



# ENERGY STAR<sup>®</sup> Program Requirements Product Specification for Televisions

## Draft Test Method

**Note:** EPA is committed to supporting and adopting the television test procedure currently under development by the U.S. Department of Energy (DOE). EPA will ensure harmonization between the ENERGY STAR test method contained in this document and the final DOE television test procedure. To ensure harmonization, EPA will revise its television test method to be identical to the DOE test procedure within 180 days of publication of the final DOE test procedure.

## 1 OVERVIEW

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

## 2 APPLICABILITY

ENERGY STAR test requirements are dependent upon the feature set of the product under evaluation. The following guidelines shall be used to determine the applicability of each section of this document:

- A) Test procedures in sections 6.1 and 6.5 shall be performed on all products;
- B) Test procedures in section 6.2 shall be performed on products without automatic brightness control (ABC) enabled by default;
- C) Test procedures in section 6.3 shall be performed on products with ABC enabled by default;
- D) Test procedures in section 6.4 shall be performed on products with download acquisition mode (DAM).

## 3 DEFINITIONS

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

## 4 TEST SETUP

- A) Test Setup and Instrumentation: Test setup and instrumentation for all portions of this procedure 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) Input Power: Input power shall be as specified in Table 1 or Table 2.

**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 Vac	+/- 1.0 %	2.0 %	60 Hz	+/- 1.0 %
Europe, Australia, New Zealand	230 Vac	+/- 1.0 %	2.0 %	50 Hz	+/- 1.0 %
Japan	100 Vac	+/- 1.0 %	2.0 %	50 Hz/ 60 Hz	+/- 1.0 %

**Table 2: Input Power Requirements for Products with Nameplate Rated Power Greater Than 1500 W**

Market	Voltage	Voltage Tolerance	Maximum Total Harmonic Distortion	Frequency	Frequency Tolerance
North America, Taiwan	115 Vac	+/- 4.0 %	5.0 %	60 Hz	+/- 1.0 %
Europe, Australia, New Zealand	230 Vac	+/- 4.0 %	5.0 %	50 Hz	+/- 1.0 %
Japan	100 Vac	+/- 4.0 %	5.0 %	50 Hz/60 Hz	+/- 1.0 %

- C) Ambient Temperature: Ambient temperature shall be from 18 °C to 28 °C.
- D) Relative Humidity: Relative humidity shall be from 10% to 80%.
- E) Power Meter: Power meters shall possess the following attributes:
- 1) Crest Factor:
    - i) An available current crest factor of 3 or more at its rated range value; and Lower bound on the current range of 10 mA or less.
  - 2) Minimum Frequency Response: 3.0 kHz
  - 3) Minimum Resolution:
    - i) 0.01 W for measurement values less than 10 W;
    - ii) 0.1 W for measurement values from 10 W to 100 W; and
    - iii) 1.0 W for measurement values greater than 100 W.
- F) Measurement Uncertainty: The uncertainty of all measurements conducted under this test method shall meet the requirements of section 4.4.1 of IEC 62301, Ed. 2.0.

## 5 TEST CONDUCT

### 5.1 Guidance for Implementation of IEC 62301

- 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 testing, with all user-configurable options set to factory defaults, except as otherwise specified by the test procedure.
- B) POD Modules: Optional POD modules shall not be installed.
- C) Network Connection: Products that offer networking capability (e.g., Ethernet, WiFi) shall be configured with networking features deactivated.
- D) Multiple Sleep Modes: If the product offers multiple Sleep Modes, the power during all Sleep Modes shall be measured and recorded.

### 5.2 Guidance for Implementation of IEC 62087

- A) Testing at Factory Default Settings:
  - 1) Power measurements shall be performed with the product in its as-shipped condition for the duration of On Mode testing, with all user-configurable options set to factory defaults, except as otherwise specified by the test procedure.
  - 2) Picture level adjustments shall be performed per the instructions in IEC 62087, Ed. 2.0, Section 11.4.8.
  - 3) Products that include a “forced menu” upon initial start-up shall be tested in “standard” or “home” picture mode. Products that do not include a forced menu shall be tested in the default picture mode. In the case that no “standard” mode or equivalent exists, the first mode listed in the on-screen menus shall be used for testing and noted in the test report.
- B) Input Signal Accuracy: Follow guidance provided in section 4.4.1 of IEC 62301, Ed. 2.0.
- C) Test Materials:
  - 1) On Mode power tests shall be performed according to IEC 62087 Ed. 2.0, sub clause 11.6, “On (average) mode testing using dynamic broadcast-content video signals.”
  - 2) On Mode power tests must be repeated using the Internet-content video signal as defined in IEC 62087 Ed. 2.0 Section 11.7. Data collected from this test will not be subject to the requirements of the ENERGY STAR Version 6.0 Specification.

**Note:** EPA is asking manufacturers to provide data for On Mode power consumption using the Internet-content video signal to develop a better understanding for how televisions consume energy when viewing internet-based content. Recent market data show that a growing number of televisions are Internet capable.

- D) True Power Factor: Due to increased awareness of the importance of power quality on the part of EPA and electric utilities, manufacturers shall indicate the true power factor of their sets during On Mode measurement.

- E) Signal Input: If the UUT has an HDMI input, the HDMI input shall be used for display of test signals during testing. If HDMI is not available, then the component interface shall be used. The VGA interface shall not be used.

**Note:** EPA has added additional detail about the use of various signal inputs for testing.

- F) Automatic Brightness Control: For televisions that include automatic brightness control feature that is enabled by default, the device shall be tested in the following minimum ambient light level room conditions in the following order: 300 lux ( $P_{BROADCAST|300\text{ lux}}$ ), 150 lux ( $P_{BROADCAST|150\text{ lux}}$ ), 100 lux ( $P_{BROADCAST|100\text{ lux}}$ ), and 10 lux ( $P_{BROADCAST|10\text{ lux}}$ ).
- G) Network Connection: Products that offer networking capability (e.g., Ethernet, WiFi) shall be configured with networking features deactivated.

### 5.3 Guidance for Implementation of CEA: Procedure for DAM Testing

- A) The “Ideal” CEA: Procedure for DAM Testing is the preferred protocol for ENERGY STAR DAM testing, though the “Practical” protocol may also be used.
- B) Energy consumption for all DAM functionalities, both frequent and infrequent, shall be declared on the data collection sheet.
- C) Energy consumption from DAM functionalities meeting the definition of “infrequent” may be excluded from the calculation of total DAM energy consumption.

### 5.4 Additional Testing

- A) For data collection purposes, EPA is requiring the following tests found in Section 6 be performed with a networking features activated, in addition to tests performed with networking deactivated, per section 5.2.G), above:
- 1) On Mode
  - 2) Sleep Mode
- B) A network connection should be made in the following order of preference and only one connection should be made:
- 1) Wired Ethernet (IEEE 802.11)
  - 2) Wireless Ethernet (WiFi, IEEE 802.3)
  - 3) Other
- C) In the case of a UUT that has no Data/Network capabilities, these tests are waived.

**Note:** EPA welcomes stakeholder input on the prevalence of network connectivity for Televisions and the associated power consumption both in Sleep Mode and On Mode when a network connection is activated. EPA is particularly interested in the proposed method of testing the power use associated with this feature. EPA envisions collecting data associated with qualified products and analyzing this data for use in future ENERGY STAR TV specifications.

## **6 TEST PROCEDURES FOR ALL PRODUCTS**

### **6.1 Luminance Testing**

- A) Luminance testing shall be performed in dark room conditions. Display screen illuminance (E) 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 display screen using a Light Measuring Device (LMD). A 500 mm measurement distance is recommended for LMDs that cannot be operated in close proximity to the screen.
- C) The position of the LMD relative to the display screen shall remain fixed throughout the duration of testing.
- D) For products with Automatic Brightness Control, luminance measurements shall be performed with ABC disabled. If ABC cannot be disabled, luminance measurements shall be performed with light entering directly into the television's ambient light sensor at greater than or equal to 300 lux.
- E) Luminance measurements shall be performed per the following procedure:
  - 1) Verify that the product is in the "home" picture mode, or the default as-shipped picture mode.
  - 2) Immediately following the conclusion of On Mode power testing, begin to display the three-bar video signal specified in IEC 62087 Ed. 2.0, Section 11.5.5 (three bars of white (100%) over a black (0%) background).
  - 3) Display the three-bar video signal for not less than 10 minutes to allow the display 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 home, or default as-shipped picture mode ( $L_{\text{HOME}}$ ).
  - 5) Within 1 minute of performing the measurement, set the television to "retail" picture mode, or the brightest-selectable preset picture mode.
  - 6) Display the three-bar video signal for not less than 10 minutes to allow the display 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.
  - 7) Measure and record luminance in the retail, or brightest-selectable, preset picture mode ( $L_{\text{RETAIL}}$ ).

### **6.2 On Mode Testing for Products without ABC Enabled by Default**

- A) On mode power ( $P_{ON}$ ) shall be measured according to IEC 62087, Ed. 2.0: Methods of Measurement for the Power Consumption of Audio, Video and Related Equipment; Section 11: Measuring Conditions for Television Sets in On (average) Mode; with the additional guidance in section 5 of this document.

### **6.3 On Mode Testing for Products with ABC Enabled by Default**

- A) On mode power shall be measured according to IEC 62087, Ed. 2.0 Methods of Measurement for the Power Consumption of Audio, Video and Related Equipment; Section 11: Measuring Conditions for Television Sets in On (average) Mode; with the additional guidance in section 5 of this document, and specifically section 5.2.F), pertaining to Automatic Brightness Control.

**Note:** EPA and DOE are interested in improving the measurement associated with ABC enabled by default. Both EPA and DOE believe that the test conditions for room illuminance should be representative of consumer use. EPA is proposing testing conditions for ABC enabled by default that have been recommended by DOE. EPA will revise its television test method to be identical to the DOE test procedure within 180 days of publication of the final DOE test procedure. EPA also welcomes feedback on testing ABC at three room illuminance levels instead of four.

### **6.4 Download Acquisition Mode Testing**

- A) Energy consumption in Download Acquisition Mode ( $E_{DAM}$ ) shall be measured per the CEA: Procedure for DAM Testing, with the additional guidance in section 5 of this document.

### **6.5 Sleep Mode Testing**

- A) Sleep Mode power ( $P_{SLEEP}$ ) shall be measured according to IEC 62301, Ed. 2.0: Household Electrical Appliances – Measurement of Standby Power, with the additional guidance in section 5 of this document.