MTON Multi-Tone Measurement S64

Pre-Release (dB-Lab Ver. 210.560)

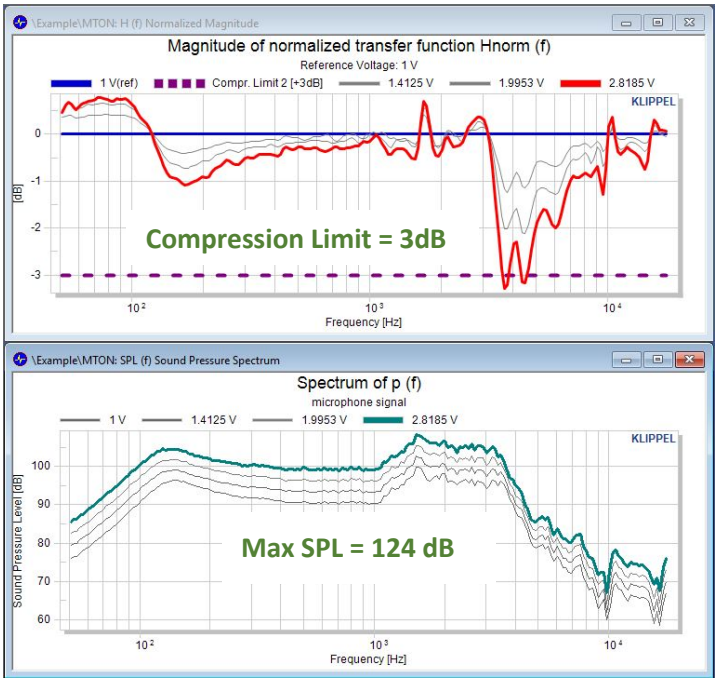
Document Revision 1.0

FEATURES

- Multi-tone fundamental and distortion measurements
- Continuous Maximum SPL related to ANSI/CEA-2010-B [1], ANSI/CEA-2034 [2] and IEC 60268-21 [3]
- Thermal compression
- Variable measurement and cooling time durations

BENEFITS

- Measurement of active and passive speakers
- Get acoustic “Fingerprint”
- Flexibility on stimulus and threshold setup
- Distortion separation without model
- Temperature protection



DESCRIPTION

The MTON module provides sound pressure level (SPL) based characteristics using a multi-tone stimulus. MTON offers different measurement modes to provide a high flexibility of measurement procedures.

While the “Single Test” mode performs a single multi-tone measurement, the “Voltage Increment” mode produces an automatic test sequence to obtain the maximum SPL value limited by user-defined thresholds considering driver compression, multi-tone distortion and temperature increase.

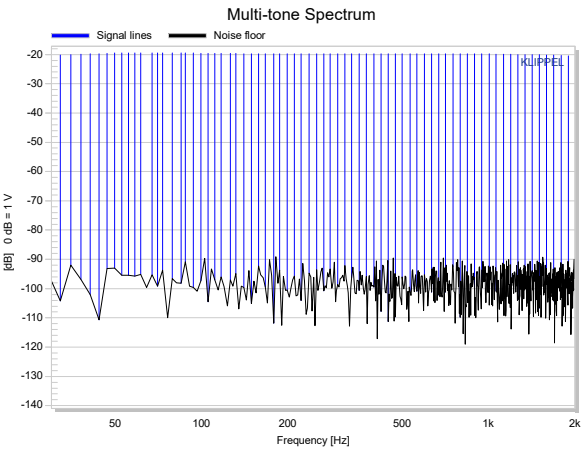
This flexibility in the threshold and stimulus configuration allows the MTON module to perform measurements related to standards ANSI/CEA-2010-B [1], ANSI/CEA-2034 [2] and IEC 60268-21 [3].

Article number	1001-114

CONTENT

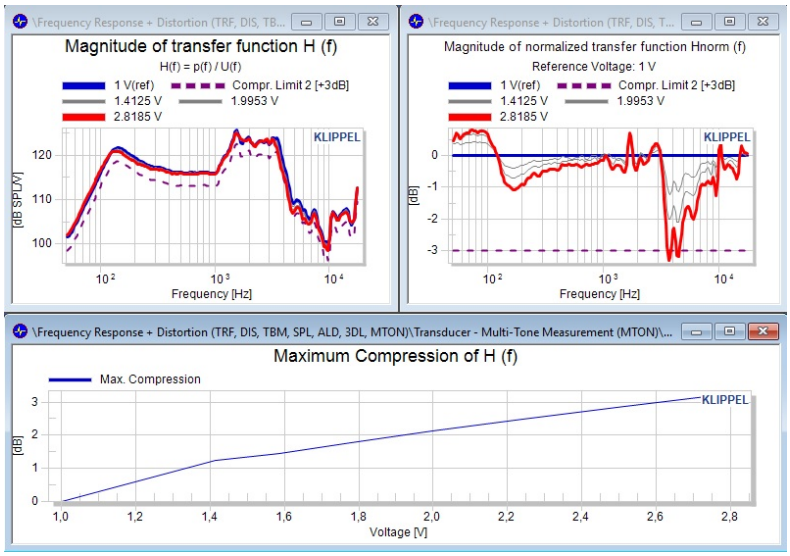
1 Overview

1.1 Principle

Objective	The main objective of this module is to quantify the maximum pressure level (SPL) performed by the Devices Under Test (DUT) in a multi-tone measurement within several conditions configured through the different module working modes: • Single Test: performs a single multi-tone measurement. • Voltage Increase: performs a measurement within compression, distortion and temperature thresholds related to standards ANSI/CEA-2010-B [1], ANSI/CEA-2034 [2] and IEC 60268-21 [3].
Excitation Signal	The stimulus used during the measurement is a sparse multi-tone complex spaced logarithmically on frequency. Frequency range, frequency resolution and stimulus shaping among other parameters may be specified by the user. The use of a sparse multi-tone complex signal to excite the system allows the separation and characterization of distortion, which can be used to define a threshold to avoid the device destruction. In addition, the thermal compression suffered by the device under test can be calculated, since increase of temperature leads to increasing DC-resistance. 

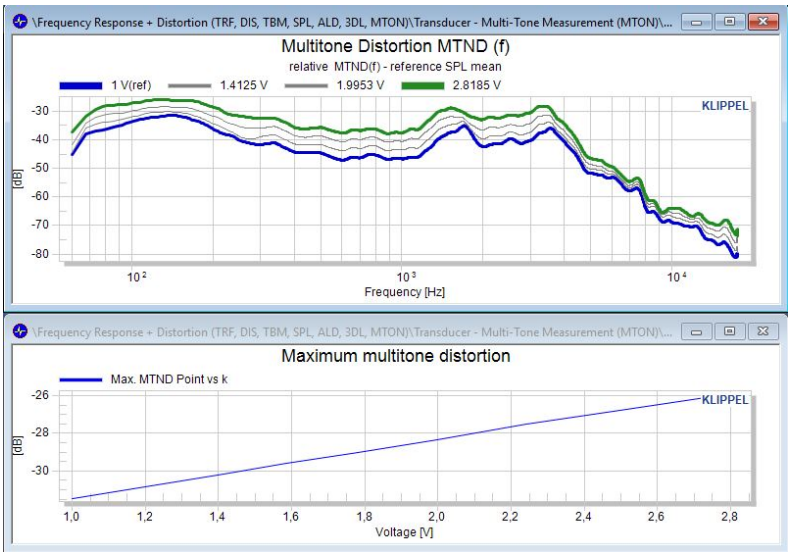
2 Examples

2.1 Max SPL limited by Compression



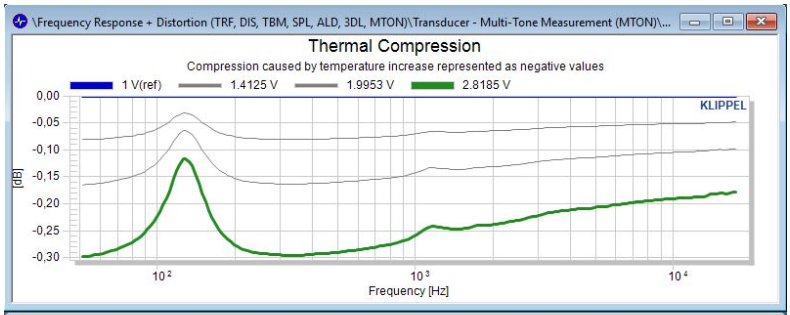
The magnitude of the transfer function is measured and normalized using as reference the first measurement performed. Measurement voltage increases automatically until the user defined compression threshold (in the example 3 dB) is reached. The results of last measurement are shown in red color to emphasize the threshold overcoming.

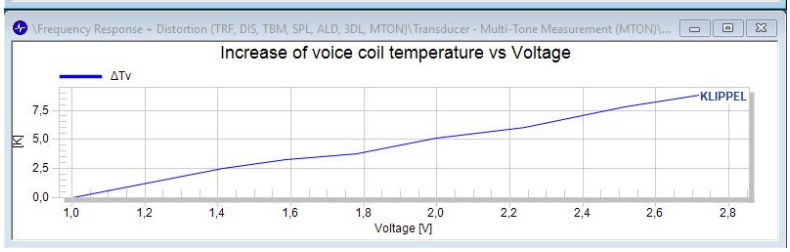
2.2 Max SPL limited by Multi-Tone Distortion



Multi-tone distortion curves are evaluated and the excitation level is increased until the threshold is reached. Three different calculation methods can be selected to obtain the multi-tone distortion results: relative to SPL mean, relative to SPL (f) and absolute.

2.3 Max SPL limited by Thermal compression / Temperature increase





Thermal compression can be measured electrically if the Klippel Analyzer (KA3, DA) is connected to the speaker terminals. This measure provides a heating threshold based on the increase of voice coil temperature.

3 Requirements

3.1 Hardware			SPEC
Analyzer		The Distortion Analyzer or the Klippel Analyzer 3 are used as the hardware to perform the measurement.	H1, H3
Microphone	Free field microphone with omnidirectional directivity characteristic over the desired measurement bandwidth.		A4
Amplifier	KA3 Amp-Card or external audio amplifier with a flat frequency response over the desired measurement bandwidth		
3.2 Software			
LPM	The Linear Parameter Measurement (LPM) is a dedicated PC software module for measurement of the electrical and mechanical parameters of a loudspeaker. It is used as actual data acquisition module for MTON measurements.		S2

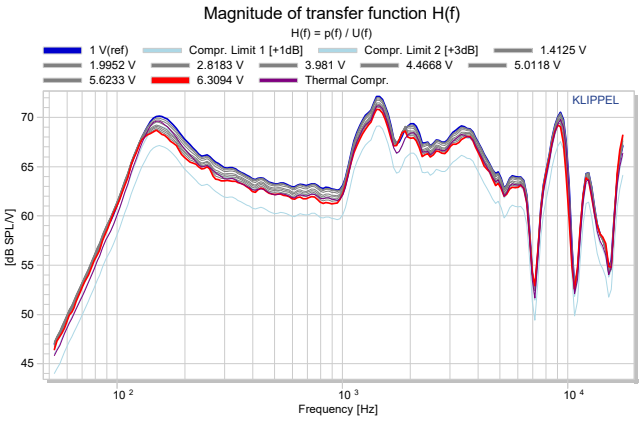
4 Limitations

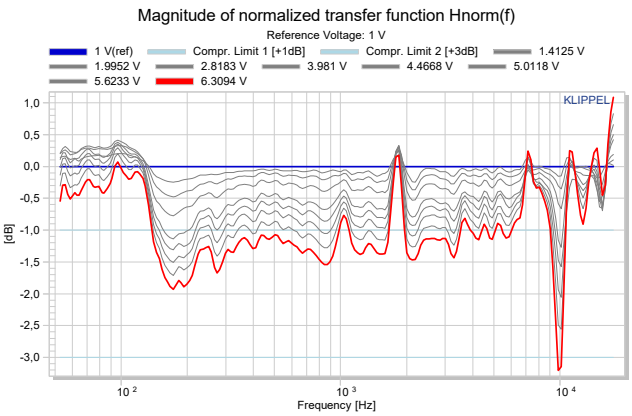
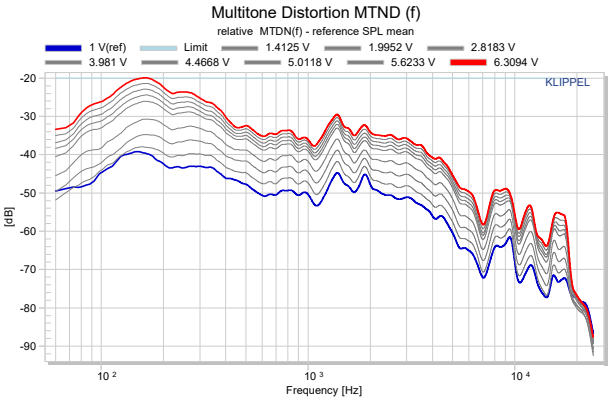
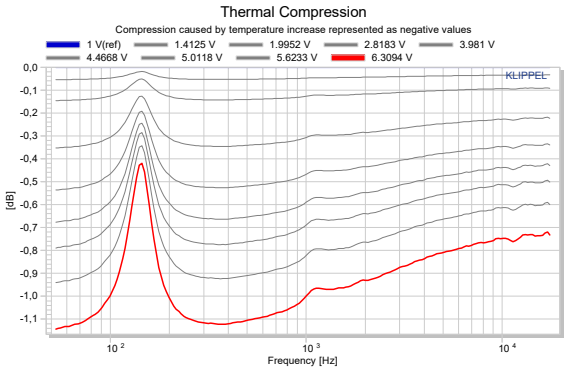
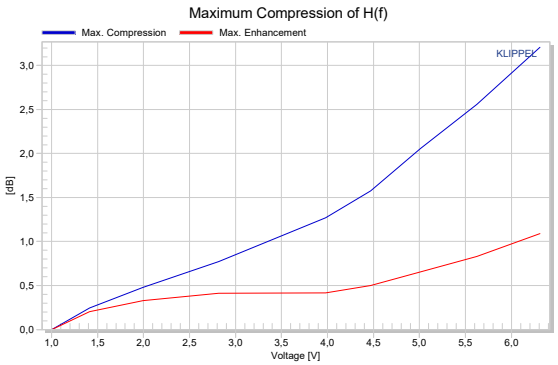
4.1 Acoustical	
Measurement in free field	According to ANSI/CEA-2010-B [1], ANSI/CEA-2034 [2] and IEC 60268-21 [3] standards, the acoustical measurement shall be performed in a free field environment.

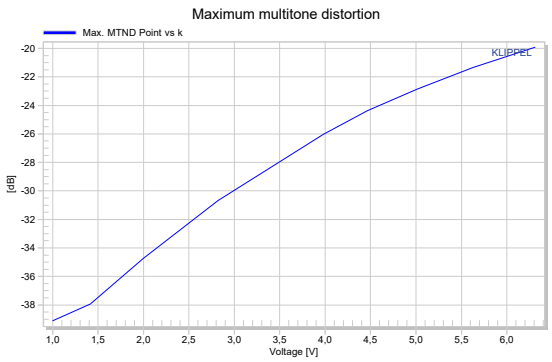
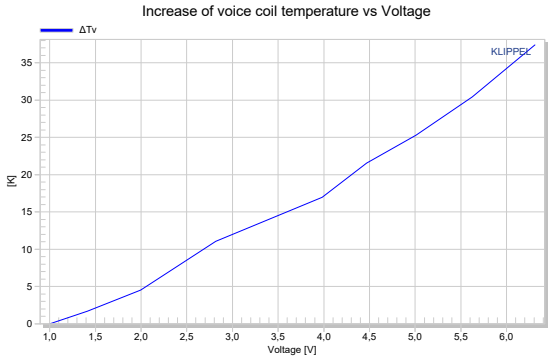
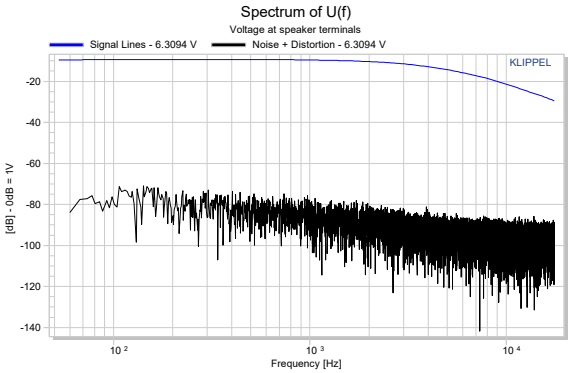
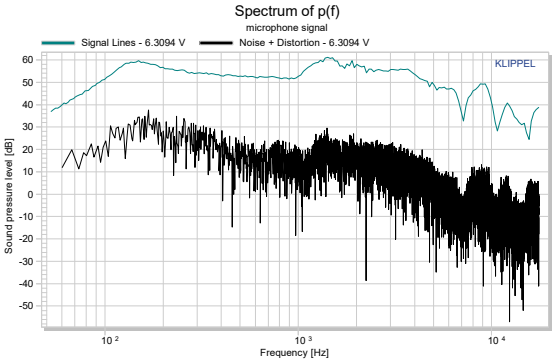
5 Input

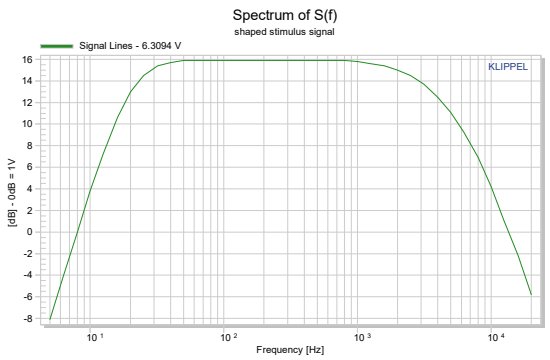
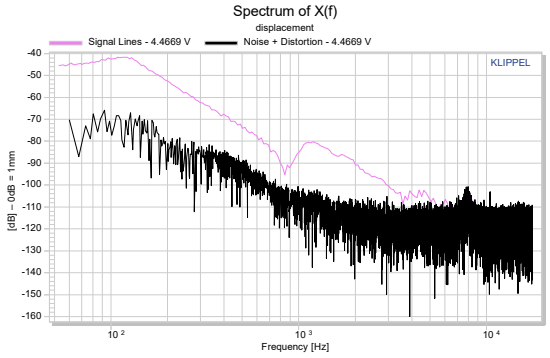
Parameter	Min	Typ	Max	Unit
Stimulus				
Frequency Range	> 0	[50 18000]	18000	Hz
Frequency Resolution	1	24	999	Points per octave
Stimulus Shaping	• No Shaping • IEC60268 • CEA2034 • Shaping Function			
Preheating Time	> 0	60		s
Averaging	1	1	128	
Pause between steps	> 0	60		s
Limits / Protection				
Voltage Stepping	• Log (may depend on compression)			
Limits	• Compression, Enhancement • Multitone distortion • Thermal Protection			
Processing				
Smoothing		1/12th		octave
Multi-tone Distortion Reference	• Relative to SPL mean • Relative to SPL (f) • Absolute			

6 Output

H (f) Magnitude	Graph showing the transfer function defined as pressure or displacement divided by stimulus voltage. Transfer function curves of reference and last measurement as well as compression limit curves relative to reference are displayed. If Thermal Protection is activated, thermal compression is measured and plotted too.	

H (f) Normalized Magnitude	Graph showing the transfer function curves normalized to reference measurement.	
MTND (f) Multitone Distortion	Graph showing multi-tone distortion curves measured, if multi-tone distortion limit activated	
TC (f) Thermal Compression	Graph showing the thermal compression measured, if thermal protection activated.	
Maximum Compression	Graph showing the maximum compression and enhancement values of each individual measurement over the measurement voltages.	

Maximum MTND	Graph showing the multi-tone distortion peak of each individual measurement over the measurement voltages, if multi-tone distortion limit activated	
Temperature	Graph showing the voice coil temperature increase of each individual measurement over the measurement voltages, if thermal protection activated.	
Table Results + Settings	Shows warnings and errors produced during the process, data collection table of results, measurements conditions and setting of measurement.	**Measurement Results Summary:** Parameter / Value / Unit / Description MIV Continuous / 6.3094 / V / Maximum Input Voltage Continuous SPL_{MUCO} measured / 77.44 / dB / Maximum Usable Continuous Output SPL measured SPL_{MUCO} Ref. Dist / 77.44 / dB / Maximum Usable Continuous Output SPL at reference distance **Max. Compression / 3.21 / dB / Maximum Compression of measurement V = 6.3094V** **Max. Multitone Distortion / -19.91 / dB / Maximum Value of Distortion of measurement V = 6.3094V** **Max. Increment Temperature / 37.42 / K / Maximum Increment Temperature of measurement V = 6.3094V** **Measurement Conditions:** Measurement Distance / Result Distance / $L_{MEAS} - L_{REF}$ 1 m / 1 m / 0 dB **Measurement Settings Summary:** Parameter / Value / Unit / Description Stimulus / CEA2034 / - / Stimulus shaping function Smoothing / 12 / oct. / Frequency response smoothing value Mic. Calibration - V / 1 / V / Microphone Calibration - Voltage Mic. Calibration - p / 93.8 / dB / Microphone Calibration - SPL dB Pause / 60 / s / Pause between measurements Preheating Time / 60 / s / Preheating time - Duration of measurements Frequency Band / [50, 18000] / Hz / Freq. Band within the limits will be checked Max. Distortion / -20 / dB / Maximal distortion allowed Alpha coeff. / 0.0039 / 1/K / Alpha coefficient Max. T increase / 37 / K / Maximal temperature increment allowed
U (f) Voltage Spectrum	Graph showing the magnitude curves of voltage signal and distortion including noise of latest measurement, if measured.	
SPL (f) Sound Pressure Spectrum	Graph showing the magnitude curves of pressure signal and noise + distortion of current measurement, if measured. **Note:** This curve is spectrum of microphone signal but NOT a frequency response curve.	

Stimulus (f) Spectrum	Graph showing the magnitude curve of stimulus signal of current measurement.	
X (f) Displacement Spectrum	Graph showing the magnitude curves of displacement signal and noise + distortion of current measurement, if measured. Curves are updated during measurement process.	

7 References

7.1 Related Modules	Linear Parameter Measurement (LPM) Tone Burst Measurement (TBM)
7.2 Manuals	LPM, dB-Lab, TBM
7.3 Standards	[1] ANSI/CEA-2010-B: “Standard Method of Measurement for Subwoofers”, 2014, Consumer Electronics Association [2] ANSI/CEA-2034: “Standard Method of Measurement for In-Home Loud-speakers”, 2013, Consumer Electronics Association [3] IEC 60268-21: “Sound system equipment – Part21: Acoustical (output-based) measurements”, 2018, International Electrotechnical Commission

Find explanations for symbols at:
http://www.klippel.de/know-how/literature.html
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