



# ENERGY STAR<sup>®</sup> Program Requirements for Audio/Video

## FINAL DRAFT Version 2.0

### Table of Contents

#### Partner Commitments

Commitment.....	3
Performance for Special Distinction.....	4

#### Program Requirements

1. Definitions.....	6
2. Qualifying Products.....	9
2.1. Included Products:.....	9
3. Energy Efficiency Criteria.....	10
3.1. General Qualification Criteria:.....	11
3.2. Modal Qualification Criteria:.....	12
4. Testing.....	15
5. User Interface.....	15
6. Effective Date.....	15
7. Future Specification Revisions.....	16

#### Appendix A: Requirements Flow Chart Reference

#### Appendix B: ENERGY STAR Test Procedure for Audio/Video Products

1. Overview.....	18
2. Applicability.....	18
3. Definitions.....	18
4. Test Setup.....	18
4.1. Calibration.....	18
4.2. Power Measurement Test Conditions.....	18
4.3. Source Signals.....	19
4.4. UUT Operation.....	19
4.5. UUT Pre-test Configuration.....	19
5. Test Procedures for All Products.....	20
5.1. Auto Power-down (APD) Function.....	20
5.2. Idle State.....	20
5.3. Sleep Mode.....	21
5.4. Standby Mode.....	21
6. Test Procedures for Optical Disc Players.....	21

6.1.	Video Playback Test .....	21
6.2.	Video Recording Test .....	21
6.3.	Audio Playback Test .....	21
6.4.	Audio Recording Test .....	22
7.	Test Procedures for Full-spectrum Audio Amplifiers .....	22
7.1.	Active State Test.....	22
8.	Test Procedures for Limited-bandwidth Audio Amplifiers .....	22
8.1.	Active State Test.....	22



# ENERGY STAR® Program Requirements for Audio/Video

## FINAL DRAFT Version 2.0 Partner Commitments

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### 1 **Commitment**

2 The following are the terms of the ENERGY STAR Partnership Agreement as it pertains to the  
3 manufacturing of ENERGY STAR qualified Audio/Video (AV) products. The ENERGY STAR Partner  
4 must adhere to the following program requirements:

- 5 • comply with current ENERGY STAR Eligibility Criteria, defining the performance criteria that must  
6 be met for use of the ENERGY STAR certification mark on Audio/Video products and specifying  
7 the testing criteria for AV products. EPA may, at its discretion, conduct tests on products that are  
8 referred to as ENERGY STAR qualified. These products may be obtained on the open market, or  
9 voluntarily supplied by Partner at EPA's request;
- 10 • comply with current ENERGY STAR Identity Guidelines, describing how the ENERGY STAR  
11 marks and name may be used. Partner is responsible for adhering to these guidelines and for  
12 ensuring that its authorized representatives, such as advertising agencies, dealers, and  
13 distributors, are also in compliance;
- 14 • qualify at least one ENERGY STAR Audio/Video product within six months of activating a  
15 Partnership agreement. When Partner qualifies a product, it must meet the specification in effect  
16 at that time;
- 17 • provide clear and consistent labeling of ENERGY STAR qualified AV products. Partner must use  
18 the ENERGY STAR mark in all of the following ways:
  - 19 ○ Via permanent or temporary label on the product. All temporary labeling must be affixed  
20 to the top/front of product with an adhesive or cling-type application. Partner must  
21 comply with guidance for certification marks provided in the ENERGY STAR Identity  
22 Guidelines, which can be found at [www.energystar.gov/marks](http://www.energystar.gov/marks).
  - 23 ○ Either in product literature (e.g., user manuals, specification sheets, etc.) or in a separate  
24 box insert that provides educational language about the product's ENERGY STAR  
25 settings; and
  - 26 ○ On product packaging/boxes for products sold at retail.
  - 27 ○ If additional information about the ENERGY STAR program(s) or other products is  
28 provided by the Partner on its Web site, Partner must comply with the ENERGY STAR  
29 Web Linking Policy, which can be found at [www.energystar.gov/partners](http://www.energystar.gov/partners).
- 30 • work with Value Added Resellers (VARs) of Partner's products to help ensure that AV products  
31 remain in compliance with ENERGY STAR requirements. Any party within the distribution  
32 channel of an ENERGY STAR qualified AV product that alters the power profile of a product after  
33 its date of manufacture through hardware or software modifications must ensure that the product  
34 continues to meet the ENERGY STAR requirements before delivering this product to the end  
35 customer. If the product no longer meets the requirements, it may not bear the ENERGY STAR  
36 mark.
- 37 • if a VAR makes any modifications to an AV product that was previously qualified under this  
38 Version 2.0 specification, re-brands the product, and promotes it as ENERGY STAR, it must  
39 become an ENERGY STAR Partner and follow the requirements outlined in this Version 2.0  
40 specification.

- 41 • provide to EPA, on an annual basis, an updated list of ENERGY STAR qualifying AV products.  
42 Once the Partner submits its first list of ENERGY STAR qualified products, the Partner will be  
43 listed as an ENERGY STAR Partner. Partner must provide annual updates in order to remain on  
44 the list of participating product manufacturers;
- 45 • provide to EPA, on an annual basis, unit shipment data or other market indicators to assist in  
46 determining the market penetration of ENERGY STAR. Specifically, Partner must submit the  
47 total number of ENERGY STAR qualified AV products shipped (in units, by model) or an  
48 equivalent measurement as agreed to in advance by EPA and Partner. Partner is also  
49 encouraged to provide ENERGY STAR qualified unit shipment data segmented by meaningful  
50 product characteristics (e.g., capacity, size, speed, or other as relevant), total unit shipments for  
51 each model in its product line, and percent of total unit shipments that qualify as ENERGY STAR.  
52 The data for each calendar year should be submitted to EPA, preferably in electronic format, no  
53 later than the following March and may be provided directly from the Partner or through a third  
54 party. The data will be used by EPA only for program evaluation purposes and will be closely  
55 controlled. If requested under the Freedom of Information Act (FOIA), EPA will argue that the  
56 data is exempt. Any information used will be masked by EPA so as to protect the confidentiality  
57 of the Partner;
- 58 • notify EPA of a change in the designated responsible party or contacts for AV products within 30  
59 days.

## 60 **Performance for Special Distinction**

61 In order to receive additional recognition and/or support from EPA for its efforts within the Partnership, the  
62 ENERGY STAR Partner may consider the following voluntary measures and should keep EPA informed  
63 on the progress of these efforts:

- 64 • consider energy efficiency improvements in company facilities and pursue the ENERGY STAR  
65 mark for buildings;
- 66 • purchase ENERGY STAR qualified products. Revise the company purchasing or procurement  
67 specifications to include ENERGY STAR. Provide procurement officials' contact information to  
68 EPA for periodic updates and coordination. Circulate general ENERGY STAR qualified product  
69 information to employees for use when purchasing products for their homes;
- 70 • ensure the power management feature is enabled on all ENERGY STAR qualified monitors in  
71 use in company facilities, particularly upon installation and after service is performed;
- 72 • provide general information about the ENERGY STAR program to employees whose jobs are  
73 relevant to the development, marketing, sales, and service of current ENERGY STAR qualified  
74 product models;
- 75 • feature the ENERGY STAR mark(s) on Partner Web site and in other promotional materials. If  
76 information concerning ENERGY STAR is provided on the Partner Web site as specified by the  
77 ENERGY STAR Web Linking Policy (this document can be found in the Partner Resources  
78 section on the ENERGY STAR Web site at [www.energystar.gov](http://www.energystar.gov)), EPA may provide links where  
79 appropriate to the Partner Web site;
- 80 • provide a simple plan to EPA outlining specific measures Partner plans to undertake beyond the  
81 program requirements listed above. By doing so, EPA may be able to coordinate, communicate,  
82 and/or promote Partner's activities, provide an EPA representative, or include news about the  
83 event in the ENERGY STAR newsletter, on the ENERGY STAR Web pages, etc. The plan may  
84 be as simple as providing a list of planned activities or planned milestones of which the Partner  
85 would like EPA to be aware. For example, activities may include: (1) increase the availability of  
86 ENERGY STAR labeled products by converting the entire product line within two years to meet  
87 ENERGY STAR guidelines; (2) demonstrate the economic and environmental benefits of energy  
88 efficiency through special in-store displays twice a year; (3) provide information to users (via the  
89 Web site and user's manual) about energy-saving features and operating characteristics of

90 ENERGY STAR qualified products, and (4) build awareness of the ENERGY STAR Partnership  
91 and brand identity by collaborating with EPA on one print advertorial and one live press event;

92 • provide quarterly, written updates to EPA as to the efforts undertaken by Partner to increase  
93 availability of ENERGY STAR qualified products, and to promote awareness of ENERGY STAR  
94 and its message.

95 • join EPA's SmartWay Transport Partnership to improve the environmental performance of the  
96 company's shipping operations. SmartWay Transport works with freight carriers, shippers, and  
97 other stakeholders in the goods movement industry to reduce fuel consumption, greenhouse  
98 gases, and air pollution. For more information on SmartWay, visit [www.epa.gov/smartway](http://www.epa.gov/smartway).

99 • join EPA's Climate Leaders Partnership to inventory and reduce greenhouse gas emissions.  
100 Through participation, companies create a credible record of their accomplishments and receive  
101 EPA recognition as corporate environmental leaders. For more information on Climate Leaders,  
102 visit [www.epa.gov/climateleaders](http://www.epa.gov/climateleaders).

103 • join EPA's Green Power partnership. EPA's Green Power Partnership encourages organizations  
104 to buy green power as a way to reduce the environmental impacts associated with traditional  
105 fossil fuel-based electricity use. The partnership includes a diverse set of organizations including  
106 Fortune 500 companies, small and medium businesses, government institutions as well as a  
107 growing number of colleges and universities, visit [www.epa.gov/grnpower](http://www.epa.gov/grnpower).



# ENERGY STAR<sup>®</sup> Program Requirements for Audio/Video

## FINAL DRAFT Version 2.0 Program Requirements

108 Below is the Version 2.0 product specification for ENERGY STAR qualified audio/video products. A  
109 product must meet all of the identified criteria if it is to earn the ENERGY STAR.

### 110 1. Definitions

111 a) APD (Auto-Power Down): The capability to automatically switch a device from On mode to Sleep  
112 mode when all of the following criteria have been met: (1) the device has ceased performance of all  
113 primary functions, (2) the last user input has been received (e.g. remote control signal, volume  
114 adjustment), and (3) a predetermined period of time (APD timing) has elapsed.

115 **Note:** EPA has modified the definition of APD for clarity.

116 b) Loss of Signal (LOS):

117 1) For audio signals, LOS is defined as:

118 i) RCA audio inputs: 1 dB or less above the measured noise floor for 60 seconds.

119 ii) HDMI: Receive <Inactive Source> or <Standby> signal over the CEC channel, or [Power  
120 Status] of an upstream device goes to "Standby" or "In Transition to Standby" over the CEC  
121 channel.

122 2) For video signals, LOS is defined as:

123 i) Composite inputs: 1 dB or less above the measured noise floor for 60 seconds.

124 ii) Analog VGA inputs: Loss of either the horizontal or vertical sync signal.

125 iii) HDMI: Receive <Inactive Source> or <Standby> signal over the CEC channel, or [Power  
126 Status] of an upstream device goes to "Standby" or "In Transition to Standby" over the CEC  
127 channel.

128 iv) DVI: Detection of a disabled TMDS link, a TMDS clock line signal below 22.5 MHz for more  
129 than one second, or a TMDS link operating outside of the valid frequency range

130 **Note:** EPA has specified audio and video LOS based on stakeholder feedback. Additional suggestions  
131 for further refinement of audio or video LOS definitions are welcome before the specification is finalized.  
132 Specifically, is the proposed 1dB above the noise floor / 60 second requirement appropriate to capture  
133 the majority of actual LOS situations without negatively affecting the end-user experience?

134 c) Primary Function: A primary function is any discrete, dynamic device function that can be perceived  
135 by an end user. The delivery of active audio/video content to an end user is considered a primary  
136 function.

137 1) Continuous device functions (e.g. clocks, status displays, indicator lamps) are not primary  
138 functions.

139 2) Static device functions are not considered to be primary functions. Static functions include, but  
140 are not limited to:

141 i) No active audio or video processing or output

142 ii) Playback paused or stopped

- 143           iii) No optical disc media in disc drive
- 144           iv) System waiting in disc menu or other menu for user input

**Note:** Per stakeholder suggestions, the list of static device functions has been expanded to specify additional device operations which do not constitute primary functions. A product which is performing a static function would be expected to APD per the requirements specified in this document.

148   d) Operational Modes:<sup>1</sup>

- 149       1) On Mode: Where the product is connected to a mains power source, has been activated and is  
150       providing one or more primary functions. The common terms “active”, “in-use” and “normal  
151       operation” also describe this mode.
  - 152           i) Active State: A state within On mode in which a product is performing a primary function.
  - 153           ii) Idle State: A state within On mode in which a product is not performing a primary function and  
154           no content is actively being delivered to the end-user.
- 155       2) Sleep Mode: The common term “standby” may also describe this mode, where the product is  
156       connected to a mains power source, is not providing a primary function, and offers one or more of  
157       the following user oriented or protective functions which may persist for an indefinite time.
  - 158           i) To facilitate the activation of other modes (including activation or deactivation of On mode) by  
159           remote switch (including remote control), internal sensor, timer;
  - 160           ii) Continuous function: information or status displays including clocks;
  - 161           iii) Continuous function: sensor-based functions.
- 162       For purposes of this specification, Sleep Mode is defined as the time when the product is  
163       connected to a power source, produces neither sound nor picture, neither transmits nor receives  
164       program information and/or data (excluding data transmitted to change the unit’s condition from  
165       Sleep Mode to On Mode), and is waiting to be switched to On Mode by a direct or indirect signal  
166       from the consumer, e.g., with the remote control.
- 167       3) Standby Mode: The mode in which the product is connected to the power source, is possibly  
168       producing status information or time readout, is waiting to be switched to the active mode, and  
169       produces/records no video or audio signal (either directly audible, or audible as reproduced by  
170       headphones, loudspeakers, or other transducers). The product may exit the standby mode  
171       through an automatic timer activation, direct activation by the user, or a remote control command  
172       from the user. In standby mode, the product is substantially shut down but may continue to  
173       perform some functions (e.g., remote control sensing and clock).

**Note:** The Standby mode definition is included for purposes of allowing Consumer AV Products additional time to meet the new Version 2.0 “Tier 2” requirements. This definition is taken directly from the Version 1.0 Audio/DVD specification.

- 177       4) Off Mode: Where the product is connected to a mains power source and is not providing any On  
178       mode or Sleep mode functions, and where the mode may persist for an indefinite time. An  
179       indicator that only shows the user that the product is in the off position is included within the  
180       classification of an off mode.

**Note:** EPA has expanded Operational Mode definitions to include additional detail about Power states within On Mode, and to align the Sleep Mode definition with the ENERGY STAR Televisions specification. These definitions are referenced in subsequent product requirements.

<sup>1</sup> Operational mode definitions are derived from IEC 62301

- 184 e) EPS (External Power Supply): Also referred to as External Power Adapter. A component contained  
 185 in a separate physical enclosure external to the AV product, designed to convert line voltage AC input  
 186 from the mains to lower DC voltage(s) in order to provide power to the AV product. An EPS must  
 187 connect to the AV product via a removable or hard-wired male/female electrical connection, cable,  
 188 cord or other wiring.
- 189 f) HDMI (High-Definition Multimedia Interface): A compact audio/video interface for transmitting  
 190 uncompressed digital data.
- 191 1) CEC (Consumer Electronics Control) Protocol: A single-conductor wire or bus technology that is  
 192 an optional feature in the HDMI specification. CEC is meant to carry IR/remote and/or control  
 193 commands between HDMI devices that are interconnected. CEC is not currently required for  
 194 HDMI compliance.

195 **Note:** In future specification revisions, EPA intends to require devices to have the ability to; (1) expose  
 196 power state across inter-device connections, (2) issue and receive power control commands across inter-  
 197 device connections, and (3) make power state changes based on available information. This requirement  
 198 would extend to other ENERGY STAR labeled products that connect to AV products (e.g. TV's, set top  
 199 boxes, etc). HDMI CEC is one of several technology options that will be evaluated. EPA intends to work  
 200 with industry to develop specific guidelines for implementation.

- 201 g) High Definition Resolution: Video output with resolution greater than 480i/p.
- 202 h) Multi-component System: A product consisting of several components with separate enclosures that  
 203 are sold as and intended for use as a single system. A "Home Theater in a Box" is an example of a  
 204 Multi-component System.
- 205 i) Audio Amplifier Type Classifications:
- 206 1) Full-spectrum Amplifier: An amplifier capable of full (20 Hz to 20 kHz) audible frequency range  
 207 output on all channels.
- 208 2) Limited-bandwidth Amplifier: An amplifier limited to less than full (20Hz to 20 kHz) audible  
 209 frequency range output on one or more channels.
- 210 j) Audio Amplifier Size Classifications:
- 211 1) Large Amplifier: Where  $P_{IN} > 100 \text{ W}$  ( $P_{IN}$  = Input Power @ 1/8 MUP 1kHz Sine Wave)
- 212 2) Medium Amplifier: Where  $20 \text{ W} \leq P_{IN} < 100 \text{ W}$  ( $P_{IN}$  = Input Power @ 1/8 MUP 1kHz Sine Wave)
- 213 3) Small Amplifier: Where  $P_{IN} < 20 \text{ W}$  ( $P_{IN}$  = Input Power @ 1/8 MUP 1kHz Sine Wave)
- 214 k) Product Classifications:
- 215 1) AV Product: For purposes of this specification, all products that offer audio amplification and/or  
 216 optical disc drive functions and do not meet the definition of a Dedicated Audio DSP Device shall  
 217 be classified as AV Products and subject to the requirements specified in this document.
- 218 2) Consumer AV Product: Consumer AV Products are intended for sale to individual consumers and  
 219 include the following: cassette decks, CD players/changers, CD recorders/burners, clock radios,  
 220 DVD & Blu-ray Disc products, equalizers, laserdisc players, mini- and midi-systems, minidisc  
 221 players, powered speakers, rack systems, stereo amplifiers/pre-amplifiers, stereo receivers, table  
 222 radios, and tuners.
- 223 3) Dedicated Audio DSP Device: A device may be classified as a "Dedicated Audio DSP Device" if it  
 224 meets all of the following criteria:
- 225 i) Provides audio digital signal processing as its primary function.
- 226 ii) Provides support for RS232 or similar protocol for hard-wired remote control.
- 227 iii) Does not provide audio amplification

228 **Note:** The “Consumer AV Product” definition is derived from the Version 1.0 Audio/DVD specification, and  
229 is included in this document to allow additional time for products qualified to the Version 1.0 specification  
230 to meet Tier 2 Version 2.0 requirements.

231 **Note:** Product Classifications have been updated to define product categories that will be subject to  
232 unique requirements under this specification. The first definition, for “AV Product” is intended to be the  
233 general purpose definition for the majority of products on the market today. A specific exception is noted  
234 for Dedicated Audio DSP Devices, since these will be subject to unique requirements under this  
235 specification.

236 l) Product Functions:

- 237 1) Audio Amplification: A function by which a device increases the amplitude of an audio signal for  
238 purposes of sending the signal to a transducer for playback.
- 239 2) Audio Signal Processing: A function by which a device modifies an audio signal for a purpose  
240 other than amplification.
- 241 3) High Resolution Display: A function by which a device converts a video signal into a visual output  
242 (e.g. LCD panel, Plasma display panel).
- 243 4) Status Display: A function by which a product provides a visual display of less than 480x234 pixel  
244 resolution or 5 inches diagonal screen size. A typical status display would be a back-lit  
245 alphanumeric clock or channel indicator. Note that single indicator lamps are not included under  
246 the definition of status displays and are not provided power allowances under this specification.

247 **Note:** EPA has revised the lower limit for high-resolution displays and added a definition for Status  
248 Display per suggestions received from stakeholders.

- 249 5) IP Networking: A function by which a device can connect to an IP-based network for transmission  
250 and receipt of data. The connection may be wired or wireless (e.g. WiFi, Ethernet, Bluetooth).
- 251 6) Optical Disc Player/Recorder: A function by which a device can read and/or write data to  
252 removable disk media (e.g. CD, DVD, Blu-ray Disc, and derivatives).
- 253 m) THD (Total Harmonic Distortion): The ratio of the sum of the powers of all harmonic components to  
254 the power of the fundamental frequency of a signal.
- 255 n) MUP (Maximum Undistorted Power): A measure of amplifier output power at the point at which the  
256 THD of the amplifier is 1% or greater.
- 257 o) UUT (Unit Under Test): The device being tested.

258 **2. Qualifying Products**

259 **2.1. Included Products:**

260 A product must meet the definitions provided in Section 1 of this document to be eligible for ENERGY  
261 STAR qualification under this specification, with the exception of products identified in Section 2.2.

262 **Note:** Note that the term “Consumer AV” refers to those products primarily intended for use in a  
263 residential environment, while “Commercial AV” refers to those products primarily intended for  
264 commercial or professional applications. The distinction is included for purposes of expanding the breadth  
265 of the ENERGY STAR Audio/Video product category in order to (1) allow commercial products that were  
266 previously excluded from qualification to immediately qualify for ENERGY STAR, and (2) allow consumer  
267 products currently covered under Version 1.0 Audio/DVD ample time to transition to the new efficiency  
268 requirements.

269 Under Tier 1, Consumer AV products will continue to be subject to Version 1.0 Standby mode  
270 requirements. Thus, these requirements as well as the testing protocol have been added to this  
271 specification.

272 **Excluded Products:**

273 Products that are covered under existing ENERGY STAR product specifications are not eligible for  
274 qualification under the Audio/Video specification. The list of specifications currently in effect can be found  
275 at [www.energystar.gov/products](http://www.energystar.gov/products). For example, displays, monitors, lighting, computers, and game  
276 consoles cannot qualify as Audio/Video products, since each is subject to qualification criteria under  
277 another ENERGY STAR specification.

278 The following products are excluded from qualification under this specification.

- 279 a) Products which meet the definition of a Display, Television, Set-Top Box (STB), Computer, or Game  
280 Console per the definitions in ENERGY STAR requirements for those product categories. Also  
281 excluded are products that include an IP video tuner and are sold or provided outside of a dedicated  
282 service contract.
- 283 b) Primarily battery-powered products (i.e. MP3 players, portable DVD players, portable gaming  
284 systems, etc.)
- 285 c) Products for use in automotive applications
- 286 d) Video projectors
- 287 e) Home and building automation & control products
- 288 f) Whole-house and whole-building audio and/or video systems
- 289 g) Videoconferencing systems
- 290 h) Wireless microphone systems
- 291 i) A/B Selector Switching
- 292 j) Media Server

293 **Note:** The ENERGY STAR label is intended for stand-alone products, not customized system  
294 installations. There is provision to qualify “products” that are made up of several sub-components in  
295 separate enclosures with independent power supplies (i.e. Home Theater in a Box). Products that include  
296 an IP video tuner and are sold or provided outside of a dedicated service contract will be considered for  
297 inclusion in the next revision of the ENERGY STAR Set-top Box specification.

298 **3. Energy Efficiency Criteria**

299 Products must meet all of the requirements specified below to be eligible for ENERGY STAR qualification  
300 under this specification. A summary of these requirements is in Table 1. Products previously eligible for  
301 qualification under the Version 1.0 ENERGY STAR Audio/DVD specification are not subject to new  
302 qualification requirements until Tier 2 takes effect.

**Table 1: Summary of Energy Efficiency Requirements**

Product	Requirements		
	Tier 1 Nov 2009	Tier 2 July 2010	Tier 3 March 2012
Consumer AV Products	<ul style="list-style-type: none"> <li>▪ Standby power consumption limit = 1W</li> </ul>	<ul style="list-style-type: none"> <li>▪ Sleep mode power consumption limits (base, IP networking)</li> <li>▪ Auto Power Down requirements</li> <li>▪ Product function power consumption limits (display, IP networking, optical disc player)</li> <li>▪ Amplifier efficiency requirement (small, medium, and large)</li> <li>▪ Idle power limits for all products if option to disable APD</li> </ul>	<ul style="list-style-type: none"> <li>▪ Sleep mode power consumption limits (base, IP networking)</li> <li>▪ Auto Power Down requirements</li> <li>▪ <b>More stringent</b> product function power consumption limits (display, IP networking, optical disc player)</li> <li>▪ <b>More stringent</b> amplifier efficiency requirement (small, medium, and large)</li> <li>▪ Idle power limits for all products if option to disable APD</li> </ul>
Professional and Commercial AV Products	<ul style="list-style-type: none"> <li>▪ Sleep mode power consumption limits (base, IP networking)</li> <li>▪ Auto Power Down requirements (for Digital Signal Processors, this is the only requirement)</li> <li>▪ Product function power consumption limits (display, IP networking, optical disc player)</li> <li>▪ Amplifier efficiency requirement (small, medium, and large)</li> <li>▪ Idle power limits for all products if option to disable APD</li> </ul>		

304

305 **3.1. General Qualification Criteria:**

306 a) **Mandatory Auto-Power Down:** To qualify for ENERGY STAR, all products must offer APD  
 307 functionality that is enabled by default. APD timing begins after the last user input has been received  
 308 (e.g. control signal, volume adjustment) and when the product ceases performance of all primary  
 309 functions. For devices that process audio or video signals from external sources, the presence of a  
 310 signal on any active AV input shall constitute performance of a primary function, and APD timing  
 311 begins upon loss of signal (LOS) on all active AV inputs. APD must function on all available AV  
 312 inputs. Manufacturers may offer users the option (via system menu, DIP-switch, or other means) to  
 313 modify APD timing in 30 minute intervals or to disable APD entirely.

314 1) **APD ≤ 30 minutes:** This timing option is acceptable for use as a default setting. If APD timing is  
 315 set to less than or equal to 30 minutes, products do not have to meet Idle state power  
 316 consumption requirements.

317 2) **30 minutes > APD < 2 hours:** This timing option is acceptable for use as a default setting. If APD  
 318 can be disabled, or if APD timing can be set to greater than 30 minutes, products must meet Idle  
 319 state power consumption requirements.

320 3) **APD ≥ 2 hours:** This timing option may only be enabled by the end user and is not acceptable for  
 321 use as a default setting. If APD can be disabled, or if APD timing can be set to greater than 2  
 322 hours, products must meet Idle state power consumption requirements.

323 Exception to Mandatory APD Requirements: Products which are subject to 3<sup>rd</sup> party performance  
 324 standards that prohibit APD, including those used for Mass Notification and Emergency  
 325 Communications Systems and subject to proposed ANSI/UL 2572, are exempt from ENERGY STAR  
 326 APD requirements.

327 **Note:** EPA has modified Section 3.1.a to clarify APD timing options and associated Idle power  
 328 requirements. Note that APD must function on all available AV inputs, although only one input must be  
 329 tested and verified for purposes of qualification for ENERGY STAR.

330 b) Products Sold with an External Power Supply: To qualify for ENERGY STAR, AV products that are  
 331 sold with an External Power Supply must use either; (1) an EPS that is ENERGY STAR qualified, or  
 332 (2) an EPS that meets the applicable no-load active mode efficiency levels and power factor  
 333 requirements provided in the latest version of the ENERGY STAR Program Requirements for Single  
 334 Voltage External AC-AC and AC-DC Power Supplies. The EPS specification and qualified product list  
 335 can be found at [www.energystar.gov/powersupplies](http://www.energystar.gov/powersupplies).

336 c) Multi-component Systems: On and Sleep mode power consumption limits for each power-consuming  
 337 component in a Multi-component System shall be assessed independently. To qualify for ENERGY  
 338 STAR, each component must meet applicable ENERGY STAR criteria.

339 **3.2. Modal Qualification Criteria:**

340 a) Standby Mode Power Consumption Requirements: The limits specified in Table 2 are the only limits  
 341 applicable to Consumer AV Products under Tier 1 of this specification. To qualify for ENERGY STAR,  
 342 the calculated Standby mode power consumption for a product must not exceed the limits in Table 2.

343 **Table 2: Standby Mode Power Consumption Limits**

<i>Product</i>	<i>Standby Mode Power Consumption Limit (W) Tier 1 Consumer AV Products ONLY</i>
Consumer AV Products	1.0

344 **Note:** Standby mode requirements for Consumer AV products will remain in place under Tier 1 of this  
 345 specification. Products currently qualified to Version 1.0 ENERGY STAR Audio/DVD will maintain their  
 346 qualification without action by partners. To qualify new Consumer AV products to ENERGY STAR under  
 347 Tier 1, manufacturers must test and submit data for Standby power consumption per Section 5.4 of the  
 348 test procedure in Appendix B.

349 b) Sleep Mode Power Consumption Requirements: The limits specified in Table 3 are additive. To  
 350 qualify for ENERGY STAR, the calculated Sleep mode power consumption for a product must not  
 351 exceed the sum of the limits for each applicable product function listed in Table 3.

352 **Table 3: Sleep Mode Power Consumption Limits**

<i>Product Function</i>	<i>Sleep Mode Power Consumption Limit (W)</i>			
	<i>Tier 1 Consumer AV Products</i>	<i>Tier 1 Commercial AV Products</i>	<i>Tier 2 All Products</i>	<i>Tier 3 All Products</i>
Base Limit (All Products)	N/A	1.0	1.0	
IP Networking	N/A	1.0	1.0	

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**Note:** Based on a recent stakeholder comment, EPA revisited the test data set to review whether an additional 1W Sleep mode power allowance was appropriate for Status Display functionality. The data set does not support an additional 1W, as most products in the data set provide Status Displays and are able to achieve Sleep mode power consumption of less than 1W.

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c) On Mode Power Consumption Requirements: The limits specified in Table 4 are additive, with the exception of the optical disc player limit. Only one optical disc player limit may be added to the On mode power consumption limit calculation for a product. To qualify for ENERGY STAR, power consumption in On mode must not exceed the sum of the limits for each applicable product function listed in Table 4. In the case where multiple On mode tests can be performed on a single product (e.g. both playback and record tests can be performed on a DVD Recorder), the product must meet the On mode requirements specified in Table 4 in each test that is performed. See the requirements flow chart in Appendix A to determine appropriate test and qualification requirements for a particular product.

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**Note:** EPA has included additional guidance regarding how to meet On mode requirements for products that are subject to several On mode tests for a single function. For example, a DVD player will have to perform various playback and recording tests for optical disc players per Section 6 of this document – the device must meet the On mode power consumption requirements specified in Table 4 in each test that is performed.

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*Exception to On Mode Power Consumption Requirements: Dedicated Audio DSP Devices that meet the definition in Section 1 are exempt from ENERGY STAR On mode power consumption requirements. In order to qualify for ENERGY STAR, these products must meet the Sleep mode power consumption limits in Table 3, must have APD enabled by default, and must meet all other requirements specified in this document. Furthermore, manufacturers must test and report On mode power consumption for all qualifying products. EPA may consider this On mode power consumption data in future evaluations of Audio/Video ENERGY STAR requirements.*

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**Table 4: On Mode Power Consumption Limits**

Product Function	On Mode Power Consumption Limit (W)			
	Tier 1 Consumer AV Products	Tier 1 Commercial AV Products	Tier 2 All Products	Tier 3 All Products
High Resolution Display (> 480x234 resolution and 5 inches diagonal)	N/A	$P = 6*(R) + 0.05*(A) + 3$ Where: $R = \text{Display Resolution (x * y)}$ $A = \text{Screen Area}$		
IP Networking	N/A	1.5 W		TBD
Standard Definition (SD) Video and Audio Source Optical Disc Player/Recorder	N/A	6.0 W (Player Only) 16 W (Player/Recorder)		TBD
SD Source to HD Output "Upconversion" Optical Disc Player	N/A	10 W (Player Only) 20 W (Player/Recorder)		TBD
High Definition (HD) Video Source Optical Disc Player/Recorder	N/A	15 W (Player Only) 25 W (Player/Recorder)		TBD

379 **Note:** EPA has added a third category to Table 4 for “upconversion” disc players, which process a SD  
 380 source for output to a HD device. The On mode limits for all optical disc players have also been relaxed  
 381 from the previous draft based on stakeholder feedback. Because there was limited data on which to  
 382 based Tier 1 levels, EPA plans to revisit Tier 2 levels to ensure appropriate levels are set.

383 d) On Mode Audio Amplifier Efficiency Requirements: To qualify for ENERGY STAR, all products that  
 384 offer Audio Amplification must meet or exceed the On mode amplifier efficiency requirements  
 385 specified in Table 5.

386 If no AV inputs are available and the optical disc player is used for audio signal input (per test  
 387 procedure Section 4.3.a), the power consumption from the optical disc player, as measured in  
 388 Section 6.3 of the test procedure, may be subtracted from the total measured power consumption of  
 389 the device for all audio amplifier efficiency calculations.

390 **Note:** EPA has added additional clarification for devices that must meet On mode amplifier efficiency  
 391 requirements but do not offer external signal input terminals for purposes of testing.

392 **Table 5: On Mode Audio Amplifier Efficiency Requirements**

Product Function	On Mode Amplifier Efficiency			
	Tier 1 Consumer AV Products	Tier 1 Commercial AV Products	Tier 2 All Products	Tier 3 All Products
Audio Amplification Small Amplifiers ( $P_{IN} < 20\text{ W}$ )	N/A	No Efficiency Requirement		No Efficiency Requirement
Audio Amplification Medium Amplifiers ( $20\text{ W} \leq P_{IN} < 100\text{ W}$ )	N/A	Efficiency > 55% Where: $Efficiency = P_{OUT} / (P_{IN} * 0.80)$		TBD
Audio Amplification Large Amplifiers ( $P_{IN} \geq 100\text{ W}$ )	N/A	Efficiency > 55% Where: $Efficiency = P_{OUT} / P_{IN}$		TBD

393  
 394  $P_{IN}$  = Input Power @ 1/8 MUP 1kHz Sine Wave  
 395  $P_{OUT}$  = Output Power @ 1/8 MUP 1kHz Sine Wave

396 **Note:** Because there is a wide range of usage patterns for products with an amplification function, EPA  
 397 believes that there are significant benefits to be derived from both on-mode efficiency and APD  
 398 requirements. The requirements above are the same as those presented in the audio amplification  
 399 proposal.

400 e) Idle State Power Consumption Requirements: The limits specified in Table 6 are additive. To qualify  
 401 for ENERGY STAR, power consumption in Idle state must not exceed the sum of the limits for each  
 402 applicable product function listed in Table 6.

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**Table 6: Idle State Power Consumption Limits**

Product Function	Idle State Power Consumption Limit (W)			
	Tier 1 Consumer AV Products	Tier 1 Commercial AV Products	Tier 2 All Products	Tier 3 All Products
Base Limit (All Products)	N/A	5.0 W		
Audio Amplification	N/A	$P = (0.10 * P_{OUT})$ or 5 W, whichever is greater Where: $P_{OUT} =$ Output Power @ 1/8 MUP 1kHz Sine Wave		

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**Note:** Based on test data received to date, EPA assumes that the overhead required to operate a product with amplifier circuitry turned off is approximately 10% of the power required to operate with a 1/8 MUP sine wave input signal. The defined limits for amplifier Idle power have been updated to be based on amplifier output power, rather than mains input power, to avoid penalizing higher-efficiency amplifiers.

408 **4. Testing**

409 Partners are required to perform tests and self-certify those products that meet the ENERGY STAR  
410 guidelines. The test results must be reported to the EPA using the Audio/Video Qualifying Product  
411 Information (QPI) Form or Online Product Submission (OPS) Tool. Test results must be included with the  
412 product submission. All testing shall be performed per the ENERGY STAR Audio/Video test procedure  
413 included as Appendix B of this document.

414 **5. User Interface**

415 Although not mandatory, manufacturers are strongly recommended to design products in accordance with  
416 IEEE 1621 “Standard for User Interface Elements in Power Control of Electronic Devices Employed in  
417 Office/Consumer Environments.” Compliance with IEEE 1621 will make power controls more consistent  
418 and intuitive across all electronic devices. For more information on the standard, visit  
419 <http://eetd.lbl.gov/controls>.

420 **6. Effective Date**

421 The date that products must meet the requirements specified under the Version 2.0 Audio/Video  
422 specification will be defined as the effective date of the agreement. Any previously executed agreement  
423 on the subject of ENERGY STAR qualified Audio/DVD products shall be terminated effective November  
424 16, 2009 for products eligible under the Version 1.0 Program Requirements for Audio/DVD Products.

425 a) Qualifying and Marking products under the Tier 1 Version 2.0 specification: Effective dates for Tier 1  
426 Version 2.0 ENERGY STAR Program Requirements for Audio/Video are listed in Table 7. Note that  
427 the requirements for Consumer AV Products originally eligible for qualification under the Version 1.0  
428 ENERGY STAR Audio/DVD specification have been transferred into this specification for the Tier 1  
429 timeframe. Commercial AV products must meet the new applicable Tier 1 requirements specified in  
430 the main body of this document in order to qualify for ENERGY STAR.

431 All products with a date of manufacture on or after the applicable Tier 1 Version 2.0 effective date  
432 must meet Tier 1 Version 2.0 requirements in order to qualify for ENERGY STAR (including additional  
433 shipments of products originally qualified under Version 1.0). The date of manufacture is specific to  
434 each unit and is the date (e.g., month and year) on which a unit is considered to be completely  
435 assembled.

436 b) Qualifying and Marking products under the Tier 2 Version 2.0 specification: Effective dates for Tier 2  
437 Version 2.0 ENERGY STAR Program Requirements for Audio/Video are listed in Table 7. All  
438 products with a date of manufacture on or after the applicable Tier 2 Version 2.0 effective date must  
439 meet the Tier 2 Version 2.0 requirements in order to qualify for ENERGY STAR. The date of  
440 manufacture is specific to each unit and is the date (e.g., month and year) on which a unit is  
441 considered to be completely assembled.

442 c) Qualifying and Marking products under the Tier 3 Version 2.0 specification: Effective dates for Tier 3  
443 Version 2.0 ENERGY STAR Program Requirements for Audio/Video are listed in Table 7. All  
444 products with a date of manufacture on or after the applicable Tier 3 Version 2.0 effective date must  
445 meet the Tier 3 Version 2.0 requirements in order to qualify for ENERGY STAR. The date of  
446 manufacture is specific to each unit and is the date (e.g., month and year) on which a unit is  
447 considered to be completely assembled.

448 **Table 7: Version 2.0 Specification Effective Dates**

<i>Audio/Video Product</i>	<i>Tier 1 Version 2.0 Effective Date</i>	<i>Tier 2 Version 2.0 Effective Date</i>	<i>Tier 3 Version 2.0 Effective Date</i>
All Products	November 16, 2009	July 30, 2010	March 30, 2012

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450 **Note:** EPA has incorporated the Audio/DVD Version 1.0 requirements into this document under the tier 1  
451 requirements for consumer AV products. This is to ensure the 9-month transition period for product types  
452 previously eligible under the Version 1.0 Audio/DVD specification.

453 d) Elimination of Grandfathering: EPA will not allow grandfathering under this Version 2.0 ENERGY  
454 STAR specification. ENERGY STAR qualification under Version 1.0 is not automatically granted for  
455 the life of the product model. Therefore, any product sold, marketed, or identified by the  
456 manufacturing Partner as ENERGY STAR must meet the specification in effect at the time of  
457 manufacture of the product.

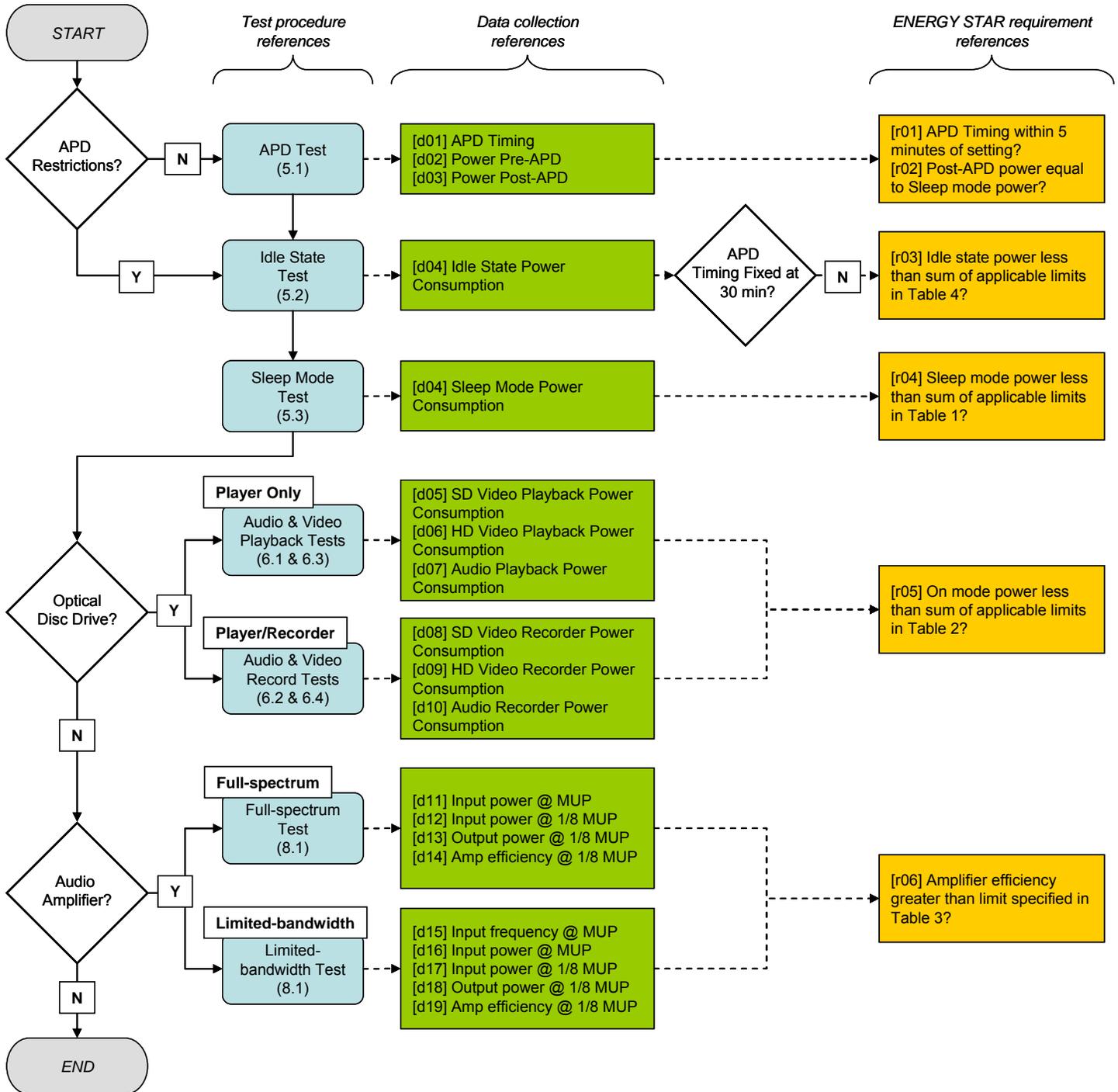
## 458 **7. Future Specification Revisions**

459 EPA reserves the right to revise the specification should technological and/or market changes affect its  
460 usefulness to consumers or industry or its impact on the environment. In keeping with current policy,  
461 revisions to the specification will be discussed with stakeholders. In the event of a specification revision,  
462 please note that ENERGY STAR qualification is not automatically granted for the life of a product model.  
463 Any product sold, marketed, or identified by the manufacturing Partner as ENERGY STAR must meet the  
464 program requirements in effect on the date of manufacture of the product.

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## APPENDIX A: Audio/Video Version 2.0 Requirements Flow Chart (Not Applicable to Tier 1 Consumer AV Products)

*Note: This flow chart is provided as a visual aid only and should not be used in place of the full requirements specification. In the event of a discrepancy between this flow chart and the primary document, the requirements specified in the primary document shall prevail.*



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## APPENDIX B: ENERGY STAR Test Procedure for Audio/Video Products

### 474 **1. Overview**

475 The following protocol should be followed when measuring power consumption levels of audio/video  
476 products for compliance with the levels provided in the ENERGY STAR Version 2.0 Audio/Video  
477 Specification.

### 478 **2. Applicability**

479 Partners must test products in their “as-shipped” configuration. For products that offer a choice of user-  
480 configurable options, all options shall be set to their default condition. EPA has prepared the following  
481 guidelines for testing of Audio/Video products:

- 482 a) Power mode tests described in Section 5 shall be performed on every product,
- 483 b) Optical media player tests (Section 6) shall be performed on any product capable of playback  
484 or recording of audio and/or video stored on optical media (e.g. CD, SACD, DVD, Blu-ray Disc),  
485 and
- 486 c) Full-spectrum audio amplifier tests (Section 7) shall be performed on any product that offers  
487 one- or two-channel audio amplification.
- 488 d) Limited-bandwidth audio amplifier tests (Section 8) shall be performed on any product that  
489 offers surround sound multi-channel audio amplification. Products that offer surround sound  
490 processing shall be tested in the default surround sound mode.

491 Under these guidelines, a HTIB system with an integrated DVD player/recorder and audio amplifiers  
492 would likely be subject to the power mode tests in Section 5, several of the optical disc player tests in  
493 Section 6, and the full-spectrum audio amplifier tests in Section 8. In contrast, a stand-alone rack-mount  
494 audio amplifier would likely only be subject to the power mode tests in Section 5 and the full-spectrum  
495 audio amplifier tests in Section 7. See the requirements flow chart in Appendix A to determine  
496 appropriate test and qualification requirements for a particular product.

497 Note that Partners who wish to qualify Consumer AV products to Tier 1 requirements need only perform  
498 the Standby mode tests in Section 5.4 of this test procedure. After the Tier 2 Version 2.0 specification  
499 becomes effective, all products must be tested to

### 500 **3. Definitions**

501 Unless otherwise specified, all terms used in this document are consistent with the definitions contained  
502 in the Version 2.0 ENERGY STAR Eligibility Criteria for Audio/Video Products.

### 503 **4. Test Setup**

504 Test setup and instrumentation shall be in accordance with the requirements of IEC 62301, Ed. 1.0,  
505 “Measurement of Household Appliance Standby Power”, Section 4, “General Conditions for  
506 Measurements”, unless otherwise noted in this document. In the event of conflicting requirements, this  
507 test procedure shall take precedence. The setup and instrumentation requirements from IEC 62301, Ed.  
508 1.0, Section 4 are applicable to both On and Sleep mode testing for ENERGY STAR.

#### 509 **4.1. Calibration**

510 All test equipment shall be annually calibrated by a laboratory accredited to ISO/IEC 17025:2005 by an  
511 ILAC recognized accreditation body.

#### 512 **4.2. Power Measurement Test Conditions**

- 513 a) Measurement Location: All power measurements shall be taken at a point between the AC  
514 mains power source and the UUT.

515 b) Component-level Measurement: For multi-component systems (e.g. a home theater system  
516 may include a receiver, powered subwoofer, and wireless speakers); all components shall be  
517 connected together in a typical end-use configuration. Components may be tested  
518 simultaneously, but each power-consuming device must be metered separately – power  
519 consumption must be measured at each plug connection to mains power.

#### 520 4.3. Source Signals

- 521 a) Signal Input Location: If the UUT does not have accessible signal input terminals, test signal  
522 input may be through the device antenna, optical disc player, or other accessible means typical  
523 of customer use.
- 524 b) Audio Sources: A 1 kHz sine wave input signal shall be used as the audio source for all  
525 amplifier tests in Sections 7 and 8. For stereo testing, sine wave signals shall be in-phase, with  
526 identical frequency.
- 527 c) Video Sources: SD and HD video content from IEC-62087 shall be used as the video source for  
528 optical disc player tests in Section 6.
- 529 d) Option to Test with Only HD Video Sources: The video test procedures in Section 6 are to be  
530 performed with both SD and HD video sources for devices capable of processing both SD and  
531 HD content. The reported power consumption for the UUT is the average of the power  
532 consumption measurements from the SD and HD video source tests. This average is intended  
533 to reward devices that can scale back power consumption when processing SD video signals.
- 534 If the UUT is found to have negligible differences in power consumption when processing SD  
535 versus HD sources, the manufacturer may choose to perform and report results from only HD  
536 tests, in order to expedite testing.

#### 537 4.4. UUT Operation

- 538 a) UUT Control: The UUT shall be controlled with the factory-supplied remote control (I/R or RF)  
539 to the extent possible. For units that do not ship with a remote control, or for functions that  
540 cannot be accessed from the supplied remote control, control interfaces on the face or body of  
541 the UUT may be used.
- 542 b) Output Volume: The UUT output volume should be set to minimum for the duration of all tests  
543 except as noted in the audio amplifier test procedures in Sections 7 & 8.
- 544 c) Battery Powered Devices: If the UUT contains rechargeable batteries, or can be integrated with  
545 another device that contains rechargeable batteries, all batteries should be in a fully charged  
546 state for the duration of testing.

#### 547 4.5. UUT Pre-test Configuration

548 Prior to the start of testing, the UUT shall be configured as follows:

- 549 1) Set up the UUT per the instructions in the supplied operating manual. If several audio and video  
550 interconnections are available, select and configure the system with one of the following  
551 interconnections, in order of preference: HDMI, component, S-video, and composite.

552 **Note:** Per conversations with stakeholders, EPA has included further detail about UUT setup  
553 requirements for systems that offer several options for audio/video interconnection. Note that the test  
554 procedure for APD requires APD to be verified using the interconnection option selected in 4.5.1, though  
555 APD is required to function on all available AV inputs.

- 556 2) If the UUT includes speaker outputs, connect a resistive load across each pair of output terminals  
557 equivalent to the nominal rated load impedance or lowest impedance of the rated impedance range.  
558 (e.g. 6 ohm if rated 6-8 ohm). The same resistive load must be used for all amplifier tests.

- 559 a) For self-powered or internal speakers with no accessible output terminals, output power shall  
560 be measured across the speaker input leads, using the attached speaker as a resistive load.

- 561 3) Connect the UUT to the power source.
- 562 4) Power on the UUT and perform initial system configuration, as applicable.
- 563 a) Disable any wireless networking functionality (WiFi), unless wireless networking is the UUT's  
564 primary means of accessing a network.
- 565 b) Ensure that all audio tone controls are set to mid-level.
- 566 c) Ensure that UUT components (display brightness, etc.) are in their as-shipped configuration.
- 567 5) Connect the UUT to the signal source. The input signal shall comply with the requirements in  
568 Section 4.4, above.
- 569 6) Let the UUT sit for at least 15 minutes, or until the unit has completed initialization and is ready for  
570 use.
- 571 7) Measure & record the AC mains input voltage and frequency.
- 572 8) Measure & record the test room ambient temperature.

## 573 5. Test Procedures for All Products

574 The following tests shall be performed on all Audio/Video products<sup>2</sup>.

### 575 5.1. Auto Power-down (APD) Function

- 576 1) Configure the UUT in a typical On mode operational state, with APD timing set to the default value,  
577 or 30 minutes.
- 578 2) Stop the UUT from performing any primary functions and turn off any input signal applied to the  
579 active AV input.
- 580 3) Measure & record the average power consumption before APD over a 2-minute period.
- 581 4) Allow the UUT to automatically power-down. Record the time elapsed before the APD event.  
582 Verify that the elapsed time is within 5 minutes of the default APD timing value.
- 583 5) Verify that the device is in the expected APD low-power state.
- 584 6) Measure & record the average power consumption after APD over a 2-minute period.

585 **Note:** The APD test procedure has been revised to reflect recent changes to APD timing options, and to  
586 include verification of APD timing.

### 587 5.2. Idle State

- 588 1) Configure the UUT in a typical Sleep or Off mode operational state.
- 589 2) Press the Power button to bring the unit into an On mode operational state, such that no active  
590 content is playing.
- 591 3) Wait 60 seconds.
- 592 4) Measure & record the average power consumption over a 2-minute period.

593 **Note:** The Idle state test procedure has been revised to include a 60-second delay before performing  
594 power measurements, to allow time for the product to manage power consumption of internal high-power  
595 devices.

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<sup>2</sup> NOTE: The APD test (5.1) is not required for products that are not required to offer an APD function. The Sleep Mode test (5.3) is not required for products that do not offer a Sleep mode.

596 **5.3. Sleep Mode**

- 597 1) Configure the UUT in a typical On mode operational state.  
598 2) Press the Power button to bring the unit into a Sleep mode low-power operational state.  
599 3) Measure & record the average power consumption over a 2-minute period.

600 **5.4 Standby Mode**

601 **\*\* ONLY APPLICABLE TO CONSUMER AV PRODUCTS FOR TIER 1 \*\***

- 602 1) Power on all test equipment and properly adjust operation range  
603 2) Connect the test equipment and unit under test.  
604 3) Check for normal operation of the test unit and leave all customer adjustment to factory default  
605 settings.  
606 4) Bring the test unit into Standby mode (not Off mode) either by using the remote control device or  
607 by using the ON/OFF switch on the test unit cabinet.  
608 5) Either verify that the wall outlet power is within specifications or adjust the AC power source  
609 output to Voltage: 115 Vrms  $\pm$  3 Vrms, Frequency: 60Hz  $\pm$  3Hz.  
610 6) Set the power meter current range. The full-scale value selected multiplied by the crest factor  
611 rating ( $I_{peak}/I_{rms}$ ) of the meter must be greater than the peak current reading from the oscilloscope.  
612 7) After the unit under test reaches operating temperature and the readings on the power meter  
613 stabilize (approximately 90 minutes), take the true power reading in watts from the power meter.  
614 8) Record the test conditions and test data. The measurement time shall be sufficiently long to  
615 measure the correct average value to within a +10% - 0% error. If the device has different  
616 standby modes that can be manually selected, the measurement should be taken with the device  
617 in the most energy consumptive mode. If the modes are cycled through automatically, the  
618 measurement time should be long enough to obtain a true average that includes all modes.

619 **Note:** The Standby mode test procedure is equivalent to the test procedure in the Version 1.0 ENERGY  
620 STAR Audio/DVD specification.

621 **6. Test Procedures for Optical Disc Players**

622 The following tests shall be performed on any product capable of playback or recording of audio and/or  
623 video stored on optical disc media (e.g. CD, DVD, Blu-ray Disc).

624 **6.1. Video Playback Test**

- 625 1) Insert / install the removable media and begin playback of IEC-62087 SD video content.  
626 2) Measure & record the average power consumption over a 2-minute period.  
627 3) If the UUT is capable of playing HD content, repeat the test with IEC-62087 HD video content and  
628 record the average power consumption from each test.

629 **6.2. Video Recording Test**

- 630 1) Insert / install the removable media and begin recording of IEC-62087 SD video content.  
631 2) Measure & record the average power consumption over a 2-minute period.  
632 3) If the UUT is capable of recording HD content, repeat the test with IEC-62087 HD video content  
633 and record the average power consumption from each test.

634 **6.3. Audio Playback Test**

- 635 1) Insert / install the optical disc media and begin playback of a pink noise signal per section 4.3.b.

636 2) Measure & record the average power consumption over a 2-minute period.

#### 637 **6.4. Audio Recording Test**

638 1) Insert / install the optical disc media and begin recording of a pink noise signal per section 4.3.b.

639 2) Measure & record the average power consumption over a 2-minute period.

### 640 **7. Test Procedures for Full-spectrum Audio Amplifiers**

641 The following tests shall be performed on any product that contains one or more full-spectrum audio  
642 power amplifiers.

#### 643 **7.1. Active State Test**

644 1) Connect the UUT to the output of the signal generator. For devices with multiple independent audio  
645 amplifiers, all amplifiers should be connected and tested simultaneously.

646 2) Generate a 1 kHz sine wave input signal per Section 4.3.b. For devices that accept only digital  
647 input signals, generate an appropriate representation of a 1 kHz sine wave.

648 3) Monitor each channel, one at a time, with a distortion analyzer and power meter.

649 4) Set the volume of the UUT to 100% and adjust the amplitude of the input signal until the THD of  
650 any single channel is 1% or greater. This shall be considered the maximum undistorted power  
651 (MUP)<sup>3</sup> of the channel, and this channel shall be considered the reference channel for testing.

652 5) Measure & record the mains input power.

653 6) Reduce the sine wave input signal amplitude until the output power of the reference channel is at  
654 1/8th MUP.

655 7) Measure & record the mains input power.

656 8) With the reference channel at 1/8th MUP, measure and record the output power for all channels,  
657 averaged over a 2-minute period. Record the sum of all the output power measurements.

### 658 **8. Test Procedures for Limited-bandwidth Audio Amplifiers**

659 The following tests shall be performed on any product that contains a limited-bandwidth audio power  
660 amplifier, including surround sound amplifiers.

#### 661 **8.1. Active State Test**

662 1) Connect the UUT to the output of the signal generator.

663 2) Generate a 1 kHz sine wave input signal per Section 4.3.b. For devices that accept only digital  
664 input signals, generate an appropriate representation of a 1 kHz sine wave. If 1 kHz is outside the  
665 range of any bandwidth-limited channel in the UUT, sweep the input signal frequency between the  
666 upper and lower -3 dB response points of the channel. Record the input signal frequency when the  
667 UUT input power is at its maximum.

668 3) Using the input signal frequency determined for each channel in 8.1.2, monitor each channel, one  
669 at a time, with a distortion analyzer and power meter.

670 4) Set the volume of the UUT to 100% and adjust the amplitude of the input signal until the THD of the  
671 output is 1% or greater. Record the output power measured on each channel at 1% THD. This shall  
672 be considered the maximum undistorted power (MUP) of the selected channel.

673 5) Measure & record the mains input power.

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<sup>3</sup> If the UUT performs signal processing such that the amplifier output does not clip at 1% THD, maximum undistorted power shall be obtained by monitoring input signal amplitude and output power simultaneously to identify the point at which input signal amplitude is increased and output power remains constant.

- 674 6) Determine which channel created the highest power draw in 8.1.3. This channel shall be  
675 considered the reference channel for testing.
- 676 7) Reduce the sine wave input signal amplitude until the output power of the reference channel is at  
677 1/8th MUP.
- 678 8) Measure & record the mains input power.
- 679 9) With the reference channel at 1/8th MUP, measure and record the output power for all channels,  
680 averaged over a 2-minute period. Record the sum of all the output power measurements.