

CEA Standard

Test Methods of Measurement for
Audio Amplifiers

CEA-490-A R-2008

December 2001



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(Formulated under the cognizance of the CEA's **R3 Audio Systems Committee**.)

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FOREWORD

This standard was developed under the auspices of the Consumer Electronics Association's (CEA) R4 Video Systems Committee, and is maintained by the CEA's R3 Audio Systems Committee.

Since adoption of the IHF Amplifier Standard (IHF-A-201, 1966), many changes have occurred in amplifier design. These changes have been prompted by technological advancement in circuit topology, in component characteristics, in test equipment and methods of measurement, and in engineering psycho-acoustics. Also, changing conditions in the marketplace driven by consumer demand for new features like home theater and surround sound have prompted industry to consider and implement additional design changes resulting in a proliferation of multi-channel amplifiers in receivers. However, the purpose of an amplifier remains the same—to increase the power level of an electrical signal that represents speech or music. Ultimately, that signal will be reproduced as sound.

EIA-RS-490 (1981), Standard Methods of Measurement for Audio Amplifiers, superseded IHF-A-201 (1966). EIA-RS-490 (1981) was specifically meant to standardize methods of measurement for audio amplifiers. In formulating EIA-RS-490 (1981), greater emphasis was placed upon those characteristics that reflect the ability of an amplifier to faithfully aid in the reproduction of the original sound under conditions similar to those used by the listener. The revised standard test conditions more accurately reflected the performance of the amplifier in actual use.

This standard, CEA-490-A, is the successor to EIA-RS-490. The revisions reflected in EIA-RS-490 (1981) brought the standard in compliance with the Federal Trade Commission (FTC) Rule, Power Output Claims for Amplifiers Utilized in Home Entertainment Products, 46 CFR 432 (1974). The revisions incorporated into this latest edition, CEA-490-A, were motivated by recent changes to the FTC Amp Rule and questions the FTC posed in a subsequent Supplemental Notice of Proposed Rulemaking and include:

- a) A standard method for measuring the output power of multi-channel amplifiers used in home theater and surround sound applications;
- b) Standard language for primary ratings of amplifiers that allows consumers to make an “apples-to-apples” comparison between various brands and models of amplifiers;
- c) Changes in the preconditioning power of amplifiers to make CEA-490-A consistent with changes made by the FTC to its Amplifier Rule as amended in the Federal Register on December 22, 2000;
- d) Changes in preconditioning operating time from one-hour to 30 minutes; and
- e) The inclusion of a formal Scope section in the standard that clearly defines the audio products are to be covered by CEA-490-A.

NOTE--Self-powered loudspeakers (including powered speakers used in multimedia applications and powered subwoofers), as well as manufacturer-packaged audio and home theater systems (systems that include loudspeakers), are specifically not covered by CEA-490-A and may be considered under a separate standard-setting activity.

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Standard Test Methods of Measurement for Audio Amplifiers

1 Scope

This standard defines test conditions and test measurement procedures for determining various performance characteristics of single-channel and multi-channel power amplifiers, pre-amplifiers, integrated amplifiers, receivers, and tuner/pre-amplifiers that use AC mains power. These performance characteristics include power output, total harmonic distortion (THD), and sensitivity, among others.

This standard is intended to apply to defined devices intended for home audio and/or professional audio use. In addition, this standard is intended to apply only to those amplifiers that have power output ratings greater than five watts per channel when measured in accordance with the procedures specified herein.

2 References

2.1 Normative References

The following standards contain provisions that, through reference in this text, constitute normative provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed in 2.1.1.

2.1.1 Normative Reference List

Federal Trade Commission (FTC) Power Output Claims for Amplifiers Utilized in Home Entertainment Products, 16 CFR 432

IEC 60651, Sound Level Meters (January, 1979)

ITU-R BS.468-4, Measurement of audio-frequency noise voltage level in sound broadcasting (July, 1986)

2.1.2 Normative Reference Acquisition

FTC:

- FTC Regulations, U.S. Government Printing Office, Washington, DC 20401; Internet <http://www.gpo.gov/nara/cfr/index.html>

IEC Standards:

- Global Engineering Documents, World Headquarters, 15 Inverness Way East, Englewood, CO USA 80112-5776; Phone 800-854-7179; Fax 303-397-2740; Internet <http://global.ihs.com>; Email global@ihs.com
- IEC Central Office, 3, rue de Varembe, PO Box 131, CH-1211 Geneva 20, Switzerland; Phone +41 22 919 02 11; Fax +41 22 919 03 00; Internet <http://www.iec.ch>; Email pubinfor@iec.ch

ITU Standards:

- International Telecommunications Union, Place des Nations, CH-1211 Geneva 20, Switzerland; Phone +41 22 730 5111; Fax +41 22 733 7256; Internet <http://www.itu.int/publications/itu-r/index.html>; Email itumail@itu.int

3 Definitions of Terms—General

Within the scope of CEA-490-A, the following definitions shall apply.

3.1 Power Amplifier

A device having separate input and output terminals, whose purpose is to provide a larger output power than its required input power over the audio range (or a portion thereof), normally construed to mean 20 Hz to 20 kHz.

For CEA-490-A purposes, the term power amplifier shall also apply to the power amplifier section of an integrated amplifier or receiver.