Sound Blaster® X-Fi™ Titanium HD Testing Methodology & Results For RMAA v6.2.3

THE AUDIOPHILE'S CHOICE - FEATURING THX TRUSTUDIO PC TECHNOLOGY

Sound Blaster® X-Fi® RMAA Testing Methodology and Results

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Testing Methodology using RMAA v6.2.3

In this section, we will guide you through setting up your Sound Blaster® X-Fi, for RMAA measurement in real-time **24-bit/96kHz** Playback and Recording using the Analog Inputs and Outputs. Comparison charts for the **24-bit/48kHz, Audio Precision test results** are also included. These Analog I/O tests prove that superb quality analog audio inputs and outputs are achieved from very high quality DAC, ADC and board design.

Setting up Sound Blaster X-Fi for Analog Measurement

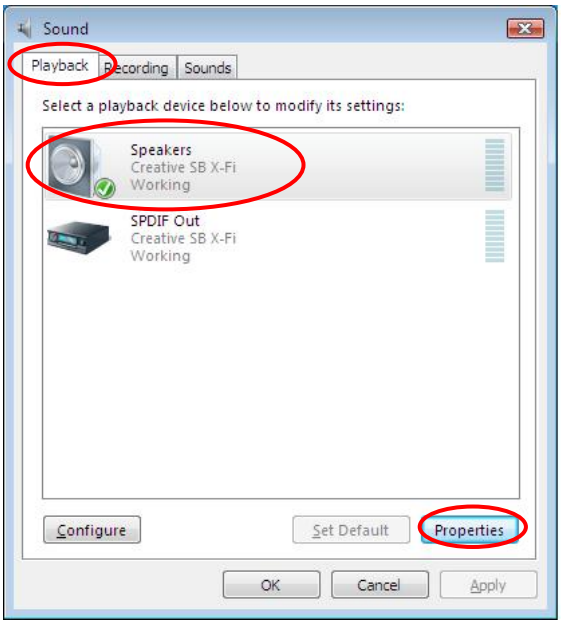
Your Sound Blaster® X-Fi has the unique property of using hardware digital signal processing to improve audio quality and listening experience. However, to a tool designed to test for audio precision, such processing would be considered "distortion."

So, in order to properly measure the Sound Blaster X-Fi's analog precision, you must first turn off all such processing.

The recommended procedure for doing this is as follows.

- Goto"Start" → "Control Panel" → "Sound"
- Or from the Taskbar right click on the speaker volume control icon to bring up a dialog box, and select "Playback Devices" or "Recording Devices".

- From the "Sound" panel window, select "Playback Devices" tab. Select and highlight "Speakers", then click on "Properties" on the bottom right button.



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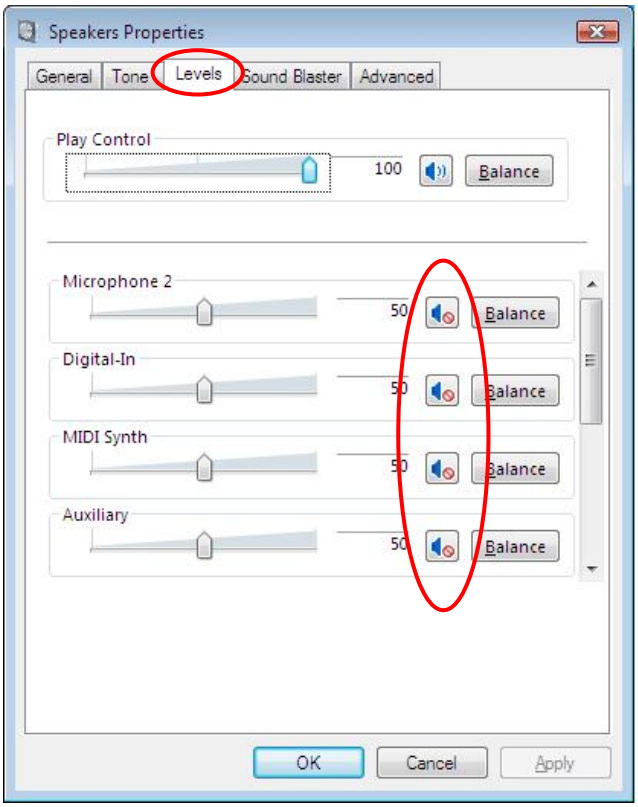
- This will bring up “Speakers Properties” dialog window, as shown below.
- Select “Levels” tab, and mute all others as follows.



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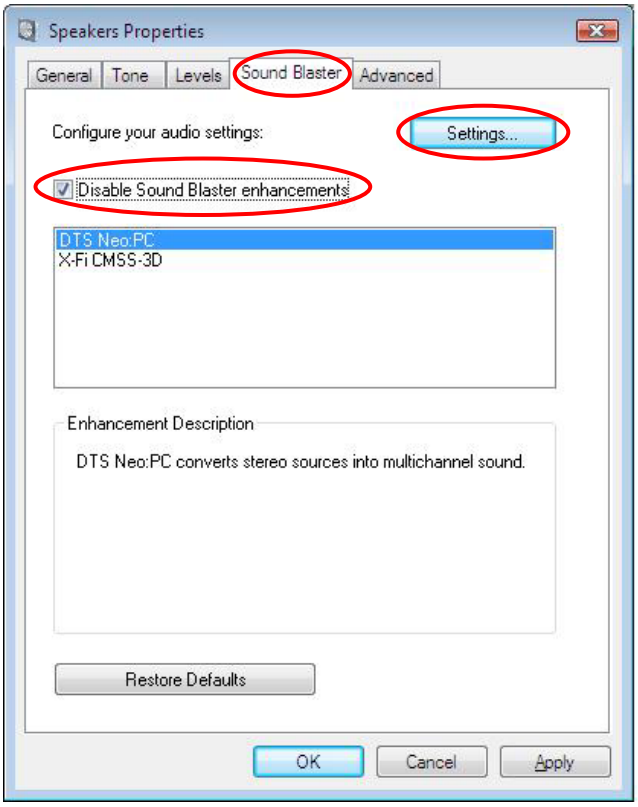
- Next, click on “Sound Blaster” tab, and ensure “Disable Sound Blaster enhancements” is selected or clicked.



- Then, click on the Settings button. This action will bring up a new dialog window “Audio Control Panel”, as shown here:

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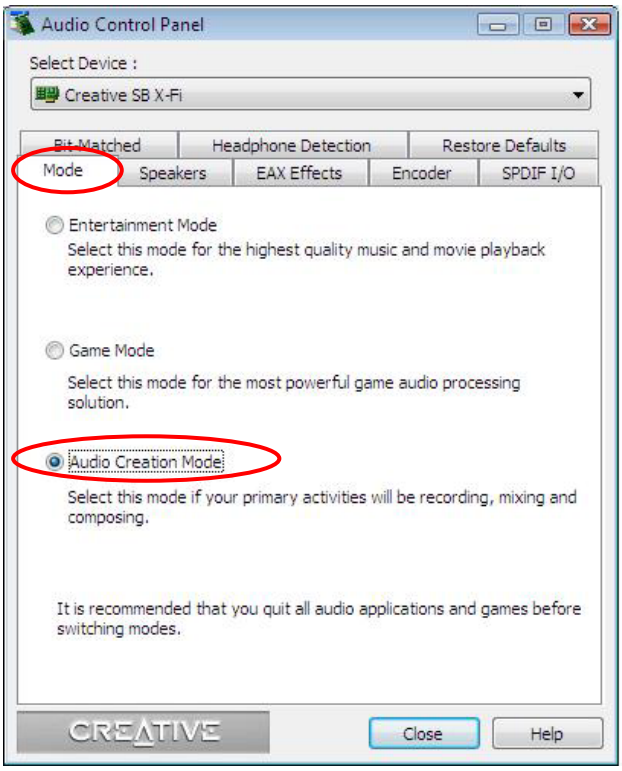
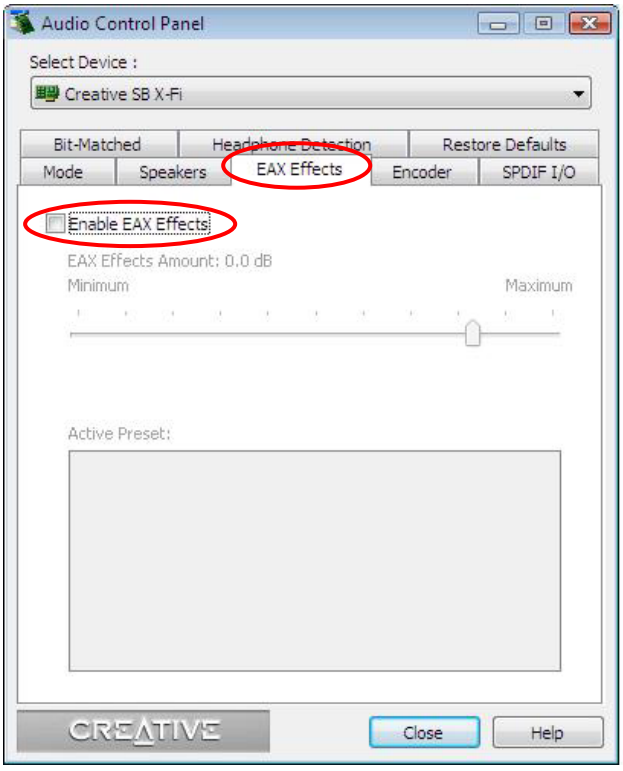
- From the “Sound” panel window, select “Playback Devices” tab. Select and highlight
- Click on the “Mode” tab to select “Audio Creation Mode”.



- Click on the “EAX Effects” tab to unselect “Enable EAX Effects”.



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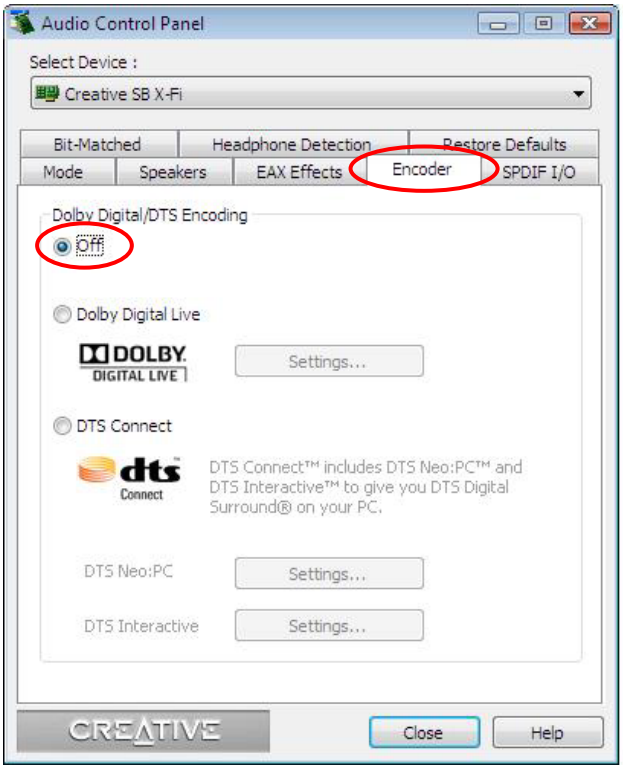
- Click on the “Encoder” tab to select “Off”.



- Click on the “Bit-Matched” tab to select “Enable Bit-Matched Recording” and “Enable Bit-Matched Playback”.

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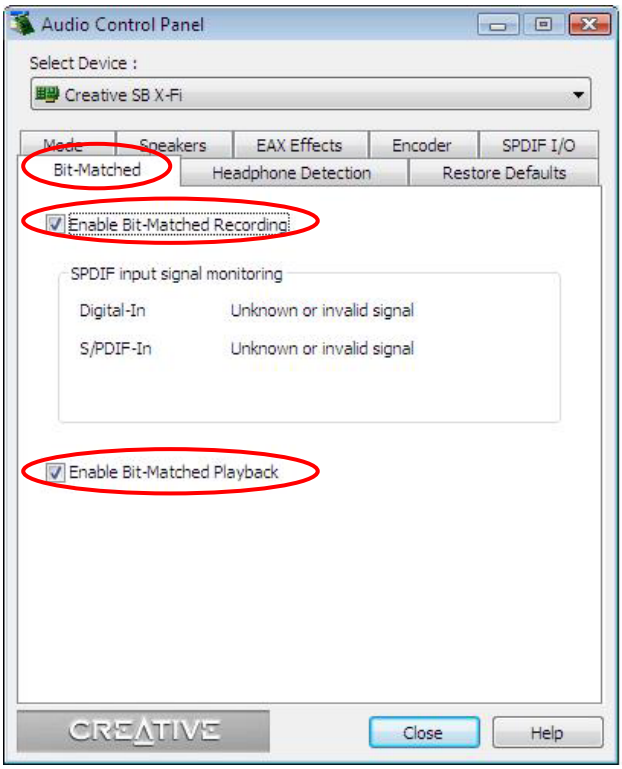

- Now click CLOSE for these settings to take effect. And returning to Speakers Properties dialog window:
- Click on the “Advanced” tab, then click on option box to select the desired sample rate and bit depth, e.g. 24 bit, 96000Hz (Studio Quality), etc.

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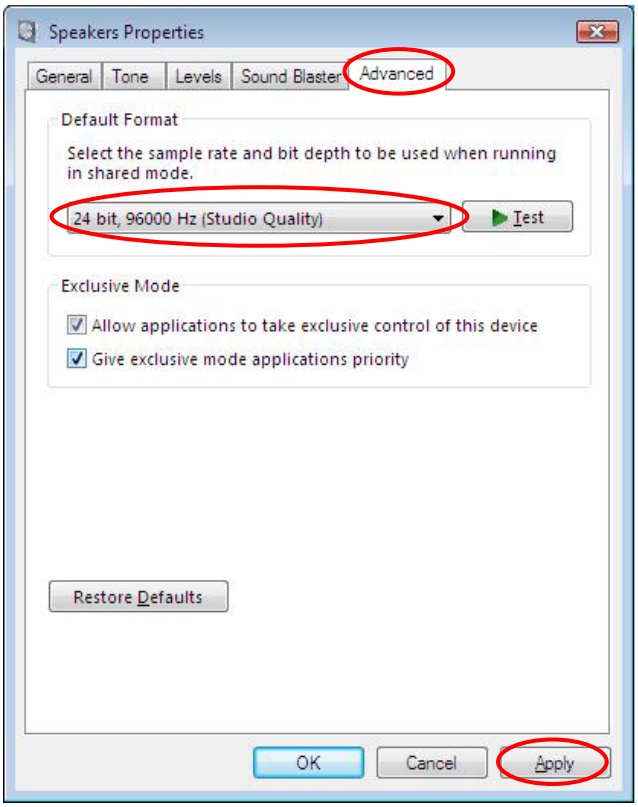

- Now click “OK” or “APPLY” button for these settings to take effect. This will return you back to the “Sound” panel window.

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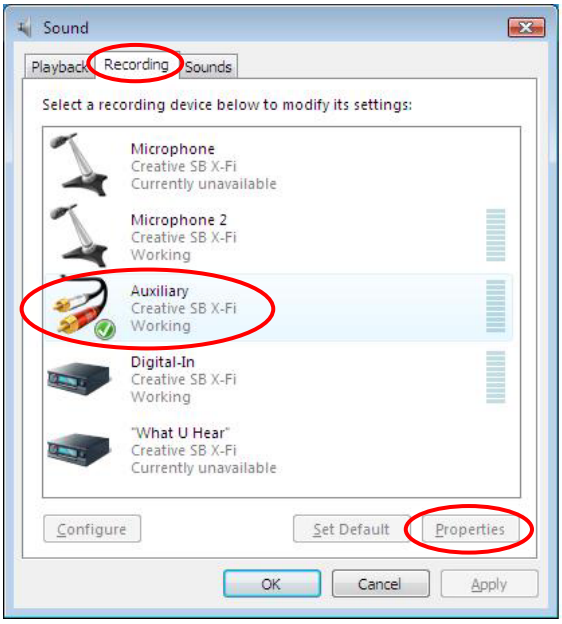
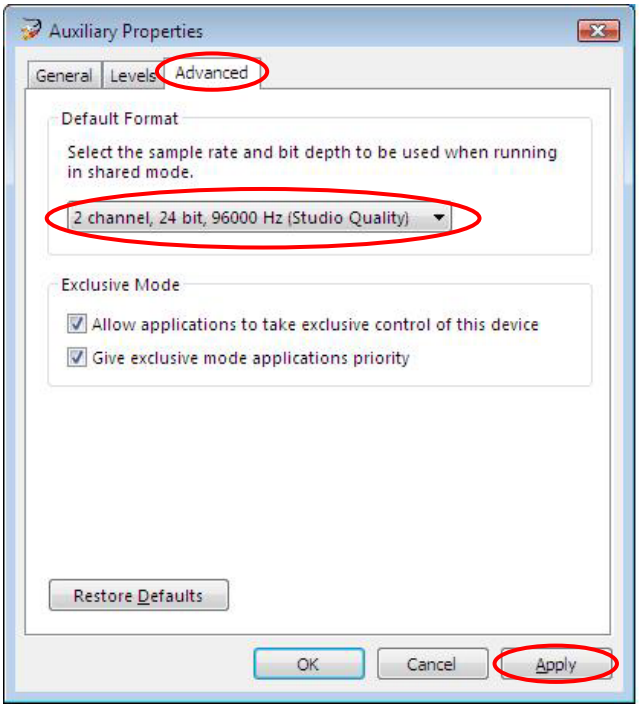
- Then click on the “Recording” tab as following. Select and highlight “Auxiliary”, then click on “Properties” on the bottom right button.



- This will bring up “Auxiliary Properties” dialog window, as shown below.
- Select “Advanced” tab, then click on option box to select the desired sample rate and bit depth, e.g. 24 bit, 96000Hz (Studio Quality), etc.

(Note: Playback and Recording sample rate and bit depth should be the same.)



- Now click “OK” or “APPLY” button for these settings to take effect. This will return you back to the “Sound” panel window.

- Switch to Audio Creation Mode

  Audio Creation Mode is the mode of operation we designed specifically for precision recording applications. As a result, it is already configured to turn much of this signal processing off. So, it is the ideal place to start.

  Sound Blaster X-Fi Mode Switcher

- Configure Creation Mode Mixer

  At this point, you should see the Audio Creation Mode Mixer. The first thing you should do is pull down the Snapshot combo box and select Default, just to be sure all previous settings are reset.

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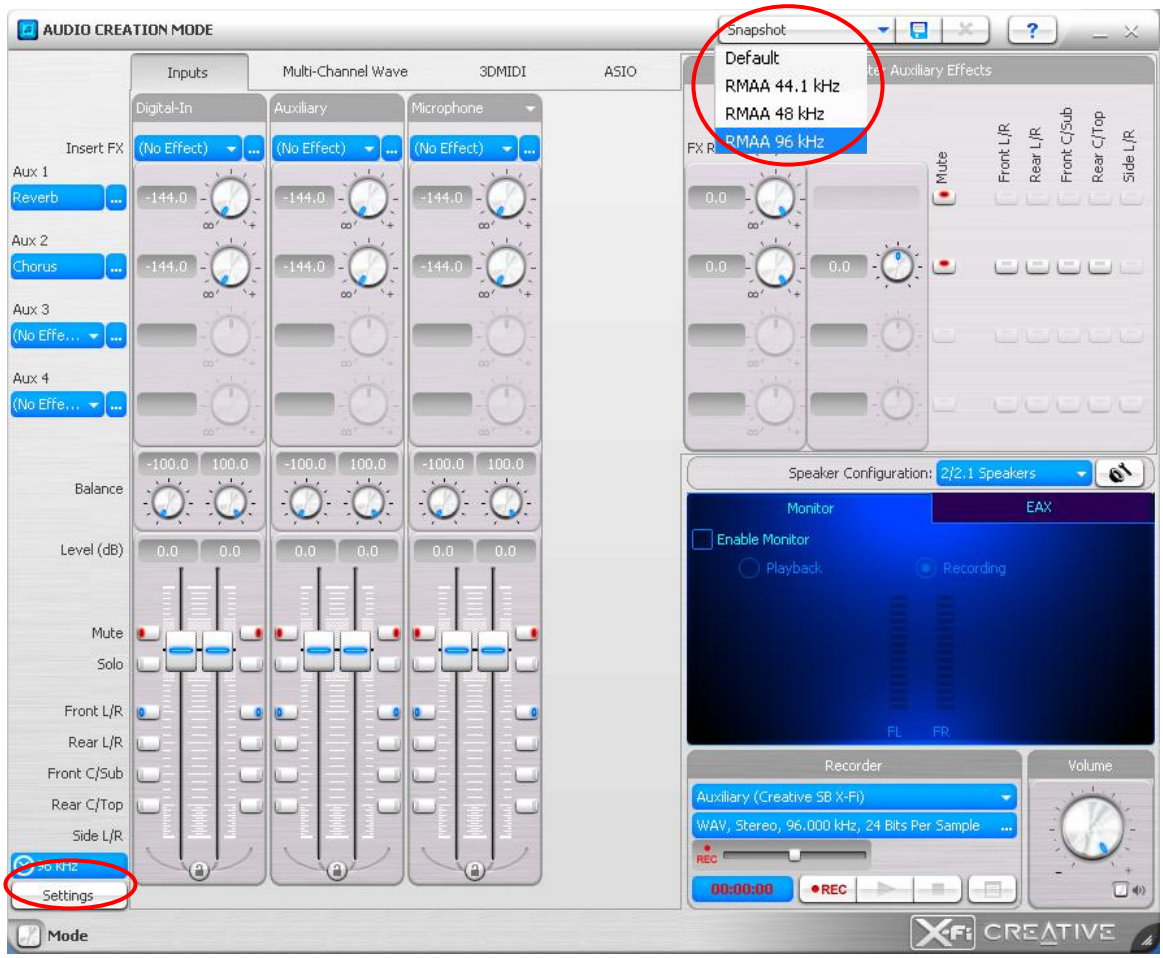
Sound Blaster X-Fi Audio Creation Mode Mixer

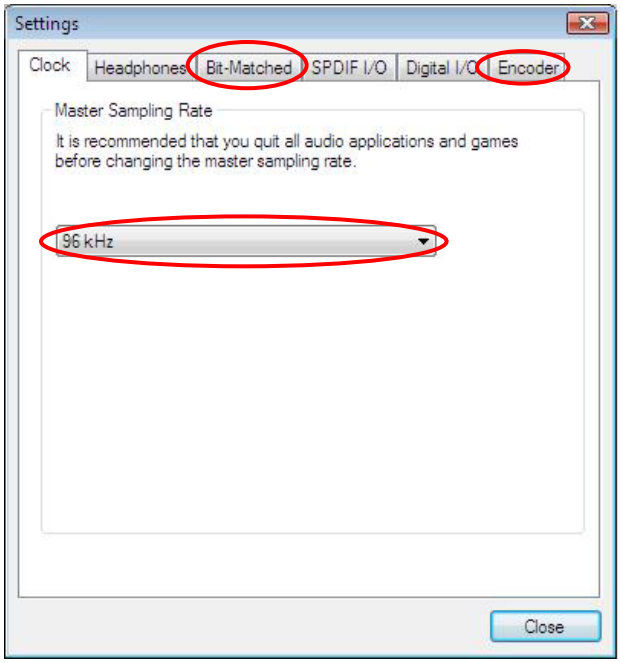


Click on the Snapshot pull down option to reveal the different RMAA settings, and select the correct option.

Then, click on the Settings button.

This action will bring up a new dialog box, as shown here:

Sound Blaster X-Fi Audio Creation Mode Mixer Settings



First, ensure Master Sampling Rate is to match the test performed by setting to the desired rating for testing, e.g. 96kHz, 48kHz, 44kHz, etc.

Then **enable** Bit Matched Playback from the Bit-Matched tab option.

Next step is to **disable** most of the remaining effects in the Encoder tab option, including CMSS-3D, EAX, 24-Bit Crystalizer, Graphic Equalizer, THX Setup.

It also guarantees that no digital sample rate conversion happens in the playback path or recording path.

Now click CLOSE for these settings to take effect.

- Verify or Adjust Creation Mode Mixer Settings:

  Now, in the Creation Mode Mixer, confirm that all the following settings are in effect, or adjust them as necessary:

  - Master Sampling Rate: Matched to the test performed e.g. 96kHz
  - Speaker Mode is 2/2.1 Speakers
  - Wave: 100%
  - All Line Inputs: 0% and Muted or -144dB level
  - Record Source: Line-In/Mic-In @ 50% (no record gain, i.e. 0dB)
  - All visible Effects Returns: Muted

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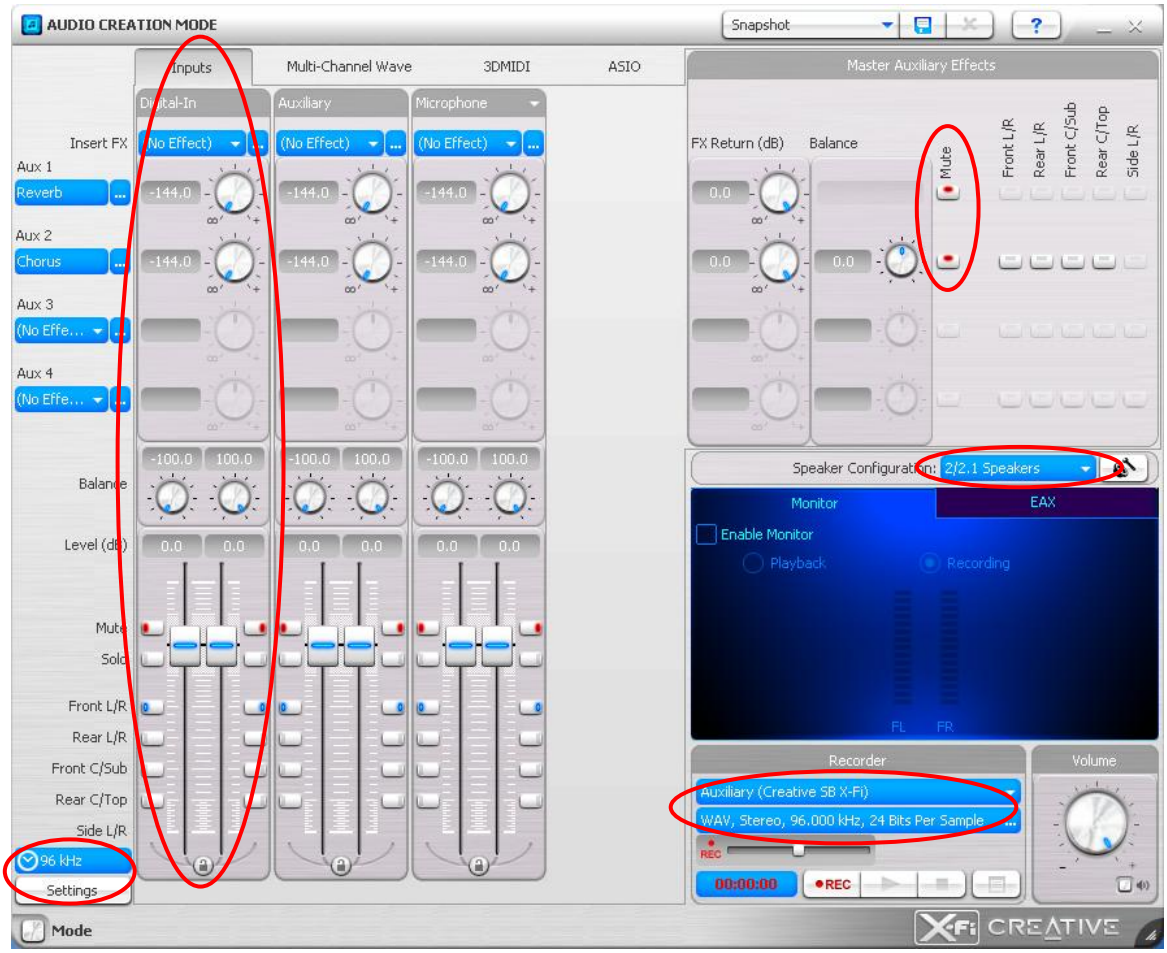
Sound Blaster X-Fi Audio Creation Mode Mixer



Your Sound Blaster X-Fi is now properly set up for Analog measurement. Now, we move to RMAA Setup.

Setting Up RMAA for Analog Measurement:

- Launch RMAA v6.2.3
  This latest version of the RMAA can be downloaded from the following web site:
  http://audio.rightmark.org/download.shtml

- Select the bit depth and sampling rate you which to test.
  - ***Note that Sound Blaster X-Fi max playback sampling rate is 192kHz, but the max recording sampling rate is 96kHz. Therefore the resolution must be set to 24-bit, 96kHz (or lower) for the test to work.***

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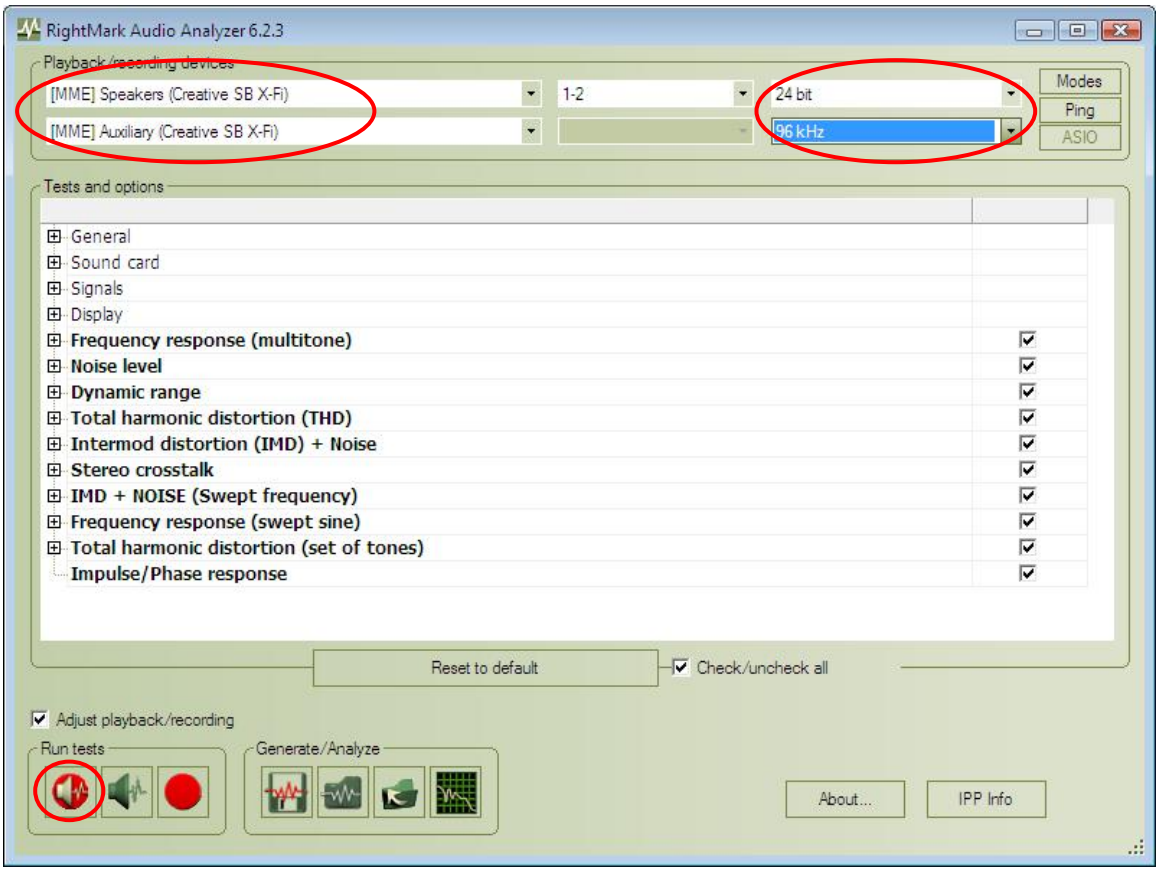
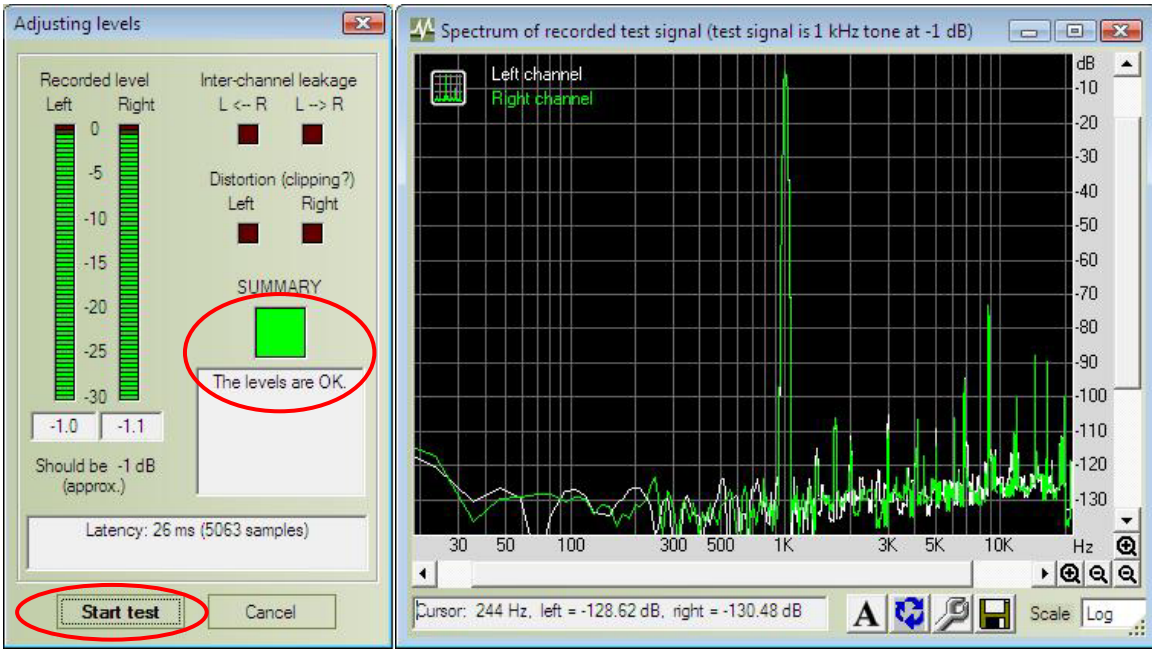


Click on 

- Click on “Test Options”, “Display” and select “Display full frequency range (up to Fs/2)”.



- An audio loopback cable connection:
  - Connect a RCA cable from RCA Line Out to RCA Line In located at the soundcard back panel.

- Establishing playback and recording levels:
  - Click “Adjust I/O Levels”,

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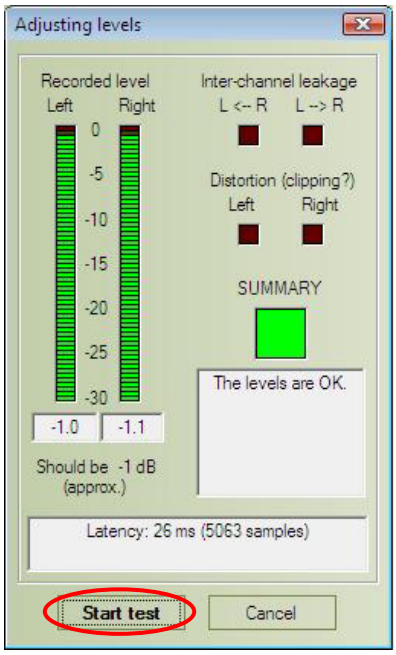
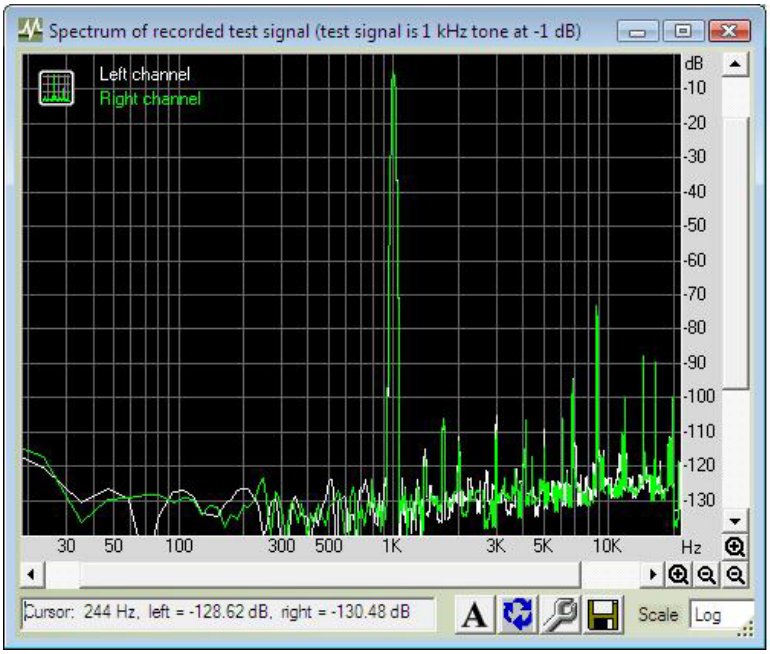


Now you can begin your tests by clicking on the “Run tests” panel.

Click on 

- Results are presented in plots and are also tabulated.



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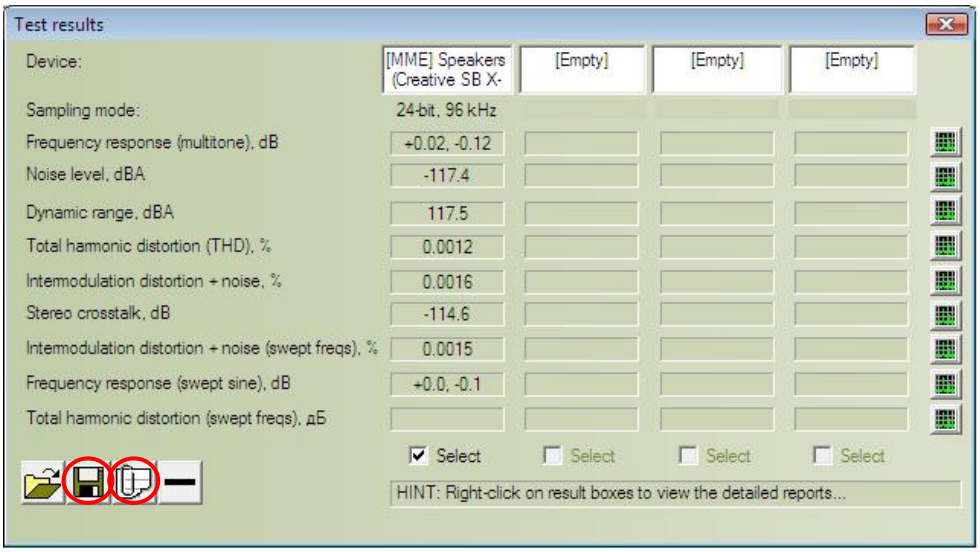


Results from RMAA v6.2.3 Tests

Summary results for
Sound Blaster X-Fi Titanium HD
(Model Number SB1270)

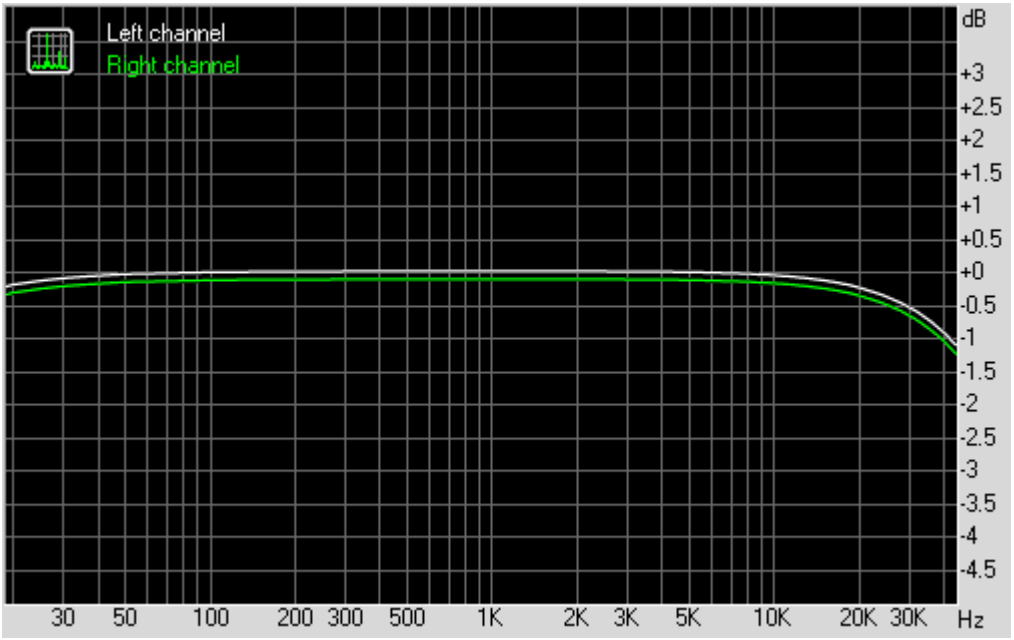
Testing chain: External loopback (line-out - line-in)
Sampling mode: 24-bit, 96 kHz

Frequency response (from 40 Hz to 15 kHz), dB:	+0.02, -0.12	Excellent
Noise level, dB (A):	-117.4	Excellent
Dynamic range, dB (A):	117.5	Excellent
THD, %:	0.0012	Excellent
THD + Noise, dB (A)	-96.3	Excellent
IMD + Noise, %:	0.0016	Excellent
Stereo crosstalk, dB:	-114.6	Excellent
IMD at 10 kHz, %:	0.0015	Excellent

General performance: Very Good

Full results (Sampling mode: 24-bit, 96 kHz)

Frequency response



Frequency range	Response
From 20 Hz to 20 kHz, dB	-0.22, +0.02
From 40 Hz to 15 kHz, dB	-0.12, +0.02

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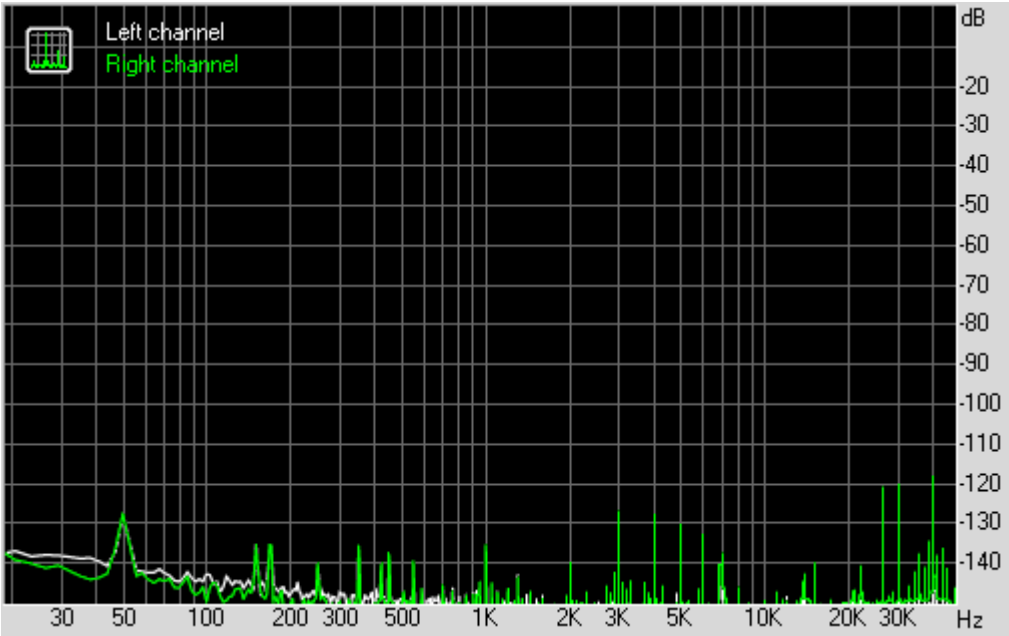
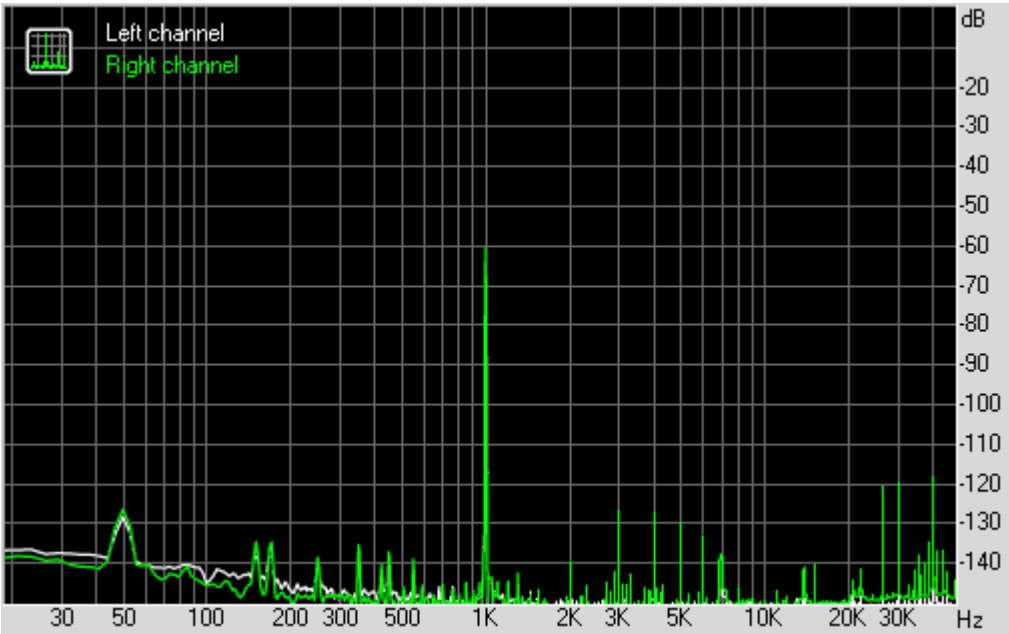
Noise level



Parameter	Left	Right
RMS power, dB:	-116.6	-116.0
RMS power (A-weighted), dB:	-117.7	117.0
Peak level, dB FS:	-89.1	-89.3
DC offset, %:	+0.0	+0.0

Dynamic range



Parameter	Left	Right

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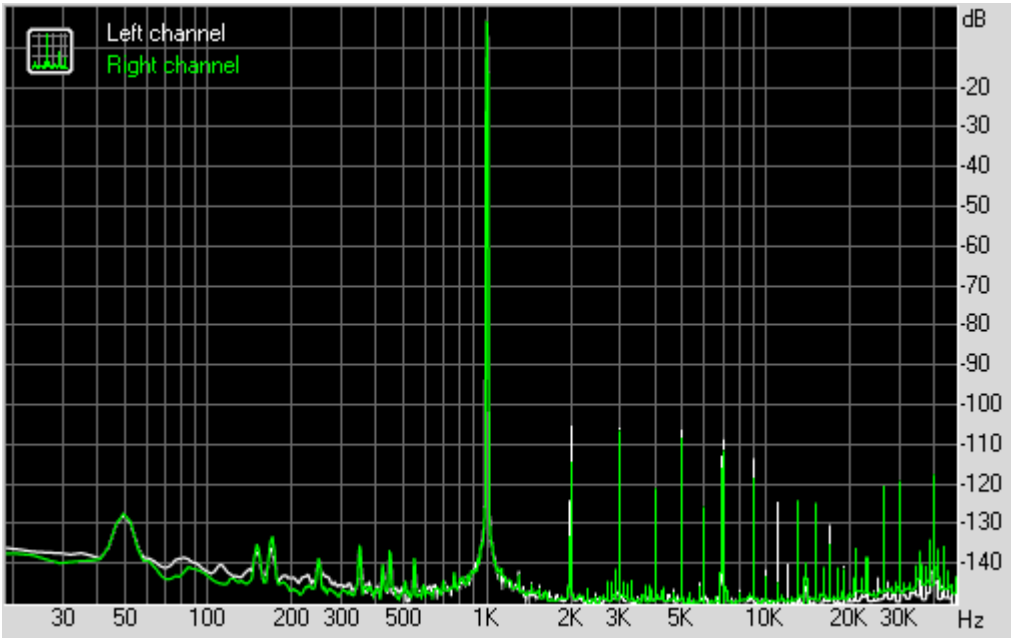
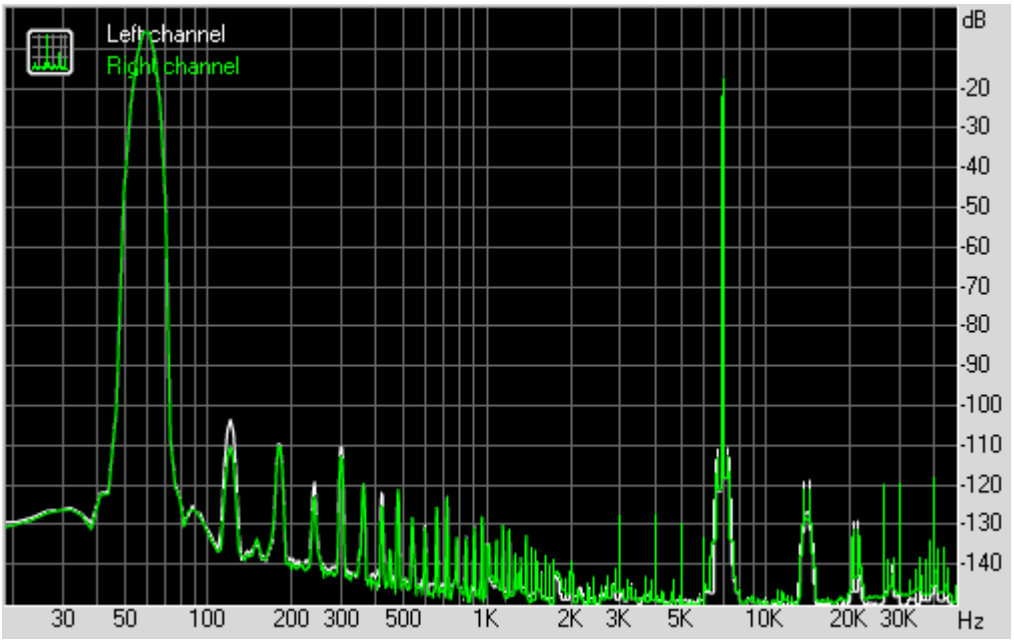
Dynamic range, dB:	+116.8	+116.1
Dynamic range (A-weighted), dB:	+117.8	+117.1
DC offset, %:	+0.0	+0.0

THD + Noise (at -3 dB FS)



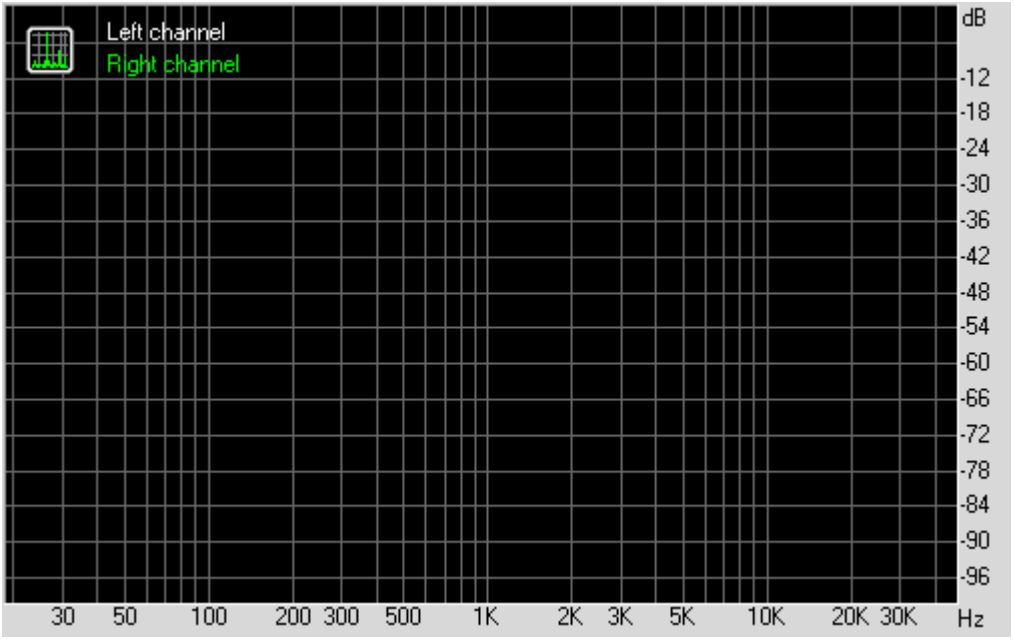
Parameter	Left	Right
THD, %:	+0.0014	+0.0010
THD + Noise, %:	+0.0014	+0.0011
THD + Noise (A-weighted), %:	+0.0018	+0.0013

Intermodulation distortion



Parameter	Left	Right
IMD + Noise, %:	+0.0019	+0.0014
IMD + Noise (A-weighted), %:	+0.0012	+0.0010

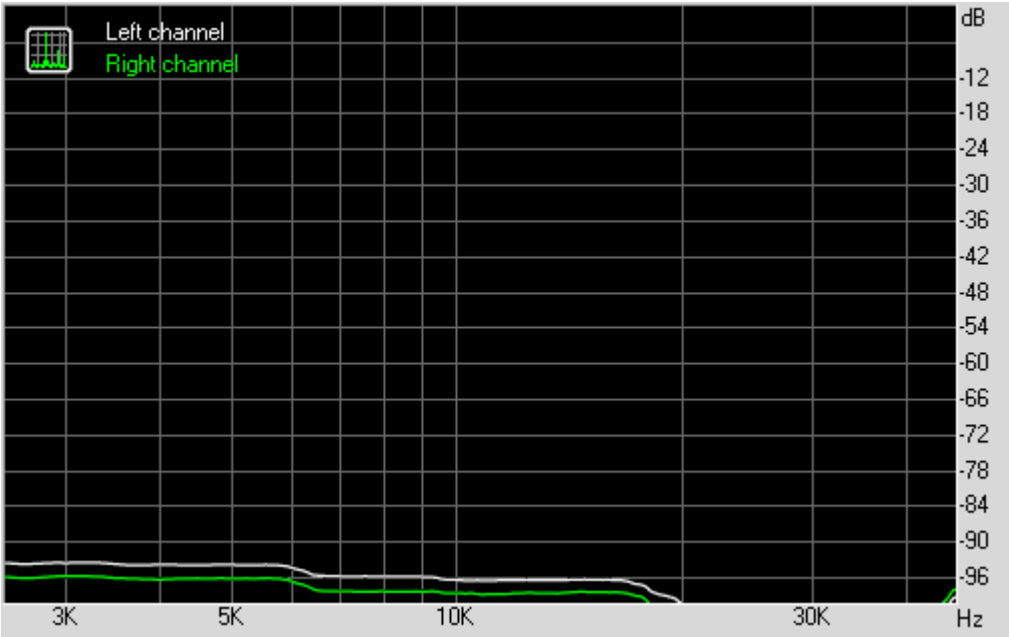
Stereo crosstalk



Parameter	L <- R	L -> R

Crosstalk at 100 Hz, dB:	-109	-108
Crosstalk at 1 kHz, dB:	-114	-113
Crosstalk at 10 kHz, dB:	-113	-113

IMD (swept tones)

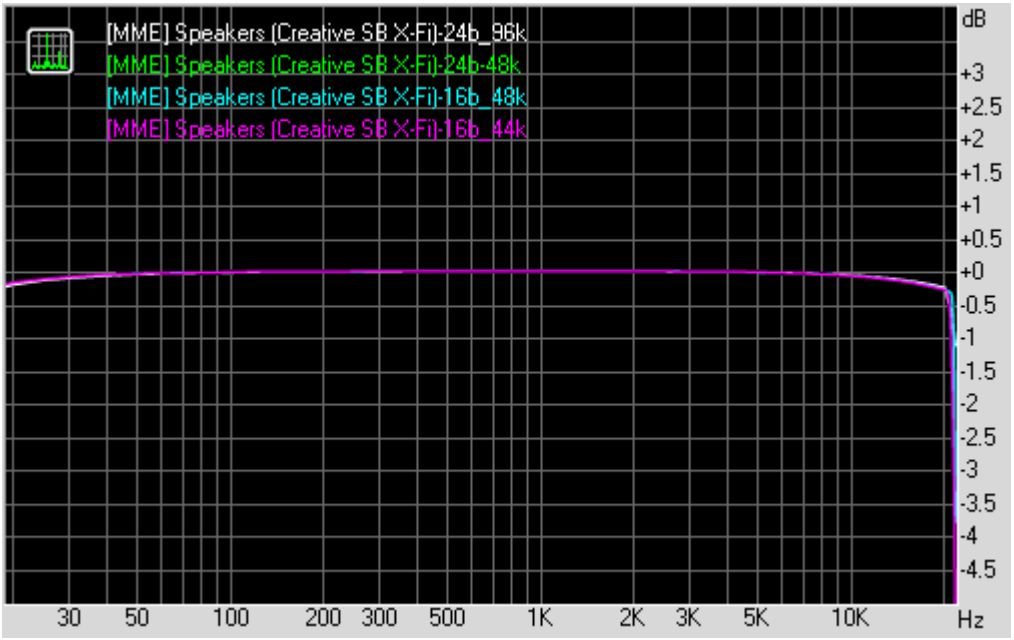


Parameter	Left	Right
IMD + Noise at 5 kHz, %:	0.0021	0.0016
IMD + Noise at 10 kHz, %:	0.0015	0.0012
IMD + Noise at 15 kHz, %:	0.0015	0.0012

Comparison of: SB1270 @ 16-bit/44.1kHz, 16-bit/48kHz, 24-bit/48kHz and 24-bit/96 kHz

Test	Titanium HD [24/96]	Titanium HD [24/48]	Titanium HD [16/48]	Titanium HD [16/44.1]
Frequency response (from 40 Hz to 15 kHz), dB:	+0.02, -0.12	+0.02, -0.13	+0.02, -0.13	+0.02, -0.14
Noise level, dB (A):	-117.4	-117.3	-93.2	-93.0
Dynamic range, dB (A):	117.5	117.4	93.1	92.6
THD, %:	0.0012	0.0011	0.0015	0.0012
IMD + Noise, %:	0.0016	0.0017	0.0063	0.0066
Stereo crosstalk, dB:	-114.6	-115.3	-92.2	-93.0

Frequency response



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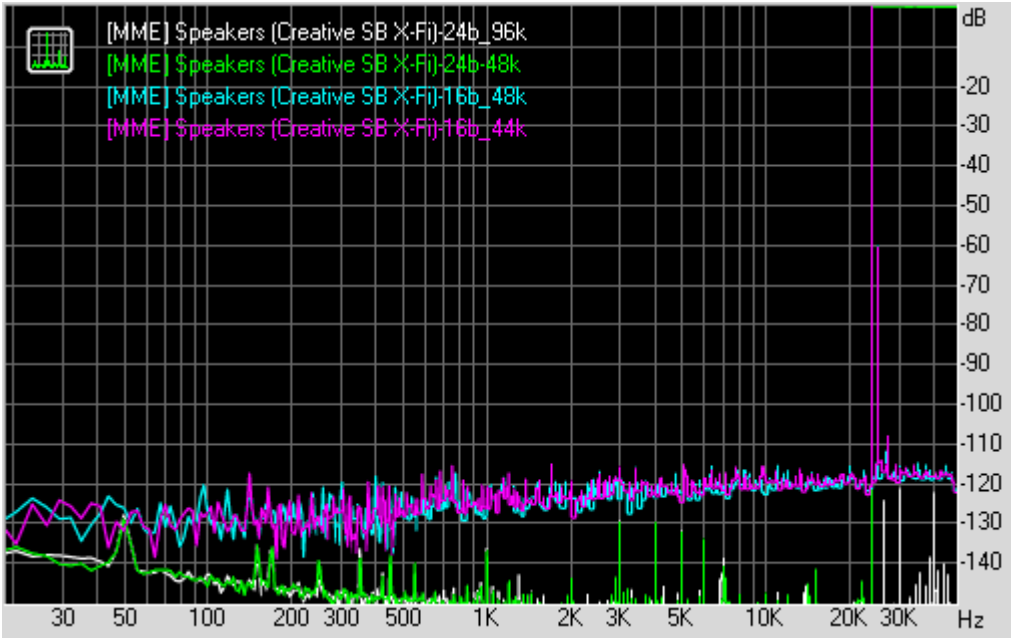
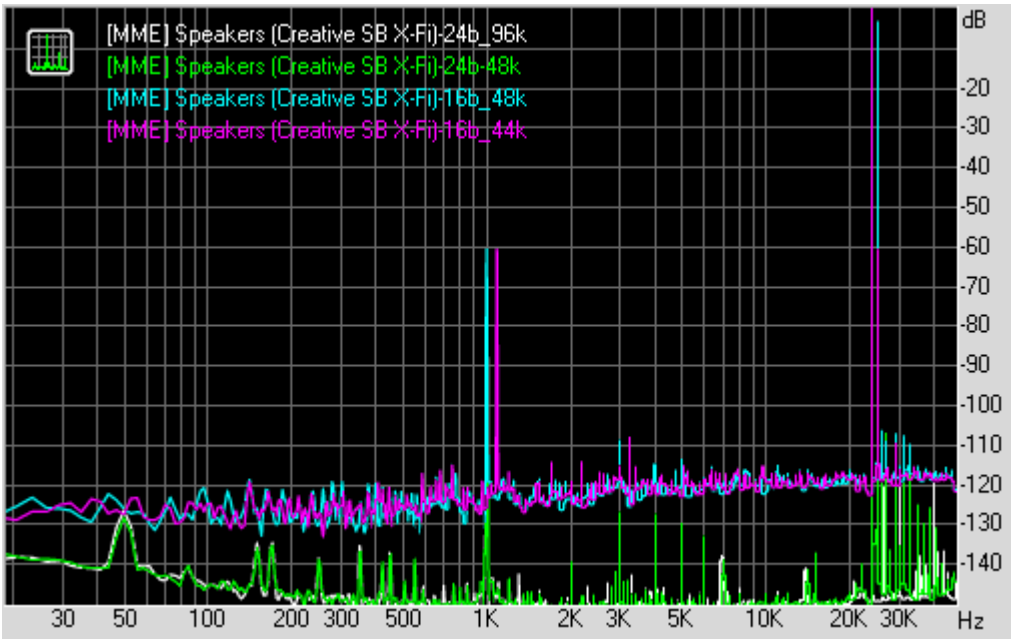
Noise level



Dynamic range



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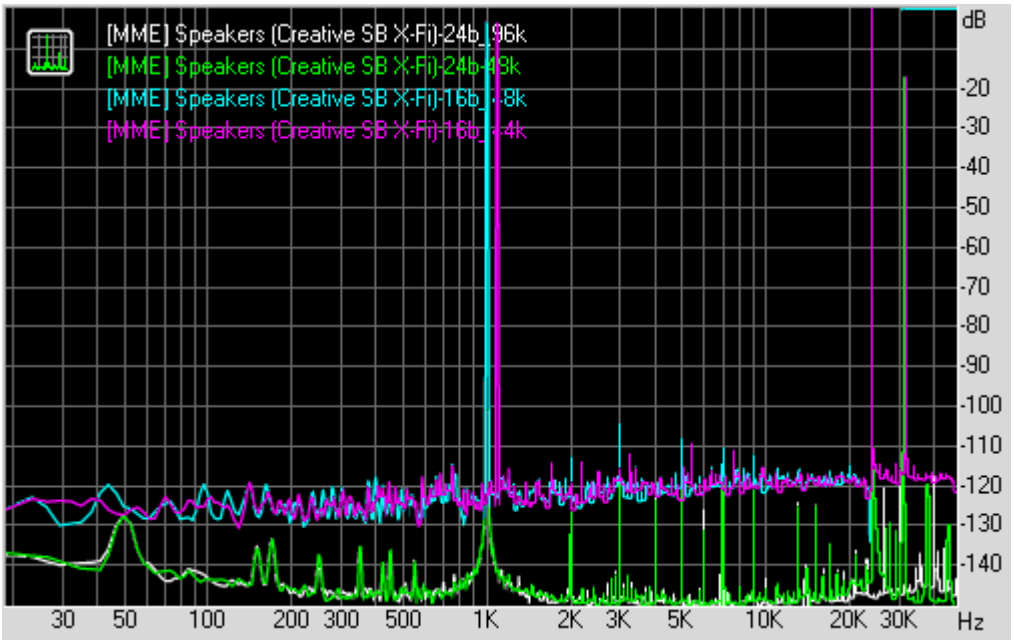
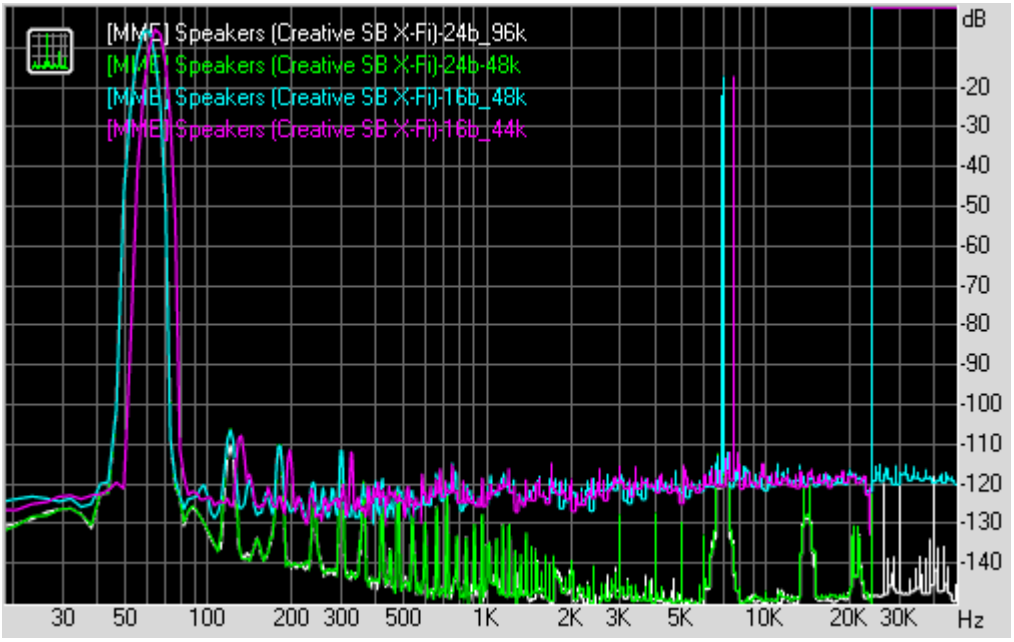
THD + Noise (at -3 dB FS)



Intermodulation distortion



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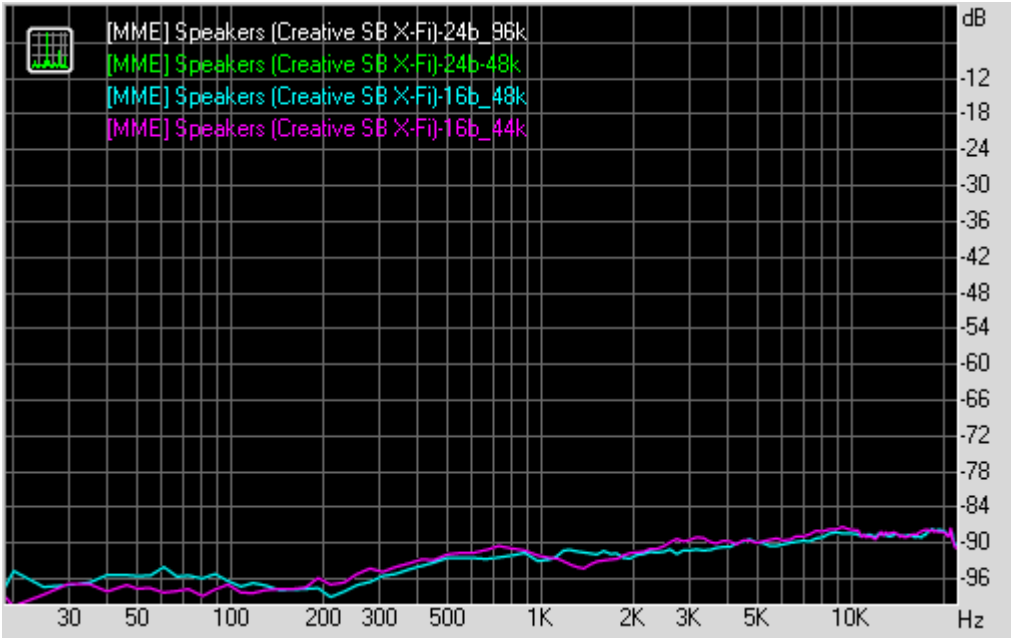
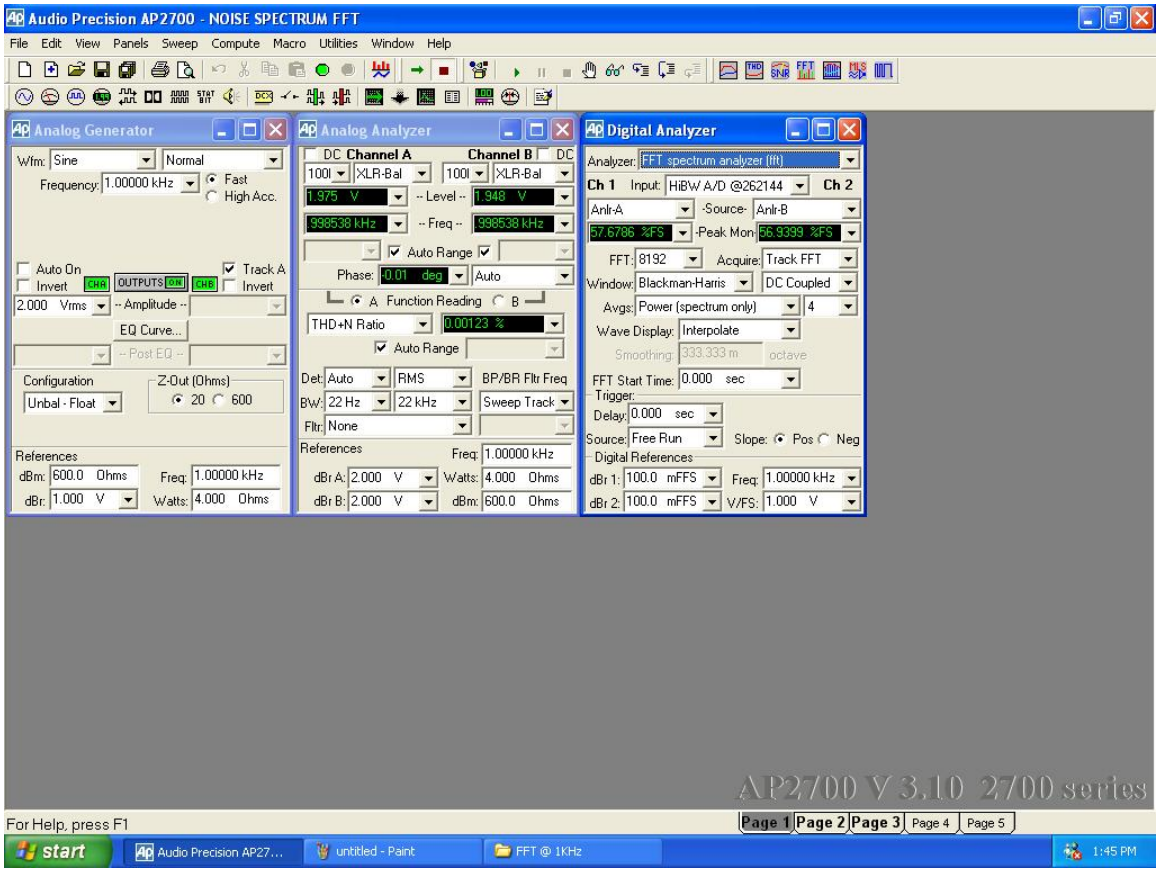
Stereo crosstalk



Graphs were generated by RightMark Audio Analyzer 6.0

ANNEX - Audio Precision AP2700 results

FTT @ 1kHz



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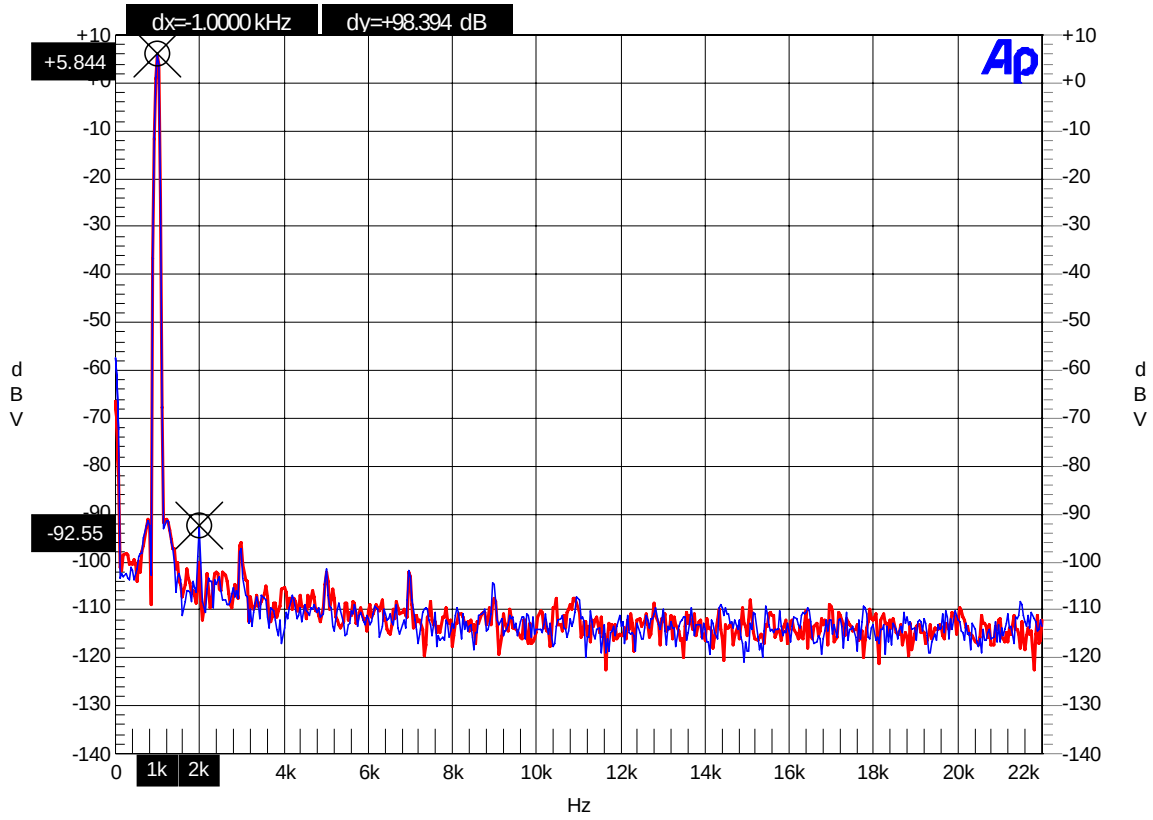
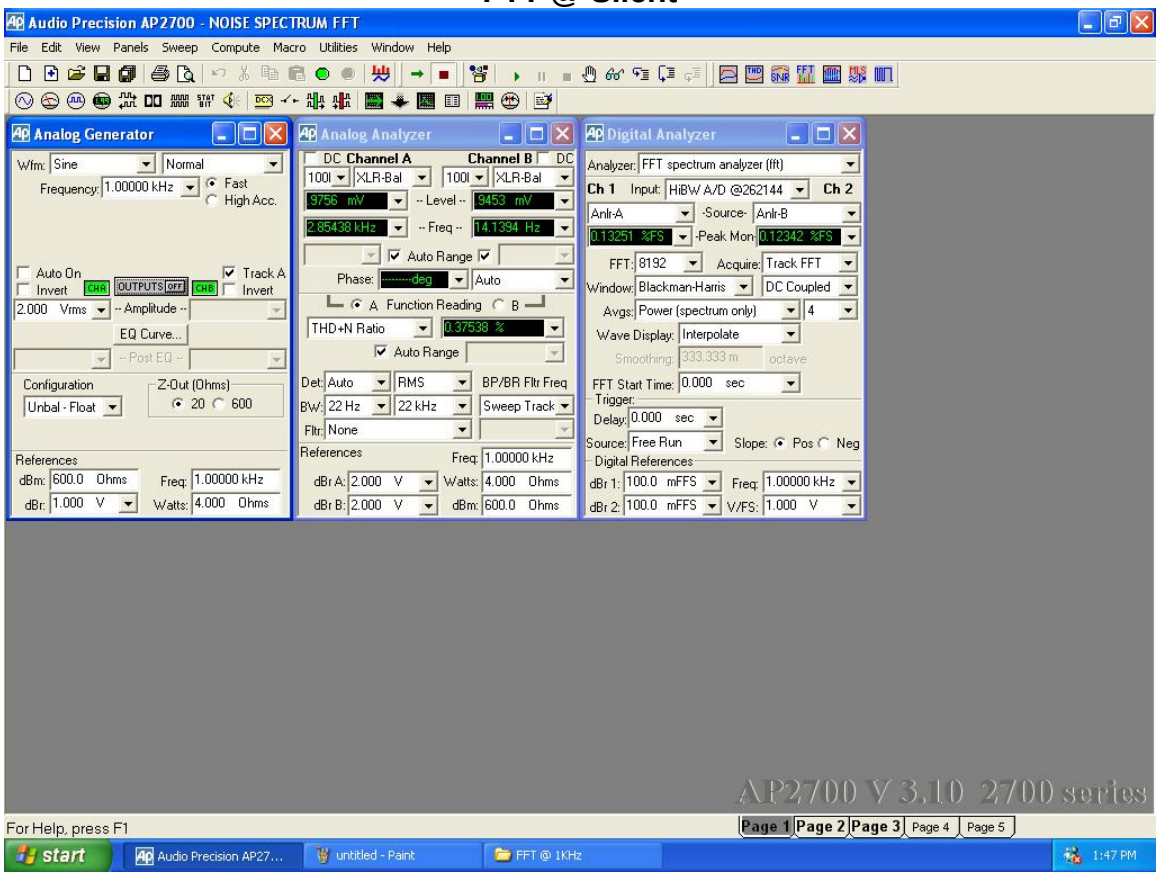
Audio Precision FFT22 AMP1(dBV) vs FREQ(Hz) 12/30/09 13:43:20

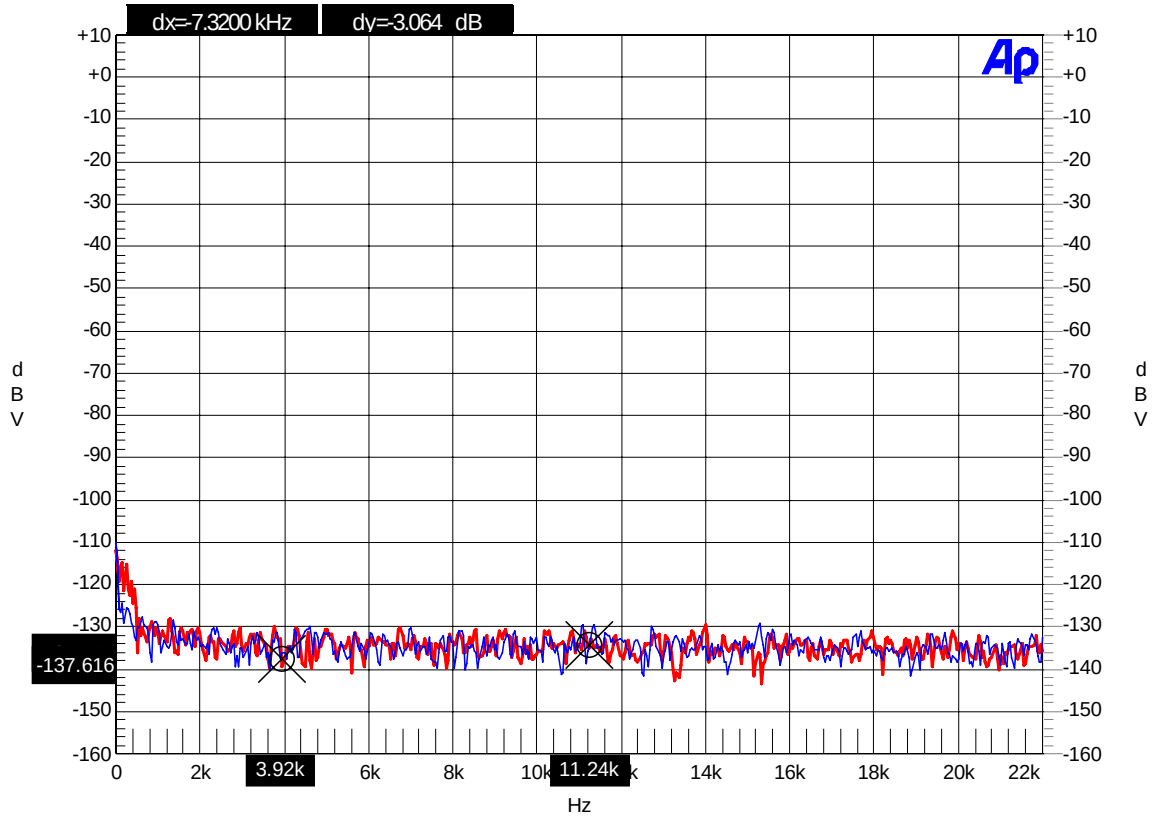


Sound Blaster® X-Fi® RMAA Testing Methodology and Results

FTT @ Silent

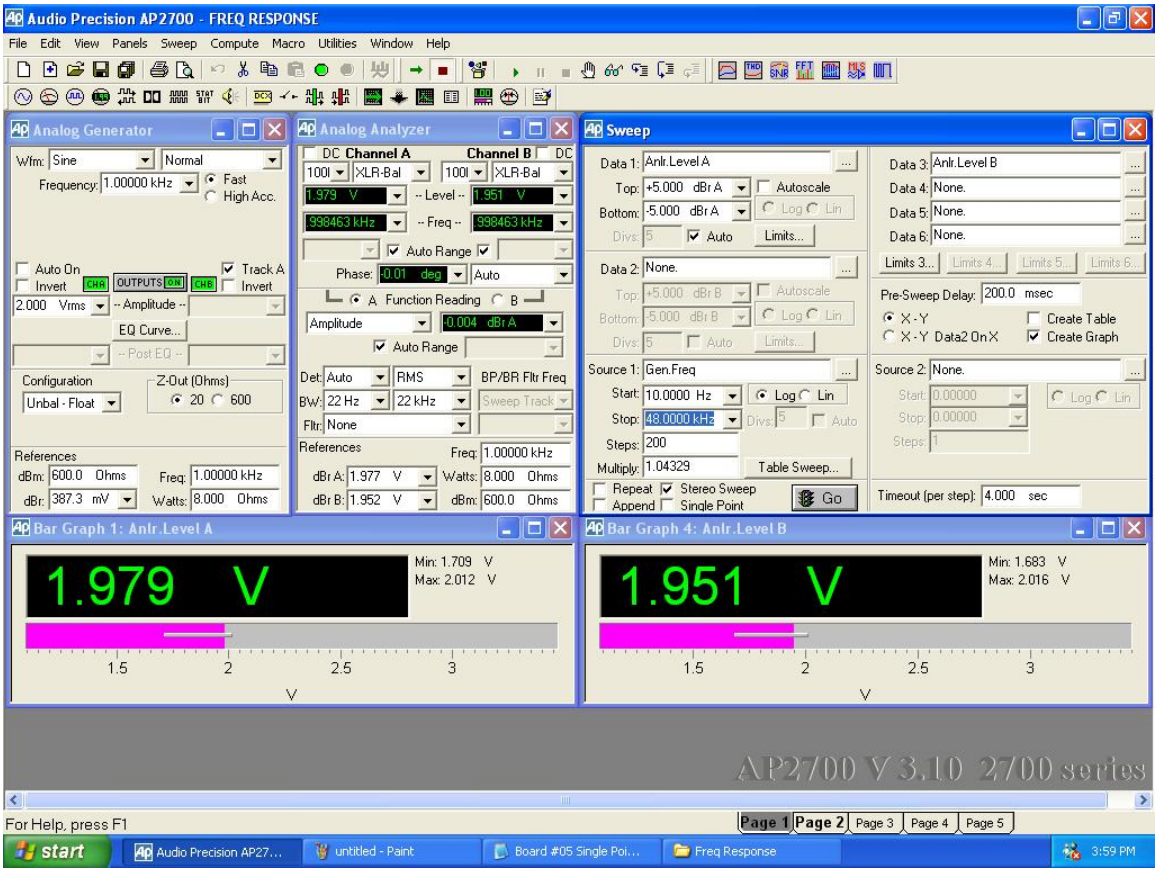


Audio Precision FFT22 AMP1(dBV) vs FREQ(Hz) 12/30/09 13:46:39



Sound Blaster® X-Fi® RMAA Testing Methodology and Results

Frequency Response



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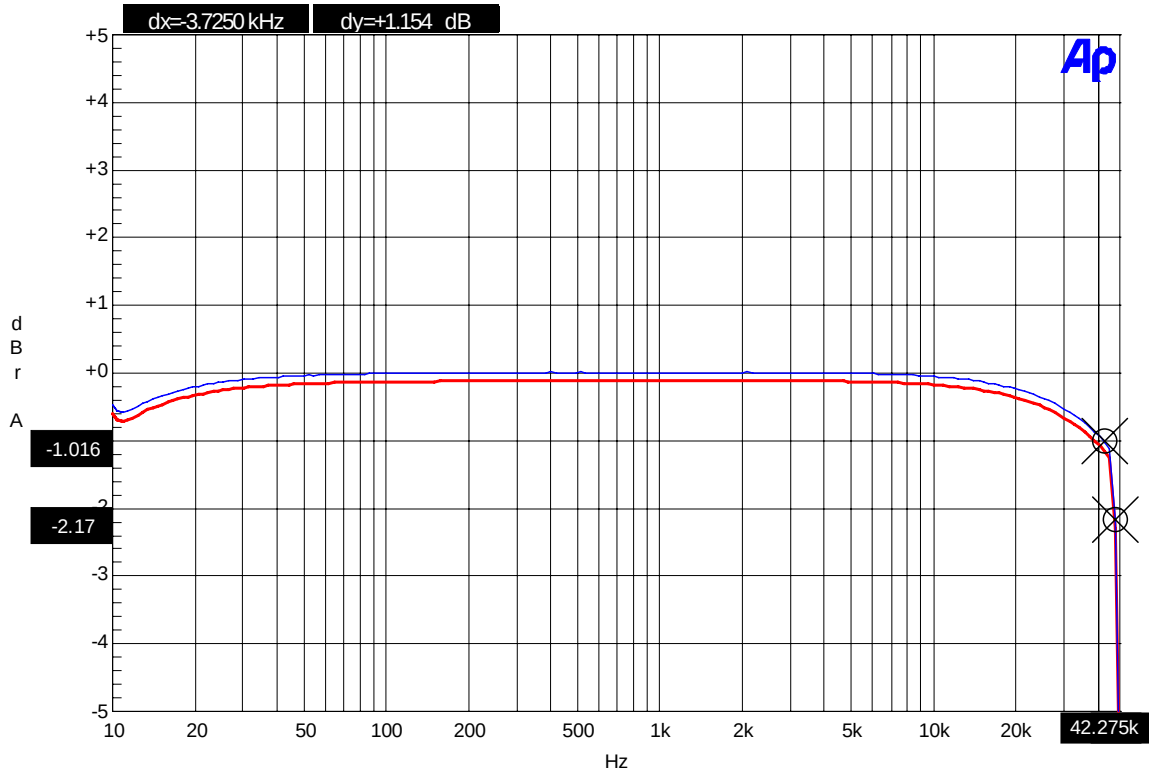
Audio Precision A-A FREQUENCY RESPONSE 12/30/09 15:58:53



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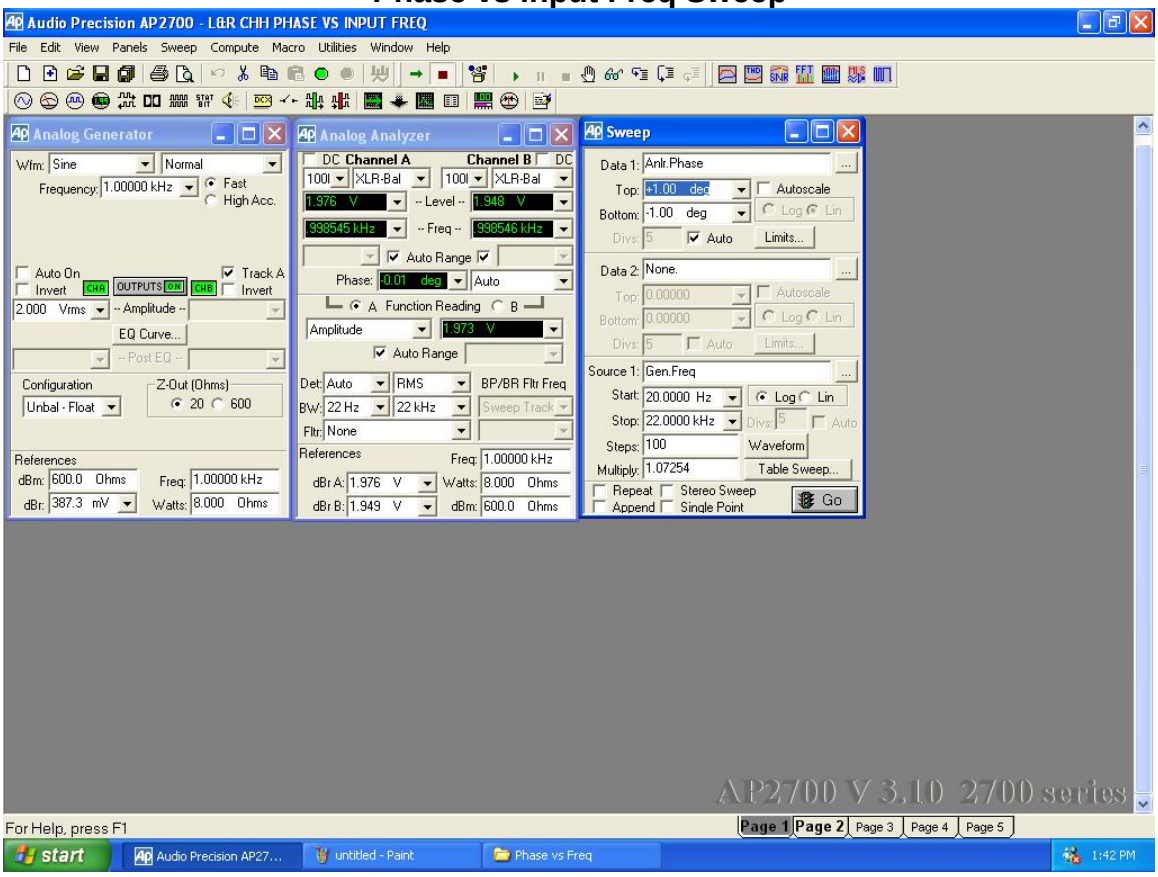
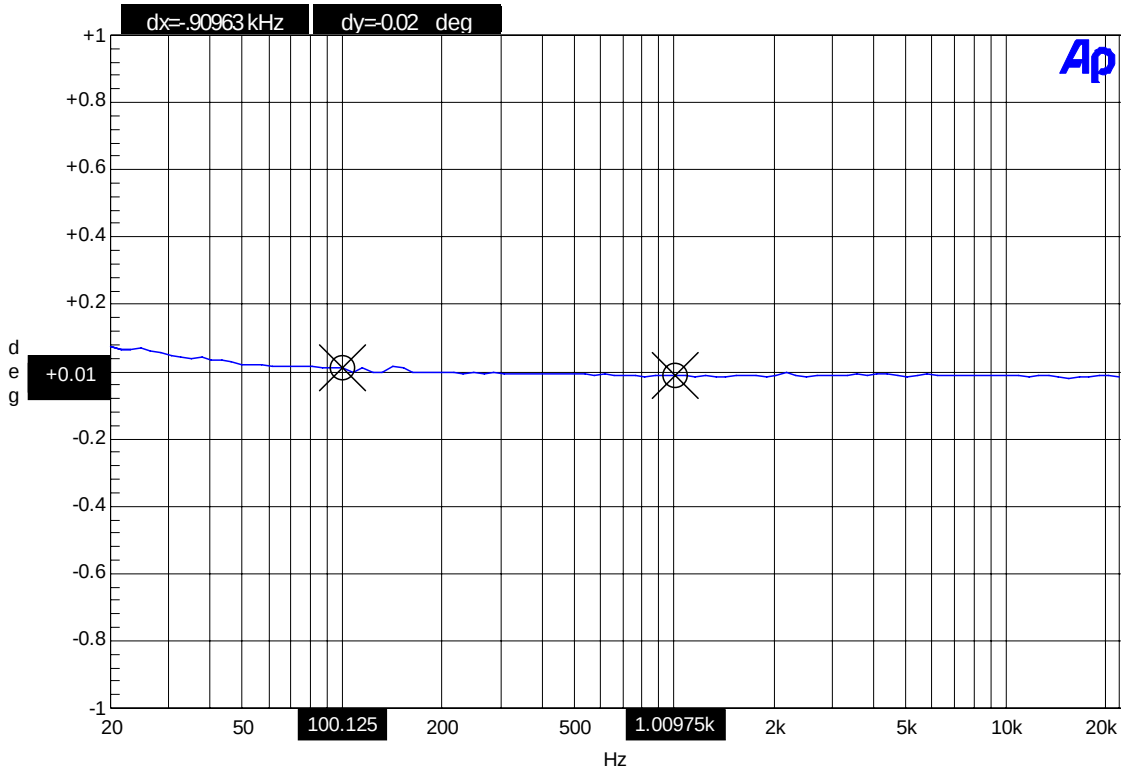
Phase vs Input Freq Sweep

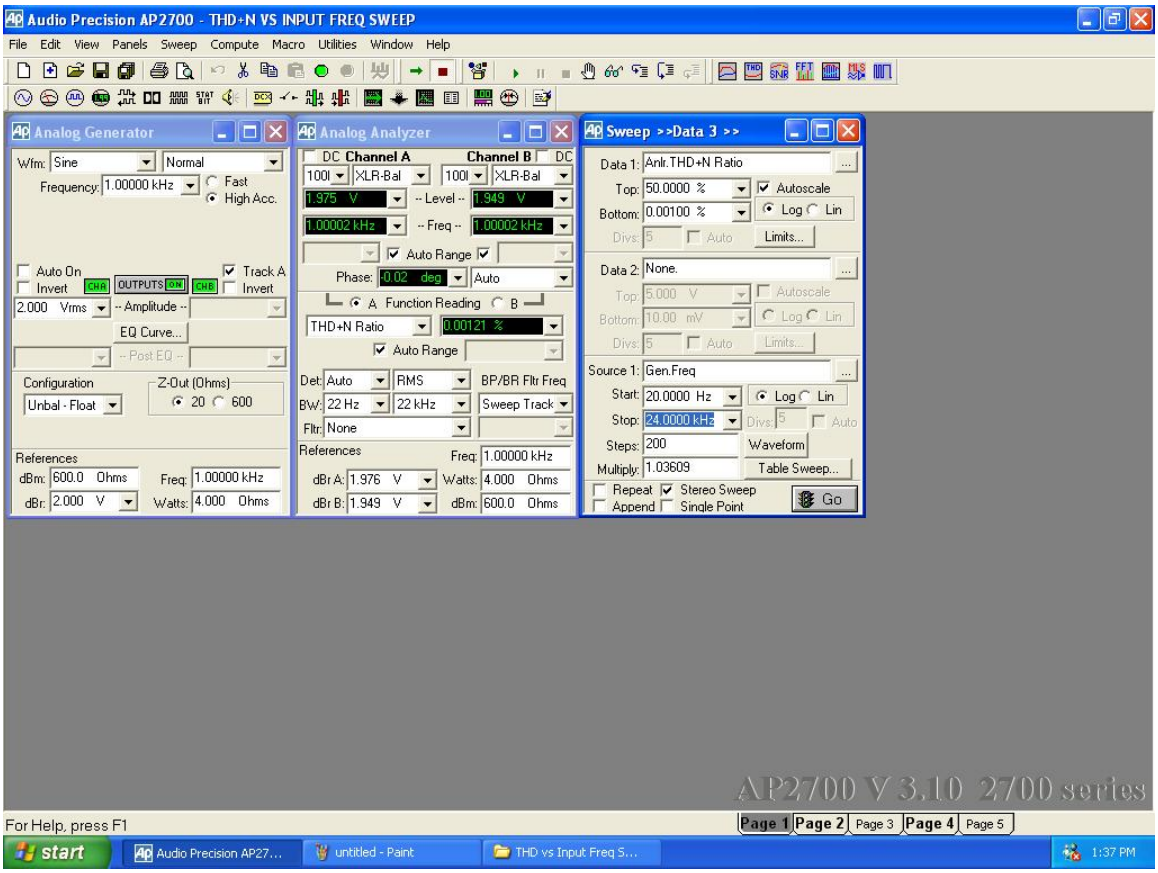


Audio Precision A-A RELATIVE (Interchannel) PHASE vs FREQUENCY 12/30/09 13:41:03

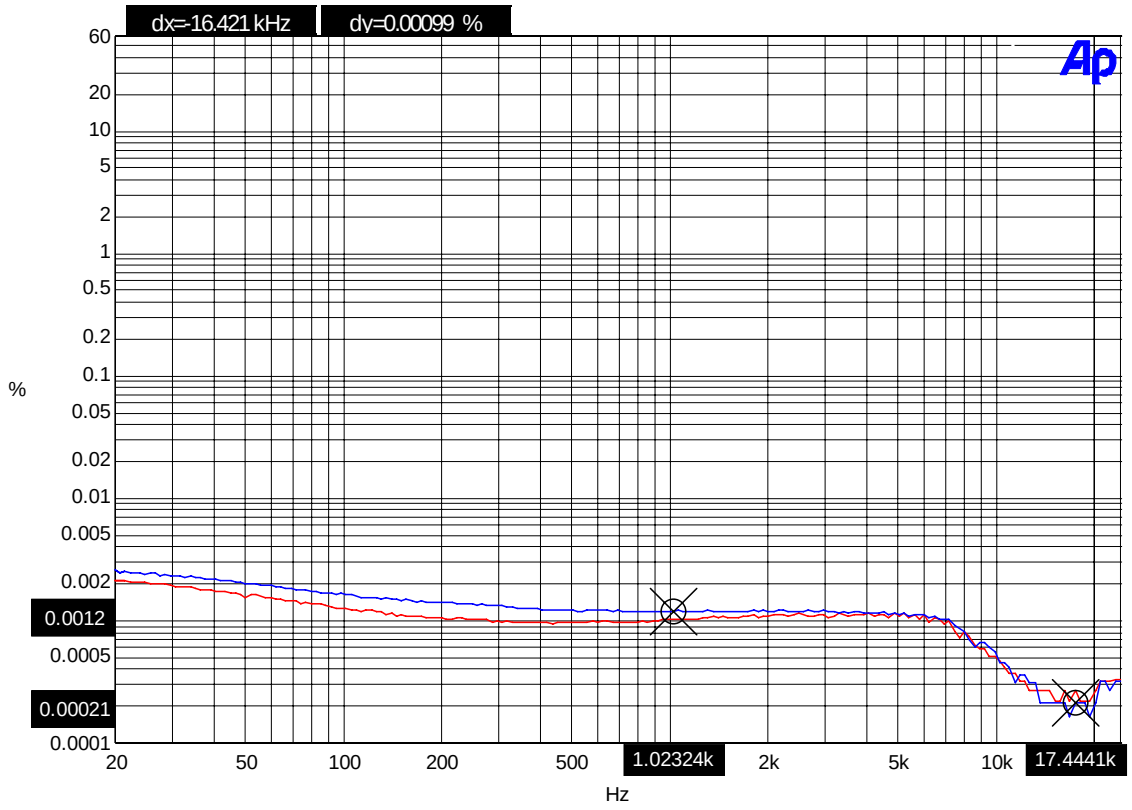


THD vs Input Freq Sweep

Sound Blaster® X-Fi® RMAA Testing Methodology and Results

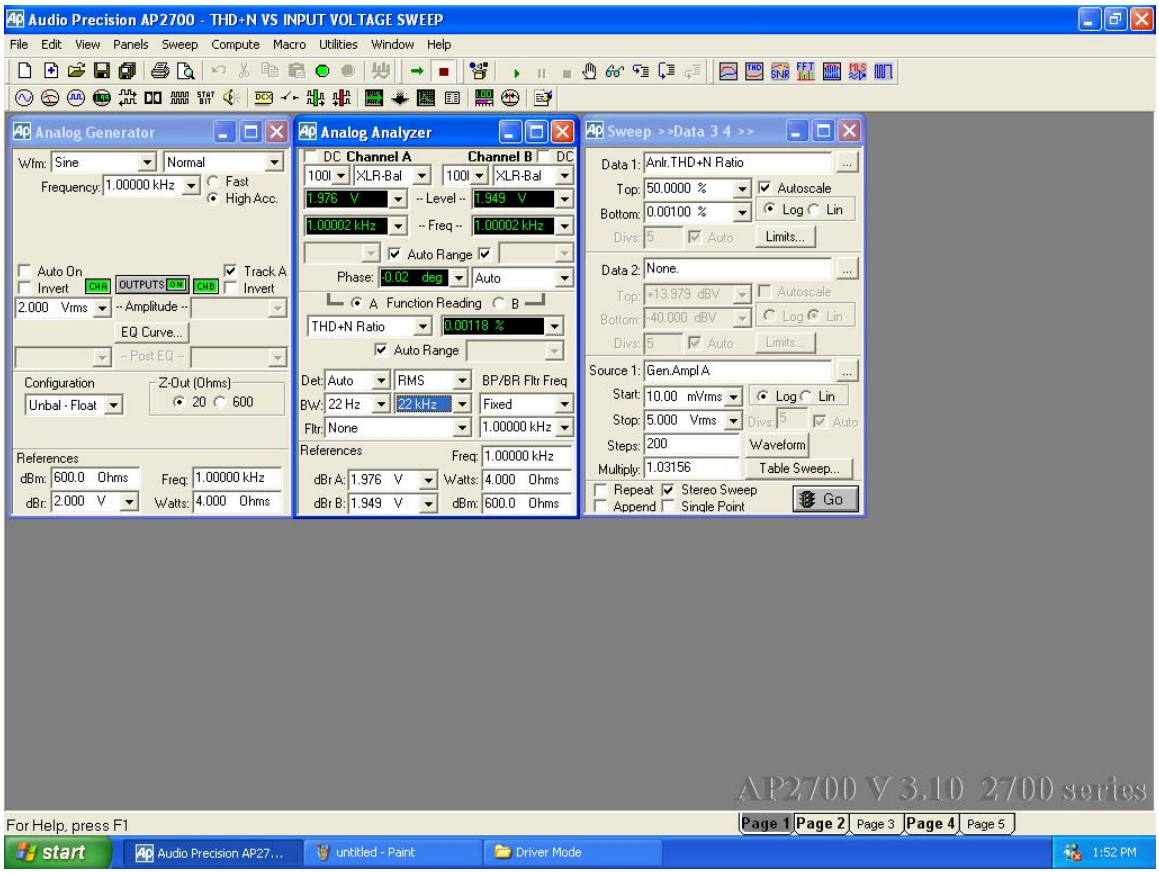


Audio Precision 12/30/09 13:31:25

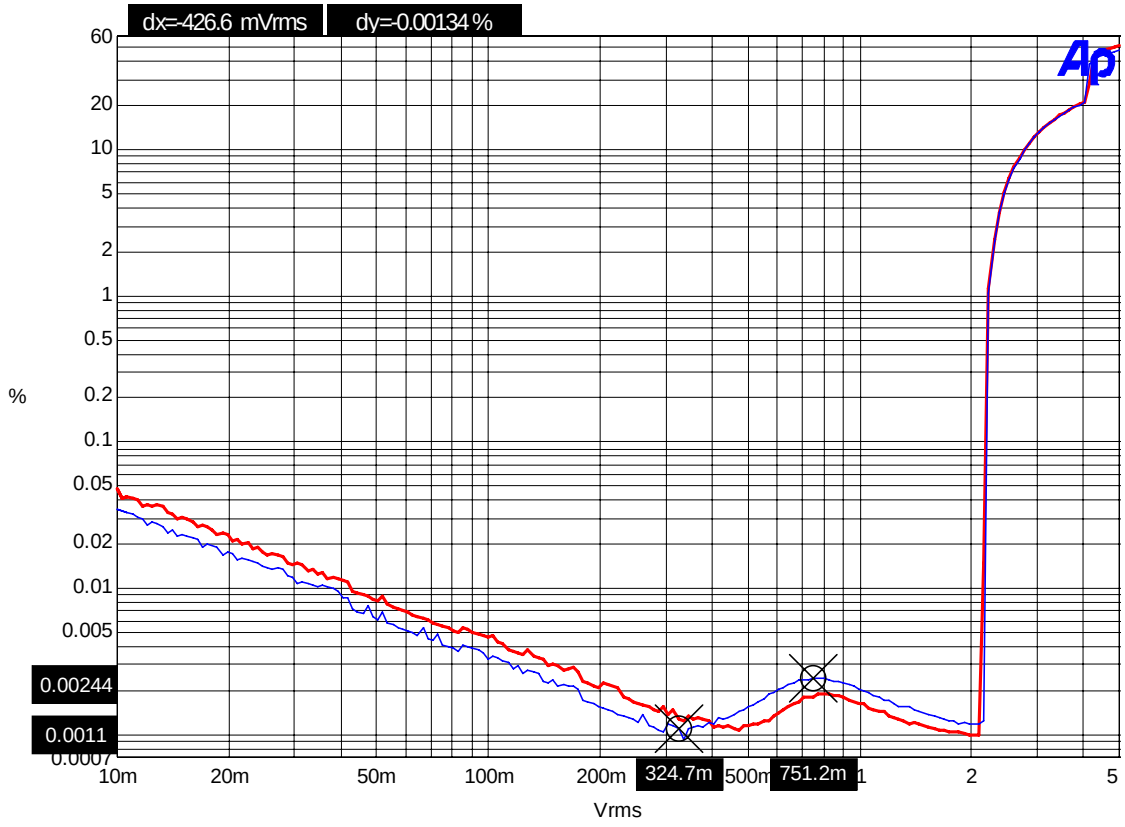


THD vs Input Voltage Sweep

Sound Blaster® X-Fi® RMAA Testing Methodology and Results

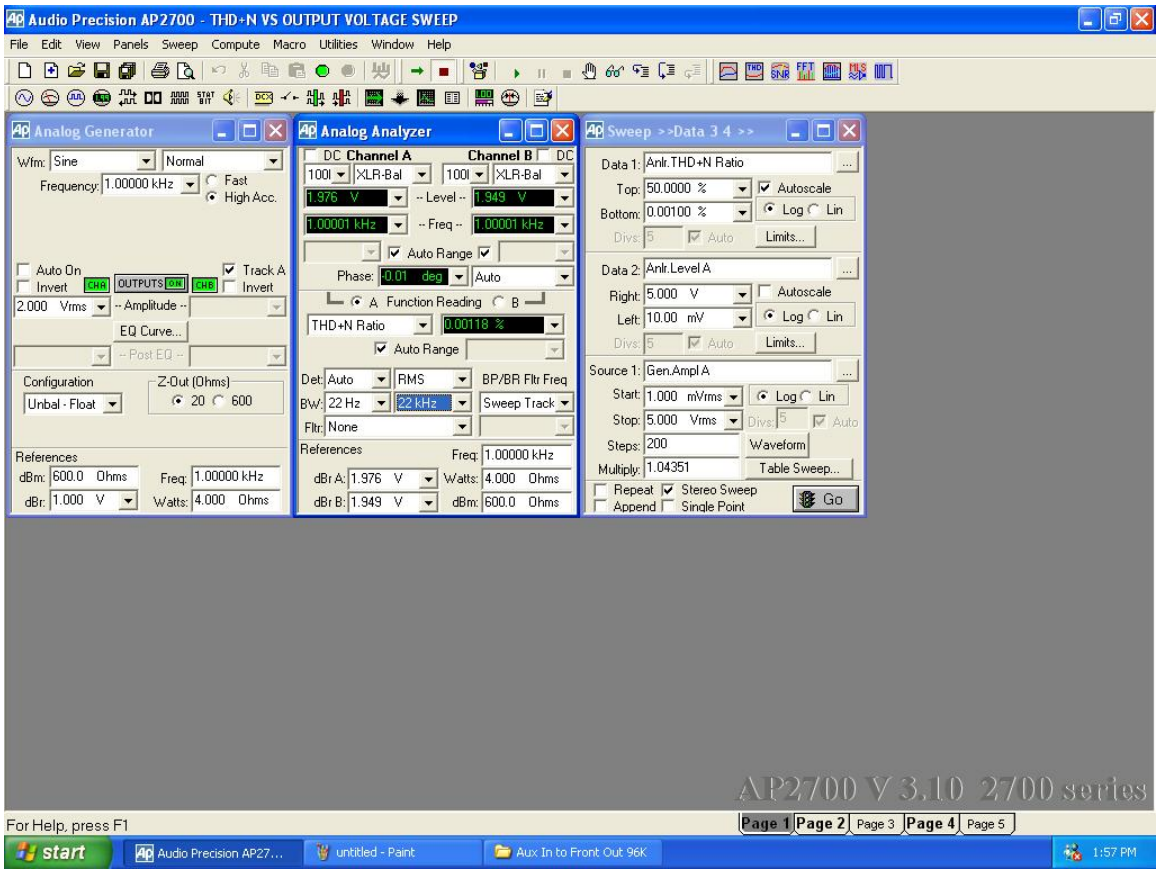


Audio Precision 12/30/09 13:48:57



THD vs Output Voltage Sweep

Sound Blaster® X-Fi® RMAA Testing Methodology and Results



Sound Blaster® X-Fi® RMAA Testing Methodology and Results

Audio Precision 12/30/09 13:53:56