

**F(t) Forssell Technologies Inc**

**MADC-2**  
**Two Channel Discrete JFET Analog to Digital Converter**

**And**

**MADC-4**  
**Four Channel Discrete JFET Analog to Digital Converter**

**User's Manual**



## **Description:**

The Forssell Technologies MADC-2 is an extremely high quality bare-bones, two channel Analog to Digital Converter (ADC) housed in a 1U rack mount enclosure. A four channel MADC-4 option is also available. The MADC-2 is designed for the most demanding applications, where capturing musical performances with accuracy and honesty is required. Output sample rates from 44.1k to 192k Fs are selected with a single front panel switch and with LED indicators showing the selected sample rate. Digital “clipping” is indicated with a single front panel LED that latches on until the “reset” switch is pressed. The MADC-2 analog circuitry features an all Class A discrete JFET with no IC opamps used in the signal path. The analog inputs use high quality XLR connectors. The digital outputs provided are AES3 (XLR), SPDIF (RCA), and Word Clock output (BNC) are provided. An additional Word Clock output is available as an option. The MADC-2 digital output word length is fixed at 24 bits.

The MADC uses an asynchronous decimation filter to provide various standard output sample rates from 44.1K to 192k. The actual low jitter sampling clock that controls the AD converter chip timing is permanently set to sample at 192K regardless of output sampling rate selection. This process is also called Asynchronous Sample Rate Conversion (ASRC) and is performed by a 32 bit sample rate converter. The output from the ASRC circuitry is 24 bit at the selected output sample rate.

**Please note that there are no provisions for word length reduction, level metering with this converter.**

## **MADC-4 option:**

The MADC-4 four channel Analog to Digital converter is housed in the same 1U channel as the MADC-2, but has two complete MADC converter boards installed with an additional set of input and output connectors on the rear panel. The second MADC board is uses the output clock from the first MADC board to insure phase matching of all four channels.

The MADC-4 can be supplied with a single output sample rate selection control, or with two. With a single sample rate control, the setting on the single front panel control section will control both stereo ADCs. With two control sections, each ADC’s output sample rate is controlled by its controller settings. Either way, both ADCs are phase locked.

## **Word Clock Output:**

The MADC-2 and MADC-4 have a single low jitter word clock output available on a rear panel mounted BNC connector. This output is designed to operate into a 75 ohm terminated coaxial cable. The output voltage is TTL compatible. The WC output follows the output sample rate, as selected by the front panel controls. Additional WC outputs are provided on the MADC board, but the user would have to install their own connectors and wire them to the MADC board.

## **Output Sample Rate selection:**

The output sample rate of the MADC is selected by the single front panel mounted “Select” switch. The LEDs to the right of this switch indicate the output sample rate currently selected. The MADC does **not** remember this setting when power is removed. If your sample rate is other than 44.1k **you must reset the output sample rate to the desired sample rate each time the unit is powered up.**

### **“Over” LED:**

The front panel mounted red “Over” LED lights when any channel reaches a digital signal level that is within 0.1 dB of digital full scale for more than two sample periods. Once lighted, the over LED will remain lighted until the “reset” switch is pressed. The reset switch only effects the Over LED and does **not** reset the converter digital circuitry nor does it change the sample rate back to power up defaults. Each time you power up the MADC, the “Over” LED will light up. Press the reset switch to turn-off the Over LED.

With a single sample rate control section, the “over” LED lights when there is an over on any of the four channels. With the dual control section version, there are two “over” LEDs, one for each stereo ADC.

### **External Sync Input:**

If your MADC is supplied with the External Word Clock Sync option, there will be additional LEDs on the front panel, and an additional “WC Input” on the back panel. External Sync is selected by pressing the “Select” switch until the WC external sync LED is lighted. If no valid WC is detected at the WC Input BNC connector, then the red SYNC LED will be lighted. Once a valid WC is applied to the BNC connector, the red LED will turn off, indicating that the MADC is locked to the external WC. The MADC should lock within one second of receiving a valid WC sync input signal. A wide range of WC input frequencies can be used, including vari-speed WC signals.

The WC level should be TTL compatible and needs to be terminated with a 75 ohm resistor. The MADC WC input is a high impedance input. This allows several units to be feed sync input with from one single WC source. To daisy-chain several units, you will need to use BNC Tee connectors on each unit. A 75 ohm terminator should be connected at the Tee connector of the very end of the chain.

With the single sample rate controller version, external sync works for both stereo ADCs. With the dual sample rate controller, the two stereo ADCs are independent of each other can be set to different external sync or internal sample rate selections. There are two sets of WC input and WC output BNC connectors on the dual sample rate controller version of the MADC-4.

### **Analog Inputs:**

Analog inputs are provided on rear panel mounted XLR connectors. The MADC can accept either balanced or unbalanced input signals. *Unbalanced signals resulting in a reduced headroom of 3-6 dB depending on level calibration.* The XLR connectors are wired for pin #2 = + input, and pin #3 = - input signal polarities. The input impedance of analog inputs is greater than 10k ohm balanced.

### **Digital Outputs:**

There are two digital outputs available with the MADC. One is an AES/EBU (AES3) 110 ohm digital output on a rear mounted XLR connector. The other is a 75 ohm SPDIF digital output on a rear mounted RCA connector. Both of these digital outputs are isolated from each other and may be used simultaneously.

## **AC Line Voltage:**

The MADC come preset for either 115 VAC or 230 VAC 50/60 Hz operation as indicated by a rear panel label. The line voltage is selected by a line voltage switch mounted inside the MADC chassis. Changing the line voltage from the factory setting requires a change to the AC line fuse which is located within the AC power entry module on the rear panel. You must use one of the following fuse values...

### **MADC-2**

115 VAC use 160 milliamp TD fuse.

230 VAC use 80 milliamp TD fuse.

### **MADC-4**

115 VAC use 250 milliamp TD fuse.

230 VAC use 125 milliamp TD fuse.

**Line voltage changes should only be made by a qualified technician.**

## **Specifications:**

Sample Rates available : 44.1k, 48k, 88.2k, 96k, 176.4k and 192k

Level Calibration : 0 dBu Input = -12 dBFs to -20 dBFs (jumper selected)

(Other calibration levels available on request.)

Analog Input Impedance = greater than 10k ohm balanced

Maximum analog input level is a function level calibration (no analog clipping).

AES3 (XLR) digital output impedance = 110 ohm balanced floating

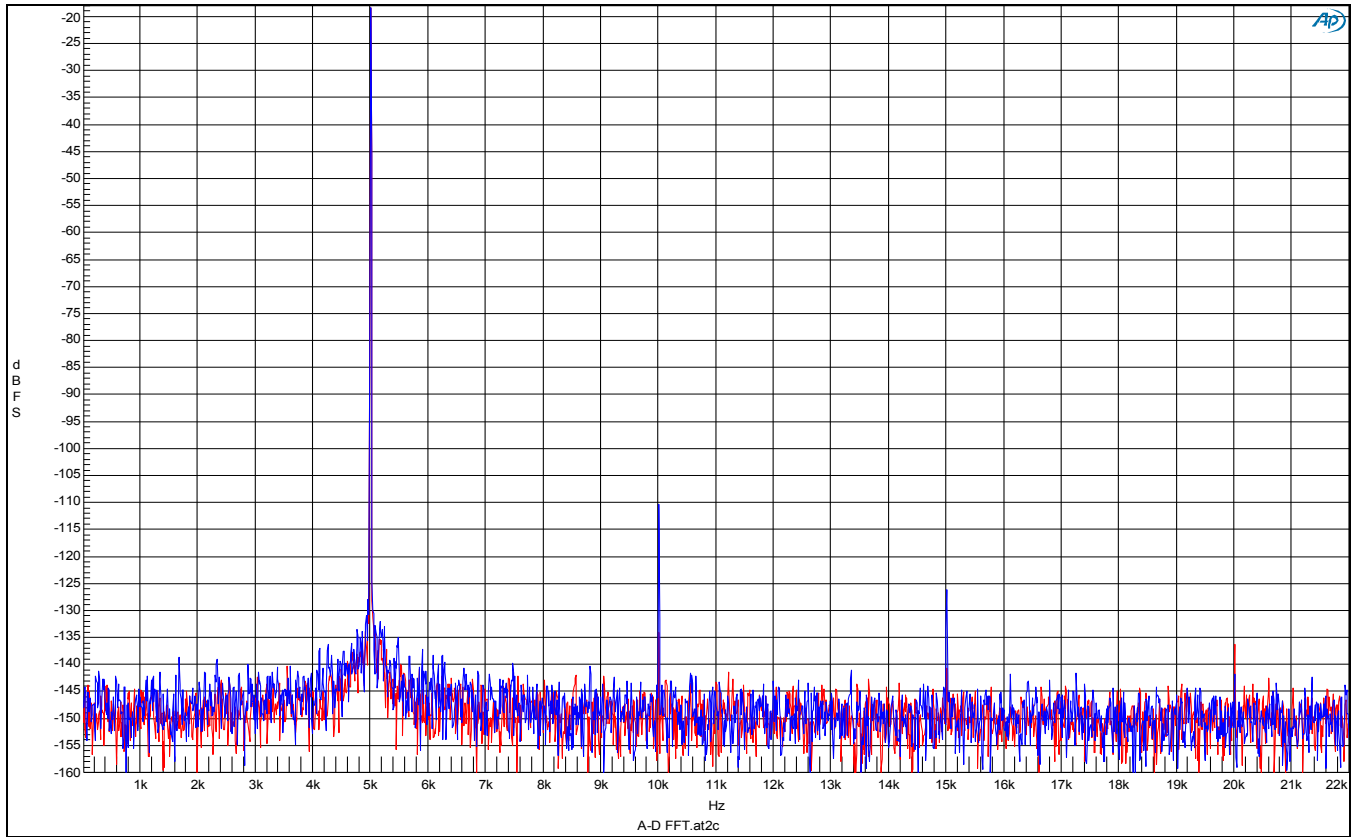
SPDIF (RCA) digital output impedance = 75 ohm balanced floating

WC output = +5V (TTL) unterminated. Requires 75 ohm load termination at load.

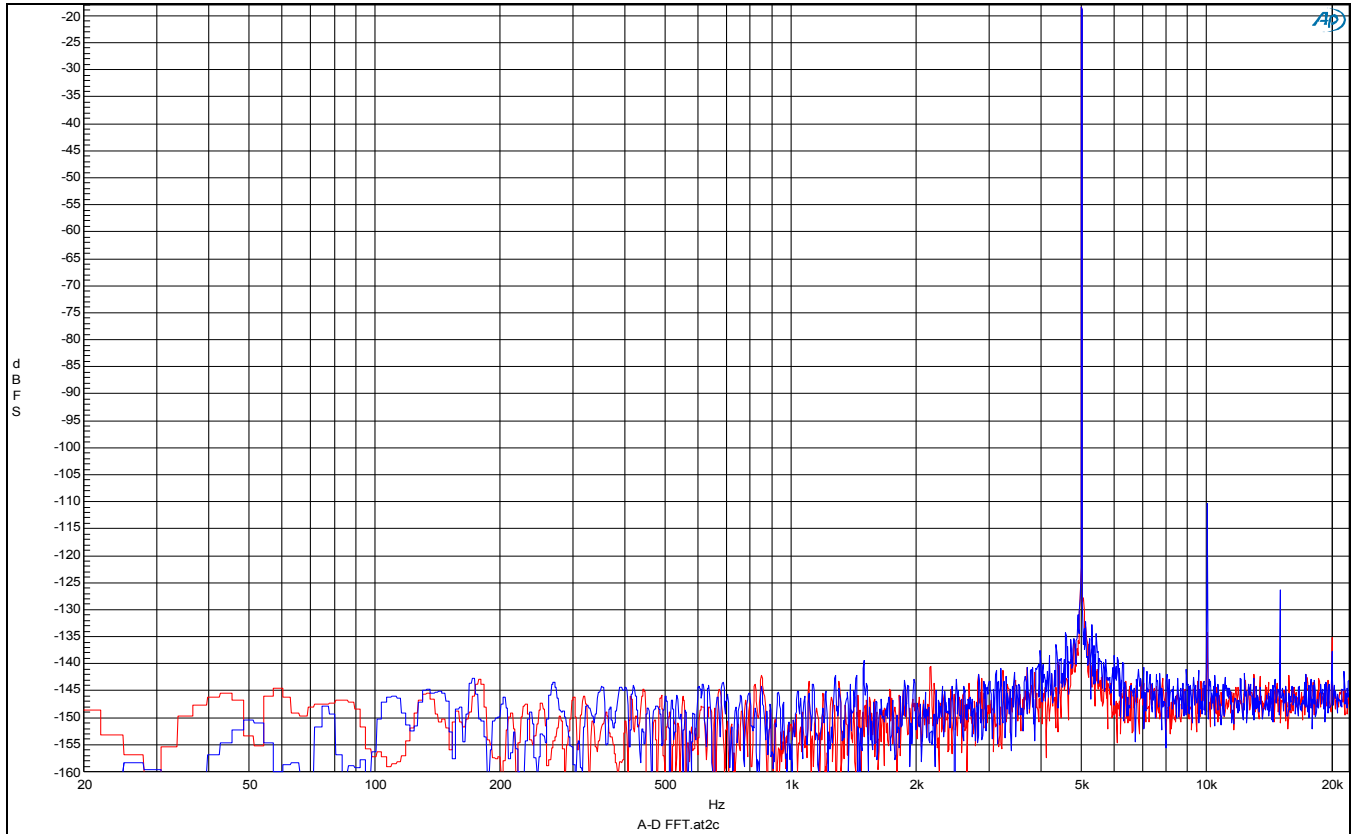
Quantization Noise = -115 dBFs      Dynamic Range = -119 dB A-weighted

## **Latency (Input to Output group delay):**

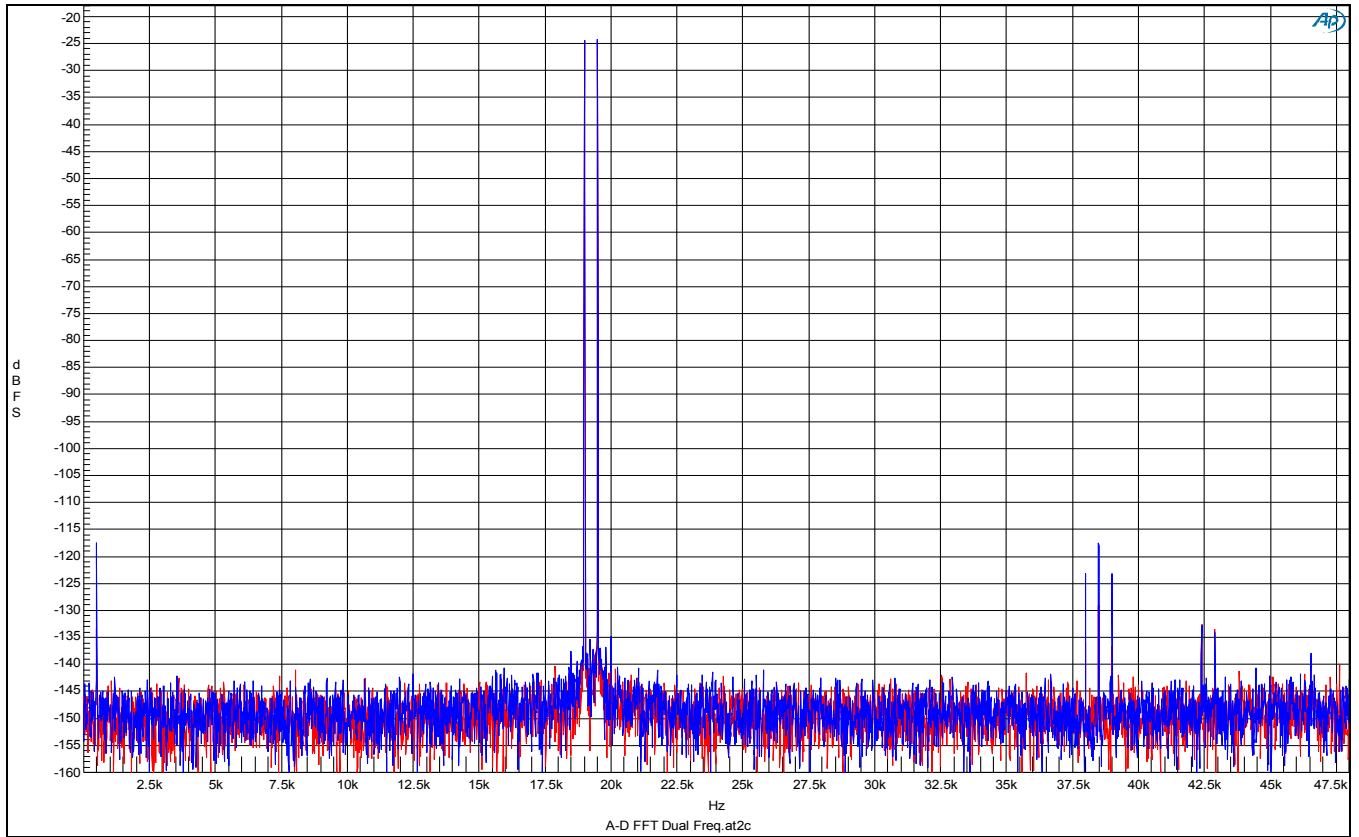
<b>Fs</b>	<b>Time</b>
44.1k	1.6 ms
48k	1.48 ms
88.2k	967 us
96k	895 us
176k	660 us
192k	605 us



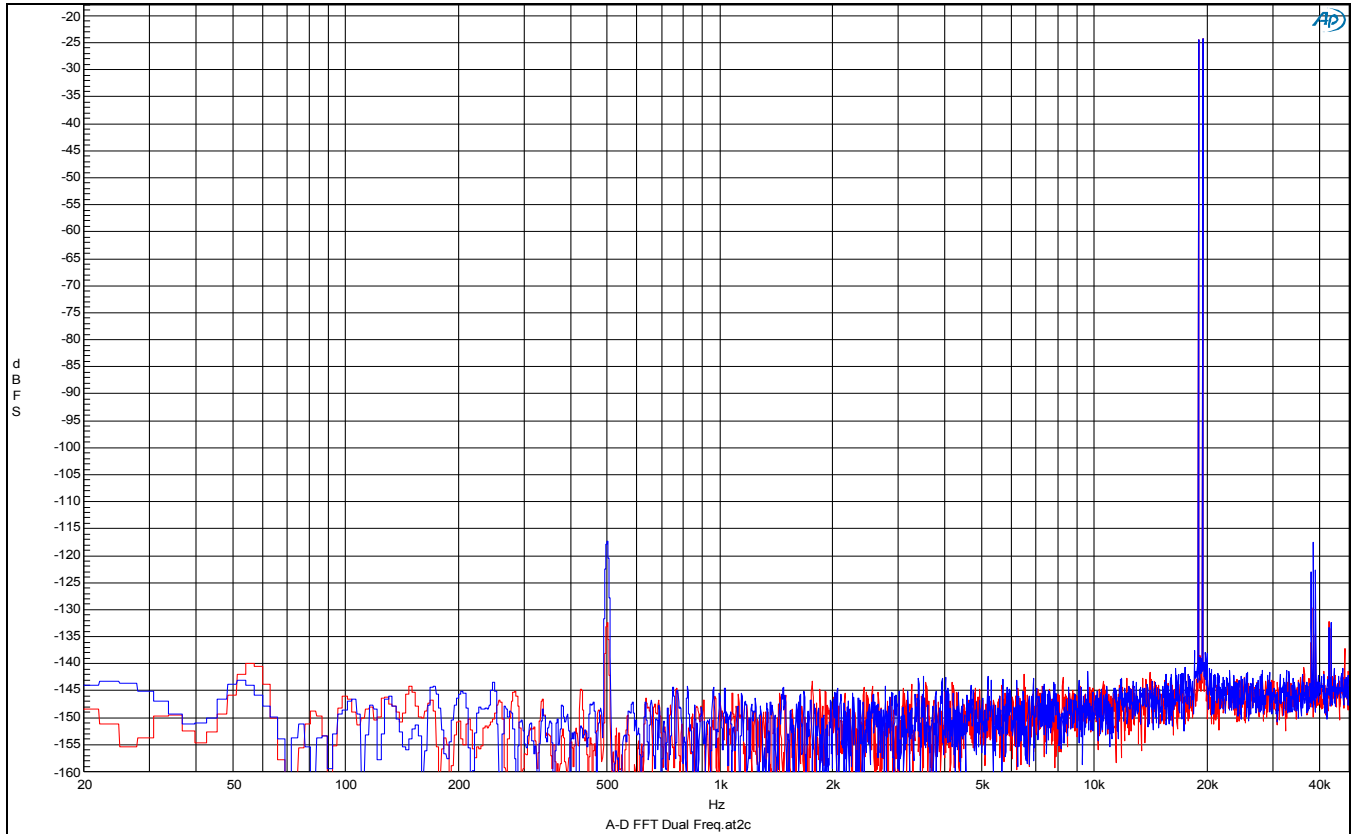
**AD FFT (linear scale) with 0 dBu 5 KHz input (-18 dBFS digital output).**



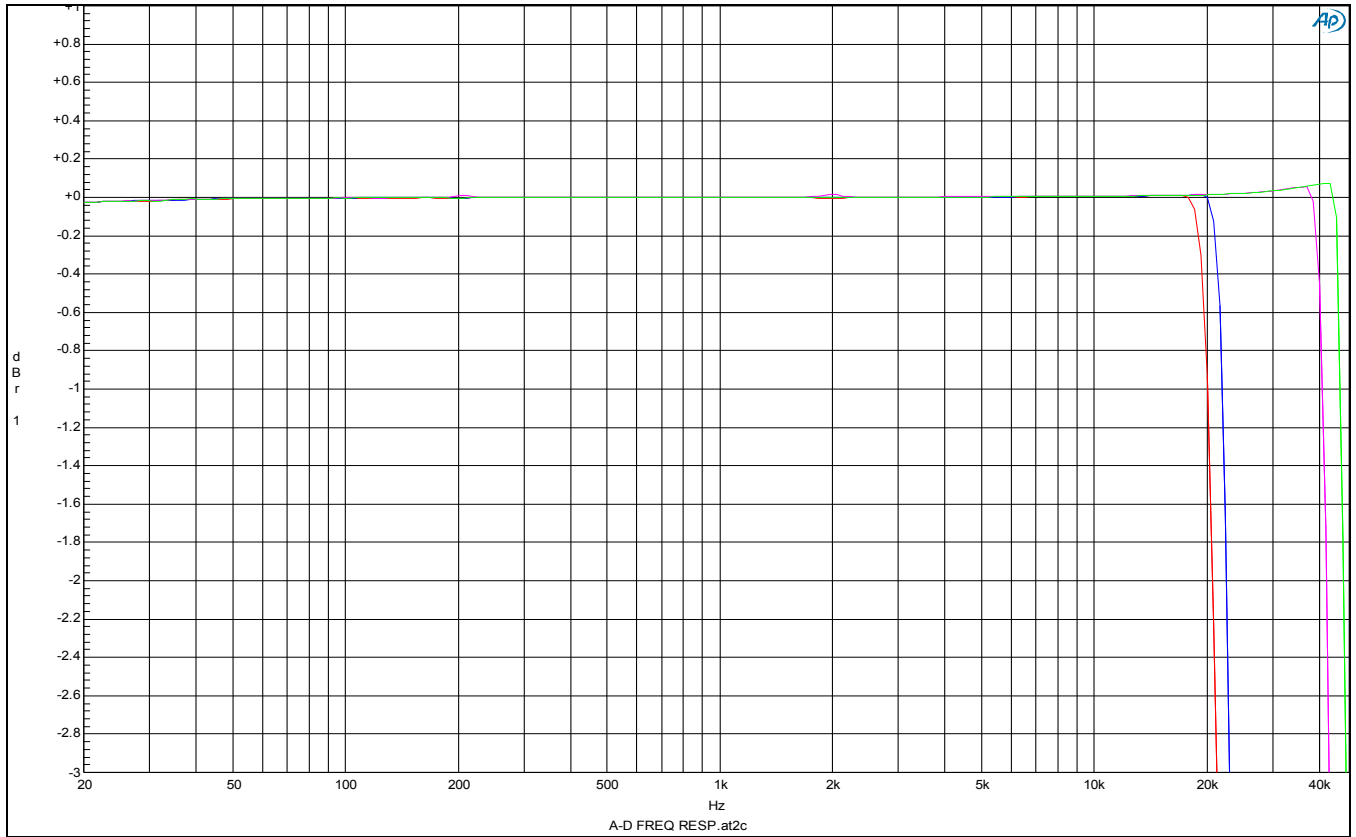
**AD FFT (log scale) with 0 dBu 5 KHz input (-18 dBFS digital output).**



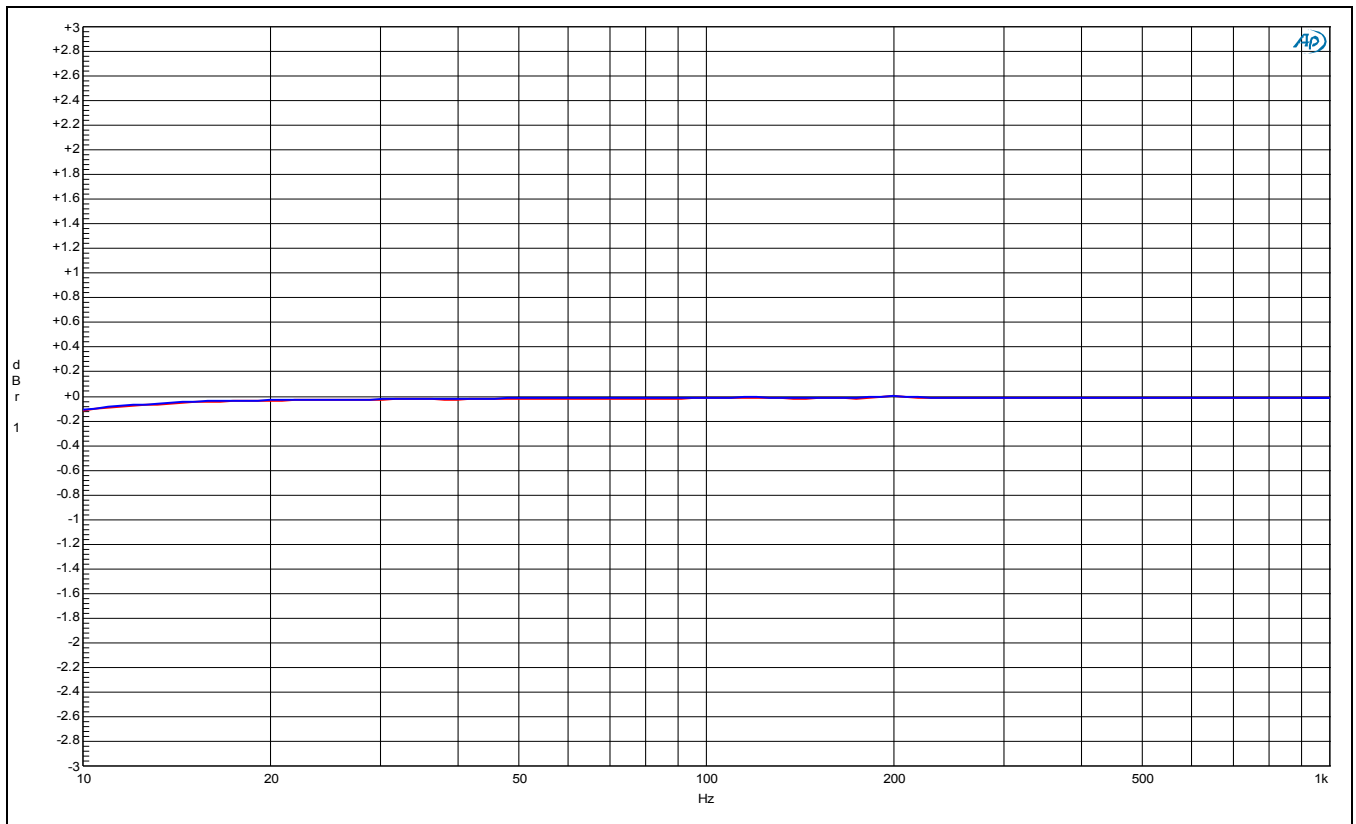
**AD FFT (linear scale) with dual frequency (19 and 19.5 KHz) 0 dBu signal**



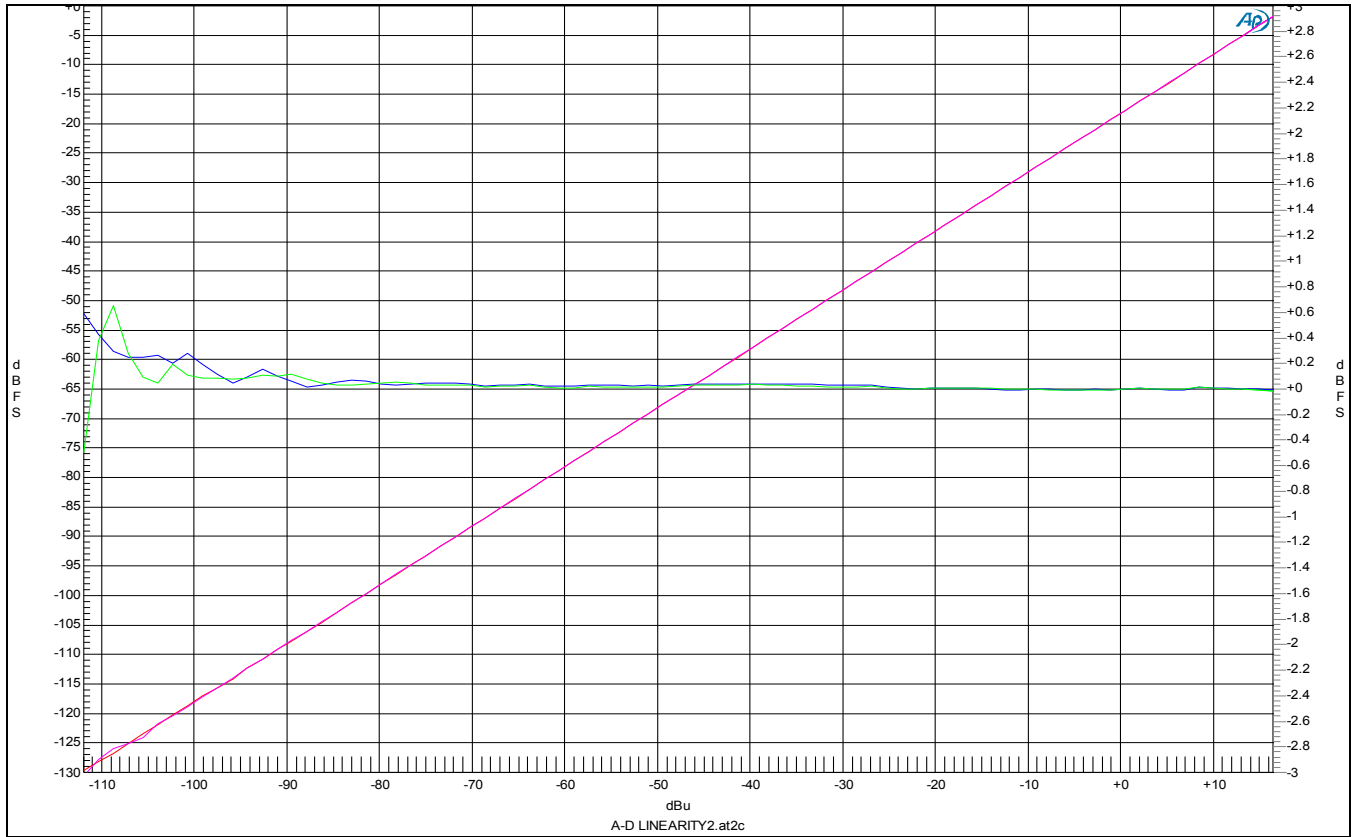
**AD FFT (log scale) with dual frequency (19 and 19.5 KHz) 0 dBu signal**



**AD High Frequency Response at 44.1k, 48k, 88.2k, and 96k. (96k is the limit of the test equipment)**



**AD Low Frequency Freq Resp**



**Deviation from Linearity (Right scale) from 0 dBFs to -130 dBFs Output**

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