ENERGY STAR Program Requirements for Displays

Draft Annex 2: Test Procedures for Displays with a viewable screen area measuring greater than or equal to (≥) 30 inches diagonal

When to use this document

This document describes the test procedures for displays with a viewable screen area measuring greater than or equal to (≥) 30 inches diagonal (i.e., Professional Displays) for the ENERGY STAR Program Requirements for Displays Version 5.0. The procedures are to be used to determine the On, Sleep, and Off Mode power consumption of the unit under test (UUT).

Table 1: Test Procedure for Measuring Operational Modes

Specification Requirement	Test Protocol	Source
On Mode	IEC 62087, Ed 2.0: Methods of Measurement for the Power Consumption of Audio, Video and Related Equipment, Section 11, "Measuring conditions of television sets for On (average) mode."	www.iec.ch

1) **Testing conditions, instrumentation, and setup**: Before testing the UUT, ensure the proper testing conditions, instrumentation, and setup are in place as outlined in the Product Test Conditions and Instrumentation, and Product Test Setup sections of the Displays specification.

2) **Measuring Power in On, Sleep, and Off Mode:**

   A. On Mode (Guidance on Implementation of IEC 62087): Below, EPA provides guidance on using IEC 62087, Ed. 2.0 for measuring Professional Displays' On Mode power. For purposes of determining ENERGY STAR qualification of a product, the below exceptions and clarifications apply.

      1. Accuracy of Input Signal Levels: Section 11.4.12, "*Accuracy of input signal levels*," reminds testers that video inputs used for testing should be within ± 2% of reference white and black levels. Section B.2 of Annex B, "Considerations for On (average) mode television set power measurements" describes the importance of input signal accuracy in further detail. EPA would like to emphasize the importance of using accurate/calibrated video inputs during On Mode testing and encourages testers to use HDMI inputs wherever possible.

      2. True Power Factor: Due to increased awareness of the importance of power quality on the part of EPA and electric utilities, Partners shall indicate the true power factor of their displays during On Mode measurement.

      3. Use of Test Materials for Testing:

         To measure average On Mode power consumption, Partners should measure 'P_{o_static}' as described in section 11.5.1, "On mode (average) testing with static video signal."

         To measure average On Mode power consumption, Partners should measure '$P_{o\_broadcast}$' as described in section 11.6.1, "On mode (average) testing with dynamic broadcast-content video signal."

To measure average On Mode power consumption, Partners should measure '$P_{o\_internet}$' as described in section 11.7.1, "On mode (average) testing with Internet-content video signal."

4. Testing at Factory Default Settings: In measuring the On Mode power consumption of Professional Displays, EPA is interested in capturing first and foremost the power consumption of products as they are shipped from the factory. Picture level adjustments that need to be made prior to testing On Mode power consumption should be made per section 11.4.8, "Picture level adjustments," if applicable.

   Section 11.4.8 reads: "The contrast and brightness of the television set and the backlight level, if it exists, shall be set as originally adjusted by the manufacturer to the end user. In the case that a setting mode must be chosen on initial activation, the 'standard mode' or equivalent shall be chosen. In the case that no 'standard mode' or equivalent exists, the first mode listed in the on-screen menus shall be selected. The mode used during the test shall be described in the report. 'Standard mode' is defined as 'recommended by the manufacturer for normal home use.'"

   For products shipped with a forced menu where the customer must select upon initial start up the mode in which the product will operate, section 11.4.8 states that testing must be conducted in "standard mode."

   Information relaying that the product qualifies for ENERGY STAR in a specific setting and that this is the setting in which power savings will be achieved will be included with the product in its packaging and posted on the Partner's Web site, where information about the model is listed.

5. Testing of displays with Automatic Brightness Control: The following alternate calculation is used to calculate maximum On Mode power consumption for displays shipped with Automatic Brightness Control enabled by default:

   $P_{o\_broadcast} = (0.8 * P_h) + (0.2 * P_l)$

   where $P_{o\_broadcast}$ is the average On Mode power consumption in watts, rounded to the nearest tenth of a watt, when testing with the broadcast video signal described in section 11.6.1, P_h is the On Mode power consumption in high ambient lighting conditions, and P_l is the On Mode power consumption in low ambient lighting conditions. The formula assumes the display will be in high ambient lighting conditions 80% of the time, and in low ambient lighting conditions 20% of the time. For this test procedure, high ambient lighting is to be set at 300 lux, while low ambient lighting is to be set at 0 lux, as follows:

   a. Set the ambient light level to 300 lux as measured at the face of an ambient light sensor.
   b. Measure the On Mode power consumption as described in section 11.6.1, "On mode (average) testing with dynamic broadcast-content video signal."
   c. Set the ambient light level to 0 lux as measured at the face of an ambient light sensor.
   d. Measure the On Mode power consumption as described in section 11.6.1, "On mode (average) testing with dynamic broadcast-content video signal."

B. Sleep Mode (Power Switch On, No Video Signal):

1. At the conclusion of the On Mode test, initiate the display's Sleep Mode. The method of adjustment shall be documented along with the sequence of events required to reach the Sleep Mode. Power on all test equipment and properly adjust operation range.
2. Allow the display to remain in Sleep Mode until stable power readings are measured. Measurements are considered stable once the wattage reading does not vary more than 1% over a three-minute period. Tester shall ignore the input sync signal check cycle when metering the unit in Sleep Mode.
3. Record the test conditions and test data. The measurement time shall be sufficiently long to measure the correct average value (i.e., not peak or instantaneous power). If the device has different Sleep Modes that can be manually selected, the measurement should be taken with

the device in the most energy consumptive of those modes. If the modes are cycled through automatically, the measurement time should be long enough to obtain a true average that includes all modes.

C. Off Mode (Power Switch Off):

1. At the conclusion of the Sleep Mode test, initiate the display's Off Mode using the power switch that is most easily accessed by the user. The method of adjustment shall be documented along with the sequence of events required to reach the Off Mode. Power on all test equipment and properly adjust operation range.
2. Allow the display to remain in Off Mode until stable power readings are measured. Measurements are considered stable once the wattage reading does not vary more than 1% over a three-minute period. Tester shall ignore the input sync signal check cycle when metering the model in Off Mode.
3. Record the test conditions and test data. The measurement time shall be sufficiently long to measure the correct average value (i.e., not peak or instantaneous power).

D. Reporting results: Upon completion of this test procedure, please refer to the Product Test Documentation section of the specification for guidance on how to report your test results to EPA.

3) **Measuring Luminance:** After the IEC test clip has run and the power consumption has been recorded, the technician shall measure the product's luminance using the methodology described below. Note, the technician shall not alter the product's settings from how they were set during the power consumption test.

A. For each of the following four static test images referenced in section 11.5 of IEC 62087, measure the center point, axial luminance of the display per the Video Electronics Standards Association (VESA) Flat Panel Display Measurements Standard (FPDM) Version 2.0, section 301-2H:

1. Black level video signal (L_b);
2. White level video signal (L_w);
3. Full field color bar video signal (L_c); and
4. Three bar video signal (L_t).

EPA is proposing to use these four static test images because their selection and relative weighting are comparable to the broadcast content used in the On Mode power consumption testing, and they are consistent with international protocols.

B. Report in OPS the four measured luminance values in candelas per square meter (cd/m^2), rounded to the nearest whole number.

C. All luminance measurements should be performed in accordance with the test conditions outlined above for professional displays. Specifically, measuring the luminance must be conducted with the display's settings as they are shipped from the factory. For products with a forced menu, measurements shall be conducted in standard, or home, mode.