Subject: Specific test plan
Posted by Wayne Parham on Thu, 13 Oct 2005 22:56:45 GMT
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The measurement system used is LMS 4.5 with the M51 calibrated precision microphone. Ground plane measurements will be performed, with the loudspeaker under test and the microphone placed on the ground. Both the loudspeaker and the microphone are placed 60 feet away from the nearest obstruction. The distance between loudspeaker and microphone is precisely measured for accurate SPL measurements, as described below.

1. Setup LMS presets for sweeps.
a. SPL: 10 - 1000Hz, 400 samples, both filters set as bandpass to track the sweep frequency (1.0) for maximum noise rejection. File - Save this Quickset preset as "SPL".
b. Distortion: 10 - 1000Hz, 400 samples, bandstop filter set to track the sweep frequency (1.0) to reject the fundamental, bandpass set to track harmonics (3.0). File - Save this preset as "Distortion".

Note: Distortion measurement can be done with bandpass set to isolate second harmonics by setting bandpass VCF tracking to 2.0. A second distortion measurement can be done to capture combined second and third harmonics by setting bandpass VCF tracking to 3.0. But the bandpass filter function is first-order, so there isn't much difference. For all practical purposes, the 3.0x setting can be considered a THD+N measurement. The bandstop filter rejects 40dB, so it does a pretty good job of eliminating the fundamental from the sweep. 40dB rejection sets the lower limit of our ability to measure distortion to 1%. We can tell when distortion rises above this, but cannot determine distortion levels below 1%.

2. Get noise floor baselines.
a. Connect microphone. Leave oscillator disconnected.
b. Run SPL sweep with amp disconnected and obtain SPL chart. Set Analyzer - Parameters - Data Curve. Choose an unused entry. Avoid accidentally recording over a previous dataset. Select Analyzer - Sweep to perform the measurement.
c. Run distortion sweep with amp disconnected and obtain SPL chart. Set Analyzer - Parameters - Data Curve. Choose an unused entry. Avoid accidentally recording over a previous dataset. Select Analyzer - Sweep to perform the measurement.

3. Measure impedance.
a. Connect oscillator output to loudspeaker. File - Load Quickset file "Zimp2wire." Remember to set Analyzer - Parameters - Data Curve and choose an unused entry to avoid accidentally recording over a previous dataset. Then click Analyzer - Sweep.
b. Determine impedance for the loudspeaker by examining the graph. This will determine power levels at various voltages.

Note: The same decibel value measured at 1W/1M will also be measured at 10 meters if power is increased by 100x or voltage increased by 10x. When finding 1W/1M values, scaling is useful for reducing horn path length error since most basshorns have path length greater than 2 meters.

The SPL value measured at 10 meters is 20dB less than SPL at 1 meter. Our goal is to obtain measurements for values of 2.83V/1M and 1W/1M (using 28.28V/10M and 100W/10M), and then double power for each subsequent measurement, i.e. 200 watts, 400 watts, etc.

4. Measure amplitude response.
a. Connect oscillator output to amplifier. Click Analyzer - Osc On. Set voltage for value required.
b. File - Load Quickset file "SPL". Remember to set Analyzer - Parameters - Data Curve and choose an unused entry to avoid accidentally recording over a previous dataset. Then click Analyzer - Sweep.

5. Measure distortion.File - Load Quickset file "Distortion". Remember to set Analyzer - Parameters - Data Curve and choose an unused entry to avoid accidentally recording over a previous dataset. Then click Analyzer - Sweep.

Reminder: Distortion at 28.28v and 100 watts will be higher than at 2.83v and 1 watt levels.

6. Generate impulse response. Perform an inverse Fourier transform. Select "Processing - Inv Fast Fourier Transform". Choose the response curve generated in step 4 as the "Source Curve" and select two unused entries, one for impulse and the other for step. Label them accordingly and click "Execute".

Repeat steps 4 - 6 at 28.28v, 100 watts, 200 watts, 400 watts, etc.

7. Heat soak the speaker. Set "Analyzer - Parameters" Frequency to 40Hz. Then click "Osc On" or press F10. Set the voltage level to 80% maximum power and leave running for 15 minutes.

Repeat steps 4 - 6 at high power levels, comparing results with the measurements made at the same power levels prior to heat soaking the driver.