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**Transforming Sound into Knowledge**

Sequence Note

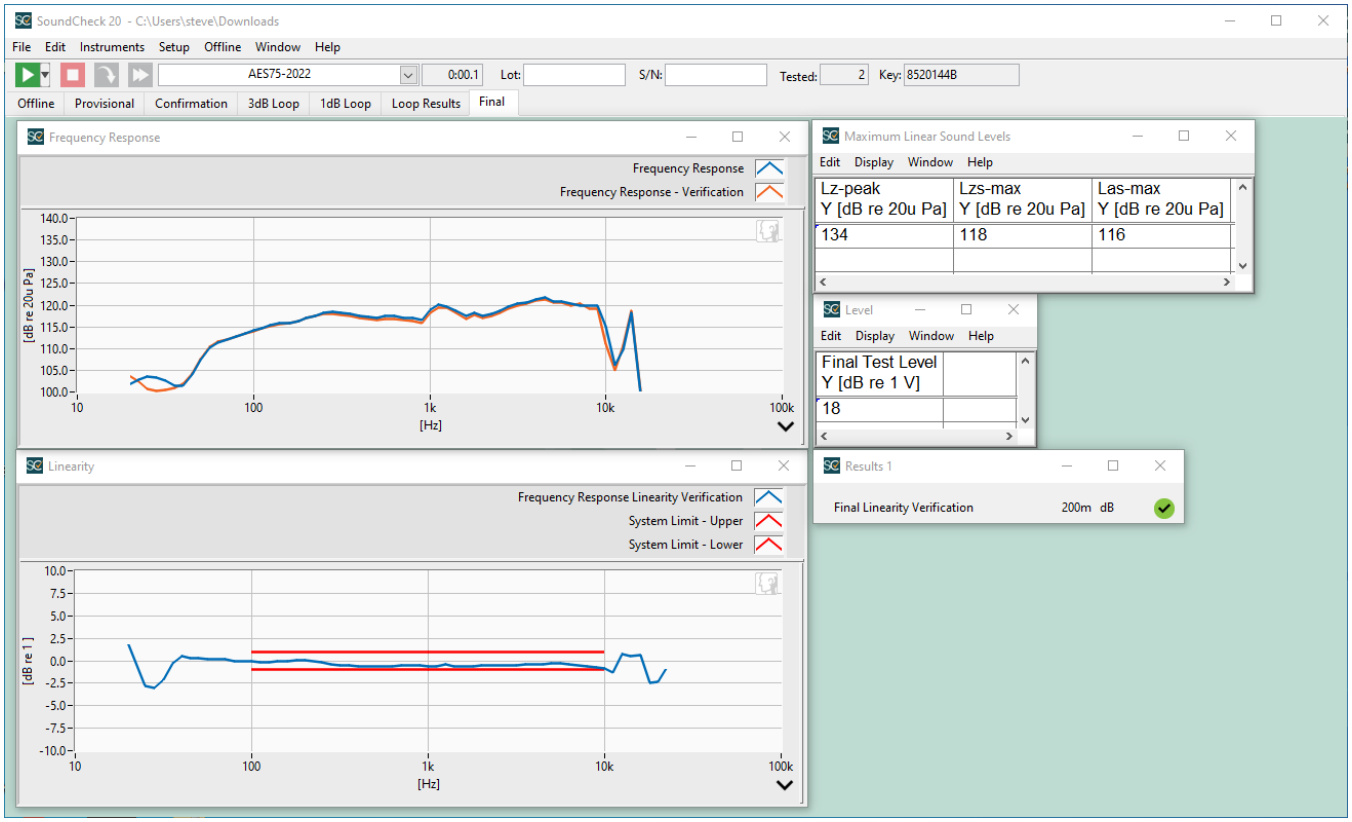
# Measuring Loudspeaker Maximum Linear Sound Levels Using Noise to the AES75-2022 Standard

## Introduction

The AES75-2022 standard details a procedure for measuring maximum linear sound levels of a loudspeaker system or driver using a test signal called M-Noise. This is a complex procedure with many repetitive steps, which makes it time-consuming to implement manually. This sequence automates the entire process, accelerating test time, minimizing operator intervention, and ensuring accurate and objective test results.

The AES75-2022 standard is available for purchase here.

The M-Noise Stimulus is available from the AES here. Please read the standard fully before implementing this test and ensure that you adhere to the specific set-up requirements defined within it.




**Final display results of the measurements**

## Sequence Overview

The sequence prompts the user to either use a 20-20kHz stimulus frequency range or a modified frequency range. Depending on the frequency response of your DUT, the M-Noise stimulus may be filtered to match the frequency range. These frequency values must be manually changed prior to running the sequence in the waveform filter steps 23, 44, 74, and 102.

The sequence first performs a provisional response measurement of your DUT at a lower signal level, recommended at 20-26dB below the anticipated maximum SPL level of your DUT. Next, the stimulus level is increased +3dB and a confirmation measurement is made. The provisional and confirmation measurements should have a coherence value of greater than 95%, a signal-to-noise ratio of 15dB or greater, and a +/-1dB linearity difference. SoundCheck acquires all of these measurements through the transfer function and displays the results in the Provisional and Confirmation display steps.

The sequence then enters the first of two loops. The sequence will play the M-Noise stimulus in +3db increments and measure three metrics: coherence, compression, and linearity. The limits set according to the standard are as follows: coherence remains above 93%, less than -2dB of compression across a two-octave range, and less than -3dB change in linearity across the frequency range. Once one of these metrics fails, the sequence will decrease the stimulus level by 3dB and enter the second loop.

The second loop uses the same stimulus level incrementing technique, but now increasing by +1dB instead of +3dB for increased accuracy. The DUT is again measured for coherence, compression, and linearity. This loop repeats until one of these metrics fails.

The sequence then enters a burn-in process, where the M-Noise stimulus is played through the DUT for five minutes and fifty-three seconds at the last signal level in the 1dB loop. After the 5:52 duration has elapsed the parameters of Lz-peak, Lzs-max, and Las-max are calculated where Lz-peak is the maximum peak sound level using Z-frequency weighting, Lzs-max is the maximum slow time-weighted sound level using Z-frequency weighting, and Las-max is the maximum slow time-weighted sound level using A-frequency weighting. The 5:53 measurement is then compared to the measurement of the final 1dB loop and must not result in more than +/-1dB of linearity change.

If the DUT passes, the sequence continues to the final display. If the DUT fails the burn in segment, the standard specifies repeating the sequence with a longer duration stimulus. Longer stimulus files may be user-created with any suitable audio program, but we have provided a few examples of longer M-Noise stimulus files in the sequence folder.

The final display shows a table with the Lz-peak, Lzs-max, and Laz-max values, in accordance with the standard. Also shown is the final test level and final linearity verification values, and graphs displaying the frequency response and linearity.

## Software Requirements

- SoundCheck 20 Plus or later
- Waveform Filter module (p/n 2032)
- Transfer Function module (p/n 2021)

## Hardware Requirements

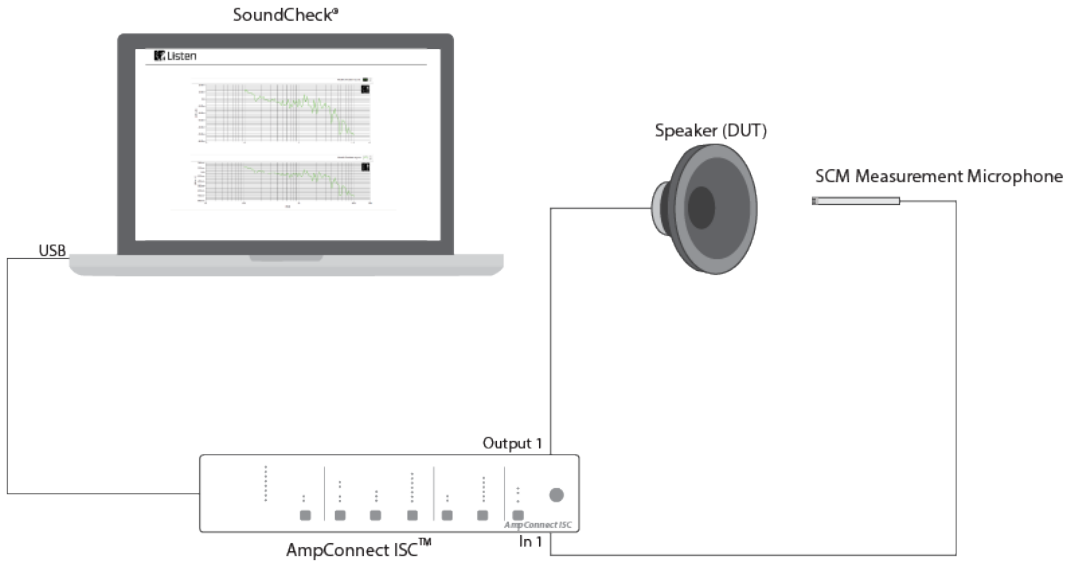
- Audio Interface/Amplifier/Microphone power supply – Listen AmpConnect ISC (p/n 4042) or separate components
- Reference Microphone – Listen SCM-4 (p/n 4012) or similar
- DUT speaker or device

## Hardware Setup & Calibration

1. Calibrate the amplifier as instructed in the SoundCheck manual
2. Calibrate the microphone as instructed in the SoundCheck manual
3. Connect output 1 of your audio interface to the input of the amplifier
4. Connect the output of the amplifier to your loudspeaker
5. Connect input 1 to the microphone

You are ready to start the sequence.

## System diagram




## Further sequence development

Ways in which you could modify or further develop the sequence include:

- Add an autosave step or steps at the conclusion of the sequence for integrated reporting