(v) Computers, Computer **Monitors**, Televisions, Signage Displays, and Consumer Audio and Video Equipment.

(1) The test method for standby-passive mode consumer audio and video equipment is International Electrotechnical Commission (IEC) 62087:2002(E) - "Methods of Measurement for the Power Consumption of Audio, Video, and Related Equipment."

(2) The test method for televisions manufactured on or after April 24, 2014 is 10 C.F.R. section 430.23(h) (Appendix H to Subpart B of part 430). The test method for signage displays manufactured on or after April 24, 2014, is 10 C.F.R. Section 430.23(h) (Appendix H to Subpart B of part 430) (January 1, 2014).

(3) The test method for televisions manufactured before April 24, 2014 is as follows:

(A) The test method for standby-passive mode for televisions is International Electrotechnical Commission (IEC) 62301:2005, Edition 1.0 "Household Electrical Appliances - Measurement of Standby Power."

(B) The on mode and power factor test method for televisions shall be International Electrotechnical Commission (IEC) 62087:2008(E), Edition 2.0 - "Methods of Measurement for the Power Consumption of Audio, Video, and Related Equipment." Televisions shall be tested using section 11.6.1: "On mode (average) testing with dynamic broadcast-content video signal."

(1) The power factor of the television shall be measured during the on mode test and the reported value shall be the average of power factor measurements taken at one minute intervals simultaneous to IEC 62087:2008(E), Edition 2.0 section 11.6.1 on mode wattage measurements. The measurement of power factor must be accurate to a hundredth of a percent.

(2) A television shall be tested as manufactured without any modifications to screen settings with the exception of televisions manufactured with a forced menu. Televisions manufactured with a forced menu shall be adjusted and tested under the following conditions, 1 or 2, as applicable to the unit being tested.

(i) The on mode measurement of a television with a forced menu shall be tested in the "home" mode or the manufacturer's recommended mode for home use. In addition, the on mode of a television shall be measured in the most energy consumptive mode available in the forced menu.

(ii) If neither a "home" mode nor a manufacturer's recommended mode for home use are available, the television shall be tested in the most consumptive mode available in the forced menu to measure the on mode power.

(3) The on mode power consumption for televisions with and without forced menus, and incorporating automatic brightness controls, shall be calculated as follows:

$P_{a1\_broadcast} = 0.55 * P_{o\_broadcast} + 0.45 * P_{abc\_broadcast}$

Where:

$P_{o\_broadcast}$ = on mode power test with 300 lux entering the light sensor

$P_{abc\_broadcast}$ = on mode power test with 0 lux entering the light sensor.

(4) All luminance testing shall be performed in dark room conditions. The display screen illuminance measurement (E) in TV standby-passive mode must be less than or equal to 1.0 lux. Measurements should be taken perpendicular to the center of the display screen using a Light Measuring Device (LMD).

Measurements shall be made using a reliable, accurate and reproducible measurement procedure, which takes into account the generally recognized state of the art measurement methods. Measurements shall also be made with the Automatic Brightness Control function, if such a function exists, disabled. If the Automatic Brightness Control function exists and cannot be disabled, then measurements shall be performed with light entering directly into the ambient light sensor at a level between 300 lux and 400 lux.

i. Ensure the television is set to the Home mode, or the default mode as shipped.

ii. Immediately following the on mode power testing using the dynamic broadcast-content video signal as outlined in Section 1604(v)(3) display the three bar video signal provided in IEC 62087 Edition 2.0, Section 11.5.5, which displays three bars of white (100%) over a black (0%) background.

iii. After the three bar video signal has been displayed for 10 minutes, measure the luminance (L_{home}). See *Note 1*.

iv. Within 1 minute of measuring L_{home}, set the television to Retail mode, or the brightest selectable preset mode, and display the three bar video signal.

v. After the three bar video signal has been displayed for an additional 10 minutes, measure the luminance (L_{home}). See *Note 2*.

vi. Calculate and report the luminance ratio by dividing L_{home} by L_{high}.: Luminance ratio = L_{home}/L_{high}.

Note 1: For television sets that are known to stabilize within 10 minutes, this duration may be reduced if the resulting measurement can be shown to be within 2% of the result that would otherwise be achieved using the full 10 minute duration.

Note 2: When possible, measurements of luminance shall be made without changing the LMD's measurement position on the display when switching between the home mode and retail mode. If this is not possible, the tester should replicate the

measurement position of the LMD so that measurements in the home-mode and retail-mode are in the same position on the display.

(4) The test method for computer **monitors** is *the ENERGY STAR Program Requirements for Displays, Final Test Method (September 2015)*, with the following modifications:

(A) On mode measurements shall be made using the *IEC 62087: 2011* and computer **monitor** sleep mode and computer **monitor** off mode measurements shall be made using the *IEC 62301:2011*, as specified in the *ENERGY STAR Program Requirements for Displays, Final Test Method (September 2015)*.

(B) A computer **monitor** shall be tested as required by the test procedure for each of the following:

1. On mode power draw.

2. Computer **monitor** sleep mode power draw.

3. Computer **monitor** off mode power draw.

(C) Product features and functions not specifically addressed by the test method shall be turned off or disconnected. Built-in speakers shall be muted or turned down to their lowest volume setting for the on mode power draw test.

(D) Before starting the test procedure for measuring on mode power draw, any feature unrelated to the display of images (for example USB hubs, webcams, speakers, LAN connections, and SD card readers) shall be turned off.

(5) The test method for computers is the *ENERGY STAR Program Requirements for Computers, Final Test Method (Rev. March-2016)*, with the following modifications:

(A) Settings regarding hard-disk spinning shall not be altered from the default as-shipped settings.

(B) The total annual energy consumption of a computer shall be calculated using Equation 1 in Section 3 of the *ENERGY STAR Program Requirements for Computers, Eligibility Criteria Version 6.1 (Rev. March-2016)*.

1. Computers manufactured before July 1, 2021 shall use the "conventional" mode weighting of Table 3 for a desktop computer, a mobile gaming system, a small-scale server, a high expandability computer, or a thin client, or Table 4 for a notebook computer, a mobile workstation, or a portable all-in-one computer, contained within Section 3 of the *ENERGY STAR Program Requirements for Computers, Final Test Method (Rev. March-2016)*, unless they meet either the criteria in Section 1604(v)(5)(B)(2) to use "full capability" mode weighting, or the criteria in Section 1604(v)(5)(B)(3) to use "remote

wake"

2. In order to use the "full capability" mode weighting a computer shall have the following features enabled as shipped:

    a. Maintain Ethernet (*IEEE 802.3-2015*) or wireless (*IEEE 802.11-2012*) network addresses and network connection capability while in ACPI System Level S3 Sleep Mode or an alternative to ACPI S3 sleep mode;

    b. Resume from ACPI System Level S3 Sleep Mode or an alternative to ACPI S3 sleep mode upon request from outside the local network; and

    c. Support advertising host services and network name while in ACPI System Level S3 Sleep Mode or an alternative to ACPI S3 sleep mode.

3. In order to use the "remote wake" mode weighting a computer shall have the following features enabled as shipped:

    a. Maintain Ethernet (*IEEE 802.3-2015*) or wireless (*IEEE 802.11-2012*) network addresses and network connection capability while in ACPI System Level S3 Sleep Mode or an alternative to ACPI S3 sleep mode; and

    b. Resume from ACPI System Level S3 Sleep Mode or an alternative to ACPI S3 sleep mode upon request from outside the local network.

4. Computers manufactured on or after July 1, 2021, shall use the "conventional" mode weighting of Table 3 for a desktop computer, a mobile gaming system, a small-scale server, a high-expandability computer, or a thin client, or Table 4 for a notebook computer, a mobile workstation, or a portable all-in-one computer, contained within Section 3 of the *ENERGY STAR Program Requirements for Computers, Eligibility Criteria Version 6.1 (Rev. March-2016)*.

5. Workstations shall calculate total annual energy consumption using the weighting of Table 8, contained within Section 3 of the *ENERGY STAR Program Requirements for Computers, Eligibility Criteria Version 6.1 (Rev. March-2016)*.

    (C) The expandability score calculation shall be included in test reports and shall be calculated as follows:

1. Identify the score for each individual interface type as determined by Table V-1 and then multiply by the total number of occurrences of that particular interface type present in the system as sold or offered for sale. Finally, sum the subtotals for all interface types.

2. Each instance of an interface may only receive one score.

3. Add 100 to the score.

Table V-1

Interface Types and Scores for Expandability Score Calculation

Interface Type	Interface Score
USB 2.0 or less	5
USB 3.0 or 3.1 Gen 1	10
USB 3.1 Gen 2	15
USB ports or Thunderbolt 3.0 or greater that can provide 100 or more watts of power	100
USB ports or Thunderbolt 3.0 or greater that can provide from 60 or more to less than 100 watts of power	60
USB ports or Thunderbolt 3.0 or greater that can provide from 30 or more to less than 60 watts of power	30
Thunderbolt 3.0 or greater or USB ports that are not otherwise addressed in Table V-1 and that cannot provide 30 or more watts of power	20
Unconnected USB 2.0 motherboard header	10 per header
Unconnected USB 3.0 or 3.1 Gen 1 motherboard header	20 per header
PCI slot other than PCIe x16 (only count mechanical slots)	25
PCIe x16 or higher (only count mechanical slots)	75
Thunderbolt 2.0 or less	20
M.2 (except key M)	10
IDE, SATA, eSATA	15
M.2 key M, SATA express, U.2	25
Integrated liquid cooling	50
Either: 1) CPU and motherboard support for 4 or more channels of system memory and at least 8 GB of installed and compatible system memory; or 2) At least 8 GB of system memory installed on a 256 bit or greater memory interface.	100

(D) A computer **monitor** used in the testing of desktop computers shall have a native resolution of at least 1920x1080 pixels and use progressive scanning. The computer operating system shall be set to operate at a minimum of 1920x1080 pixels and progressive scanning. If multiple display connections are available on the computer, choose the correct connection using the following criteria:

1. If hybrid graphics is available, choose the port that enables hybrid graphics.

2. If a discrete GPU is installed, choose a connection to the first GPU, except for where it conflicts with subdivision (D)(1) of this section.

3. If no discrete GPU is installed, choose a connection to a port integrated into the motherboard.

4. If there are multiple connector ports to choose from pursuant to subdivisions (v)(5)(D)1. through (v)(5)(D)3. of this section, connect the display to a port using the first available from the port types listed below:

    a. Display Port

    b. HDMI

    c. DVI

    d. VGA

    e. Other

(E) An integrated desktop computer, mobile gaming system, or notebook computer shall be tested using the integrated display's native resolution.

(F) High expandability computers shall be configured for the test in a manner identical to desktop computers. Mobile gaming systems and mobile workstations shall be configured for the test in a manner identical to notebook computers.

(G) For purposes of providing data as required in Section 1606, desktop computers, thin clients, mobile gaming systems, notebook computers, and portable all-in-ones shall be tested by selecting the configuration that has the greatest allowable energy consumption as provided for in Section 1605.3(v)(5). If multiple configurations exist that meet this criteria, select the configuration that will yield the greatest annual energy consumption as measured by the test procedure.

(H) The computer sleep mode power measurement shall be tested in a modified manner from the test procedure described in *IEC 62623:2012*. Instead of measuring power after manually entering sleep mode, the power measurement shall begin no sooner than 30 minutes and no later than 31 minutes of user inactivity on the unit under test. This measurement shall be performed after the long-idle test without altering the unit under test.

(I) The power factor of a computer power supply and compliance with Table V-9 in Section 1605.3(v)(6) shall both be determined by the following test procedure: *Generalized Test Protocol for Calculating the Energy Efficiency of Internal Ac-Dc and Dc-Dc Power Supplies* Revision 6.7 (March 1, 2014). In addition the median power factor during short-idle measurements shall be recorded in the test report.