

Stakeholder Comment Response Summary
 Draft 2 Specification and Audio Amplification Proposal
 Version 2.0 ENERGY STAR Audio/Video Specification

Topic	Comment	EPA Response
Amplifier Efficiency	The Audio Amplifier test procedure & proposed limits need to account for products that do more than just amplification. Some products contain integrated disk players, clocks, and other features. The way the procedure is written now, a product that is playing back a CD to generate the audio signal will be allotted the same amount of power as one that is receiving the signal from external inputs.	EPA will clarify in the Final Draft how the power for audio amplification can be separated from the power for providing the signal from a CD
Amplifier Efficiency	Propose the following alternate calculation for efficiency: Medium: Efficiency = Pout / (0.8 * Pin – Idle) Large: Efficiency = Pout / (Pin – Idle)	The proposed calculation is not consistent with ENERGY STAR goals of reducing power consumption of products in all operational modes. The proposal stated here would reward products for consuming more power in Idle state. In contrast, the formula proposed by EPA accounts for overhead power consumption of consumer devices (which are assumed to offer more highly-integrated functionality) by deducting 20% from the measured input power in the efficiency calculation.
Amplifier Efficiency	There is currently no focus on the number of channels in a device. In larger installs it is common to use 4 or 8 channel amplifiers to save space and efficiency, e.g. it is better to have one 8x100W amplifier than to have 4 2x100W amplifiers. The channel count for a large house of worship is often around 60 channels, so it is always many amplifiers that have to get installed. It seems that some initiatives like LEED (for buildings) gives more points the more products there are in an install that are labeled with energy star. However, an install with four 2-channel amplifiers will typically consume less than an install with one 8-channel amplifier, even if they all meet the requirements. It will also use fewer resources when built and transported. But, the “many products”-path is currently favored by the draft and other mechanism	EPA is taking a uniform approach to AV products in this specification by encouraging improved efficiency across all products, rather than trying to drive a particular purchasing decision. ENERGY STAR does not believe that promoting all-in-ones with greater power allowances is the appropriate way of addressing the concerns stated here.
Amplifier Efficiency	An amplifier consuming more power than another isn't necessarily larger, so output power should be used to classify the amplifier. The idle consumption will also offset the classification if the input power is used. This would lead to: Large: When the sum of the outputs at rated power is >800W Small: When the sum of the outputs at rated power is <160W	This recommendation can actually create a perverse incentive. If the categorization is based on output power, manufacturers could reduce the efficiency of a product to force it into a lesser size category with easier requirements. In order to ensure that amplifier power is used as efficiently as possible, EPA believes it is more appropriate to rate units based on input power.
APD	For mandatory power down, the manufacturer should be given the option whether to meet APD after either: (1) product ceases primary functions, OR (2) the last user input. We do not object to the inclusion of item (2), but we believe there are many products (such as DVD players) where it is not necessary to monitor for the last user input.	Change will be reflected in the Final Draft

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APD	There are several applications in which the amplifier or powered loudspeaker aren't part of the Emergency System (e.g. theatres and performing art centers) in which an APD scheme is very tricky. Here there can be parts or breaks with silence and then a sudden need for power. A product with a large amplifier will typically not be able to turn on instantly. It will in most such applications be a challenge to require that a person sends a command to turn on in good time before the power is needed again as he/she will not necessarily be aware that the products have gone to sleep.	For the examples described, EPA allows manufacturers to set APD Timing to more than 30 minutes and meet an idle power consumption requirement of up to 10W (5W base + 10% of output power at 1/8 MUP or 5W, whichever is greater).
APD	APD should be harmonized with a globally recognized standard such as the EUP Lot 6. Differences of requirements in the product types will ensure a raise in the time required for manufacturers to ensure compliance.	EUP lot 6 is still in development. EPA plans to track the progress of that effort.
APD	Suggest excluding "Initiate from Pause" from the APD requirements because this feature is not user friendly.	EPA believes that APD should be implemented for paused playback since there is no value to an end user for instantaneous restart of paused content after 30+ minutes have elapsed.
APD	Recommend providing a clearly defined loss of signal (LOS) and including a detecting period that last for minimum of one hour because some pieces of music lasts more than 30 minutes with a minimum signal.	EPA will modify the LOS definition discussed on the call. If the new definition does not satisfy the concern, EPA will need more details on the scenario of concern.
APD	<p>If a device is receiving broadcast over-the-air signals, must APD operate or not? If EPA requires this intelligence, it will be complicated and expensive to implement. Accuracy of LOS detection is also important.</p> <p>As EPA intends to adopt more strict definition of "primary functions", we also think definition of "Primary Function" is very important. For example Tuner receiving mode (only watching as receiver) by DVD recorder must be one of Primary function for recorder. In this case, we think APD must not occur no more than 30 minutes.</p>	A device which is playing back a live OTA signal would be considered to be performing a primary function and would not be required to APD. Per the definition of primary function, "The delivery of active audio/video content to an end user is considered a primary function." EPA welcomes further feedback on this topic.
APD	In the definitions section for primary function (1b), the static device functions should be better enumerated to ensure that "delivering audio or video content" has a narrow enough definition. In particular, displaying the DVD main menu for a movie may have moving images and sound, but it should not be considered performing a primary function. In the work we've done looking into this, the DVD main menu for the movie is a very common place for the DVD player to spend its days unused. Static functions can be defined to be: Paused playback, No media in drive, Waiting in disc or other menu system for user input, Stopped media in drive, Other static functions without primary audio or video streams	Change will be reflected in the Final Draft
Definitions	Request that EPA remove references to Dedicated Audio DSP from "AV Product Definition, or clarify the intent of this exclusion. Through other references to Dedicated Audio DSP, it appears that EPA's intent is to exclude Dedicated Audio DSP Devices from On-Mode Requirements only. Additionally, there is not a separate definition provided for Dedicated Audio DSP in AV Specification 2.0 as implied by this reference.	EPA will add a separate definition for dedicated DSP in the Final Draft

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Definitions	What is the rationale for the Commercial/Prosumer Amplifier distinction? There does not appear to be any difference in qualification criteria between Commercial and Non-commercial Amplifiers to drive a need for any distinction. What is the reason to restrict Commercial Audio Amplifiers from performing additional primary functions?	EPA's intent was to provide delayed APD requirements for a certain classification of amplifiers. Upon further discussion, EPA is planning to add options for delayed APD across all amplifiers. The Commercial/Prosumer distinction has been removed from the Final Draft.
Definitions	Recommend reinstating some features such as audio tuner, data storage, HDD players, and Video Signal Processing, and other removable media (compact cassette tape and SA-CD).	EPA will consider adding power allowances for these features in future tiers if data is provided.
DSP	The level of Signal Processing performed in a Dedicated Audio DSP Device can be very extensive utilizing multiple (10 or more) DSP Processors to replace multiple discrete components of rack system. This level of processing cannot be compared to a generic level of analog or digital signal processing performed within a Surround Receiver, DVD Player or Home Theater in a Box. The DSP power allowance is also critical when DSP is combined with other functions such as IP Networking or amplification. Example: A Dedicated DSP processor with IP Network cannot operate on 1.5 W for On Mode.	Limited data makes it difficult to set more detailed requirements. EPA has provided an exception to On mode power consumption for dedicated Audio DSP devices.
Effective Date	The qualification date is based solely on the date of manufacturing. It is somewhat misleading to also reference "additional shipments of products." This could be misread to infer that products shipped after the effective date must comply with new requirements (regardless of the date of manufacture). This sentence should be revised for clarity. We think it is sufficient to delete the phrase "additional shipments of", but we have shown proposed change with additional language to further clarify.	The language regarding effective date is standard language used in all ES specs. The phrase additional shipments is necessary since a product line may continue to be manufactured and shipped even if it no longer meets ES requirements.
Effective Date	We need 18 months to the effective date for Tier1 of our AV consumer products which qualify for the final specification by EPA. Sufficient time is necessary for changing product designs and for developing new devices that meet the ENERGY STAR Specification.	EPA is committed to a prompt but reasonable transition period for this specification revision and believes adequate notice of the effective date has been provided. It is EPA's standard policy to allow manufacturers nine months of lead time from when the specification is finalized to the effective date.
Effective Date	Recommend indicating "TBD" for Tier 2 and revisiting its limits before the effective date and Tier 2 should also be evaluated for whether it is achievable and reasonable. With the current technology and uncertainty of future technology, manufacturers are unsure if they will be able to accomplish the limits by the effective date, March 1, 2012.	EPA has modified most of the tier 2 levels (now called tier 3 levels) to TBD to allow us to revisit these numbers once additional data is available.
High Resolution Display	We recommend decreasing the resolution and considering High Resolution Display. The resolution of 480 X 234 is sufficient for providing a high resolution display for 7 inches DVD player models and for allowing customers to watch a movie with clarity.	EPA will broaden the definition of high-definition display to include 480 x 234 resolution. However, since portable DVD players are primarily battery-powered devices, they would only be able to qualify as end-use products under the new requirements.

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Idle State	We have no objection to adding the definition of "Idle", but we would like to know the purpose of the definition and test procedure in Section 5.2. It does not appear that there are any "Idle" mode modal requirements in Section 3.2. If there are no requirements, we question the necessity of this test. Is this intended to be data collection for future revisions to the spec.?	Idle mode requirements have been added to the Final Draft.
Idle State	Question regarding Table 2 shown on page 4: By "Idle State" do you mean after APD kicks in, or just when momentarily there is no input signal?	Idle state refers to the amplifier with no signal applied to the input. EPA will clarify this in the Final Draft.
Idle State	Amplifier Idle Mode power should be based on Audio Output power rather than Mains Input to avoid penalizing higher amplifier efficiencies. As the specification stands now, a high efficiency amplifier would receive lower Idle Mode limit.	Change will be reflected in the Final Draft
Idle State	To us, idle is what a product consumes when it is in On mode, with an input signal that is zero. It is a little bit confusing to talk about an Idle state occurring within 5 minutes. Perhaps a graph showing the power states would make sense?	The reference to 5 minutes has been removed from the specification. The test procedure has been updated to incorporate a 1 minute waiting period before testing of Idle power consumption.
Idle State	The draft gives an amplifier with a higher efficiency a lower allowance for idle consumption than one with a lower efficiency. The formula should therefore be based on output power. Any output stage topology will have a loss, so the greater the number of channels there are in a product, the higher the idle loss will be, even if the sum of the powers is the same. Proposed allowance: $P_{idle} < 0.006 * P_{out,tot} + 6 + N * (0.008 * P_{out,ch} + 8)$ where N is the number of channels P _{out,ch} is the rated output power per channel P _{out,tot} is the sum of the rated output powers	The calculation for Idle state power consumption has been revised to reference output power instead of input power. EPA is proposing to provide a 20% overhead allowance for medium-sized products. For larger products, this overhead should be a relatively small portion of the overall power consumption and is therefore not accounted for in the equation. To build allowances for additional Idle power per channel would require a much larger dataset than we currently have.
Multi Component Systems	Some AV equipment has multiple integrated functions that are not addressed by this specification. For example, some devices have several storage media drives (e.g. DVD with HDD, DVD with VCR, BD with HDD etc). These integrated devices are often very effective and convenient for saving space and reducing total power consumption compared to individual products for each function. In this point of view, we would like additional functions to be added to the specification for consideration.	EPA received no test data from manufacturers on products with HDD functionality, thus we were not able to propose any modal power consumption limits for products with this function. EPA will consider the best way to collect this information in order to consider additional allowances for Tier 2.
Multi Component Systems	In the Home Theater In Box (HTIB) case, testing of entire systems rather than components independently is more energy efficient and the definitions need to be defined.	The manner of testing a system should have no impact on the measured energy efficiency.

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Multi Component Systems	It is practical to measure entire systems because we can share common regulators from a power supply board for sub components that are energy efficient. However, it is very difficult to measure subcomponent separately because we can not control software and use the same power supply board. This would lose energy efficiency greatly due to many regulators for each subcomponents if require to measure sub components independently.	Subcomponents do not need to be measured separately under the existing specification. EPA will clarify this in the Final Draft.
On Mode	The On mode requirements for optical disc drives are too strict. How did EPA set the proposed levels? Recommend using the player/recorder 15 watt level for all optical disc players since most products are comprised of the same components.	EPA chose levels based on a combination of test data submitted through the spec revision process and from the TIAX report referenced in the Draft 2 specification. EPA does not believe a basic player merits the same allowance as a combination player/recorder
On Mode	Recommend that the EPA consider less stringent requirements than current proposals for Tier 1 of Version 2.0. The proposed requirements for Tier 1 would force many manufacturers to become unqualified as ENERGY STAR, therefore, jeopardizing the manufacturer's overall business. The major retailers request that manufactures have ENERGY STAR qualified products, although ENERGY STAR program should be a voluntary program.	Per ENERGY STAR's guiding principles, ENERGY STAR levels are intended to recognize the most efficient products. In order to effectively differentiate products in the market place and provide significant energy savings at a national level, EPA must set ENERGY STAR levels that are more efficient than the status quo.
On Mode	Recommend that the On mode power consumption limit of the Standard Definition (SD) Optical Disc Drive should be 8.0W from 5.0W for Tier 1. DVD players are widespread category having been existent for over 10years and thus leaving no room for improvement. Asking Audio/Video manufacturers to achieve Version 2.0 proposals on this product requires manufacturers to re-engineer the products. The re-engineering of DVD player models to satisfy the Version 2.0 proposal is not justifiable and viable for any manufacturer. Rather, we should concentrate on improving power consumption and saving energy efficiency for new technology such as Blu-ray Disc Player.	EPA has not received data or other technical information that supports this request. Manufacturers statements that no changes have occurred since 2006 would support a 6W limit for DVD players.
On Mode	Recommend allowing manufacturers to directly inject 1/8 power for amplifier testing. Manufacturers should be able to use a test mode program that allow output of 1/8 power output from a Digital Signal Processor (DSP) for Audio Amplification.	ENERGY STAR test procedures are intended to be easily reproducible and verifiable in the field, and should represent actual customer usage of a product. By allowing for 20% of input power to be subtracted as overhead before calculating efficiency of medium sized amplifiers, EPA has attempted to accommodate the additional power consumption of ancillary features in a product.
On Mode	Suggest including exemption of On mode power consumption for high end models which require high power consumption such as receiver and analog amplifier due to additional features.	EPA does not intend to exclude high-end products from the ENERGY STAR program. Therefore, it does not make sense to include further exemptions. However it is worth noting that ENERGY STAR is not intended to recognize every single possible product configuration.
On Mode	Low cost products may have difficulty meeting aggressive limits. Setting aggressive goals which may require expensive changes may generate pressure from manufactures to stop supporting the Energy Star program.	EPA does not intend to set specs at a level that is cost prohibitive to participation. Further data regarding cost constraints is needed to determine the actual impact on manufacturers.

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On Mode	For products that are commonly used for short durations and are mostly in STBY or OFF mode, recommend that the focus should be on the STBY requirement. The limits for On Mode may be relaxed, especially if the product is not consuming high power while in On Mode.	The focus of ENERGY STAR for AV since 2002 has been Standby. EPA is now focused on ensuring that products APD into Sleep mode when not being used and that power consumption is limited during On mode.
On Mode	HD based products are constantly offering new functions. Such applications require more power and memory. The expectation that the power for such product will decrease from 15 to 10 W in 2010 may be problematic. Again, as such product are in most of the time in STBY or Off, recommend keeping the ON power limit at 15 W for 2010.	EPA would prefer to add power allowances for these new functions rather than to increase limits. New allowances can be explored in Tier 2 after additional data has been collected.
On Mode	The 5W/4W limits proposed for SD optical disc players are too aggressive. These new specifications will force drastic changes to DVD player designs. Recommend 10W in 2009 and 8W in 2010 as new limits.	Based on industry data collected in 2006, 8W was approximately the average of all DVD players on the market. Setting a level of 10W for Tier 1 and 8W for Tier 2 would allow most DVD players to qualify. This would not be in line with ENERGY STAR's guiding principles.
On Mode	It is not clear if HD disc player criteria includes any player that outputs video in a resolution higher than 480i/p or if it only addresses players that decode HD content. Players that output video in resolution higher than 480 usually use an HDMI interface which will increase the power consumption of the unit. Therefore, we recommend changing the draft spec to clarify that any player outputting video in high resolution (>480) will be included in the criteria of High definition to meet 15w in 2009 and later on 10w in 2010.	EPA has included new requirements for "upconversion" optical disc players with an SD source and an HD output. Tier 3 levels will be set once more data is available.
On Mode	Some product functions have been removed from the specification, but are important to include since the functions require additional energy. For example, "Audio Tuner" "Data Storage" : HDD player. "Other removable Media Drive" : Compact cassette recorder, Flash memory player "Video Signal Processing" : HDMI repeater function, Upscale convertor from SD to HD video signal.	EPA only provided allowances for functions when data was provided. Although these functions were not addressed directly, the ENERGY STAR program implicitly recognizes power consumption of all product features because any power attributed to these functions will have to be within the limits of the product-level On or Sleep mode requirements.
Sleep Mode	There is ambiguity in the Sleep mode requirements which state, "If the product manual contains several example configurations, select the most basic configuration." If the product contains multiple set ups that can affect sleep mode, are we required to test the most consumptive? Or the "most basic configuration"?	EPA has clarified requirements for test configuration in the Final Draft as discussed on the call.
Sleep Mode	Add the following language to the end of the definition of "Sleep Mode": For purposes of this specification, Sleep Mode is defined as the time when the product is connected to a power source, produces neither sound nor picture, neither transmits nor receives program information and/or data (excluding data transmitted to change the unit's condition from Sleep Mode to On Mode), and is waiting to be switched to On Mode by a direct or indirect signal from the consumer, e.g., with the remote control.	EPA has modified the sleep mode definition in the Final Draft to be consistent with the TV specification.

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Sleep Mode	It is our interpretation that Sleep mode is the mode to which an amplifier is to go when APD has occurred. It is then expected to wake up if it gets a ON command via Ethernet or gets audio in any of its inputs. If this interpretation is correct, then it needs clarification under 1.c.2 and then the demand under 3.2.a, in this case 2W for sleep mode for a 4 or 8 channel high power amplifier is extremely challenging if it should be able to wake up in the event that there is audio on any of the 8 inputs. WUOL (Wake up on LAN) is also difficult as there is often broadcast traffic that will keep waking up the device, so in a real life scenario it will toggle between sleep and a more consuming state.	The reason for Idle state requirements is to allow for rapid wake-up. Sleep mode is intended to be further down the power consumption ladder. There is no "expectation" that the system will wake up instantaneously from Sleep with an audio signal input, although it would be a very energy efficient solution. To ensure correct implementation of WOL, manufacturers should choose directed packet and/or investigate the network proxy design by Ecma TC32-TG21.
Sleep Mode	Please include a Sleep mode limit for Status Display. An extra 1W is needed for typical clock implementations on home AV products. This 1W is required to make the display bright and legible enough for the average consumer.	EPA reviewed the data set that was received from manufacturers during the development of the AV specification and found that many products with clock displays consumed less than 1W in Sleep mode. As a result, no additional power allowance has been provided for clocks in the Final Draft.
Testing	We believe that a 1/8 MUP sine wave is not representative of actual customer use. More data is required to find a signal representative of actual use.	The purpose of testing at 1/8 output power is to create consistent testing conditions for all products. Primary research indicates that 1/8 power is representative of typical output power, but if usage data becomes available that indicates otherwise, EPA will consider making changes in future versions of the specification.
Testing	We do not necessarily object to referencing IEC 62301 for On and Sleep mode test procedures. However, we would like to note that that standard, as indicated by the title included in this section, is for the measurement of "Standby Power" (i.e. Sleep) only- not On Modes.	EPA will indicate in a notebbox in the Final Draft that IEC is intended for Standby but in this case the requirements are being applied to all ENERGY STAR modal testing.
Testing	<p>In the noise profile for pink noise, what does the term "correlated between channels" mean? Is this a standard industry term? And is there a particular reason a mono signal was chosen?</p> <p>For example, the NAB Broadcast and Audio System Test CD provides two pink noise stereo signals "L+R" and "L-R" (Track 47, index 1 & 2). As we believe this is a widely available signal, could one of these sources be referenced as appropriate? It may also be valuable to reference this CD as an acceptable source. Each of the pink noise signals is a 30 sec track that can be looped to the appropriate length. Referencing this signal may conflict with the test procedure in Section 6.3 ("...playback shall begin in a region located 24 to 27.5 mm radially from the center of the disc..."), but a test CD could be made if the 6.3 requirement is deemed necessary.</p>	The final version of the test procedure uses sine wave signals for all audio testing. The pink noise requirements have been removed from the Final Draft.

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Testing	We request the test time be reduced to 2 minutes. This is the test time in the CD version of IEC 62087 for STBs currently in development. The concept is the same. This reduces the time for this test from 40 minutes to 8 minutes (80%). We have performed preliminary testing on DVD players to confirm, as we expected, there is no appreciable difference between the power consumed when measured over: (1) 10 minutes: Entire 10 min IEC 62087 test loop, (2) 2 minutes: 5 consecutive 2 minute segments comprising the entire 10 minute IEC 62086 loop.	EPA has changed all relevant test durations to 2 minutes in the Final Draft.
Testing	Is it intended that the testing in Section 6 will result in a single number to be compared with the appropriate limit in Table 2? For example, in a DVD player/recorder, how do the 4 separate measurements result in a single number? Are these 4 test results averaged? Or is the worst case test result compared to the limit? Or? There should be language added to this section to clarify how the results of these four tests are used to determine if the UUT complies with the limits in Table 2.	EPA will clarify how the measurements tie back to the requirements in the Final Draft.
Testing	The amplifier test procedures refer to monitoring "each speaker". It is suggested that the speakers could be replaced by a pure resistive load to improve repeatability of the tests and measurement.	Change will be reflected in the Final Draft
Testing	As measurement equipment that actually measures power for multiple channels isn't readily available I'm worried that many companies will calculate what input level (Vrms) they need to feed the inputs with in order to get the correct output voltage. This has the risk of being very inaccurate as it will ignore that a) The load might not be exactly the impedance expected (and be different for the different channels) b) The gain between the channels may vary c) The channels may go into clip and engage limiters that will reduce the gain and thereby reduce the output power and the consumed input power.	In the most recent version of the test procedure, multi-channel amplifiers are tested with each channel monitored independently, one at a time. There is no longer a requirement to test all channel simultaneously.
Testing	Please review IEC and UL60065 test procedures for amplifiers. These are applicable to the ENERGY STAR program. This procedure includes a static test mode that controls all speaker outputs without surround and audio filter circuits and allows for test signal direct input by physically cutting off the electric circuit in front of the amplifier.	Upon further review, EPA has determined that it is inappropriate to reference the IEC and UL 60065 test procedures, since they are intended for safety testing rather than power consumption testing. ENERGY STAR is interested in measuring the energy efficiency of products during typical usage, while safety tests are more concerned with testing extremes. The minor differences between EPA's test procedure and the UL/IEC test procedure are necessary for purposes of measuring power consumption.

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Testing	If the UUT is capable of recording HD content, recording source is defined with IEC-62087 HD video content. However almost HD recorder has no HD signal input terminal like a RCA input pin for SD source. That means, it is not possible to measure power consumption at HD recording mode. Under consideration of above situation, we would like to propose addition of the following alternative manner: If the UUT does not have HD signal input by baseband signal, followings signal input may used, (1) a test stream similar as IEC-62087 HD video content, or (2) RF antenna input and test by tuning Reference Channel. (Reference Channel; HD source, 16:9 moving picture)	Section 4.3.a of the test procedure notes: "If the UUT does not have accessible signal input terminals, test signal input may be through the device antenna, optical disc player, or other accessible means typical of customer use." In the example provided, it would be acceptable to use a test stream of IEC-62087 content for testing if no alternative was available.
Testing	Removable media players like iPods and other MP3 devices will be difficult to test under this test procedure. There are too many combinations of products that can be tested. Recommend excluding Flash media players from the test procedure.	EPA has modified the test procedure to address this concern. The test procedures are now required only for optical disc drives.
Testing	To accurately convey the intent of these sections, recommend change headings to: 7. "Test Procedures for Full Audio Spectrum Amplifiers" and 8. "Test Procedures for Limited Bandwidth Amplifiers"	Change will be reflected in the Final Draft
Testing	Recommend excluding Audio Playback Test and Audio Recording Test for Video removable players. The main purpose of video products is to watch movies, not to listen to music.	EPA is requiring both audio and video tests for video devices, since consumers have the option to play audio-only discs in their video disc players.
Testing	There is no mention of what load to use (4 Ohm, 8 Ohm, 70V etc). As amplifiers typically will have different rated power and different efficiency depending on the load it is important to clarify if it is enough if it has this efficiency in any of the relevant use cases, or of it is in a specific use case or in all use cases	Per section 4.5.2 of the test procedure, the resistive load should be equivalent to the nominal rated load impedance or lowest impedance of the rated impedance range. (e.g., 6 ohm if rated 6-8 ohm). The same resistive load must be used for all amplifier tests.