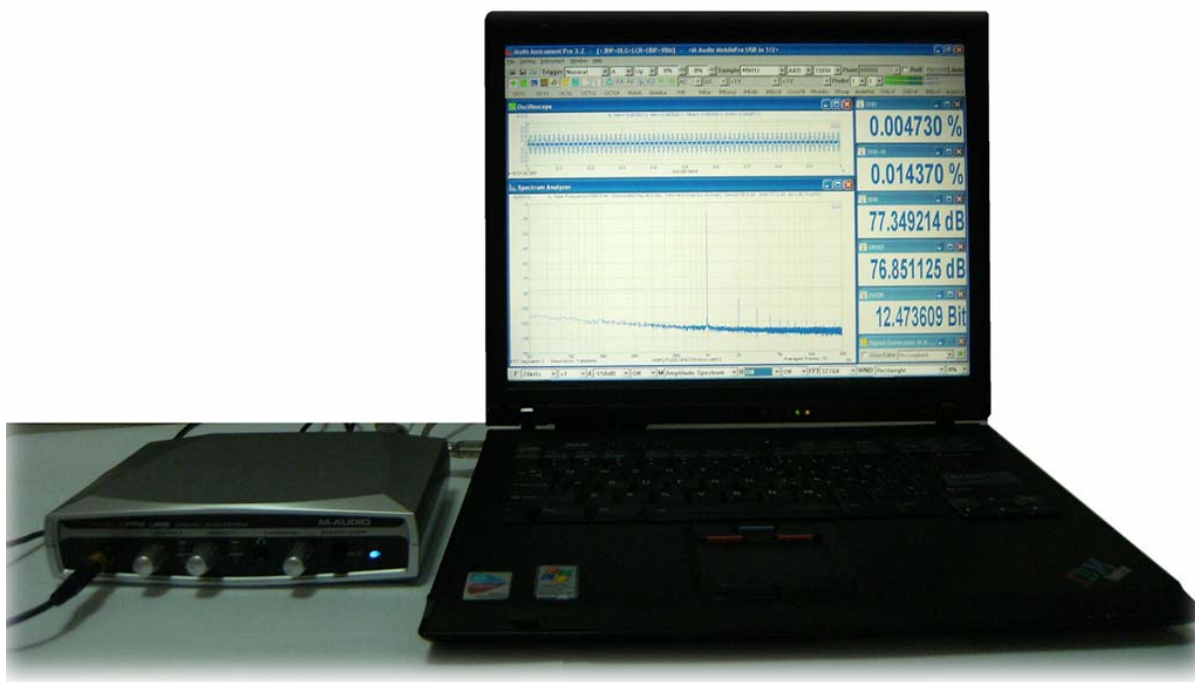


M-Audio MobilePre Test Report using Multi-Instrument



Rev: 01
April 21, 2010

This report is valid only for the particular M-Audio MobilePre unit we tested. The purpose of these tests was not only to evaluate the performance of M-Audio MobilePre, but also to find the conditions under which the best performance of M-Audio MobilePre can be obtained. The information obtained from these tests can be used as a reference for those who want to use M-Audio MobilePre as a test and measurement instrument to measure other devices or signals.

Note: VIRTINS TECHNOLOGY reserves the right to make modifications to this document at any time without notice. This document may contain typographical errors.

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1. Test Setup

- (1) M-Audio MobilePre USB Audio Interface (www.m-audio.com), Driver Version: 5.10.00.5128.
- (2) IBM ThinkPad R51 Laptop PC with Intel Pentium M processor 1.60 GHz, , 248M RAM, 32-bit Windows XP Professional SP2.
- (3) Multi-Instrument 3.2 (Full version, Build 3.2.0.3). (21-day fully functional FREE trial available at: www.virtins.com/MIsetup.exe, or www.multi-instrument.com/MIsetup.exe)

Tips:

- *To reduce the CPU time consumption, in Multi-Instrument, you can set the Trigger Mode to “Auto” if necessary, use integer test frequency in the Signal Generator if possible, and if you are using ASIO driver, you can go to [Setting]>[Display]>and set “ASIO Buffer Size” to “Max” if necessary. These methods may help if you encounter erratic behavior caused by insufficient computing power of the computer.*
- *For THD measurement, use a test frequency with no spectral leakage. If you do not know what the “no spectral leakage” frequency is, just enter the test frequency you want in the Signal Generator and then tick the “no spectral leakage” option. The Signal Generator will then calculate the “no spectral leakage” frequency for you based on the current sampling frequency and FFT size. In most of cases, the “no spectral leakage” frequency is not an integer value. With a “no spectral leakage” test frequency, Rectangle window function should be used in the Spectrum Analyzer. Otherwise, Kaiser 6 window function is recommended. For both cases, the record length of the Oscilloscope should be set to a value equal or greater value than the FFT size to avoid zero padding.*
- *The screenshots of this document are of high resolution. You can zoom in to see all the details.*

2. Output -> Line In

The following tests were carried out by looping back the Output to the Line In. This is an unbalanced connection as the Output is unbalanced.

2.1 Noise Level

Test Conditions

On M-Audio MobilePre:

- [Output 1/L] was connected to [Input Channel 1 Inst/Line] via a ¼" male to ¼" male TRS cable. As [Output 1/L] is unbalanced, this connection is unbalanced.
- [Output 2/R] was connected to [Input Channel 2 Inst/Line] via a ¼" male to ¼" male TRS cable. As [Output 2/R] is unbalanced, this connection is unbalanced.
- The knobs for [Input Channel 1 Inst/Line] and [Input Channel 2 Inst/Line] were at the 5th mark roughly (1st: minimum, 27th: maximum), the rest of the knobs on the panel were set to minimum.
- Phantom Power: Off
- Input Gain: 0 dB (via its software control panel)
- Direct Monitor: Off (via its software control panel)
- Output Volume: 0dB (via its software control panel)

On Laptop:

Powered by its AC adapter.

On Windows Control Panel:

- [Sounds and Audio Devices]>[Sound Recording]>[M-Audio MobilePre USB]: Not activated.
- [Sounds and Audio Devices]>[Sound Playback]>[M-Audio MobilePre USB]>[Wave]: 100%

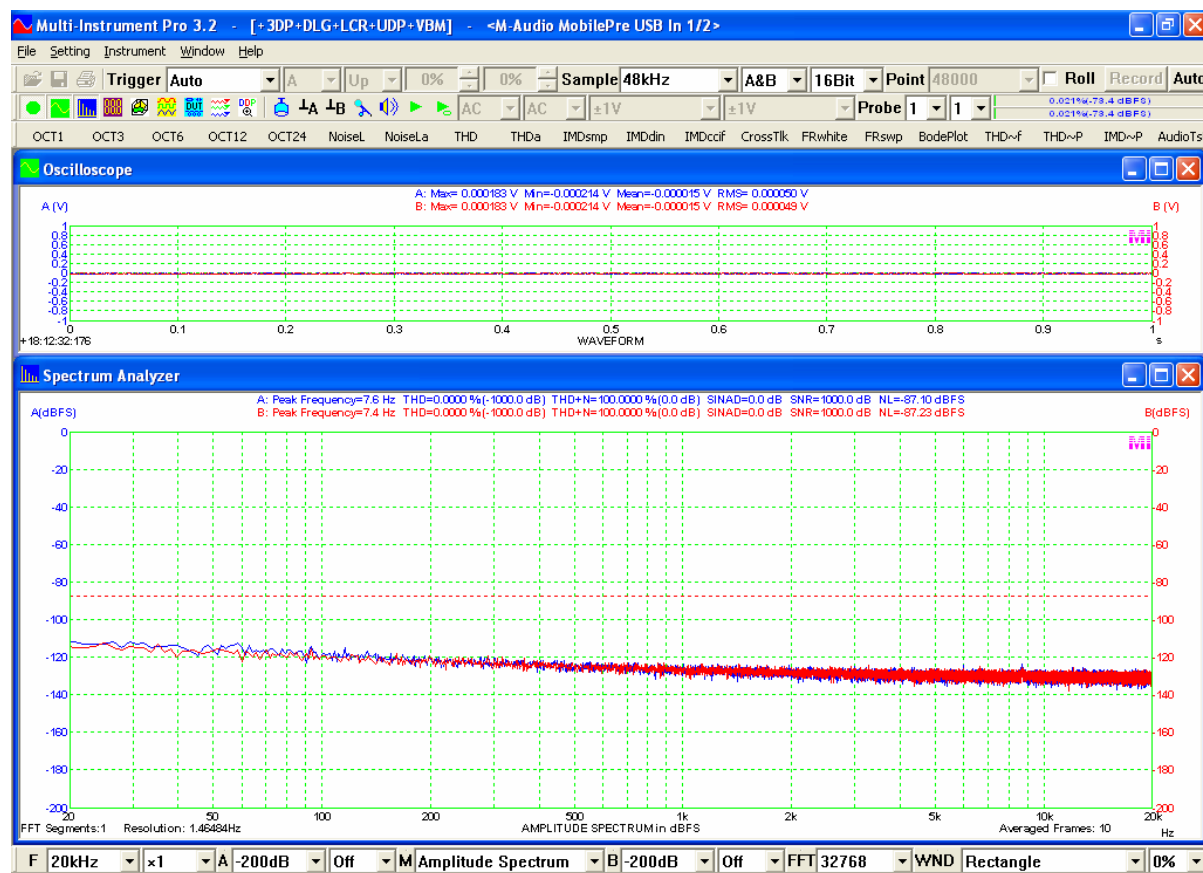
In Multi-Instrument:

- MME Driver
- Sampling Rate: 48 kHz
- Sampling Bit Resolution: 16 Bit
- Sampling Channels: A&B (stereo)
- Record Length: 48000
- FFT Size: 32768
- Window Function: Rectangle
- Test Tone: No signal
- Noise Measurement Range: 20~20 kHz
- Linear average: 10 frames

Test Results

Please refer to the Multi-Instrument manual for a clear definition of the following parameters.

Noise Level (no signal): -87.1 dBFS (represented by the dotted line in the following screen shot)



2.2 THD, THD+N, SNR, SINAD, ENOB, Noise Level

Test Conditions

On M-Audio MobilePre:

- [Output 1/L] was connected to [Input Channel 1 Inst/Line] via a ¼" male to ¼" male TRS cable. As [Output 1/L] is unbalanced, this connection is unbalanced.
- [Output 2/R] was connected to [Input Channel 2 Inst/Line] via a ¼" male to ¼" male TRS cable. As [Output 2/R] is unbalanced, this connection is unbalanced.
- The knobs for [Input Channel 1 Inst/Line] and [Input Channel 1 Inst/Line] were at the 5th mark roughly (1st: minimum, 27th: maximum), the rest of the knobs on the panel were set to minimum.
- Phantom Power: Off
- Input Gain: 0 dB (via its software control panel)
- Direct Monitor: Off (via its software control panel)
- Output Volume: 0dB (via its software control panel)

On Laptop:

Powered by its AC adapter.

On Windows Control Panel:

- [Sounds and Audio Devices]>[Sound Recording]>[M-Audio MobilePre USB]: Not activated.
- [Sounds and Audio Devices]>[Sound Playback]>[M-Audio MobilePre USB]>[Wave]: 100%

In Multi-Instrument:

- MME Driver
- Sampling Rate: 48 kHz
- Sampling Bit Resolution: 16 Bit
- Sampling Channels: A&B (stereo)
- Record Length: 48000
- FFT Size: 32768
- Window Function: Rectangle
- Test Tone: Sine, 1000.4882812 Hz
- Harmonic Distortion and Noise Measurement Range: 20~20 kHz
- Linear average: 10 frames

Test Results

Please refer to the Multi-Instrument manual for a clear definition of the following parameters. They were measured at peak level: -6.3 dBFS.

THD (1kHz, -6.3dBFS): 0.00473% (-86.5 dB)

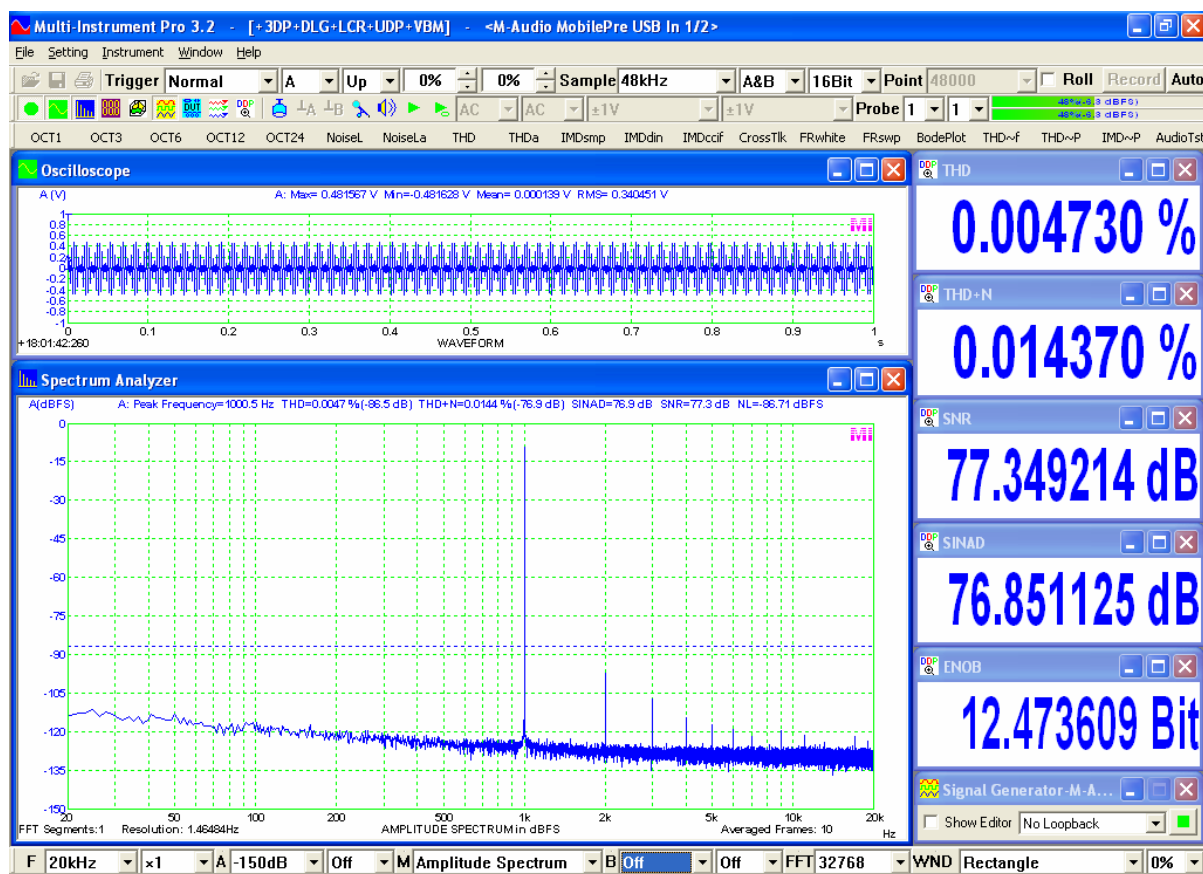
THD+N (1kHz, -6.3dBFS): 0.01437% (-76.9 dB)

SINAD (1kHz, -6.3dBFS): 76.9 dB

SNR (1kHz, -6.3dBFS): 77.3 dB

ENOB (1kHz, -6.3dBFS): 12.47 Bit

Noise Level (1kHz, -6.3dBFS): -86.7 dBFS (represented by the dotted line in the following screen shot)



Other Test Results:

It has been found through additional tests that:

- The combination of the input gain and output volume in the above test were optimized in order to obtain the best results. Other combination may make the above results worse.
- Changing the laptop’s power supply from the AC adapter to its internal battery does not have discernible effect on the above results.
- Applying A-weighting profile will make the THD+N, SNR, SINAD, ENOB, Noise Level a little better.

2.3 IMD

Test Conditions

On M-Audio MobilePre:

- [Output 1/L] was connected to [Input Channel 1 Inst/Line] via a ¼” male to ¼” male TRS cable. As [Output 1/L] is unbalanced, this connection is unbalanced.
- [Output 2/R] was connected to [Input Channel 2 Inst/Line] via a ¼” male to ¼” male TRS cable. As [Output 2/R] is unbalanced, this connection is unbalanced.

- The knobs for [Input Channel 1 Inst/Line] and [Input Channel 1 Inst/Line] were at the 5th mark roughly (1st: minimum, 27th: maximum), the rest of the knobs on the panel were set to minimum.
- Phantom Power: Off
- Input Gain: 0 dB (via its software control panel)
- Direct Monitor: Off (via its software control panel)
- Output Volume: 0dB (via its software control panel)

On Laptop:

Powered by its AC adapter.

On Windows Control Panel:

- [Sounds and Audio Devices]>[Sound Recording]>[M-Audio MobilePre USB]: Not activated.
- [Sounds and Audio Devices]>[Sound Playback]>[M-Audio MobilePre USB]>[Wave]: 100%

In Multi-Instrument:

- MME Driver
- Sampling Rate: 48 kHz
- Sampling Bit Resolution: 16 Bit
- Sampling Channels: A&B (stereo)
- Record Length: 48000
- FFT Size: 32768
- Window Function: Kaiser 6
- Linear average: 10 frames

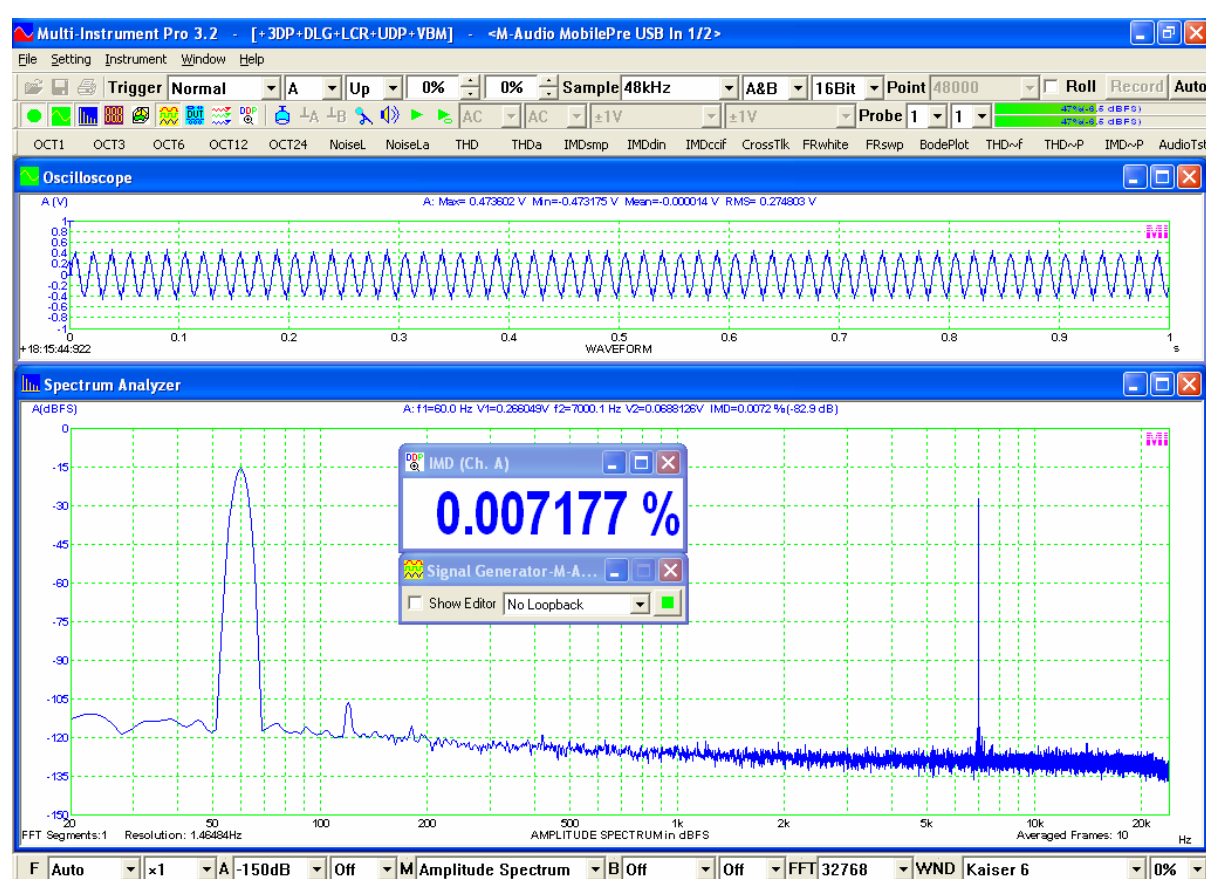
Test Results

Please refer to the Multi-Instrument manual for a clear definition of the following parameters. They were measured at peak level: -6.4 dBFS.

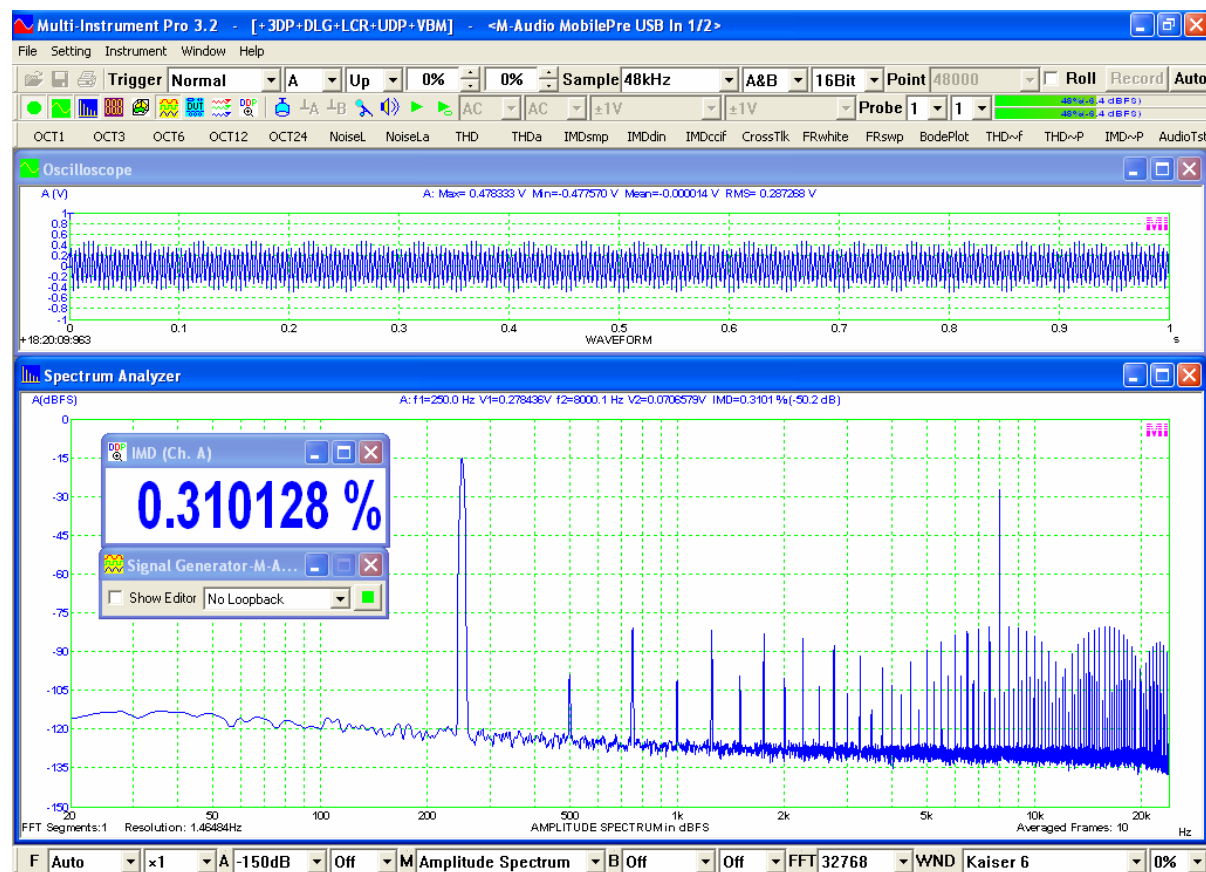
SMPTE IMD (-6.4dBFS) : 0.007177% (-82.9 dB)

DIN IMD (-6.4dBFS): 0.31% (-50.2 dB)

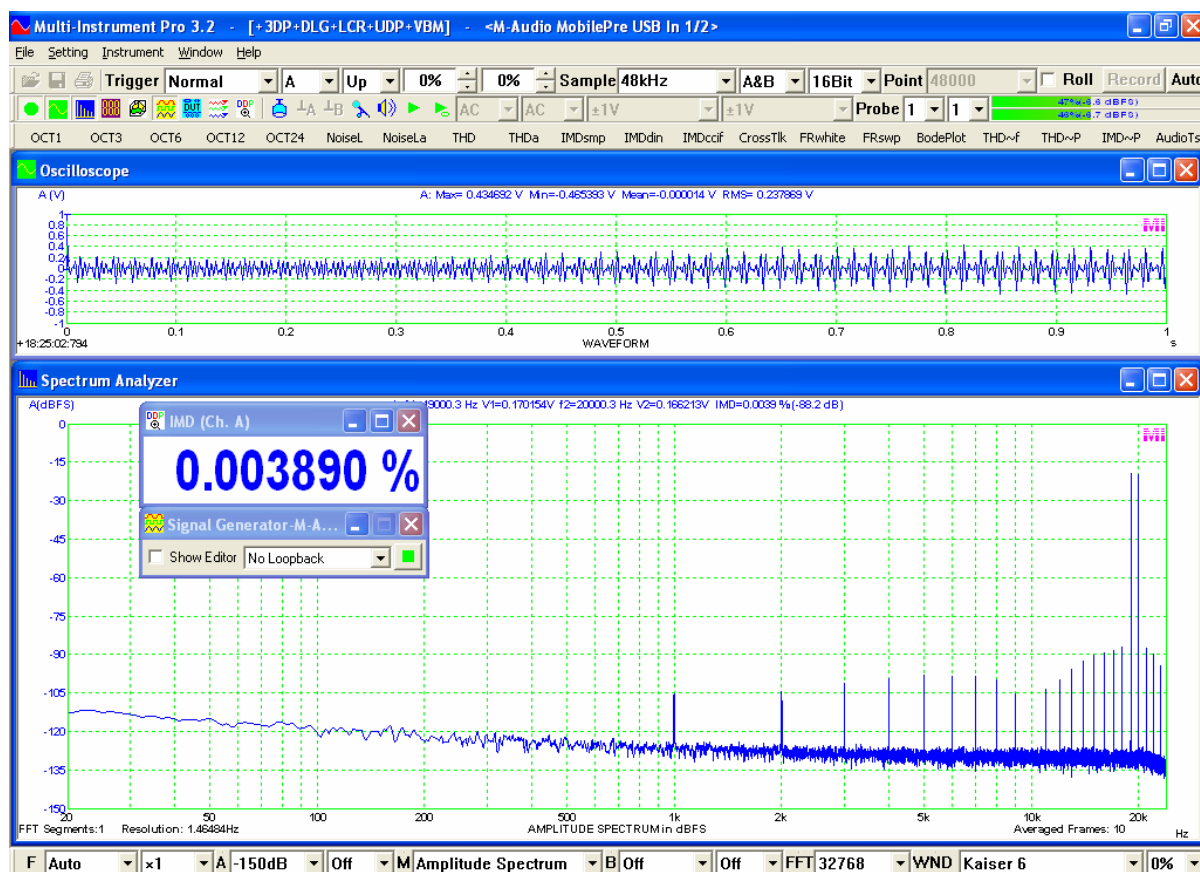
CCIF2 IMD (-6.4dBFS): 0.00389% (-88.2 dB)



SMPTE IMD (Test Tone: 60Hz and 7kHz mixed at an amplitude ratio of 4:1)



DIN IMD (Test Tone: 250Hz and 8kHz mixed at an amplitude ratio of 4:1)



CCIF2 IMD (Test Tone: 19kHz and 20kHz mixed at an amplitude ratio of 1:1)

2.4 Bandwidth

Test Conditions

On M-Audio MobilePre:

- [Output 1/L] was connected to [Input Channel 1 Inst/Line] via a ¼" male to ¼" male TRS cable. As [Output 1/L] is unbalanced, this connection is unbalanced.
- [Output 2/R] was connected to [Input Channel 2 Inst/Line] via a ¼" male to ¼" male TRS cable. As [Output 2/R] is unbalanced, this connection is unbalanced.
- The knobs for [Input Channel 1 Inst/Line] and [Input Channel 1 Inst/Line] were at the 5th mark roughly (1st: minimum, 27th: maximum), the rest of the knobs on the panel were set to minimum.
- Phantom Power: Off
- Input Gain: 0 dB (via its software control panel)
- Direct Monitor: Off (via its software control panel)
- Output Volume: 0dB (via its software control panel)

On Laptop:

Powered by its AC adapter.

On Windows Control Panel:

- [Sounds and Audio Devices]>[Sound Recording]>[M-Audio MobilePre USB]: Not activated.
- [Sounds and Audio Devices]>[Sound Playback]>[M-Audio MobilePre USB]>[Wave]: 100%

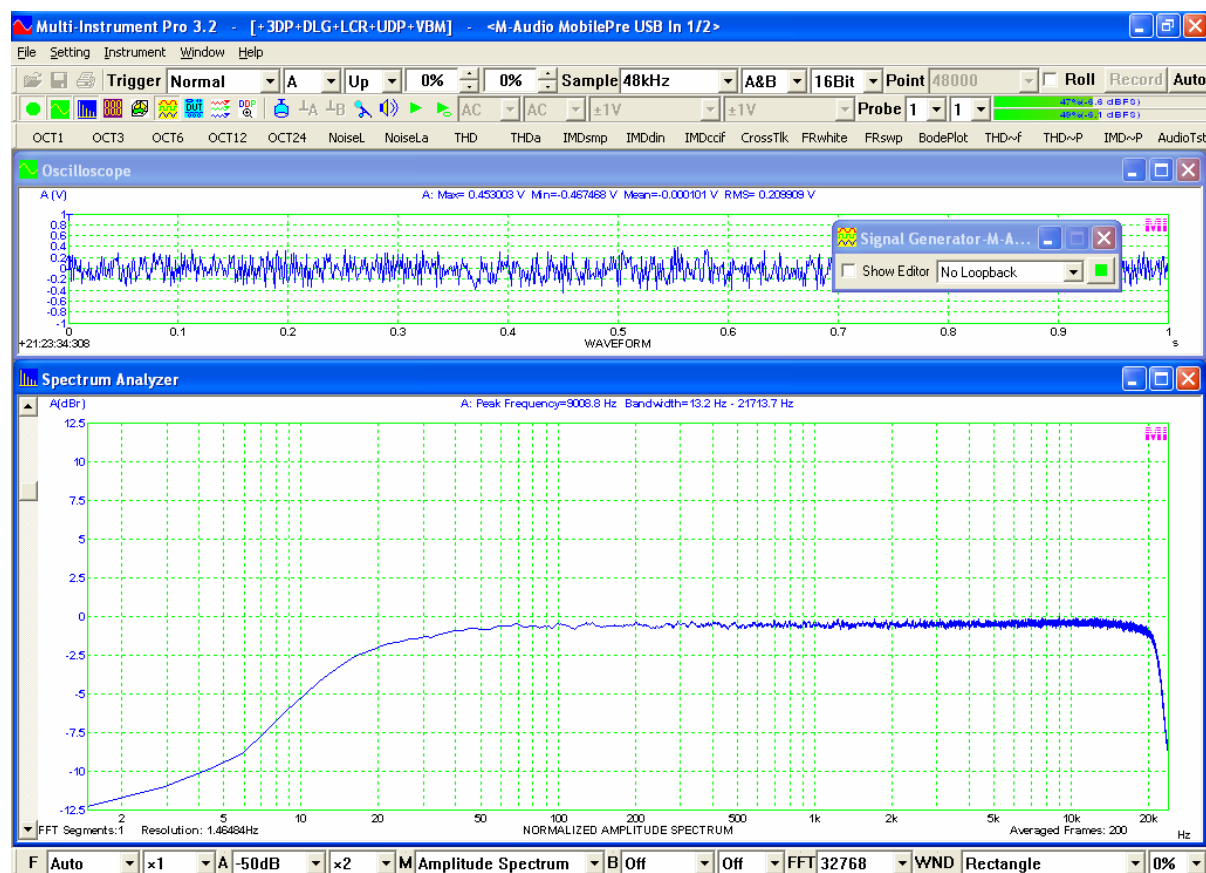
In Multi-Instrument:

- MME Driver
- Sampling Bit Resolution: 16 Bit
- Sampling Channels: A&B (stereo)
- Window Function: Rectangle
- Test Tone: White Noise
- Linear average: 200 frames

Test Results

Please refer to the Multi-Instrument manual for a clear definition of the following parameters.

Bandwidth (-3dB) at the sampling rate of 48kHz: 13.2Hz ~21714Hz



2.5 Crosstalk

Test Conditions

On M-Audio MobilePre:

- [Output 1/L] was connected to [Input Channel 1 Inst/Line] via a ¼" male to ¼" male TRS cable. As [Output 1/L] is unbalanced, this connection is unbalanced.
- [Output 2/R] was connected to [Input Channel 2 Inst/Line] via a ¼" male to ¼" male TRS cable. As [Output 2/R] is unbalanced, this connection is unbalanced.
- The knobs for [Input Channel 1 Inst/Line] and [Input Channel 2 Inst/Line] were at the 5th mark roughly (1st: minimum, 27th: maximum), the rest of the knobs on the panel were set to minimum.
- Phantom Power: Off
- Input Gain: 0 dB (via its software control panel)
- Direct Monitor: Off (via its software control panel)
- Output Volume: 0dB (via its software control panel)

On Laptop:

Powered by its AC adapter.

On Windows Control Panel:

- [Sounds and Audio Devices]>[Sound Recording]>[M-Audio MobilePre USB]: Not activated.
- [Sounds and Audio Devices]>[Sound Playback]>[M-Audio MobilePre USB]>[Wave]: 100%

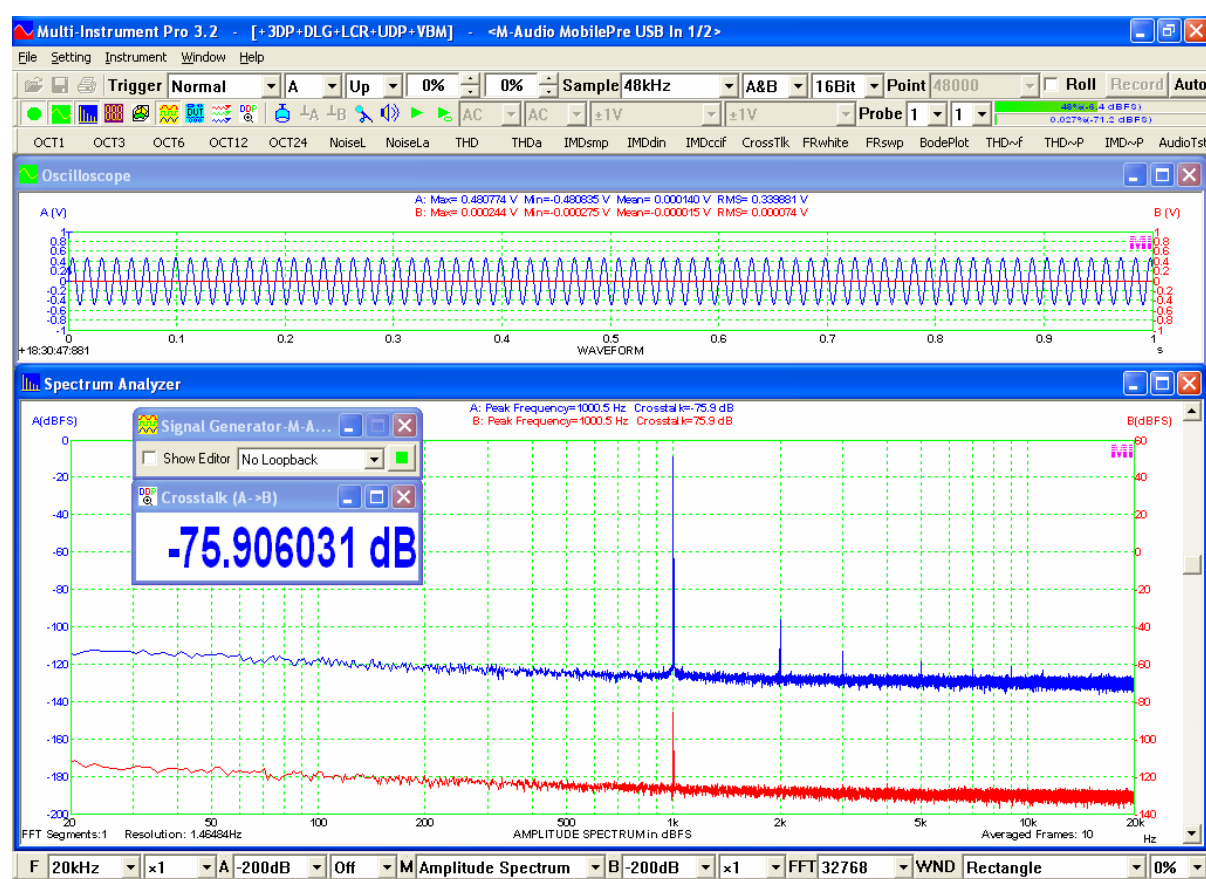
In Multi-Instrument:

- MME Driver
- Sampling Rate: 48 kHz
- Sampling Bit Resolution: 16 Bit
- Sampling Channels: A&B (stereo)
- Record Length: 48000
- FFT Size: 32768
- Window Function: Rectangle
- Test Tone: Channel A: Sine, 1000.4882812 Hz Channel B: No signal
- Linear average: 10 frames

Test Results

Please refer to the Multi-Instrument manual for a clear definition of the following parameters. They were measured at a peak level of -6.4 dBFS.

Crosstalk (1kHz): -75.9 dB



2.6 Dynamic Range

Test Conditions

On M-Audio MobilePre:

- [Output 1/L] was connected to [Input Channel 1 Inst/Line] via a ¼" male to ¼" male TRS cable. As [Output 1/L] is unbalanced, this connection is unbalanced.
- [Output 2/R] was connected to [Input Channel 2 Inst/Line] via a ¼" male to ¼" male TRS cable. As [Output 2/R] is unbalanced, this connection is unbalanced.
- The knobs for [Input Channel 1 Inst/Line] and [Input Channel 1 Inst/Line] were at the 5th mark roughly (1st: minimum, 27th: maximum), the rest of the knobs on the panel were set to minimum.
- Phantom Power: Off
- Input Gain: 0 dB (via its software control panel)
- Direct Monitor: Off (via its software control panel)
- Output Volume: -55dB (via its software control panel)

On Laptop:

Powered by its AC adapter.

On Windows Control Panel:

- [Sounds and Audio Devices]>[Sound Recording]>[M-Audio MobilePre USB]: Not activated.
- [Sounds and Audio Devices]>[Sound Playback]>[M-Audio MobilePre USB]>[Wave]: 100%

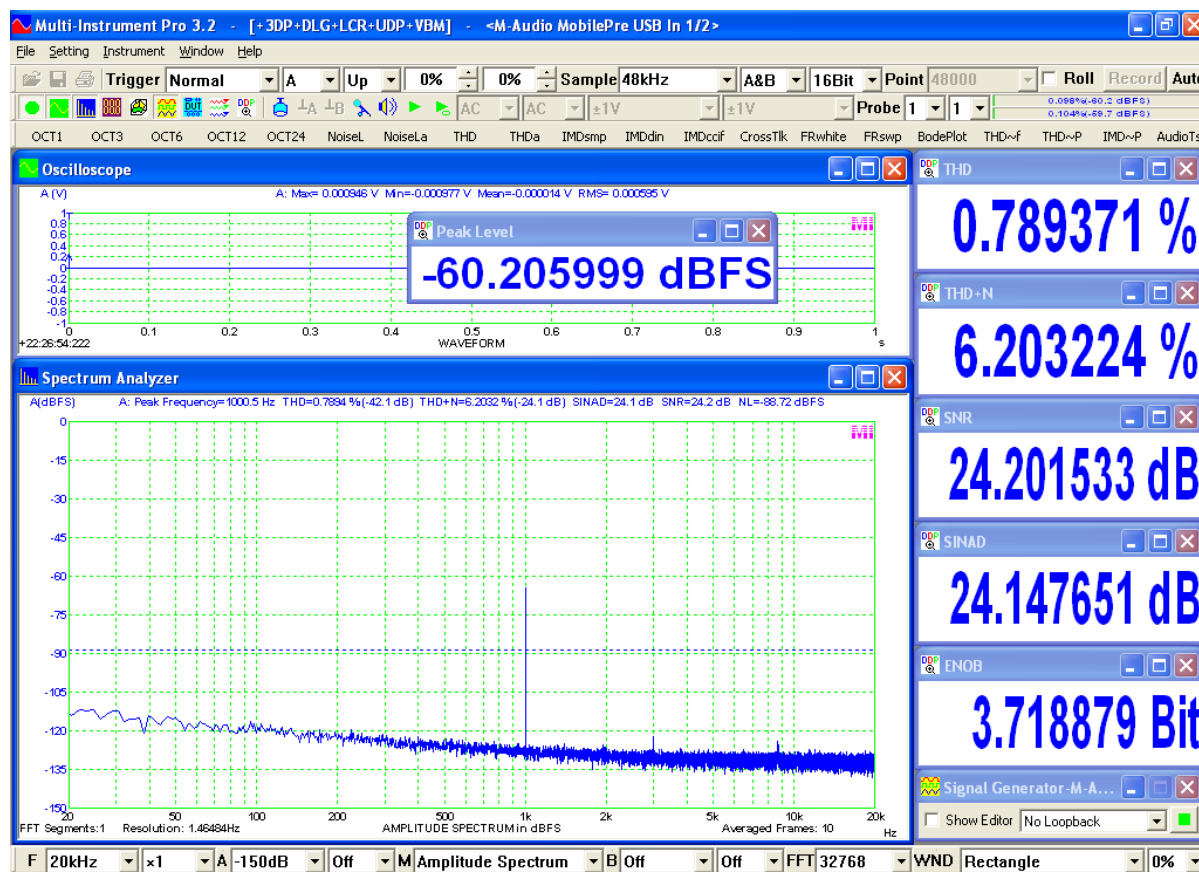
In Multi-Instrument:

- MME Driver
- Sampling Rate: 48 kHz
- Sampling Bit Resolution: 16 Bit
- Sampling Channels: A&B (stereo)
- Record Length: 48000
- FFT Size: 32768
- Window Function: Rectangle
- Test Tone: Sine, 1000.4882812 Hz
- Harmonic Distortion and Noise Measurement Range: 20~20 kHz
- Linear average: 10 frames

Test Results

Please refer to the Multi-Instrument manual for a clear definition of the following parameters. They were measured at peak level: -60 dBFS.

SNR (-60dBFS, 1kHz): 24.2 dB
 Dynamic Range: 24.2+60=84.2 dB



2.7 Gain and Phase Difference between Channels

This test is important if you want to measure the transfer function (Bode plot, or frequency response) of a DUT using the dual-FFT method.

Test Conditions

On M-Audio MobilePre:

- [Output 1/L] was connected to both [Input Channel 1 Inst/Line] and [Input Channel 2 Inst/Line] via an in-house made ¼” male to 2 × ¼” male TRS cable. As [Output 1/L] is unbalanced, this connection is unbalanced.
- [Output 2/R] was not connected.
- The knobs for [Input Channel 1 Inst/Line] and [Input Channel 1 Inst/Line] were at the 5th mark roughly (1st: minimum, 27th: maximum), the rest of the knobs on the panel were set to minimum.
- Phantom Power: Off
- Input Gain: 0 dB (via its software control panel)
- Direct Monitor: Off (via its software control panel)
- Output Volume: -0dB (via its software control panel)

On Laptop:

Powered by its AC adapter.

On Windows Control Panel:

- [Sounds and Audio Devices]>[Sound Recording]>[M-Audio MobilePre USB]: Not activated.
- [Sounds and Audio Devices]>[Sound Playback]>[M-Audio MobilePre USB]>[Wave]: 100%

In Multi-Instrument:

- MME Driver
- Sampling Rate: 48 kHz
- Sampling Bit Resolution: 16 Bit
- Sampling Channels: A&B (stereo)
- Record Length: 48000
- FFT Size: 1024
- Window Function: Rectangle
- Test Tone: White Noise
- Measurement Range: 0~24 kHz
- Linear average: 50 frames

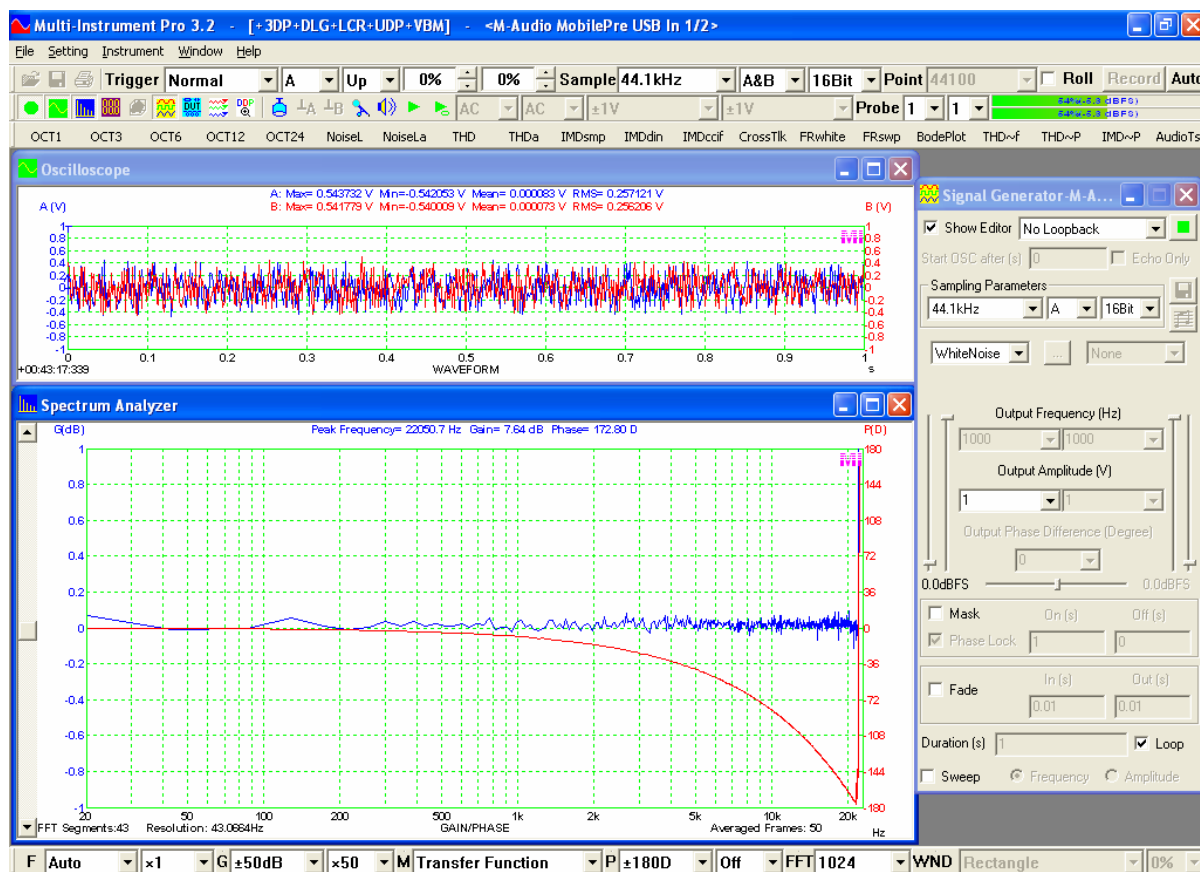
Test Results

Please refer to the Multi-Instrument manual for a clear definition of the following parameters.

Gain Difference (0 ~ 24 kHz): $< \pm 0.13$ dB

(Note: the average gain difference of 0.023 dB could be further removed by fine tuning the gain knobs for individual channels)

Phase Difference (0 ~ 24 kHz): 0 Hz (about 0°), 1 kHz (about -8°), 10 kHz (about -82°), 20 kHz (about -164°).



Discussion

As the phase differences between the two channels are too big at high frequencies, M-Audio MobilePre is not suitable for transfer function measurement using dual-FFT method.

2.8 THD+N, THD, SNR, Magnitude Response vs Frequency

Test Conditions

On M-Audio MobilePre:

- [Output 1/L] was connected to [Input Channel 1 Inst/Line] via a $\frac{1}{4}$ " male to $\frac{1}{4}$ " male TRS cable. As [Output 1/L] is unbalanced, this connection is unbalanced.
- [Output 2/R] was connected to [Input Channel 2 Inst/Line] via a $\frac{1}{4}$ " male to $\frac{1}{4}$ " male TRS cable. As [Output 2/R] is unbalanced, this connection is unbalanced.

- The knobs for [Input Channel 1 Inst/Line] and [Input Channel 1 Inst/Line] were at the 5th mark roughly (1st: minimum, 27th: maximum), the rest of the knobs on the panel were set to minimum.
- Phantom Power: Off
- Input Gain: 0 dB (via its software control panel)
- Direct Monitor: Off (via its software control panel)
- Output Volume: 0dB (via its software control panel)

On Laptop:

Powered by its AC adapter.

On Windows Control Panel:

- [Sounds and Audio Devices]>[Sound Recording]>[M-Audio MobilePre USB]: Not activated.
- [Sounds and Audio Devices]>[Sound Playback]>[M-Audio MobilePre USB]>[Wave]: 100%

In Multi-Instrument:

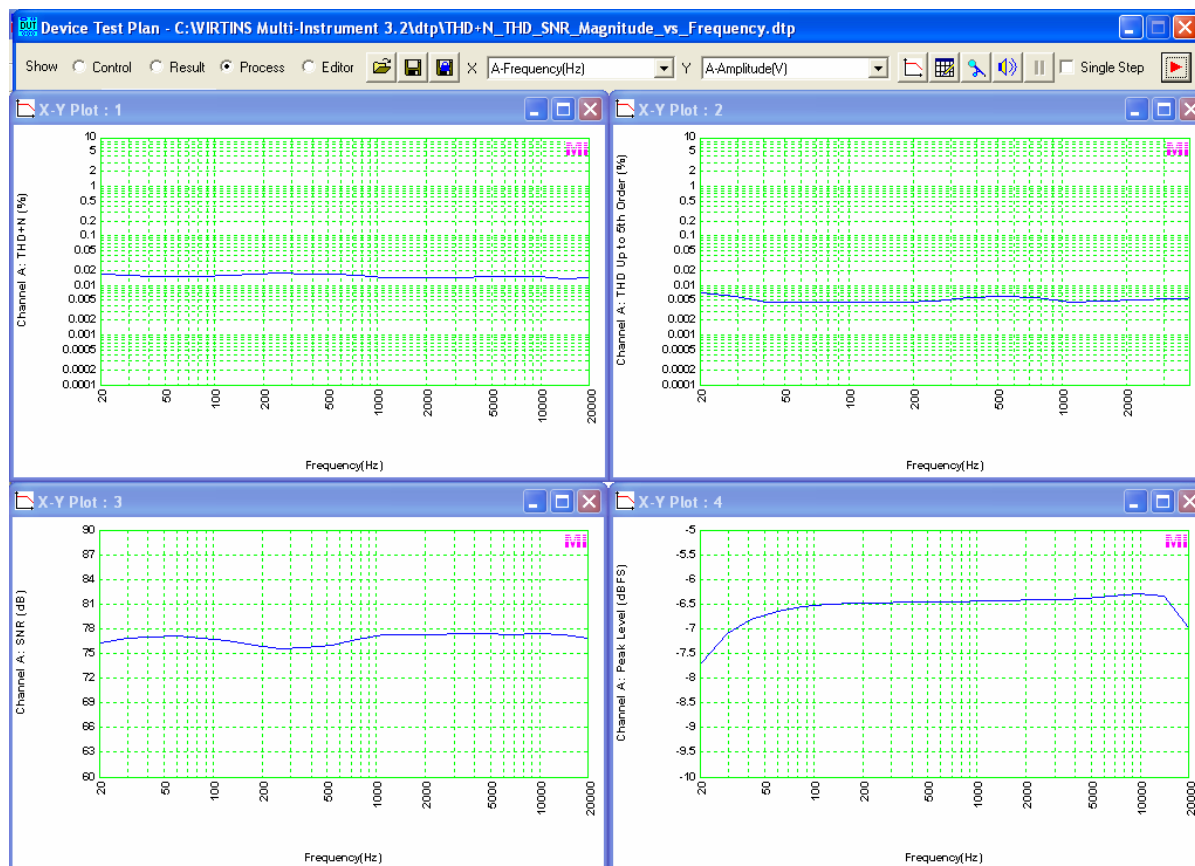
- MME Driver
- Sampling Rate: 48 kHz
- Sampling Bit Resolution: 16 Bit
- Sampling Channels: A&B (stereo)
- Record Length: 48000
- FFT Size: 32768
- Window Function: Rectangle
- Test Tone: 20-point Logarithmically Stepped Sine in the range of 20Hz~20kHz (No Spectral Leakage).
- Harmonic Distortion and Noise Measurement Range: 20~20 kHz
- Device Test Plan is used

Test Results

Please refer to the Multi-Instrument manual for a clear definition of the following parameters. They were measured at a peak level of -6.4 dBFS.

- (1) Upper left graph: THD+N vs Frequency
- (2) Upper right graph: THD (up to 3rd order) vs Frequency
- (3) Lower left graph: SNR vs Frequency
- (4) Lower right graph: Peak Level vs Frequency.

Frequency Response (20Hz~20kHz): -1.2/-0.5 dB (obtained by examining the data)



2.9 Crosstalk vs Frequency

Test Conditions

On M-Audio MobilePre:

- [Output 1/L] was connected to [Input Channel 1 Inst/Line] via a ¼" male to ¼" male TRS cable. As [Output 1/L] is unbalanced, this connection is unbalanced.
- [Output 2/R] was connected to [Input Channel 2 Inst/Line] via a ¼" male to ¼" male TRS cable. As [Output 2/R] is unbalanced, this connection is unbalanced.
- The knobs for [Input Channel 1 Inst/Line] and [Input Channel 1 Inst/Line] were at the 5th mark roughly (1st: minimum, 27th: maximum), the rest of the knobs on the panel were set to minimum.
- Phantom Power: Off
- Input Gain: 0 dB (via its software control panel)
- Direct Monitor: Off (via its software control panel)
- Output Volume: 0dB (via its software control panel)

On Laptop:

Powered by its AC adapter.

On Windows Control Panel:

- [Sounds and Audio Devices]>[Sound Recording]>[M-Audio MobilePre USB]: Not activated.
- [Sounds and Audio Devices]>[Sound Playback]>[M-Audio MobilePre USB]>[Wave]: 100%

In Multi-Instrument:

- MME Driver
- Sampling Rate: 48 kHz
- Sampling Bit Resolution: 16 Bit
- Sampling Channels: A&B (stereo)
- Record Length: 48000
- FFT Size: 32768
- Window Function: Rectangle
- Test Tone: Channel A: 100-point Logarithmically Stepped Sine in the range of 20Hz~20kHz (No Spectral Leakage), Channel B: No signal.
- Device Test Plan is used.

Test Results

Please refer to the Multi-Instrument manual for a clear definition of the following parameters. They were measured at a peak level of -6.4 dBFS.

