sélectionnables, comme cela est déterminé au 6.5.1.5 et au 6.5.2.4.

Les réglages d'image prédéfinis utilisés pour les essais doivent exclure les réglages suivants:

- les réglages d'image désignés "PC" ou "Ordinateur" ou qui sont destinés à des cas d'utilisation où le téléviseur doit être utilisé comme un moniteur connecté à un ordinateur;
- les réglages d'image désignés "Jeu" ou qui sont destinés à une utilisation à faible latence lorsque le téléviseur est connecté à une console de jeu;
- les réglages d'image désignés "Accessibilité" ou "Faible vision" ou qui sont destinés à produire des images à contraste élevé pour une utilisation explicite par des spectateurs dont les capacités visuelles sont limitées.

L'état de la fonction MDD lors des essais doit être consigné.

### 6.2.10 Choix de la connexion réseau

Il convient d'énumérer les connexions réseau dans le manuel de l'utilisateur. Si aucune connexion n'est spécifiée dans le manuel de l'utilisateur, vérifier que le téléviseur ne comporte aucune capacité de réseau en contrôlant l'absence de connexions physiques et de réglages de réseau dans le menu. Si le téléviseur a la capacité de se connecter à un réseau, mais qu'il lui manque un dispositif matériel exigé (adaptateur sans fil, par exemple), à l'exclusion des câbles externes, ce type de connexion ne doit pas être soumis à l'essai.

Si le téléviseur prend en charge la mise en réseau, le connecter à un réseau local en mode Marche, en particulier avant son passage en mode Veille. Le réseau local doit permettre aux appareils d'envoyer un signal ping aux autres appareils sur le réseau, sans toutefois permettre l'accès à un réseau étendu (WAN). Si le téléviseur possède plusieurs connexions réseau (Wi-Fi et Ethernet, par exemple), il doit être configuré puis connecté à une seule source réseau conformément à la hiérarchie des connexions indiquée dans le Tableau 2.

**Tableau 2 – Hiérarchie des connexions réseau**

Priorité	Type de connexion réseau
1	Wi-Fi (Institution of Electrical and Electronics Engineers — IEEE 802.11-2007)
2	Ethernet (IEEE 802.3). Si le téléviseur prend en charge la connectivité Energy Efficient Ethernet (IEEE 802.3az-2010), il doit être connecté à un appareil qui prend également en charge IEEE 802.3az.
3	Bluetooth®

Pour une connectivité Wi-Fi sans fil, un point d'accès Wi-Fi sans fil compatible avec les spécifications de performance maximales (vitesse ou débit de données maximal pris en charge par le port Wi-Fi de l'UUT, par exemple) doit être utilisé.

Pour une connectivité Bluetooth® sans fil, un périphérique compatible avec la mise en œuvre du Bluetooth® de l'UUT doit être utilisé. Pour une connectivité filaire, un câble de catégorie 5e ou meilleure et un commutateur ou un routeur Ethernet qui prend en charge les spécifications de performance maximales (vitesse ou débit de données maximal pris en charge par le port Ethernet de l'UUT, par exemple) doivent être utilisés. Si l'UUT prend en charge la connectivité Energy Efficient Ethernet, le routeur Ethernet doit également être compatible avec la même version Energy Efficient Ethernet.

Le matériel de mise en réseau ne doit pas être connecté à un réseau étendu (WAN).

Le matériel de mise en réseau sans fil et l'UUT doivent se trouver dans la même pièce avec un espacement de 1 m à 5 m et sans objet qui fait obstacle entre eux.

La présence de connectivités Wi-Fi, Ethernet et Energy Efficient Ethernet dans l'UUT doit être consignée.

NOTE Les dispositifs fournis comme éléments de l'UUT qui sont capables de réactiver l'UUT (télécommande IR, RF, Wi-Fi ou Bluetooth®, par exemple) ne sont pas considérés comme des matériels de mise en réseau. Les dispositifs ou applications non fournis avec l'UUT (caisson de basse connecté au Wi-Fi ou applications téléchargeables, par exemple) qui sont capables de réactiver l'UUT par un dispositif IR, RF, Bluetooth® ou Wi-Fi (accessoire facultatif ou téléphone mobile, par exemple) sont considérés comme des matériels de mise en réseau.

## 6.3 Opérations initiales

### 6.3.1 Ordre des opérations initiales

La Figure 3 indique l'ordre dans lequel doivent être effectuées les opérations initiales.

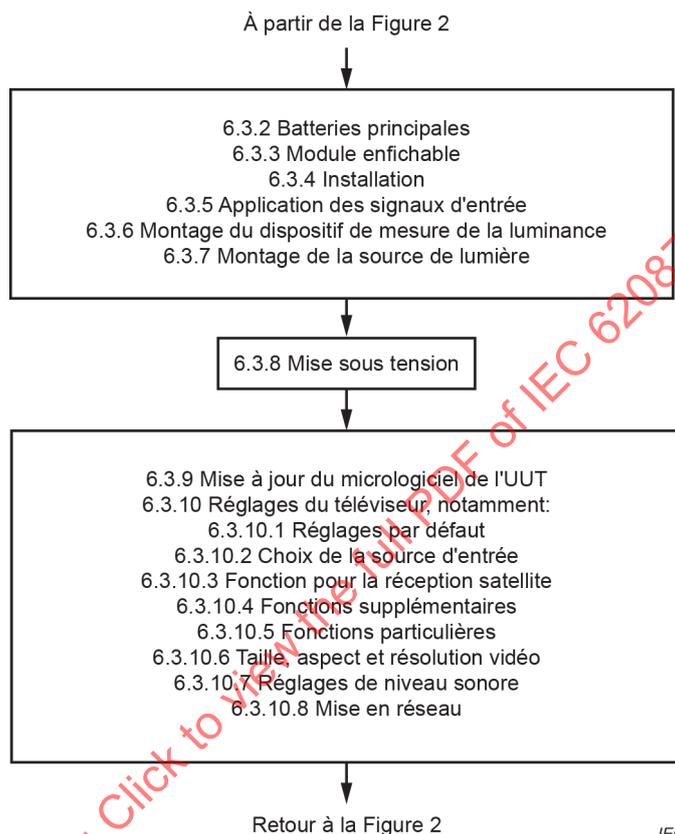


Figure 3 – Ordre des opérations initiales

### 6.3.2 Batteries principales

Les batteries principales, s'il y a lieu, doivent être enlevées pendant toute la durée de la procédure de mesure.

### 6.3.3 Module enfichable

Aucun module enfichable amovible, tel qu'un module d'accès conditionnel, un module de point de déploiement, une clé USB ou HDMI® ou une unité de stockage de supports externe, ne doit être connecté à l'UUT pendant la procédure de mesure, sauf si l'UUT est livrée au client final avec un module enfichable amovible installé. Si l'UUT est livrée au client final avec un module enfichable amovible qui est décrit dans le manuel de l'utilisateur comme étant nécessaire aux principales fonctionnalités prêtes à l'emploi du produit, ce module amovible doit être connecté pendant la procédure de mesure.

Une clé USB qui contient des fichiers multimédias (vidéo, image, audio) pour les besoins des essais spécifiés dans le présent document peut être connectée à l'UUT comme source de supports d'essai pendant une procédure de mesure donnée.