ENERGY STAR® Program Requirements
Product Specification for Displays

Test Method – Draft 3.0
Rev. Feb-2012

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1 OVERVIEW

The following test method shall be used for determining product compliance with requirements in the ENERGY STAR Eligibility Criteria for Displays.

2 APPLICABILITY

The following test method is applicable to all products eligible for qualification under the ENERGY STAR Product Specification for Displays.

Products must be tested with hardware and software features and capabilities in the default, or "as-shipped" configuration, unless otherwise specified in this document.

Note: DOE is publishing a test procedure Notice of Proposed Rulemaking (NOPR) for Television Sets (TVs). Any product that is included in DOE's scope of coverage for TVs shall ultimately be tested according to the final test procedure published by DOE.

3 DEFINITIONS

Unless otherwise specified, all terms used in this document are consistent with the definitions in the ENERGY STAR Eligibility Criteria for Displays.

4 ACRONYMS

A) ^{0}C: Degree Centigrade

B) A: Ampere

C) ABC: Automatic Brightness Control

D) AC: Alternating Current

E) DBC: Dynamic Broadcast Content

F) DC: Direct Current

G) DOE: U.S. Department of Energy

H) DVI: Digital Visual Interface

I) EPA: Environmental Protection Agency

J) EPS: External Power Supply

K) FPDM: Flat Panel Display Measurement

L) HDMI: High Definition Multimedia Interface

M) Hz: Hertz

N) IEC: International Electrotechnical Commission

O) IEEE: Institute of Electrical and Electronics Engineers

P) IP: Internet Protocol

Q) LMD: Light Measuring Device

R) POD: Point of Deployment

S) UPS: Uninterruptible Power Supply

T) USB: Universal Serial Bus

U) UUT: Unit Under Test

V) V: Voltage

W) VESA: Video Electronics Standard Association

X) W: Watts

5 TEST SETUP

A) Test Setup and Instrumentation: Test setup and instrumentation for all portions of this method shall be in accordance with the requirements of IEC 62301, Ed. 2.0, "Measurement of Household Appliance Standby Power," Section 4, "General Conditions for Measurements," unless otherwise noted in this document. In the event of conflicting requirements, the ENERGY STAR test method shall take precedence.

B) Ac Input Power: Products capable of being powered from ac mains shall be connected to an external power supply, if one is shipped with the unit, and then connected to a voltage source appropriate for the intended market, as specified Table 1.

Table 1: Input Power Requirements for Products with Nameplate Rated Power Less Than or Equal to 1500 W

Market	Voltage	Voltage Tolerance	Maximum Total Harmonic Distortion	Frequency	Frequency Tolerance
North America, Taiwan	115 V ac	+/- 1.0 %	5.0 %	60 Hz	+/- 1.0 %
Europe, Australia, New Zealand	230 V ac	+/- 1.0 %	5.0 %	50 Hz	+/- 1.0 %
Japan	100 V ac	+/- 1.0 %	5.0 %	50 Hz/60 Hz	+/- 1.0 %

C) Low-voltage Dc Input Power:

1) Products may be powered with a low-voltage dc source (e.g., via network or data connection) only if the dc source is the only available source of power for the product (i.e., no ac plug or External Power Supply (EPS) is available).

2) Products powered by low-voltage dc shall be configured with an ac source of the dc power for testing (e.g., an ac-powered Universal Serial Bus (USB) hub).

3) The USB hub power adapter must have the following attributes:

   a) Voltage Rating: 5 V.

   b) Current Range: 2 A to 3 A.

Note: The USB hub power adapter voltage and current ratings are specified to maintain uniformity and improve testing repeatability. DOE and EPA understand that these ratings will change with future changes in USB technology. As such, DOE and EPA request information from stakeholders regarding market availability of USB 3.0 compatible Displays. DOE and EPA welcome comments on this clarification.

4) Power for the unit under test (UUT) shall include the following, as measured per Section 6.3 of this method:

   a) Ac power consumption of the low-voltage dc source with the UUT as the load (P_L).

   b) Ac power consumption of the low-voltage dc source with no load (P_S).

Note: DOE and EPA are interested in understanding the characteristics of the dc signal at the power input of dc devices and are soliciting feedback on alternative options for dc power measurement, such as oscilloscopes, dc power meters, and programmable dc power supplies with built-in metering. In addition, DOE and EPA are interested to know if dc measuring devices, such as oscilloscopes, can meet the accuracy requirements necessary for measuring the main dc input power.

D) Ambient Temperature: Ambient temperature shall be 23^{o} C ± 5^{o} C.

E) Relative Humidity: Relative humidity shall be from 10% to 80%.

F) Light Source: 100 watt halogen incandescent bulb.

Note: In its Test Procedure Notice of Proposed Rulemaking (NOPR) for TVs, DOE is proposing that 100 watt halogen incandescent bulbs be used as the primary light source during testing. DOE and EPA are working to ensure harmonization between the DOE TV NOPR and the ENERGY STAR Displays Test Method, and as such recommend testing Displays with a 100 watt halogen incandescent light source.

A halogen incandescent light source operates at higher color temperatures (2700 K – 3300 K) than vacuum or gas-filled lamps. At higher color temperatures, a greater portion of the visible spectrum is available to the UUT. As such, DOE and EPA propose testing with a 100 watt halogen incandescent bulb. DOE and EPA also expect that specifying a light source will improve test repeatability. DOE and EPA request comments and data, if available, on:

1. Value and necessity of incorporating a color temperature range in addition to a specific light source requirement. Consumers have a wide variety of lighting options to choose from ranging from "warm" (2800 – 3000 K) to "cool" (3600 – 5500 K) color temperatures and it is not well understood how these spectral characteristics may be perceived by Automatic Brightness Control (ABC) sensors.
2. Specifying a warm up time for the light source.

G) Power Meter: Power meters shall possess the following attributes[1]:

1) Crest Factor:

a) An available current crest factor of 3 or more at its rated range value; and

b) Lower bound on the current range of 10 mA or less.

2) Minimum Frequency Response: 3.0 kHz.

3) Minimum Resolution:

a) 0.01 W for measurement values less than or equal to 10 W;

b) 0.1 W for measurement values from greater than 10 W to 100 W; and

c) 1.0 W for measurement values greater than 100 W.

H) Light Measuring Device (LMD): All LMDs shall meet the following specifications:

1) Accuracy: ± 2% (± 2 digits) of the digitally displayed value.

2) Repeatability: Within 0.4% (± 2 digits) of displayed value.

3) Acceptance Angle: 3 degrees or less.

[1] Characteristics of approved meters from IEC 62301 Ed 2.0: Household Electrical Appliances – Measurement of Standby Power.

The overall accuracy of LMDs is found by taking (+/-) the absolute sum of 2 % of the targeted luminance and a 2 digit tolerance of the displayed value least significant digit. For example, if the LMD displays “200.0” when measuring a screen brightness of 200 nits, 2% of 200 nits is 4.0 nits. The least significant digit is 0.1 nits. “Two digits” implies 0.2 nits. Thus, the displayed value would be 200 ± 4.2 nits (4 nits + 0.2 nits). The accuracy and repeatability are specific to the LMD and shall not be considered as tolerance during actual light measurements. Light measured shall be within the tolerance specified in 5I)4).

Note: DOE and EPA have added requirements for the LMD. These requirements ensure test consistency and improve test repeatability. DOE and EPA welcome feedback on these conditions.

I) Measurement Accuracy:

1) Power measurements with a value greater than or equal to 0.5 W shall be made with an uncertainty of less than or equal to 2% at the 95% confidence level.

2) Power measurements with a value less than 0.5 W shall be made with an uncertainty of less than or equal to 0.01 W at the 95% confidence level.

3) All ambient light values (measured lux) shall be measured at the location of the Automatic Brightness Control (ABC) sensor on the UUT with light entering directly into the sensor and with the IEC 62087 Ed. 3.0 test signal main menu displayed on the product. For products not compatible with the IEC 62087 test signal format, ambient light values shall be measured with the VESA FPDM2 FK test signal being displayed on the product.

4) Ambient light values shall be measured within the following tolerances:

   a) At 10 lux, ambient lighting shall be within ± 1.0 lux;

   b) At 100 lux, ambient lighting shall be within ± 5.0 lux; and

   c) At 300 lux and 500 lux, ambient lighting shall be within ± 9.0 lux.

Note: The main menu of the IEC 62087 Ed. 3.0 test signal is an image with a dark background. This reduces any interference from bright light emitted by the screen with the room illuminance values measured at the Display's light sensors. This helps make the illuminance readings more accurate.

DOE and EPA note that it may be difficult to measure exact ambient light values even with illuminance meters having high accuracy (high resolution). As such, DOE and EPA propose specifying tolerance values for each ambient light level. All measurements made would need to fall within the specified tolerance levels.

Tolerance levels for room illuminance measurement recommended by DOE and EPA are based on the observation that power consumed by ABC-enabled products varies greatly with changes in ambient lighting conditions less than 100 lux. Based on this observation, DOE and EPA propose requiring that measurements at lower lighting levels be as accurate as possible and recommends a tolerance of ± 1 lux at 10 lux. DOE and EPA observed low variance in power consumed by these products at higher ambient light levels and therefore propose wider tolerance levels of ± 5 lux at 100 lux, ± 9 lux at 300 lux and ± 9 lux at 500 lux. The values proposed are consistent with the tolerance values proposed in the DOE Test Procedure NOPR for TVs.

DOE and EPA welcome feedback on the measuring requirements and tolerance levels at each illuminance point.

6 TEST CONDUCT

6.1 Guidance for Implementation of IEC 62087 Ed. 3.0

A) Testing at Factory Default Settings: Power measurements shall be performed with the product in its as-shipped condition for the duration of Sleep Mode and On Mode testing, with all user-configurable options set to factory defaults, except as otherwise specified by this test method.

1) Picture level adjustments shall be performed per the instructions in this test method.

2) Products that include a "forced menu" upon initial start-up shall be tested in "standard" or "home" picture setting. In the case that no "standard" setting or equivalent exists, the default setting recommended by the manufacturer shall be used for testing, and recorded in the test report. Products that do not include a "forced menu" shall be tested in the default picture setting.

B) Point of Deployment (POD) Modules: Optional POD modules shall not be installed.

C) Multiple Sleep Modes: If the product offers multiple Sleep Modes, the power during all Sleep Modes shall be measured and recorded. All Sleep Mode Testing shall be carried out as per Section 7.5.

6.2 Conditions for Power Measurements

A) Power measurements:

1) Power measurements shall be taken from a point between the power source and the UUT. No Uninterruptible Power Supply (UPS) units may be connected between the power meter and the UUT. The power meter shall remain in place until all On Mode, Sleep Mode and Off Mode power data are fully recorded.

2) Power measurements shall be recorded in watts as directly measured (unrounded) values.

3) Power measurements shall be recorded after voltage measurements are stable to within 1%.

B) Dark Room Conditions:

1) Unless otherwise specified, the UUT screen illuminance measured with the UUT in Off Mode shall be less than or equal to 1.0 lux.

C) UUT Configuration and Control:

1) Peripherals and Network Connections:

a) External peripheral devices shall not be connected to USB ports or other data ports on the UUT.

b) UUT connections shall be set up as follows:

i. If the UUT has both data and network capabilities (e.g., USB, Wi-Fi, Ethernet), the UUT shall be configured and connected to a single active data source or a single network source, while maintaining a video signal connection.

ii. If the UUT has data connection capability (e.g., USB, Firewire), another device shall be capable of bridging the data connection, while active and powered with a live bridge i.e., the two devices shall act as bridged USB hub controllers.

iii. If the UUT has network capabilities, the capabilities shall be activated and the UUT shall be connected to a live physical network, including wireless Radio Frequency (RF), which supports the highest and lowest data speeds of the UUT's network function. An active connection is defined as a live physical connection over the physical layer of the networking protocol. The tester shall configure the address layer of the protocol, taking note of the following:

a. Internet Protocol (IP) v4 and IPv6 have neighbor discovery and will generally configure a limited, non-routable connection automatically.

b. IP can be configured manually or using Dynamic Host Configuration Protocol (DHCP) with an address in the 192.168.1.x Network Address Translation (NAT) address space if the UUT does not behave normally when autoIP is used. The network shall be configured to support the NAT address space and/or autoIP.

c) The UUT shall maintain this live connection to the network for the duration of testing, disregarding any brief lapses, (e.g., when transitioning between link speeds). If the UUT is equipped with multiple network capabilities, only one connection shall be made in the following order of preference:

i. Wi-Fi (Institution of Electrical and Electronics Engineers - IEEE 802.11- 2007[2]).

ii. Ethernet (IEEE 802.3). If the UUT supports Energy Efficient Ethernet (IEEE 802.3az-2010[3]), then it shall be connected to a device that also supports IEEE 802.3az.

iii. Thunderbolt

[2] IEEE 802 – Telecommunications and information exchange between systems – Local and metropolitan area networks – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications

[3] Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications - Amendment 5: Media Access Control Parameters, Physical Layers, and Management Parameters for Energy-Efficient Ethernet

iv. USB

v. Firewire (IEEE 1394)

vi. Other

d) A bridge connection shall be made between the UUT and the host machine. The connection shall be made in the following order of preference. Only one connection shall be made.

i. Thunderbolt

ii. Universal Serial Bus (USB)

iii. Firewire (IEEE 1394)

iv. Other

e) In the case of a UUT that has no data/network capabilities, the UUT shall be tested as-shipped.

f) Built-in speakers and other product features and functions not specifically addressed by the ENERGY STAR eligibility criteria or test method must be configured in the as-shipped power configuration.

g) Availability of other capabilities such as occupancy sensors, flash memory-card/smart-card readers, camera interfaces, PictBridge shall be recorded.

Note: DOE and EPA have specified a single connection, either data or network, in addition to the video interface signal connection, during testing. In cases where a single connection can supply video and data/networking transfer, such as Thunderbolt, only that single connection is necessary.

2) Signal Interface:

a) If the UUT has multiple digital interfaces, the UUT shall be tested with the first available interface from the list below:

i. Thunderbolt

ii. DisplayPort

iii. HDMI

iv. DVI

v. Other Digital Interface

vi. Analog Component

vii. Analog Composite

viii. Other Analog Interfaces

D) Resolution and Refresh Rate:

1) Fixed-pixel Displays:

a) Pixel format shall be set to the native level as specified in the product manual.

b) For non-Cathode Ray Tube (CRT) Displays, refresh rate shall be set to 60 Hz, unless a different default refresh rate is specified in the product manual, in which case the specified default refresh rate shall be used.

c) For CRT Displays, pixel format shall be set to the highest resolution that is designed to be driven at a 75 Hz refresh rate, as specified in the product manual. Typical industry standards for pixel format timing shall be used for testing. Refresh rate shall be set to 75 Hz.

E) Battery Operated Products:

1) For products designed to operate using batteries when not connected to the mains, the battery shall be removed for all tests. For UUTs where operation without a battery pack is not a supported configuration, the batteries shall be fully charged before the start of testing and shall be left in place for the test. To ensure the battery is fully charged, perform the following steps:

a) For products that have an indicator to show that the battery is fully charged, continue charging for an additional 5 hours after the charged indicator is present.

b) If there is no charge indicator, but the manufacturer's instructions provide a time estimate for when charging this battery or this capacity of battery should be complete, continue charging for an additional 5 hours after the manufacturer's estimate.

c) If there is no indicator and no time estimate in the instructions, but the charging current is stated on the UUT or in the instructions, terminate charging 1 hour after the calculated test duration or, if none of the above applies, the duration shall be 24 hours.

Note: DOE and EPA have clarified guidelines for products designed to operate on battery power, requiring batteries to be removed for all testing, or, if not possible, testing with a fully charged battery. This clarification harmonizes with the specification requirements for other ENERGY STAR products.

F) Accuracy of Input Signal Levels: When using analog interfaces, video inputs shall be within ± 2% of referenced white and black levels. When using digital interfaces, the source video signal shall not be adjusted for color, or modified by the tester for any purpose other than to compress/inflate and encode/decode for transmission, as required.

G) True Power Factor: Partners shall report the true power factor (PF) of the UUT during On Mode measurement.

H) Test Materials:

1) "IEC 62087-2011 Dynamic Broadcast-Content Signal" shall be used for testing, as specified in IEC 62087, Ed. 3.0, Section 11.6, "On (average) mode testing using dynamic broadcast-content video signal."

2) "Video Electronics Standard Association (VESA) Flat Panel Display Measurements (FPDM) Standard version 2.0 test patterns" shall be used only for products that cannot be tested using the dynamic broadcast-content video signal.

Note: DOE and EPA intend for Displays of all sizes to be tested using the IEC 62087 dynamic broadcast-content video signal. For Displays that cannot be tested with the above mentioned IEC signal, DOE and EPA propose testing with the VESA FPDM2 test patterns. For example, some digital picture frames cannot currently be tested with the IEC 62087 dynamic broadcast-content signal. Testing showed little difference in the power consumed by a picture frame when tested with VESA FPDM2 signals and a replica of the IEC static image content signal.

DOE and EPA welcome feedback on the use of VESA FPDM2 test pattern for testing Displays that cannot be tested using the IEC 62087 Ed. 3.0 test signal.

6.3 Low-Voltage Dc Source Measurement

A) Connect the dc source to the power meter and relevant ac supply as specified Table 1.

1) Verify that the dc source is unloaded.

2) Allow the dc source to warm up for a minimum of 30 minutes.

3) Measure and record the unloaded dc source power (P_S) according to IEC 62301 Ed. 2.0

4) Record the brand name, model number, voltage and current rating of the dc source.

Note: DOE and EPA propose that information on the dc source (e.g., an ac-powered USB hub), including adapter ratings, be recorded during qualification testing. This information will be used to better understand the impact of the dc source on the test results, and will also provide a method for replicating test setup during possible verification testing.

7 TEST METHOD FOR ALL PRODUCTS

7.1 Pre-Test UUT Initialization

A) Prior to the start of testing, the UUT shall be initialized as follows:

1) Set up the UUT per the instructions in the supplied product manual.

2) Connect an acceptable watt meter to the power source and connect the UUT to the power outlet on the watt meter.

3) With the UUT off, set the ambient light level such that the measured screen illuminance is less than 1.0 lux (see Section 6.2B) Dark Room Conditions:).

4) Power on the UUT and perform initial system configuration, as applicable.

5) Ensure UUT settings are in their as-shipped configuration.

6) Warm up the UUT for 20 minutes, or the time it takes the UUT to complete initialization and become ready for use, whichever is longer.

7) Measure and record the ac input voltage and frequency.

8) Measure and record the test room ambient temperature and relative humidity.

7.2 Luminance Testing

A) Luminance testing shall be performed immediately following the warm-up period and in dark room conditions. Product screen illuminance, as measured with the UUT in Off Mode, shall be less than or equal to 1.0 lux.

B) Luminance shall be measured perpendicular to the center of the product screen using a Light Measuring Device (LMD). Following the LMD manufacturer's instructions, it is recommended that the LMD either be used as close to the screen as possible, or measure an area of at least 500 pixels.

C) The position of the LMD relative to the product screen shall remain fixed throughout the duration of testing.

D) For products with ABC, luminance measurements shall be performed with ABC disabled. If ABC cannot be disabled, luminance measurements shall be measured perpendicular to the center of the product screen with light entering directly into the UUT's ambient light sensor at greater than or equal to 500 lux.

E) Luminance measurements shall be performed as follows:

1) Verify that the UUT is in the default as-shipped luminance value or 'Home' picture setting.

2) Display the test video signal for the specific product class, as described below:

a) All products: IEC 62087-2011 Three-bar video signal specified in IEC 62087, Ed. 3.0, Section 11.5.5 (three bars of white (100%) over a black (0%) background).

b) Products that cannot be tested with signals from IEC 62087: VESA FPDM2 L80 test signal for the maximum resolution supported by the product.

3) Display the test video signal for no less than 10 minutes to allow the UUT luminance to stabilize. This 10 minute stabilization period may be reduced if luminance measurements are stable to within 2% over a period of not less than 60 seconds.

4) Measure and record luminance in the default as-shipped setting $L_{As\text{-}shipped}$.

5) Set the brightness and contrast level of the UUT to its maximum value.

6) Measure and record the luminance as $L_{Max\_Measured}$.

7) Record the manufacturer-reported maximum luminance $L_{Max\_Reported}$.

Note: DOE and EPA believe that maximum luminance value, specified by manufacturers, may vary depending on the test signal and ambient conditions set by the manufacturer. As such, DOE and EPA recommend testing and reporting the maximum measured Display luminance to demonstrate the differences when compared to the manufacturer-reported maximum luminance. DOE and EPA also seek feedback from manufacturers on how the maximum-reported luminance is derived relative to the maximum measured luminance.

7.3 On Mode Testing for Products without ABC Enabled by Default

A) Prior to On Mode power measurement, the luminance of the UUT shall be set according to the following:

1) For products with viewable diagonal screen size **less than 30 inches and any Computer Monitors 30 inches or more**, adjust the brightness control until the luminance of the screen is **200 candelas per square meter (cd/m^2)**. If the UUT cannot achieve this luminance, set the product luminance to the nearest achievable value. This luminance value L_{On} shall be reported.

8) For products with viewable diagonal screen size of **30 inches or more that are Signage Displays**, the product shall be tested with luminance set at a value greater than or equal to 65% of the manufacturer-reported maximum luminance ($L_{Max\_Reported}$). This luminance value L_{On} shall be recorded.

Note: DOE and EPA seek to determine the most appropriate luminance setting for displays with viewable diagonal screen size of 30 inches or more. Based on stakeholder feedback indicating that the maximum measured luminance can vary across the same product models and thus impact verification of products, EPA is proposing, for qualification purposes, that products be tested with luminance set at a value greater than or equal to 65% of the manufacturer-reported maximum luminance. DOE and EPA request stakeholder feedback on this approach and also seek to information on the extent to which maximum measured luminance can vary across the same product models.

Based on stakeholder feedback and further analysis of EPA's dataset, EPA found that most computer monitors, which mostly have a viewable screen size of less than 30 inches, shipped with an average luminance of approximately 200 cd/m^2. Therefore, in order to allow for comparability among computer monitors, DOE and EPA are proposing to retain testing at a fixed luminance, which often corresponds to how products are shipped. This approach for computer monitors remains consistent with the approach in Version 5.1.

B) For a UUT capable of displaying the IEC signals, On Mode power (P_{ON}) shall be measured according to IEC 62087 Ed 3.0 Section 11: Measuring Conditions for Television Sets in On (average) Mode; with the additional guidance in Section 6.

1) Section 11.6 "On (average) mode testing using dynamic broadcast-content video signal" for products capable of playing video.

C) For a UUT not capable of displaying the IEC signals, On Mode power (P_{ON}) shall be measured as follows:

1) Ensure that the UUT has been initialized per Section 7.1.

2) Display the VESA FPDM2, A112-2F, SET01K test pattern (8 shades of gray from full black (0 volts) to full white (0.7 volts)).

3) Verify that input signal levels conform to VESA Video Signal Standard (VSIS), Version 1.0, Rev. 2.0, December 2002.

4) With the brightness and contrast controls at maximum, verify that the white and near-white grey levels can be distinguished. If necessary, adjust contrast controls until the white and near-white grey levels can be distinguished.

5) Display the VESA FPDM2, A112-2H, L80 test pattern (full white (0.7 volts) box that occupies 80% of the image).

6) Ensure that the LMD measurement area falls entirely within the white portion of the test pattern.

7) Adjust the brightness control until the luminance of the white area of the screen is **200 Cd/m^2**. If the UUT cannot achieve the specified luminance, set the luminance to the nearest achievable value.

8) Measure and record the screen luminance.

9) Measure and record On Mode power (P_{ON}) and total pixel format (horizontal x vertical).

7.4 On Mode Testing for Products with ABC Enabled by Default

The average On Mode power consumption of products shall be tested with the dynamic broadcast-content as defined in IEC 62087 Ed. 3.0.

A) Stabilize the UUT for 30 minutes. This shall be done with three repetitions of the 10 minute IEC dynamic broadcast-content video signal.

B) Set the ambient light to 10 lux as measured at the face of the ambient light sensor.

C) Display the 10 minute dynamic broadcast-content video signal and measure and record the average volts, amps, and watt-hours. Record the power consumption, P_{10}, during the 10 minute dynamic broadcast-content video signal.

D) Repeat steps 7.4A) and 7.4C) for ambient light levels of 100 lux, 300 lux, and 500 lux to measure P_{100}, P_{300}, and P_{500}.

E) Disable ABC and measure On Mode power (P_{ON}) per Section 7.3. If ABC cannot be disabled, power measurements shall be conducted as follows:

1) If the brightness can be set to a fixed value as specified in Section 7.3, then On Mode power for these products shall be measured as per Section 7.3 with light entering directly into the UUT's ambient light sensor at greater than or equal to 500 lux.

2) If the brightness cannot be set to a fixed value, then On Mode power for these products shall be measured as per Section 7.3 with light entering directly into the UUT's ambient light sensor at greater than or equal to 500 lux and without modifying the screen brightness.

Note: DOE and EPA are interested in improving the measurement accuracy associated with ABC enabled by default. DOE and EPA continue to investigate room illuminance and typical customer use-levels and welcome stakeholder feedback on room illuminance levels for testing ABC Displays.

DOE and EPA also seek feedback on whether products that cannot disable the ABC sensor currently exist and, if so, how a product that cannot disable the ABC sensor would be tested for On Mode Power at a fixed brightness.

7.5 Sleep Mode Testing

A) Sleep Mode power (P_{SLEEP}) shall be measured according to IEC 62301-2011: Household Electrical Appliances – Measurement of Standby Power, with the additional guidance in Section 5.

B) If the product has a variety of Sleep Modes that can be manually selected, measurements shall be performed and recorded in all Sleep Modes. If the product automatically cycles through its various Sleep Modes, measurement time shall be long enough to obtain a true average of all Sleep Modes, which will be the Sleep Mode power used for qualification.

7.6 Off Mode Testing

A) At the conclusion of the Sleep Mode test, initiate Off Mode via the most easily accessible power switch.

B) Measure Off Mode power (P_{OFF}) according to Section 5.3.1 of the IEC 62301 off mode test. Document the method of adjustment and sequence of events required to reach Off Mode.

C) Any input synchronizing signal check cycle may be ignored when measuring Off Mode power.

7.7 Additional Testing

A) For products with data/networking capabilities, in addition to tests performed with data/networking capabilities activated and a bridge connection established (see Section 6.2C)1)), Sleep Mode Testing shall be performed with data/networking features deactivated and without any bridge connection established, per Section 6.2.C)1) Peripherals and Network Connections: b) and c).