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1 M-Audio Firewire 410



External firewire solution with

- 8 channel analog outputs 192kHz /24Bit 1/4"
- 2 front +2 rear analog inputs 96kHz/24Bit switchable 1/4"
- Variable gain control for the front inputs
- 2 microphone inputs XLR with switchable phantompower
- Mic. connectors supports XLR and 1/4"
- Switchable 20dB attenuator
- S/P-DIF optical/coaxial input+output
- 2 headphone output with individual volume control
- clip-LEDs
- display active output channels with 8 LEDs
- MIDI in/out

The card is advertised sometimes with "4+10". Customers might expect that this card has 4 analog inputs and 10 analog outputs. The front and rear analog inputs cannot be used simultaneously. The card has a total of 2 analog inputs and 8 analog outputs. The digital interface can be operated in parallel. This adds 2 input and 2 output channels. The ASIO drivers identify the card as a 4+10 device.

Bus powered

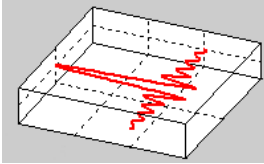
The m410 can be operated completely (including phantompower) from the firewire interface. Please note that this feature requires the bigger 6-pole firewire connector. The smaller 4-pole firewire connector has no power supply. In this case the m410 requires an external power supply (12V/1A), which is included in the bundle. Most notebooks have the small connector, only.

Driver installation

The drivers must be installed before the device is connected to the PC. The installation runs smoothly. Two reboots are required. The card requires Windows 2000 or XP.

Summary

The m410 runs much more stable than any USB device. The frequency response is flat up to 40kHz. The analog performance is below high-end PCI device e.g. RME. The card reaches up to 89dB(A) THD+N at the rear inputs. The front inputs show 3dB less performance. These values should be sufficient for most applications. The m410 has a rich set of connectors,



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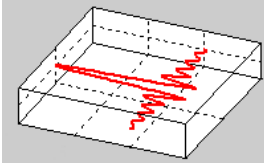
which makes it ideal for many applications. All analog interfaces (except mic) are single ended so it is targeting semi-professional recording studios.

The card has sufficient performance in the subsonic area allowing vibration analysis.

This test report utilizes the high precision plug-in for WinAudioMLS with 192kHz/24bit ASIO, the high resolution **64-bit** FFT, the **digital notch** filter and large FFT size for **high frequency resolution** below 0.08Hz. These techniques allow analyzing the high dynamic of this soundcard.

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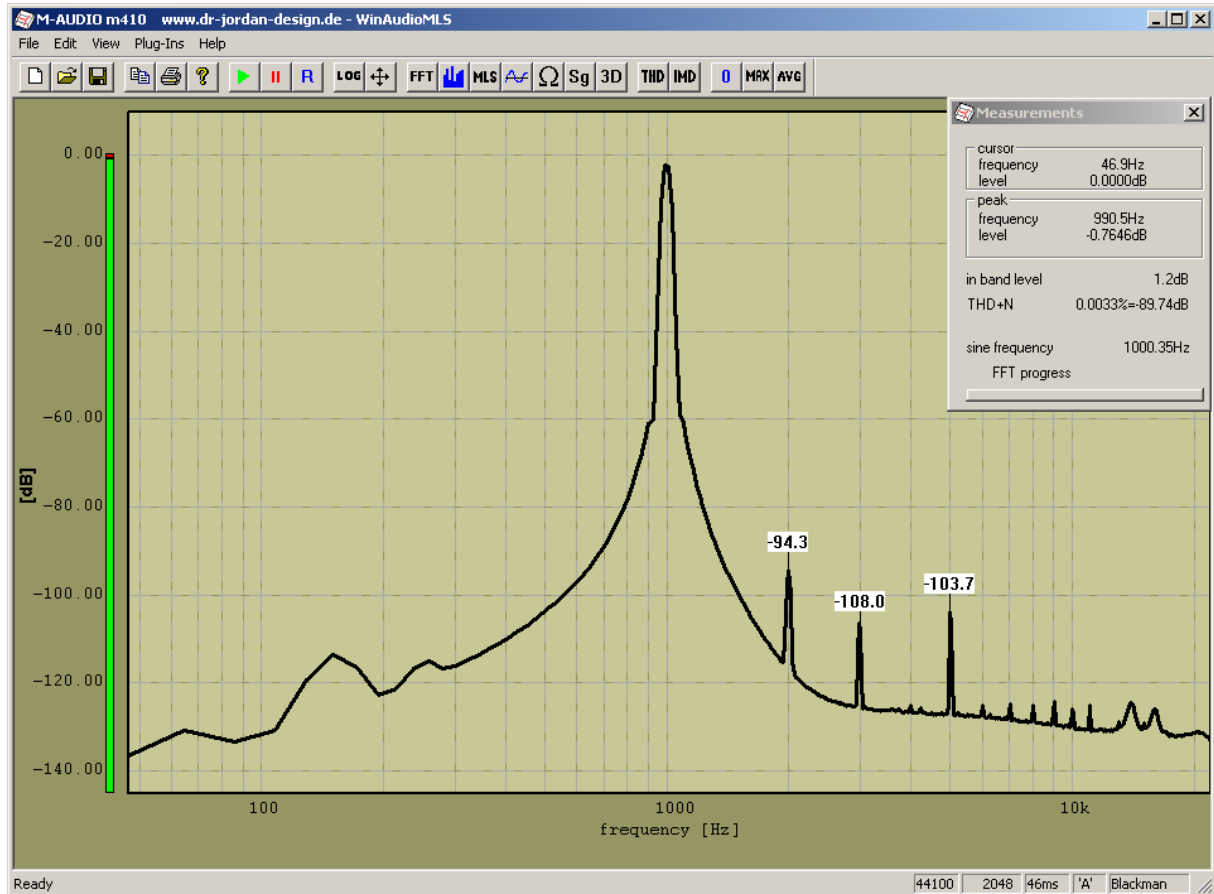
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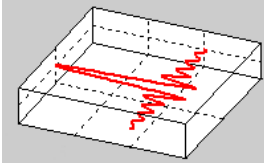
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1.1 THD+N 32 bit ASIO weighted rear connector

Analog connection between input and output

THD+N -89.7 dB(A)





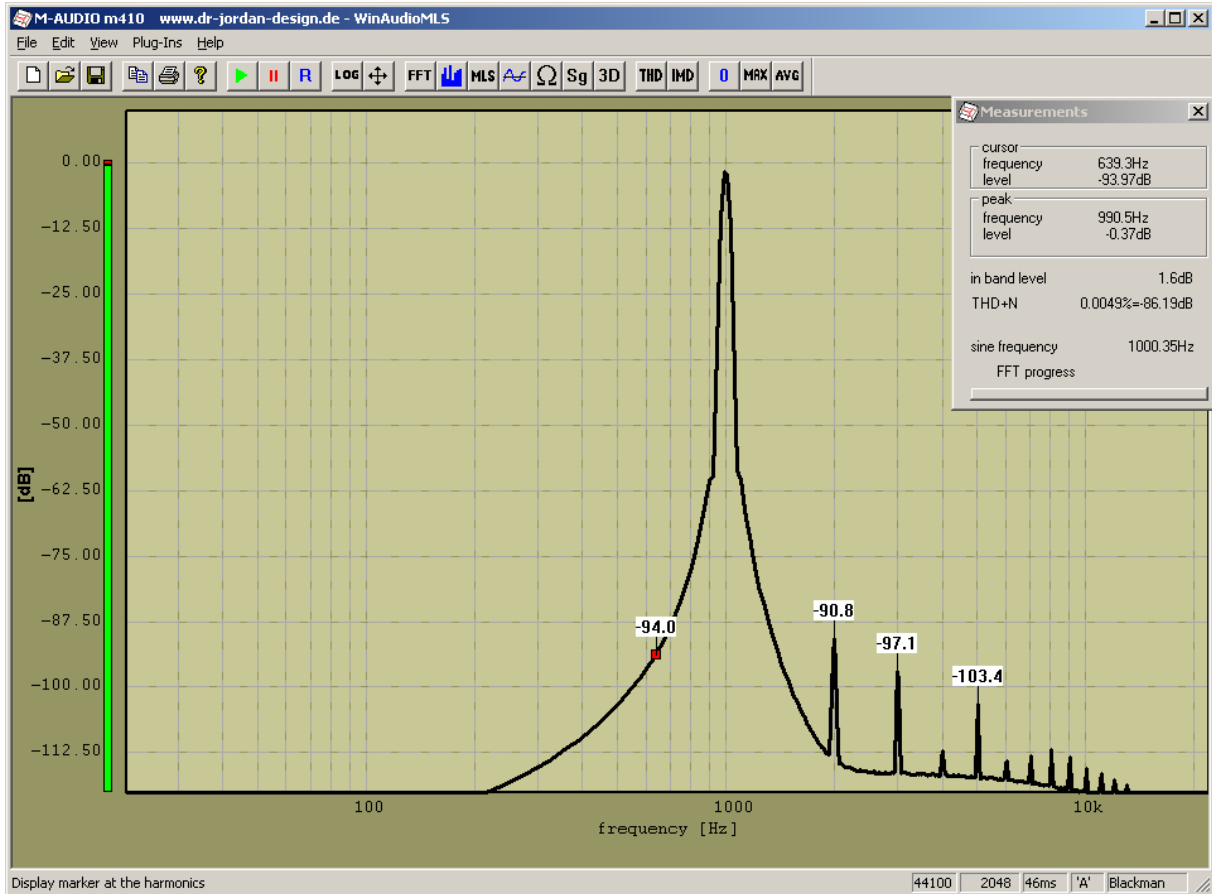
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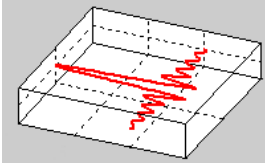
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1.2 THD+N 24 bit ASIO weighted front connector

Analog connection between input and output

THD+N -86.2 dB(A)



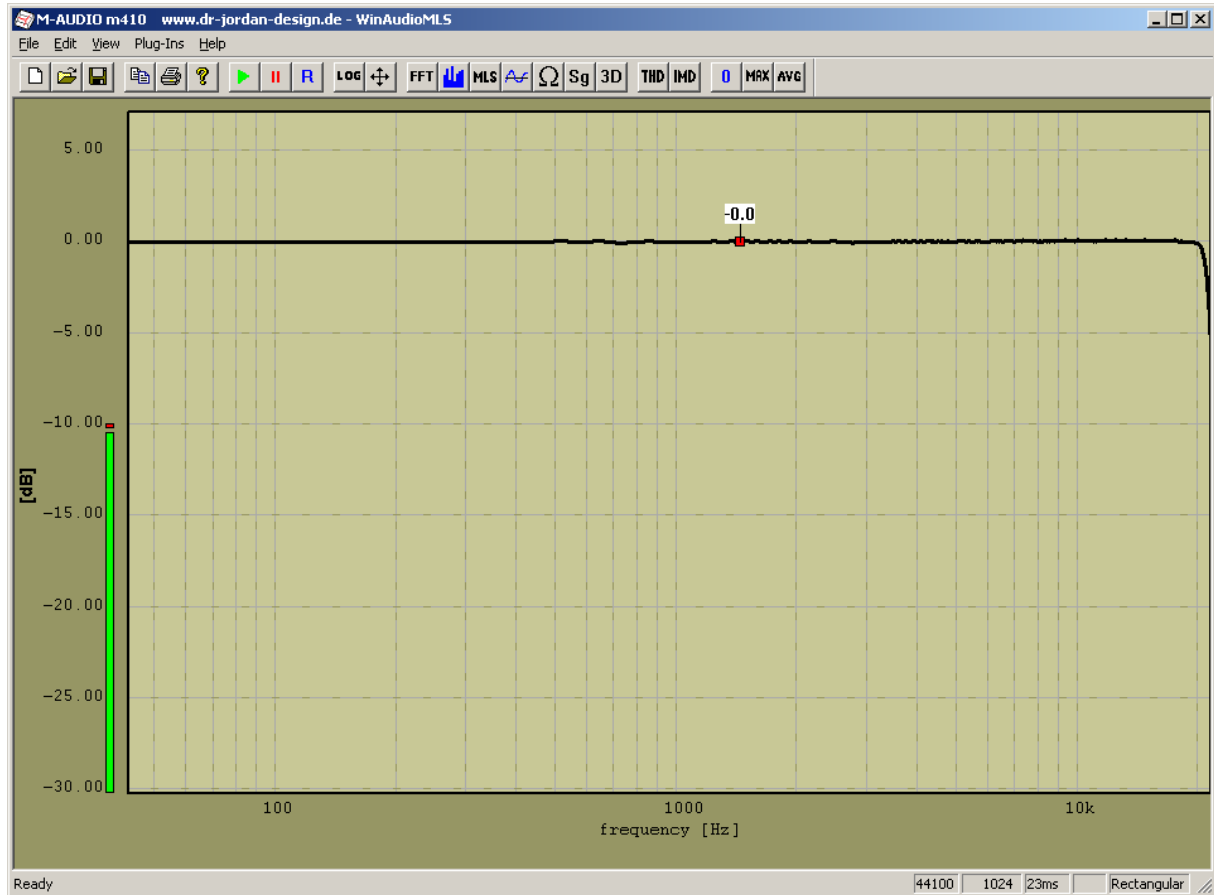


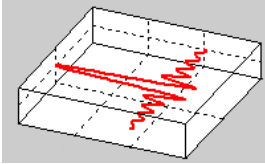
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1.3 Frequency response 44.1kHz analog

- Sample rate is 44.1kHz.
- 32 bit ASIO mode



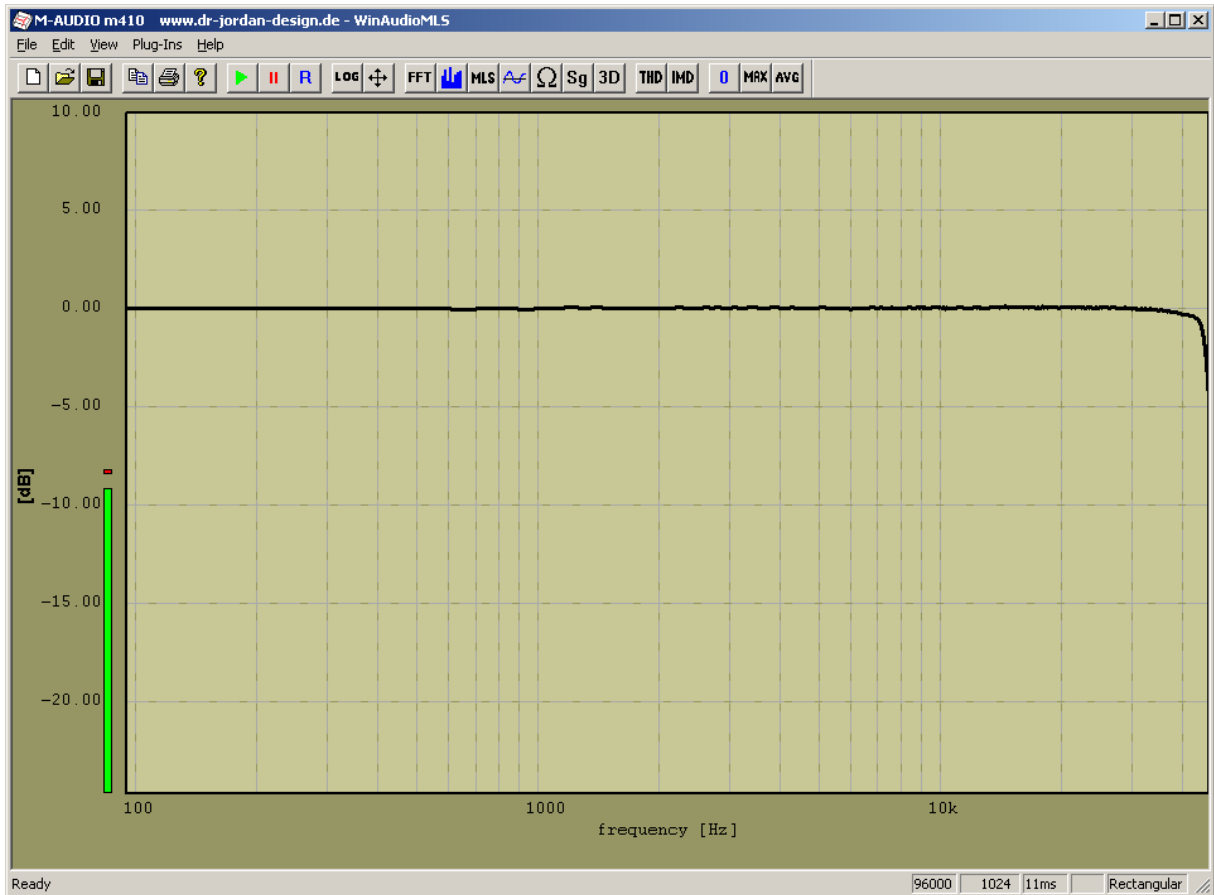


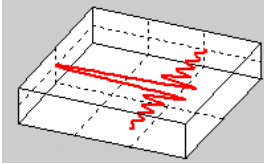
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1.4 Frequency response 96kHz analog

- Sample rate is 96kHz.
- 32 bit ASIO mode





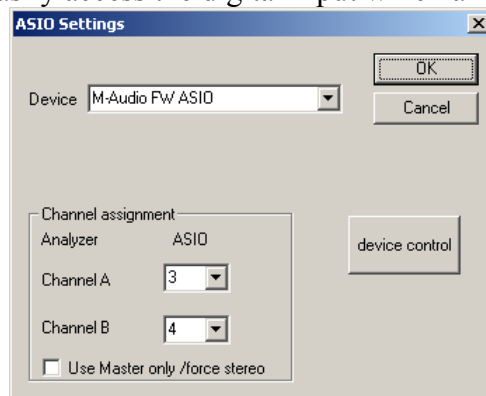
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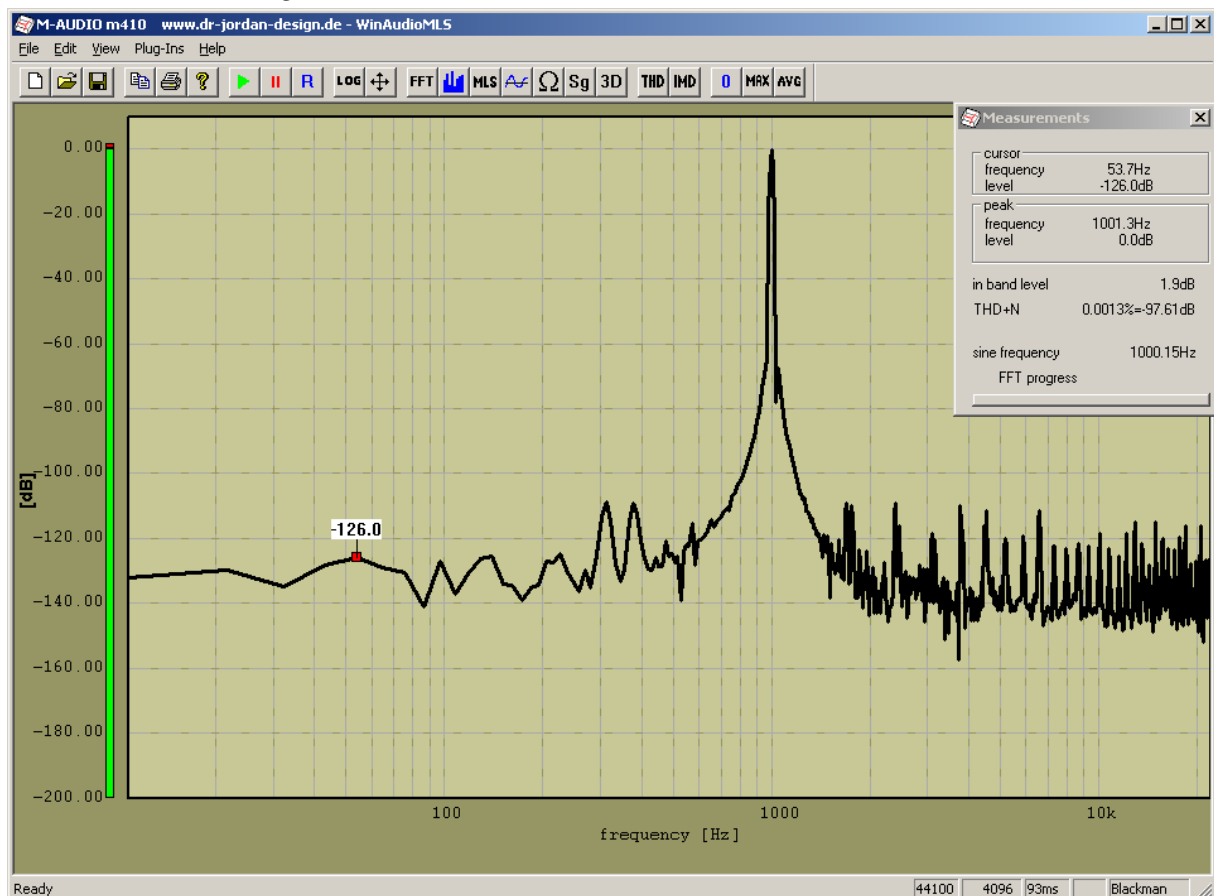
1.5 Digital link test 24 Bit

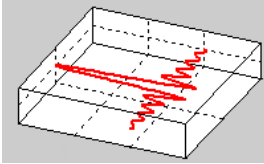
- Output is 1kHz full scale
- Input and output connected via optical link
- Sample rate is 44.1kHz.
- 32 bit ASIO mode
- We use a 1kHz notch filter to remove the main frequency to analyze the residual noise.

This test proves that the card performs real 24bit transfers. This measurement is a good example to demonstrate the high dynamic of WinAudioMLS. The ASIO interface of WinAudioMLS allows to easily access the digital input which is mapped as channel 3 and 4.



1.5.1 Direct analysis with 32 bit FFT



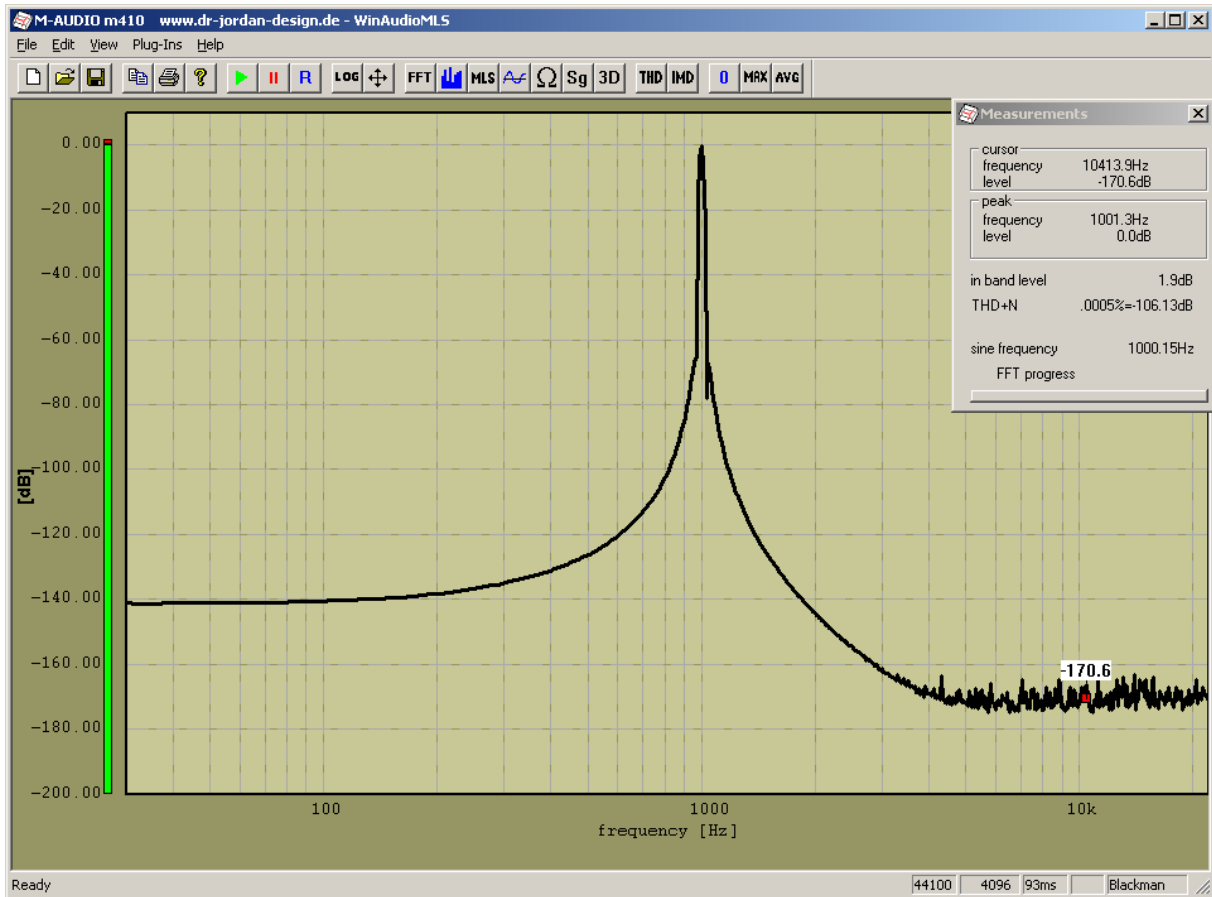


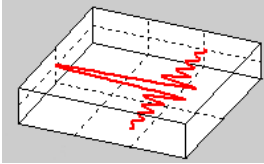
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1.5.2 Direct analysis with 64 bit high resolution FFT

This measurement demonstrates the reduced noise floor with the high dynamic 64-bit FFT processing.



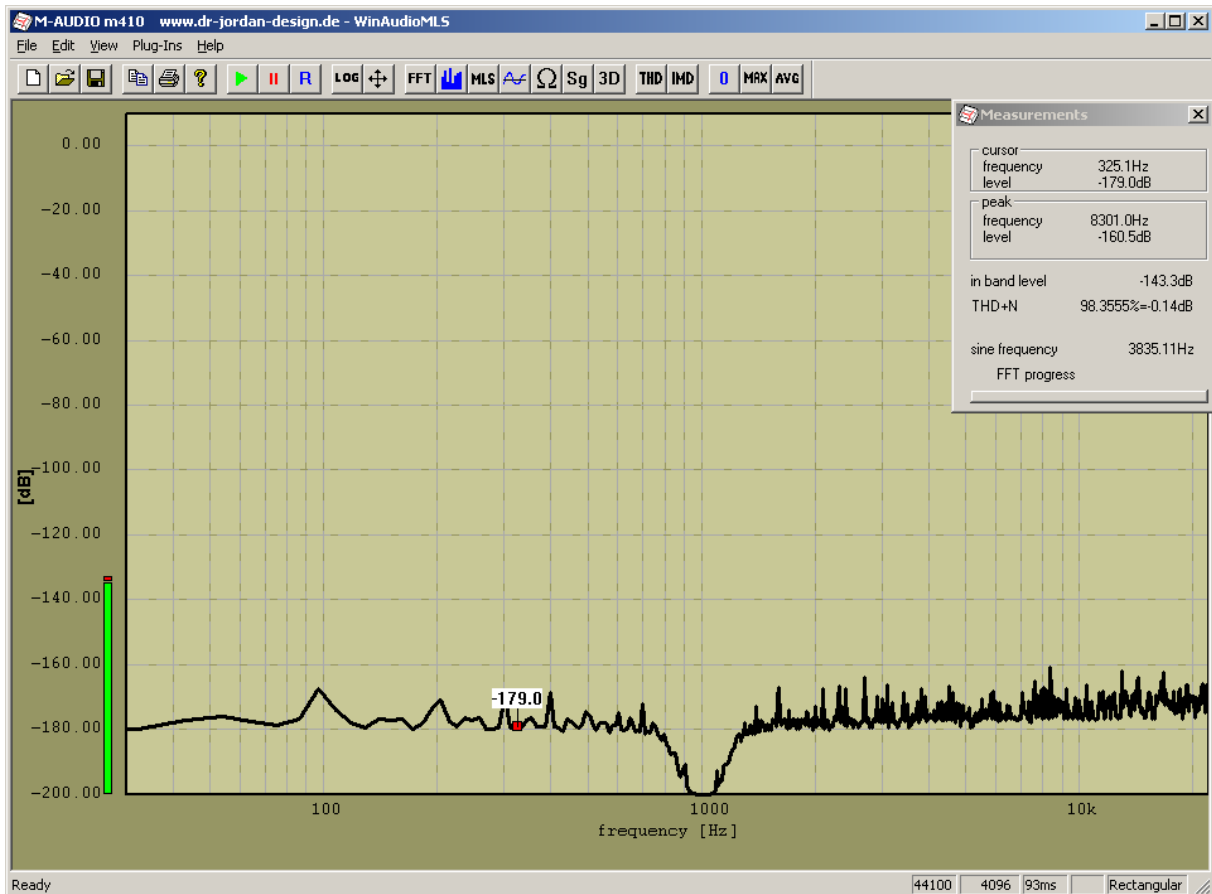


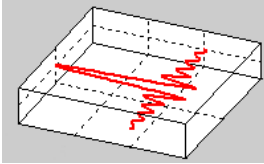
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1.5.3 Analysis with 1kHz digital notch filter

This filter removes the main frequency and allows to precisely analyse the residual signal for high-precision THD+N analysis. Please note that in this special measurement case we have to take the in band level which is the level of the remaining signal. In this case we reach 143.3dB, which is very close to the theoretical value of 144dB.





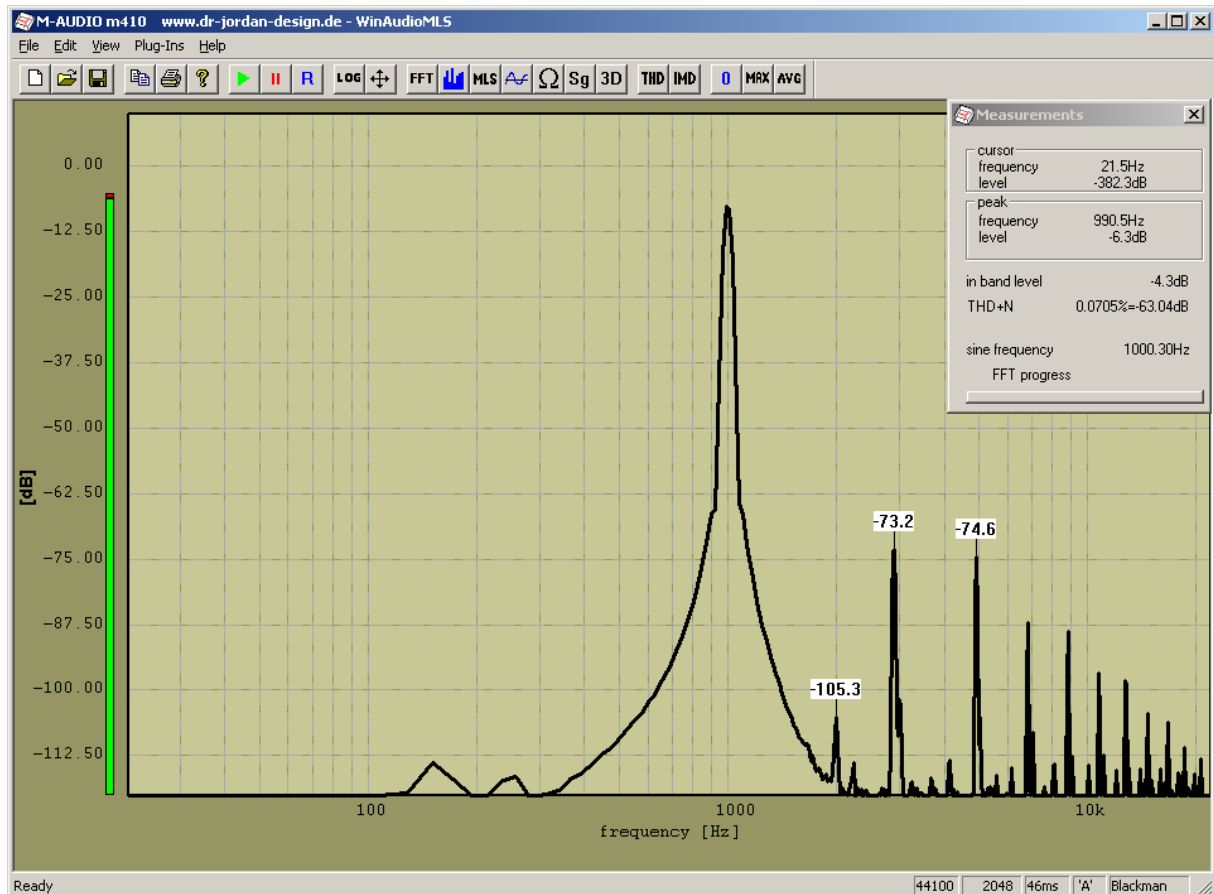
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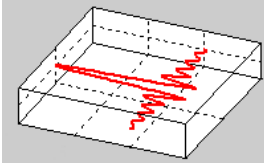
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1.6 Enhanced full duplex mode

- Sample rate is 48kHz for output and 44.1kHz for input.
- Analysis with 1kHz sine

The m410 uses a sample rate conversion to interpolate between the different sample rates. This calculation introduces significant rounding errors.





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1.7 Low frequency analysis at 1Hz

There are many applications (vibration analysis etc.) that require a significant performance of a soundcard below the audio range. The following plot uses the extreme high frequency resolution of WinAudioMLS with a 512000 FFT. We use the 64-bit FFT to minimize rounding noise. The m410 shows a good performance at low frequencies with sufficient dynamic.

- Sample rate is 44.1kHz.
- 32 bit ASIO mode

