



Global LEAP Off-Grid Television Test Method

Beta Version (2015-09)

1 Scope

This document establishes methods to measure the performance, quality, and durability of televisions (TVs) for use in off-grid applications (e.g. standalone solar home system, mini-grid).

The following test conditions are defined for the evaluation of product suitability for use in off-grid applications:

- **Nominal conditions;**
- **Voltage fluctuation conditions**, which simulate performance during over-voltage and under-voltage conditions.
- **Harsh environment exposure conditions**, which simulate exposure to high temperature and humidity environments. Procedures are adopted from *IEC 60068-2-78: Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state* (2012).

The following test procedures are then defined for the evaluation of product performance under the above test conditions:

- A procedure for measuring **on mode power consumption** adapted from *IEC 62087 Ed 3.0: Methods of measurement for the power consumption of audio, video and related equipment* (2011).
- A procedure for measuring **standby mode power consumption** adapted from *IEC 62301 Ed 2.0: Household electrical appliances – Measurement of standby power* (2011).
- A procedure for measuring **screen luminance** adapted from the *ENERGY STAR® Program Requirements Product Specification for Televisions Test Method* (2011)¹.
- A procedure for evaluating **physical ingress protection** adapted from *IEC 62257-9-5:2013: Recommendations for small renewable energy and hybrid systems for rural electrification: Integrated system – Selection of stand-alone lighting kits for rural electrification*.
- A procedure for measuring **viewing angle** adapted from *IEC 60107-7:1997: Methods of measurement on receivers for television - Part 7: HDTV displays*.

¹ http://www.energystar.gov/sites/default/files/specs//ENERGY_STAR_TV_TestMethod_Aug-2011.pdf

2 Definitions

2.1 On Mode

The power mode in which the TV is connected to a power source, has been activated, and is providing one or more of its principal functions.

2.2 Standby Mode

The power modes where the TV is connected to a power source and offers one or more of the following user oriented or protective functions which usually persist

- to facilitate the activation of other modes (including activation or deactivation of active mode) by remote switch (including remote control), internal sensor, timer;
- continuous function: information or status displays including clocks;
- continuous function: sensor-based functions.

2.3 Screen Area

The viewable screen area of the product, calculated by multiplying the viewable image width by the viewable image height.

2.4 Luminance

The photometric measure of the luminous intensity per unit area of light traveling in a given direction, expressed in units of candelas per square meter (cd/m²).

2.5 Viewing Angle

The maximum angle at which the television can be viewed with acceptable visual performance, expressed in degrees (e.g. 120°).

3 Test Conditions

3.1 Nominal conditions

Nominal conditions are defined as follows:

Parameter	Value
Input voltage	Nameplate voltage (e.g. 12 VDC) +/- 2%
Temperature	25°C +/- 5°C
Relative humidity	20% to 80%

3.2 Voltage fluctuation conditions

Over-voltage conditions are equivalent to Nominal conditions, except that Input voltage is increased by 15% from Nameplate voltage.

Under-voltage conditions are equivalent to Nominal conditions, except that Input voltage is decreased by 15% from Nameplate voltage.

3.3 Harsh environment exposure conditions

Harsh environment exposure conditions are equivalent to Nominal conditions, except that products are exposed to 40°C temperature and 95% relative humidity² for a minimum of 24 hours prior to testing.

4 Test Sequence

The following sequence should be followed when carrying out the tests:

- 1) Conduct Overall Quality Inspection (5.1).
- 2) Measure Standby mode power consumption, Luminance, On mode power consumption and Viewing angle in Nominal conditions (3.1, 5.2, 5.3, 5.4, 5.6).
- 3) Measure Standby mode power consumption, Luminance, and On mode power consumption in Over-voltage conditions (3.2, 5.2, 5.3, 5.4).
- 4) Measure Standby mode power consumption, Luminance, and On mode power consumption in Under-voltage conditions (3.2, 5.2, 5.3, 5.4).
- 5) Expose TV to Harsh Environment conditions (3.3)
- 6) Measure Standby mode power consumption, Luminance, and On mode power consumption (5.2, 5.3, 5.4).
- 7) Conduct physical ingress protection test (5.5).

5 Test Procedures

5.1 Overall quality inspection

- 1) Inspect the TV components (including but not limited to enclosure, screen, wirings, fittings, and connections) for quality and workmanship and note any visible defects.
- 2) Review product packaging for necessary information (e.g. manufacturer name, product name, model number, trademark, product color, gross weight, package dimension, precaution text or signage, date of manufacture and applicable standards).
- 3) Review the product nameplate for necessary information (e.g. input voltage, TV size, and standby power).
- 4) Review TV instructions, user manual and warranty information.
- 5) Review the TV and determine whether low voltage disconnect (LVD) & reconnect (LVR) circuit or similar automatic shutdown mechanism, is available to protect batteries from unintended drainage.
- 6) Take photographs of the TV, including front view, side view, and nameplate.
- 7) Document findings in test report.

² Per IEC 60068-2-78: *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

5.2 Standby mode power consumption

- 1) Ensure the product is in its as-shipped (factory default) settings. If necessary, reset the product to its factory defaults.
- 2) Prepare the product for testing in accordance with Clause 4 (*General conditions for measurements*) of IEC 62301 Ed. 2.0, with the exception of any required Test conditions as specified in Section 3 of this test method.
- 3) Measure Standby mode power consumption in accordance with Clause 5.3.3 (*Average reading method*) of IEC 62301 Ed. 2.0.
- 4) Document findings in test report.

5.3 Luminance

- 1) Ensure the product is in its as-shipped (factory default) settings. If necessary, reset the product to its factory defaults.
- 2) Prepare the product for testing in accordance with Clause 4 (*General conditions for measurements*) of IEC 62301 Ed. 2.0, with the exception of any required Test conditions as specified in Section 3 of this test method.
- 3) Measure default Luminance in accordance with Clause 6.2 (*Luminance testing*) of the ENERGY STAR Televisions Test Method – 2011.
- 4) Using the product user interface, select the brightest-selectable picture mode.
- 5) Measure brightest selectable Luminance in accordance with Clause 6.2 (*Luminance testing*) of the ENERGY STAR Televisions Test Method – 2011.
- 6) Document findings in test report.

5.4 On mode power consumption

- 1) Ensure the product is in its as-shipped (factory default) settings. If necessary, reset the product to its factory defaults.
- 2) Using the product user interface, adjust TV volume to 50% of its maximum-selectable volume.
- 3) Prepare the product for testing in accordance with Clause 5 (*General method of measurement*) and Clause 11 (*Measuring conditions for television sets in On (average) mode*) of IEC 62087 Ed. 3.0, with the exception of any required Test conditions as specified in Section 3 of this test method.
- 4) Measure Average On mode power consumption in accordance with Clause 11.6 (*On (average) mode testing using dynamic broadcast-content video signal*) of IEC 62087 Ed. 3.0.
- 5) Using the product user interface, select the brightest-selectable picture mode.
- 6) Measure Average On mode power consumption in accordance with Clause 11.6 (*On (average) mode testing using dynamic broadcast-content video signal*) of IEC 62087 Ed 3.0.
- 7) Document findings in test report.

5.5 Physical ingress protection test

- 1) Ensure the product is in its as-shipped condition.

- 2) Prepare and conduct the physical ingress protection test in accordance with Clause U.4.3 (*Simplified IP inspection for ingress of solid foreign objects*) of IEC 62257-9-5:2013.
- 3) Document findings in test report.

5.6 Viewing angle test

- 1) Ensure the product is in its as-shipped condition.
- 2) Prepare and conduct the viewing angle test in accordance with Clause 4.4.2 (*Viewing angle and dependence of luminance uniformity on the angle*) of IEC 60107-7:1997.
- 3) Document findings in the test report.