MULTITONE TESTS

Multitone Analyzer tests using synthetic test wave files

V1.0b

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Updated Sept 15, 2023 (original August 19, 2023)
https://distortaudio.org/multitone.html

Comparisons with Multitone version 1.0.90 and REW version 5.20.14

- Test files generated by Multitone Transfer Function generator, 24-bit PCM @ 48kHz.
- All 1kHz sine wave test signals generated at -1dBFS and centered on the nearest bin for 64k FFT (999.756kHz)
- All measurements conducted with a rectangular FFT window
- Measurement range set from 5Hz to 22.8kHz in both apps (REW couldn't be set to full range of 5-24k)
- REW set to 64-bit calculation mode. Multitone always uses 64-bit floating point for calculations
- Screenshots of settings used in both REW and Multitone are at the end of this document

Result 1: RMS

Measurement	Theoretical	Multitone	REW
Noise=-100dB	-100.2	-100.2	-100.2
Noise=-50dB	-50.2	-50.2	-50.2

Result 2: THD+N

Measurement	Theoretical	Multitone	REW
1kHz@-1dB; Noise=-100dB	-96.2	-96.2	-96.2
1kHz@-1dB; Noise= -50dB	-46.2	-46.2	-46.2
1kHz@-1dB; Noise=none; H2=-101dB	-100.0	-100.0	-100.0
1kHz@-1dB; Noise=none; H2=-51dB	-50.0	-50.0	-50.0
1kHz@-1dB; Noise=-100dB; H2=-101dB	-94.7	-94.7	-94.7
1kHz@-1dB; Noise=-100dB; H2= -51dB	-50.0	-50.0	-50.0
1kHz@-1dB; Noise=-50dB; H2=-101dB	-46.2	-46.2	-46.2
1kHz@-1dB; Noise=-50dB; H2=-51dB	-44.7	-44.7	-44.7

Result 2: Noise

Measurement	Theoretical	Multitone	REW
1kHz@-1dB; Noise=-100dB	-100.2	-100.3	-100.2
1kHz@-1dB; Noise= -50dB	-50.2	-50.3	-50.3
1kHz@-1dB; Noise=none H2=-101dB	-147.0	-147.0	-147.0
1kHz@-1dB; Noise=none H2=-51dB	-147.0	-146.7	-146.9
1kHz@-1dB; Noise=-100dB H2=-101dB	-100.2	-100.3	-100.2
1kHz@-1dB; Noise=-100dB H2= -51dB	-100.2	-100.3	-100.2
1kHz@-1dB; Noise=-50dB H2=-101dB	-50.2	-50.3	-50.2
1kHz@-1dB; Noise=-50dB H2=-51dB	-50.2	-50.3	-50.2

Result 3: THD

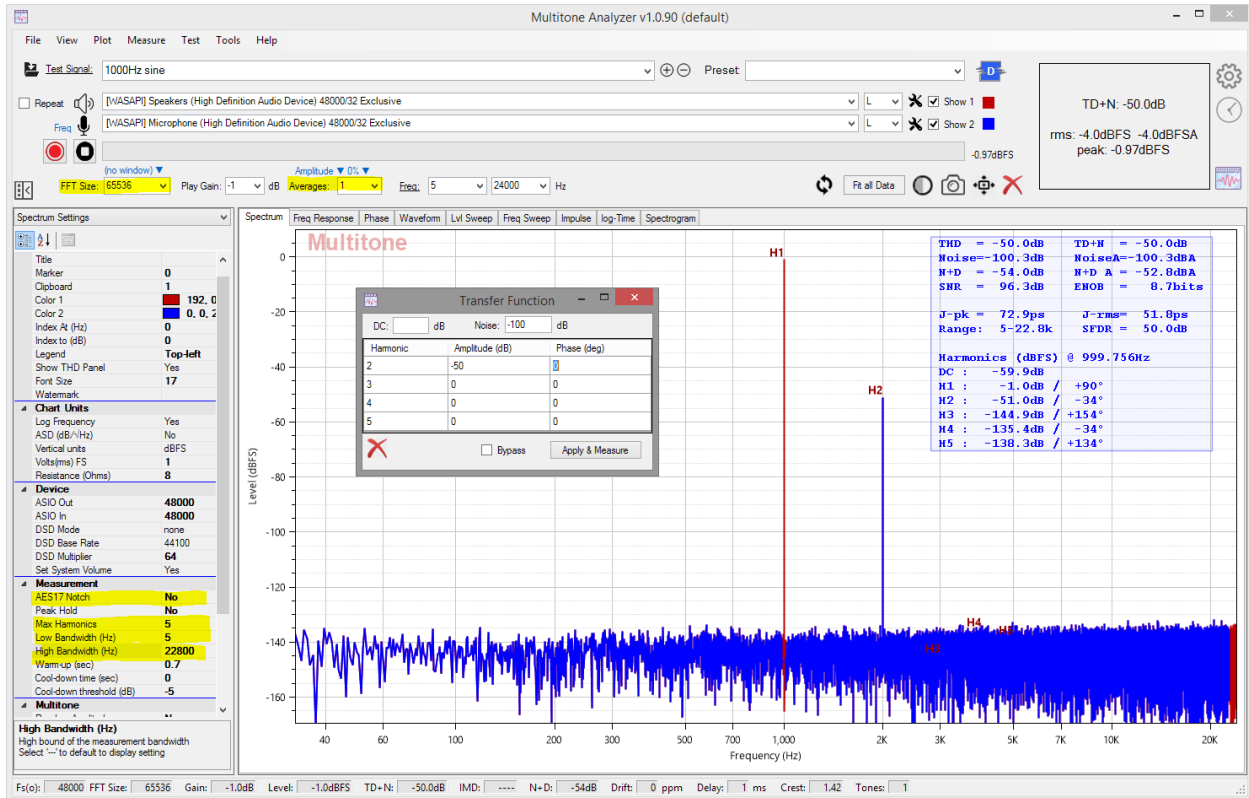| Measurement	Theoretical	Multitone	REW
1kHz@-1dB; Noise=-100dB H2=-101dB	-100.0	-100.0	-100.0
1kHz@-1dB; Noise=-100dB H2= -51dB	-50.0	-50.0	-50.0
1kHz@-1dB; Noise=-50dB H2=-51dB	-50.0	-50.1	-50.0
1kHz@-20dB; Noise=none H2=-89dB	-69.0	-69.0	-69.0

Result 4: N+D (dBA)

Measurement	Theoretical	Multitone	REW
1kHz@-1dB; Noise=-100dB	-102.8	-102.8	-102.8
1kHz@-1dB; Noise= -50dB	-52.7	-52.7	-52.7
1kHz@-1dB; Noise=none H2=-101dB	-104.0	-104.0	-102.8
1kHz@-1dB; Noise=none H2=-51dB	-54.0	-54.0	-52.8
1kHz@-1dB; Noise=-100dB H2=-101dB	-98.6	-98.7	-99.7
1kHz@-1dB; Noise=-100dB H2= -51dB	-54.0	-54.0	-52.8
1kHz@-1dB; Noise=-50dB H2=-101dB	-50.2	-50.2	-52.7
1kHz@-1dB; Noise=-50dB H2=-51dB	-49.8	-49.8	-49.8
1kHz@-20dB; Noise=none H2=-89dB	-92.0	-92.0	-90.8

Result 4: SNR

Measurement	Theoretical	Multitone	REW
1kHz@-1dB; Noise=-100dB H2=-101dB	96.2	96.3	96.2
1kHz@-1dB; Noise=-100dB H2= -51dB	96.2	96.3	96.2
1kHz@-1dB; Noise=-50dB H2=-101dB	46.2	46.3	46.2
1kHz@-1dB; Noise=-50dB H2=-51dB	46.2	46.3	46.2
1kHz@-20dB; Noise=none H2=-89dB		123.6	123.5

Multitone settings

REW Settings

Important settings highlighted in red:

Distortion settings

- ☑ Use distortion high pass: 5 Hz
- ☑ Use distortion low pass: 22,800 Hz
- Highest harmonic in THD: 50
- ☑ Show harmonics up to: 5
- ☐ Manual fundamental: 1 V

- ☐ Monitor clock match
- ☐ Highlight fundamental
- ☐ Show phase of harmonics
- ☑ Show higher harmonic distortion
- ☐ Use AES17-2015 standard notch

- ☐ Show distortion in %
- ⦿ Show distortion in dB
- ☐ Coherent averaging

Preferences

Soundcard | Cal files | Comms | Analysis | Equaliser | **View**

Graph

- ☑ Use thick traces
- ☑ Use antialiasing for traces
- ☑ Use thicker traces for averages
- ☐ Show aspect ratio dB/decade

- ☑ Enable mousewheel zoom
- ☐ Limit mousewheel zoom rate
- ☐ Save trace colour with measurement

Trace highlight options ▼
- ☐ Show watermark text on graphs
- Enter watermark text
- Default trace colours ● ● ●

Freq axis start (Hz) | 0.1
Freq axis preset 1 L | 10
Freq axis preset 1 R | 200

Freq axis preset 2 L | 20
Freq axis preset 2 R | 20000

Preset 1 aspect ratio: | As plotted
Preset 2 aspect ratio: | As plotted

Interface

- ☑ Show toolbar text labels
- ☑ Show graph button text labels
- ☐ Suppress soundcard errors
- ☐ Full scale sine rms is 0 dBFS
- ☑ Keep SPL Meter on top
- ☑ Keep Level Meters on top
- ☑ Keep signal generator on top
- ☑ Keep filters panel on top
- ☐ Show measurement level on thumbnails
- ☑ Confirm unsaved measurement removal
- ☑ Mousewheel adjusts controls on hover

- ☑ Show grid on thumbnails
- ☑ Show toolbar
- ☑ Show [FDW] in name if used
- ☐ Don't show the welcome message
- ☐ Show measurement notes in tooltip
- ☑ Show phase wrap lines
- ☑ Show minor grid lines
- ☑ Animate measurements list
- ☐ Disable tooltips
- ☐ Opaque control panels
- ☑ Select all traces on Overlays open

- ☑ *Scale fonts for display DPI
- *Maximum measurements: 30
- *General font size: 12
- *Graph font size: 12
- *Max RTA inputs (Pro): 16
- *Max level meters inputs (Pro): 16
- *Settings marked * are applied after restart*
- Speed of sound (ft/s): 1125
- Distance units: feet
- Colour scheme: Light
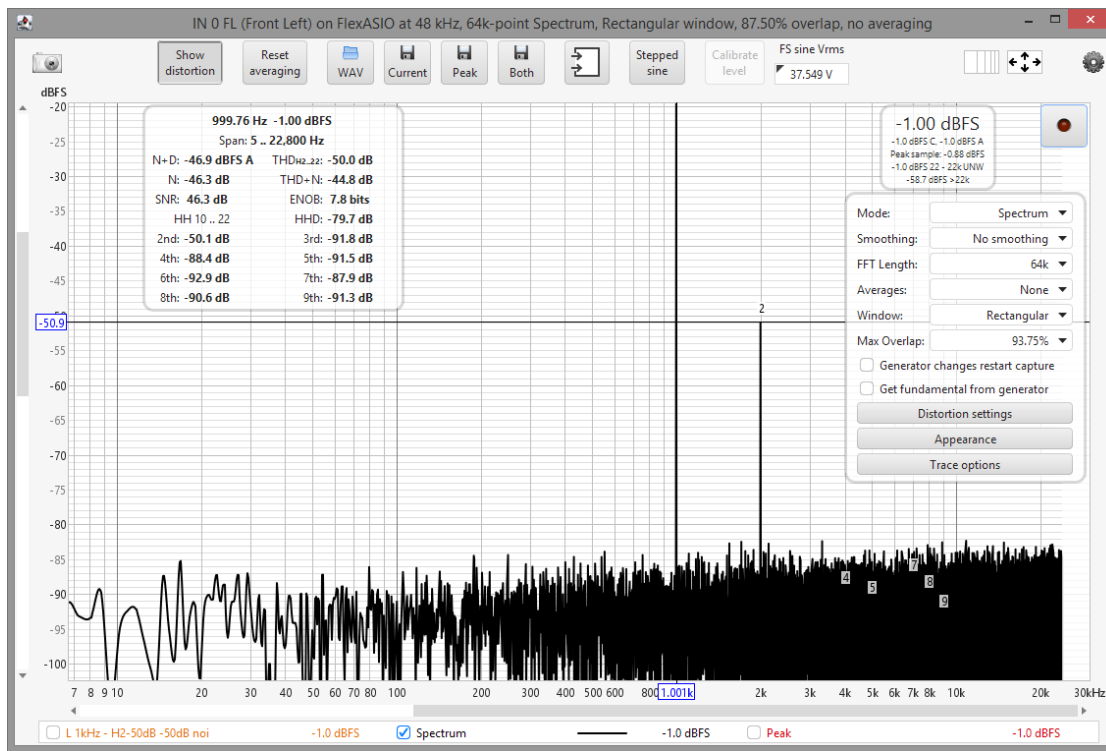
Test Files

Measurement	File Download
Noise=-100dB	link
Noise=-50dB	link
1kHz@-1dB; Noise=-100dB	link
1kHz@-1dB; Noise= -50dB	link
1kHz@-1dB; Noise=none; H2=-101dB	link
1kHz@-1dB; Noise=none; H2=-51dB	link
1kHz@-1dB; Noise=-100dB; H2=-101dB	link
1kHz@-1dB; Noise=-100dB; H2= -51dB	link
1kHz@-1dB; Noise=-50dB; H2=-101dB	link
1kHz@-1dB; Noise=-50dB; H2=-51dB	link
1kHz@-20dB; Noise=none H2=-89dB	link