

# CEA Standard

## Loudspeaker, Optimum Amplifier Power

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## Loudspeakers, Optimum Amplifier Power

### 1 Foreword

**1.1** This standard was developed by the CEA R-3 Audio Systems Committee working group for study and revision of CEA-426-A, in response to a survey of loudspeaker manufacturers which indicated a need to re-examine the current standard in the areas of test signal spectrum, test duration, and the calculation of power. CEA-426-A comprises an "accelerated life" test of full-range systems.

**1.2** This document extends 426-A to include standards for performance with respect to power compression and distortion at the optimum amplifier power, and provides for a test signal contained on a compact disc, to improve test reliability and to facilitate and encourage wider use of the standard. The procedures are organized in three sections: Section A contains the procedure for testing power compression, Section B contains the procedure for testing distortion, and Section C contains the procedure for the accelerated life test. The *optimum amplifier power* is the maximum input power at which the product under test is rated to meet the stated CEA criteria for acceptability under all three limit categories — power compression, distortion, and accelerated life.

**1.3** Whereas CEA-426-A rated the ability of a loudspeaker to handle power — a concept of little practical use — the revised standard, CEA-426-B, recommends the maximum power rating for an amplifier to be connected to the loudspeaker. This could be considered an "optimum" power match, as this is the most power which can be delivered to the speaker while permitting the speaker to operate within acceptable limits of performance as defined by CEA in this standard under the categories of power compression, distortion, and accelerated life testing.

### 2 Introduction

**2.1** The present standard specifies a test signal generated by applying a shaping filter to a random noise source and diode-clipping the signal to a 6 dB crest factor. In a study of this signal, new data suggested that the signal spectrum should contain a greater amount of energy in the mid-bass and treble regions. Therefore, a new spectrum shape has been created. To improve the consistency and convenience of the standard, test signals with the new spectrum have been recorded on compact disc along with other test signals for distribution through the CEA. Power calculation is made simple through the use of a calibrated test tone recorded on the compact disc. A complete description of the test signals used in all three tests is found in Annex A (normative).

**2.2** The input voltage for the accelerated life test is specified to be 3 dB lower than for the power compression and distortion tests for the same power rating amplifier power recommendation, as the crest factor of the weighted compressed noise test signal is 3 dB higher than that of the sine wave used for these other tests.

## 2.3 Test safety considerations

All of the test procedures require the generation of high sound levels capable of producing hearing loss after extended exposure to them. It is highly recommended that the operator use earplugs or other sound attenuators. Balanced attenuation earplugs offer protection without impairing the operator's ability to listen critically to a loudspeaker's performance. All procedures, particularly the accelerated life test, require loudspeakers and amplifiers to be operated at or near their performance limits and all will tend to get hot. It is therefore important that the processes be monitored, and that a fire extinguisher be kept handy.

## 3 Scope

**3.1** This standard defines test methods and criteria of acceptability for testing the performance of a loudspeaker or loudspeaker system designed for consumer use within defined limits in the areas of power compression, harmonic distortion, and accelerated life testing, when operated at or below the optimum amplifier power. Guidelines for using this standard to establish a power rating for a product are presented in Annex C (informative).

**3.2** Loudspeakers are to be tested as they are intended to be used. Transducers are to be tested either on a test baffle (see Annex B (normative)) or in the enclosure recommended by the manufacturer; manufacturer's stated ratings must clearly specify any such enclosure. No external crossover network shall be used except as specified by the manufacturer. Systems provided with enclosures and/or crossover networks are to be tested with crossover networks and enclosures intact, unless otherwise specified by the manufacturer.

## 4 Normative references

- 4.1** EIA-299-A Loudspeakers, Dynamic - Magnetic Structures and Impedance
- 4.2** IEC-60268-5 Sound System Equipment. Part 5: Loudspeakers
- 4.3** Keele, D.B.. Low Frequency Loudspeaker Assessment by Nearfield Sound-Pressure Measurement, *Journal of the Audio Engineering Society*, vol. 22, no. 3, p. 154 (1974)

## 5 Definitions

Full range is defined as substantially including bass, midrange, and treble frequencies occurring in music and speech.

## 6 Test methods

### 6.1 Apparatus

6.1.1 Compact disc player with "Track Repeat" function (if using the CEA compact disc with recorded test signals)

6.1.2 Power amplifier minimally rated at the test power