

AKM

AKD4620B-B

Evaluation board AK4620B

GENERAL DESCRIPTION

The AKD4620B-B is an evaluation board for the AK4620B, the 24Bit A/D & D/A converter. The AKD4620B-B can evaluate A/D converter and D/A converter separately in addition to loopback mode (A/D→D/A). The AKD4620B-B also has the digital audio interface and can achieve the interface with digital audio systems via opt-connector.

■ Ordering guide

AKD4620B-B --- Evaluation board for AK4620B
(Cable for connecting with printer port of IBM-AT compatible PC and control software are packed with this. This control software does not operate on Windows NT.)

FUNCTION

- Digital interface
 - DIT (AK4114): optical or BNC
 - DIR (AK4114): optical or BNC
- 10pin header for serial control interface

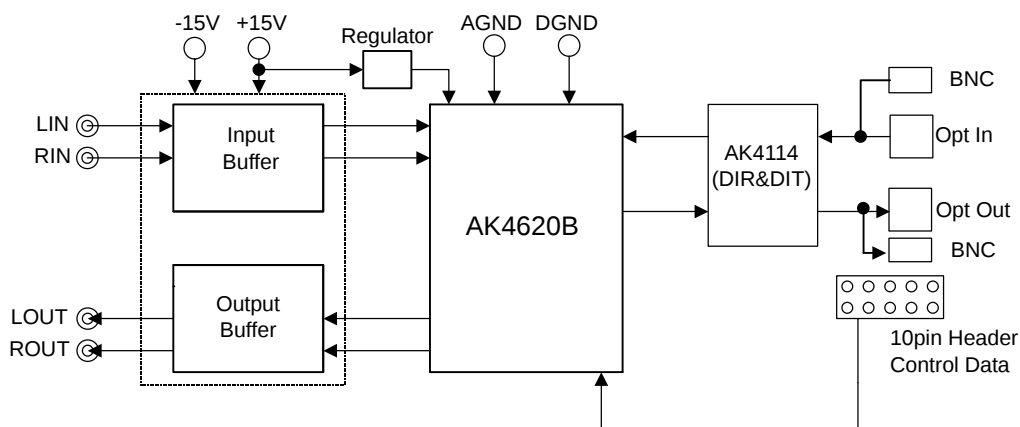


Figure 1. AKD4620B-B Block Diagram

* Circuit diagram are attached at the end of this manual.

Evaluation Board Manual

■ Operation sequence

1) Set up the power supply line

[+15V]	(green)	= +15V
[-15V]	(blue)	= -15V
[GND]	(black)	= 0V

Note: Each supply line should be distributed from the power supply unit.

2) Set up the evaluation modes, jumper pins and DIP switch. (See the followings.)

3) Power on

The AK4620B should be reset once bringing SW2 (PDN) "L" upon power-up.

■ Evaluation modes

Applicable evaluation modes

- (1) Loopback mode (Default)
- (2) Evaluation of DAC
- (3) Evaluation of ADC

1) Loopback mode (Default)

1-1) Analog input mode

Jumper	JP3 (LIN)	JP4 (AINL)	JP5 (RIN)	JP6 (AINR)	SW1-2 (ADMODE)
Single-ended	SINGLE	SINGLE	SINGLE	SINGLE	OFF
Differential	DIFF	DIFF	DIFF	DIFF	ON

(Default)

Table 1. Analog Input Mode

* As for analog input circuit, please see the following item “Analog Input Buffer Circuit”.

1-2) Sampling speed & MCLK frequency

a) parallel mode

SW1-1 (P/S)	SW1-4 (DFS0)	SW1-6 (CKS1)	SW1-7 (CKS0)	SW3-4 (OCKS1)	SW3-5 (OCKS0)	Sampling Speed of AK4620B	MCLK Frequency of AK4620B
ON	OFF	OFF	ON	ON	OFF	Normal Speed	512fs
ON	ON	OFF	ON	OFF	OFF	Double Speed	256fs

(Default)

Table 2. Sampling Speed & Master clock Frequency in parallel mode

* Parallel mode does not support quad speed mode.

b) serial mode

SW1 (P/S)	DFS1 bit	DFS0 bit	CMODE bit	CKS1 bit	CKS0 bit	SW3-4 (OCKS1)	SW3-5 (OCKS0)	Sampling Speed of AK4620B	MCLK Frequency of AK4620B
OFF	0	0	0	0	1	ON	OFF	Normal Speed	512fs
OFF	0	1	0	0	1	OFF	OFF	Double Speed	256fs
OFF	1	0	0	0	1	ON	ON	Quad Speed	128fs

Table 3. Sampling Speed & Master clock Frequency in serial mode

* In serial mode, SW1-4(DFS0), SW1-6(CKS1) and SW1-7(CKS0) should be always “OFF”, and DFS1, DFS0, CKS1, CKS0 and CMODE bits in the AK4620B should be set via the printer port (PORT3).

1-3) AK4114's master clock mode & reference X'tal frequency

Mode	SW3-6 (CM1)	SW3-7 (CM0)	PLL	X'tal	Clock source	SDTO
1	OFF	ON	OFF	ON	X'tal	DAUX

(Default)

Table 4. AK4114'S Clock Operation Mode

SW3-1 (XTL1)	SW3-2 (XTL0)	X'tal Frequency
ON	OFF	24.576MHz

(Default)

Table 5. Reference X'tal frequency

2) Evaluation of D/A using DIR. (Optical link)

The DIR generates MCLK, BICK, LRCK and SDATA from the received data through optical connector (PORT1). PORT1 is also used for the evaluation using such as CD test disk.

BNC connector is recommended for an evaluation of the Sound quality.

2-1) DIR input interface (Default: JP2="OPT")

Jumper	JP2 (RX3)
Normal & Double Speed	OPT or BNC
Quard Speed	BNC

Table 6. DIR Input Interface

2-2) Sampling speed & MCLK frequency

a) parallel mode

SW1-1 (P/S)	SW1-4 (DFS0)	SW1-6 (CKS1)	SW1-7 (CKS0)	SW3-4 (OCKS1)	SW3-5 (OCKS0)	Sampling Speed of AK4620B	MCLK Frequency of AK4620B
ON	OFF	OFF	OFF	OFF	OFF	Normal Speed	256fs
ON	OFF	OFF	ON	ON	OFF	Normal Speed	512fs
ON	ON	OFF	ON	OFF	OFF	Double Speed	256fs

Table 7. Sampling Speed & Master clock Frequency in parallel mode

* Parallel mode does not support quad speed mode.

b) serial mode

SW1-1 (P/S)	DFS1 bit	DFS0 bit	CMODE bit	CKS1 bit	CKS0 bit	SW3-4 (OCKS1)	SW3-5 (OCKS0)	Sampling Speed of AK4620B	MCLK Frequency of AK4620B
OFF	0	0	0	0	0	OFF	OFF	Normal Speed	256fs
OFF	0	0	0	0	1	ON	OFF	Normal Speed	512fs
OFF	0	1	0	0	1	OFF	OFF	Double Speed	256fs
OFF	1	0	0	0	1	ON	ON	Quad Speed	128fs

Table 8. Sampling Speed & Master clock Frequency in serial mode

* In serial mode, SW1-4(DFS0), SW1-6(CKS1) and SW1-7(CSK0) should be always “OFF”, and DFS1, DFS0, CKS1, CKS0 and CMODE bits in the AK4620B should be set via the printer port (PORT3).

2-3) AK4114's master clock mode & reference X'tal frequency

Mode	SW3-6 (CM1)	SW3-7 (CM0)	PLL	X'tal	Clock source	SDTO
0	OFF	OFF	ON	OFF	PLL	RX

Table 9. Clock Operation Mode

SW3-1 (XTL1)	SW3-2 (XTL0)	X'tal Frequency
ON	ON	OFF

Table 10. Reference X'tal frequency

3) Evaluation of A/D using DIT. (Optical link)

DIT generates audio bi-phase signal from received data and which is output through optical connector (PORT2). It is possible to connect AKM's D/A converter evaluation boards on the digital-amplifier which equips DIR input.

3-1) Analog input mode

Jumper	JP3 (LIN)	JP4 (AINL)	JP5 (RIN)	JP6 (AINR)	SW1-2 (ADM0DE)
Single-ended	SINGLE	SINGLE	SINGLE	SINGLE	OFF
Differential	DIFF	DIFF	DIFF	DIFF	ON

Table 11. Analog Input Mode

* As for analog input circuit, please see the following item "Analog Input Buffer Circuit".

3-2) DIT output interface (Default: JP7="OPT")

Jumper	JP7 (TX)
Normal & Double Speed	OPT or BNC
Quard Speed	BNC

Table 12. DIT Output Interface

3-3) Sampling speed & MCLK frequency

a) parallel mode

SW1-1 (P/S)	SW1-4 (DFS0)	SW1-6 (CKS1)	SW1-7 (CKS0)	SW3-4 (OCKS1)	SW3-5 (OCKS0)	Sampling Speed of AK4620B	MCLK Frequency of AK4620B
ON	OFF	OFF	OFF	OFF	OFF	Normal Speed	256fs
ON	OFF	OFF	ON	ON	OFF	Normal Speed	512fs
ON	ON	OFF	ON	OFF	OFF	Double Speed	256fs

Table 13. Sampling Speed & Master clock Frequency in parallel mode

* Parallel mode does not support quad speed mode.

b) serial mode

SW1-1 (P/S)	DFS1 bit	DFS0 bit	CMODE bit	CKS1 bit	CKS0 bit	SW3-4 (OCKS1)	SW3-5 (OCKS0)	Sampling Speed of AK4620B	MCLK Frequency of AK4620B
L	0	0	0	0	0	OFF	OFF	Normal Speed	256fs
L	0	0	0	0	1	ON	OFF	Normal Speed	512fs
L	0	1	0	0	1	OFF	OFF	Double Speed	256fs
L	1	0	0	0	1	ON	ON	Quad Speed	128fs

Table 14. Sampling Speed & Master clock Frequency in serial mode

* In serial mode, SW1-4(DFS0), SW1-6(CKS1) and S1-7(CSK0) should be always “OFF”, and DFS1, DFS0, CKS1, CKS0 and CMODE bits in the AK4620B should be set via the printer port (PORT3).

3-4) AK4114's master clock mode & reference X'tal frequency

3-4-1) PLL is used as clock source

Synchronized signal should be set via PORT1(optical) or J6(BNC).

Mode	SW3-6 (CM1)	SW3-7 (CM0)	PLL	X'tal	Clock source	SDTO
0	OFF	OFF	ON	OFF	PLL	RX

Table 15. Clock Operation Mode (PLL)

SW3-1 (XTL1)	SW3-2 (XTL0)	X'tal Frequency
1	1	OFF

Table 16. Reference X'tal frequency(PLL)

3-4-2) X'tal is used as clock source

Mode	SW3-6 (CM1)	SW3-7 (CM0)	PLL	X'tal	Clock source	SDTO
1	OFF	ON	OFF	ON	X'tal	DAUX

Table 17. Clock Operation Mode (X'tal)

SW3-1 (XTL1)	SW3-2 (XTL0)	X'tal Frequency
1	0	24.576MHz

Table 18. Reference X'tal frequency (X'tal)

■ Set-up of SW1 and SW3

1) Set-up of SW1(AK4620B's mode set-up)

1-1) Audio data format in parallel mode

Mode	DIF (SW1-5)	SDTO	SDTI	LRCK	BICK	
2	OFF	24bit MSB Justified	24bit MSB Justified	H/L	≥48fs	(Default)
3	ON	I ² S Compatible	I ² S Compatible	L/H	≥48fs	

Table 19. Audio data format (parallel Mode)

1-2) De-emphasis control in parallel mode

DEM0 pin (SW1-3)	MODE	
OFF	ON(44.1KHz)	(Default)
ON	OFF	

Table 20. De-emphasis control (parallel mode)

1-3) parallel mode/ serial mode

P/S pin (SW1-1)	MODE	
OFF	Serial	(Default)
ON	Parallel	

Table 21. Set up P/S pin

2) Set-up of SW3(AK4114's mode set-up)

2-1) Audio data format

Mode	DIF0 (SW3-5)	SDTO	SDTI	LRCK	BICK	
4	L	24bit MSB Justified	24bit MSB Justified	H/L	≥48fs	(Default)
5	H	I ² S Compatible	I ² S Compatible	L/H	≥48fs	

Table22. Audio data format

* DIF1=L and DIF2=H are fixed in AKD4620B-B evaluation board.

■ The function of the toggle SW.

[SW2] : Resets the AK4620B. Keep “H” during normal operation.

■ Serial control mode

The AK4620B can be controlled via the printer port (parallel port) of IBM-AT compatible PC. Connect PORT3(CR-I/F) with PC by 10-wire flat cable packed with the AKD4620B-B.

Take care of the direction of connector. There is a mark at pin#1.

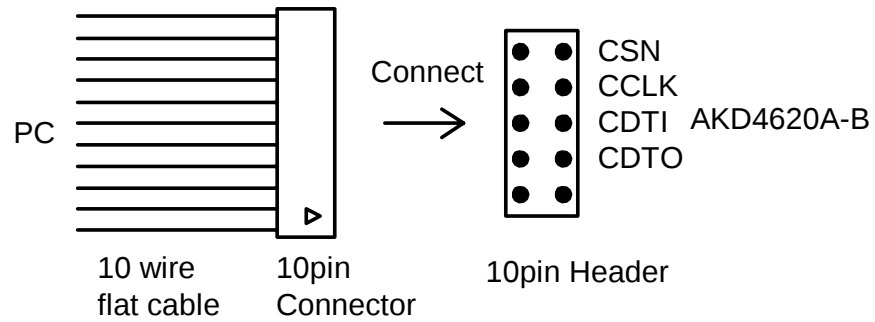


Figure 2. Connect of 10 wire flat cable

■ Analog Input Buffer Circuit

1. Differential Input Mode

The AK4620B can accept input voltages from AGND to VA. The input signal range scales with the VREF voltage and is nominally 2.82Vpp (VREF = 5V). Figure 3 shows an input buffer circuit example. This is a fully differential input buffer circuit with an inverted amplifier ($f_c=370\text{KHz}$, gain: -10dB).

The capacitor of 10nF between AINL+/- (AINR+/-) decreases the clock feedthrough noise of the modulator, and composes a 1st order LPF ($f_c=360\text{kHz}$) with a 22Ω resistor before the capacitor.

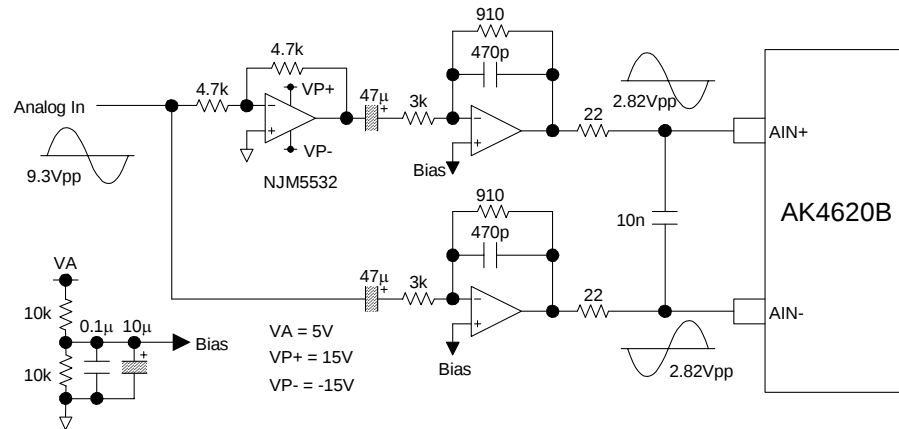


Figure 3. Input buffer circuit in differential mode

2. Single-ended Input Mode

When the AK4620B is evaluated by single-ended mode, C49 and C90 should be removed.

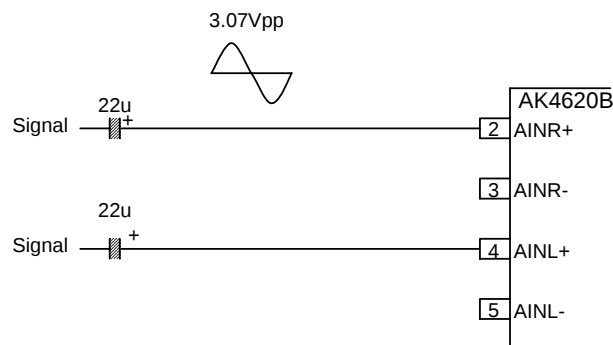


Figure 4. Input buffer circuit in Single-ended mode

■ Analog Output Buffer Circuit

The differential output circuit(2nd order LPF, $f_c=182\text{KHz}$, $Q=0.637$, $G=+3.9\text{dB}$) and LPF(1st order LPF, $f_c=284\text{KHz}$, $G=-0.84\text{dB}$) is implemented on board. The differential outputs of AK4620B is buffered by non-inverted circuit and output via Cannon connector (differential output). LPF adds differential outputs. NJM5534D is used for op-amp on this board that has low noise and high voltage tolerance characteristics. Analog signal is output via BNC connectors on the board. The output level is about 2.8Vrms (typ@ $V_{\text{REF}}=5.0\text{V}$) by BNC.

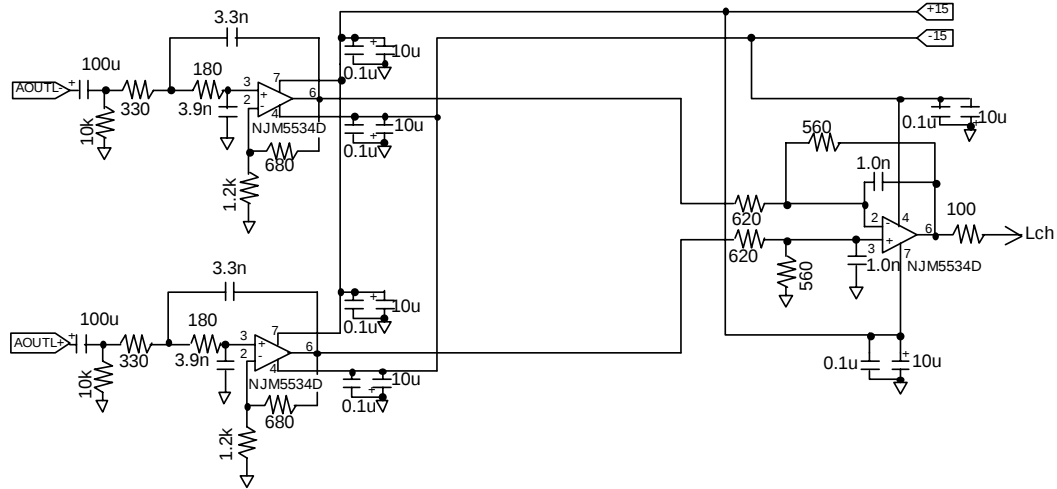


Figure 5. Output buffer circuit

* AKM assumes no responsibility for the trouble when using the above circuit examples.

Control Software Manual

■ Set-up of evaluation board and control software

1. Set up the AKD4620B-B according to previous term.
2. Connect IBM-AT compatible PC with AKD4620B-B by 10-line type flat cable (packed with AKD4620B-B). Take care of the direction of 10pin header. (Please install the driver in the CD-ROM when this control software is used on Windows 2000/XP. Please refer "Installation Manual of Control Software Driver by AKM device control software". In case of Windows95/98/ME, this installation is not needed. This control software does not operate on Windows NT.)
3. Insert the CD-ROM labeled "AKD4620B-B Evaluation Kit" into the CD-ROM drive.
4. Access the CD-ROM drive and double-click the icon of "akd4620B-b0.exe" to set up the control program.
5. Then please evaluate according to the follows.

■ Operation flow

Keep the following flow.

1. Set up the control program according to explanation above.
2. Click "Write default" button.
3. Then set up the dialog and input data.

■ Explanation of each buttons

- | | |
|----------------------|--|
| 1. [Port Setup] : | Set up the printer port. |
| 2. [Write default] : | Initialize the register of AK4620B. |
| 3. [All Write] : | Write all registers that is currently displayed. |
| 4. [Function1] : | Dialog to write data by keyboard operation. |
| 5. [Function2] : | Dialog to evaluate IPGA and ATTL/ATTR. |
| 6. [F3] : | Dialog of sequential writing. |
| 7. [SAVE] : | Save the current register setting. |
| 8. [OPEN] : | Write the saved values to all register. |
| 9. [Write] : | Dialog to write data by mouse operation. |

■ Explanation of each dialog

1. [Function1 Dialog] : Dialog to write data by keyboard operation

Address Box: Input register address in 2 figures of hexadecimal.

Data Box: Input register data in 2 figures of hexadecimal.

If you want to write the input data to AK4620B, click "OK" button. If not, click "Cancel" button.

2. [Function2 Dialog] : Dialog to evaluate IPGA, IATT and OATT

Address Box: Input register address in 2 figures of hexadecimal.

Start Data Box: Input start data in 2 figures of hexadecimal.

End Data Box: Input end data in 2 figures of hexadecimal.

Interval Box: Data is written to AK4620B by this interval.

Step Box: Data changes by this step.

Mode Select Box:

If you check this check box, data reaches end data, and returns to start data.

[Example] Start Data = 00, End Data = 09

Data flow: 00 01 02 03 04 05 06 07 08 09 09 08 07 06 05 04 03 02 01 00

If you do not check this check box, data reaches end data, but does not return to start data.

[Example] Start Data = 00, End Data = 09

Data flow: 00 01 02 03 04 05 06 07 08 09

If you want to write the input data to AK4620B, click "OK" button. If not, click "Cancel" button.

3. [Write Dialog] : Dialog to write data by mouse operation

There are dialogs corresponding to each register.

Click the "Write" button corresponding to each register to set up the dialog. If you check the check box, data becomes "H" or "1". If not, "L" or "0".

If you want to write the input data to AK4620B, click "OK" button. If not, click "Cancel" button.

■ Indication of data

Input data is indicated on the register map. Red letter indicates “H” or “1” and blue one indicates “L” or “0”. Blank is the part that is not defined in the datasheet.

■ Attention on the operation

If you set up Function1 or Function2 dialog, input data to all boxes. Attention dialog is indicated if you input data or address that is not specified in the datasheet or you click “OK” button before you input data. In that case set up the dialog and input data once more again. These operations does not need if you click “Cancel” button or check the check box.

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Measurement Result Example

[Measurement condition]

Measurement unit: Audio Precision System Two Cascade

MCLK: 512fs (44.1kHz), 256fs (96kHz), 128fs (192kHz)

BICK: 64fs

Power supply Voltage: $V_A=V_T=5.0V$, $V_D=3.3V$

Interface: Internal DIT or DIR (44.1kHz, 96kHz, 192kHz)

Temperature: Room Temp.

1. ADC (Single-ended)

fs=44.1kHz

Parameter	Input signal	Measurement filter	Results	
			L ch	R ch
S/(N+D)	1kHz, -1dB	20kLPF	89.7dB	90.0dB
DR	1kHz, -60dB	20kLPF	108.2dB	108.2dB
DR	1kHz, -60dB	20kLPF, A-weighted	110.9dB	110.9dB
S/N	No input	20kLPF, A-weighted	110.9dB	110.9dB

fs=96kHz

Parameter	Input signal	Measurement filter	Results	
			L ch	R ch
S/(N+D)	1kHz, -1dB	40kLPF	89.2dB	89.5dB
DR	1kHz, -60dB	40kLPF	104.8dB	104.7dB
DR	1kHz, -60dB	40kLPF, A-weighted	110.7dB	110.7dB
S/N	No input	40kLPF, A-weighted	110.7dB	110.7dB

fs=192kHz

Parameter	Input signal	Measurement filter	Results	
			L ch	R ch
S/(N+D)	1kHz, -1dB	40kLPF	89.0dB	89.3dB
DR	1kHz, -60dB	40kLPF	104.8dB	104.8dB
DR	1kHz, -60dB	40kLPF, A-weighted	110.6dB	110.6dB
S/N	No input	40kLPF, A-weighted	110.5dB	110.5dB

2. ADC (Differential)

fs=44.1kHz

Parameter	Input signal	Measurement filter	Results	
			L ch	R ch
S/(N+D)	1kHz, -1dB	20kLPF	100.7dB	101.5dB
DR	1kHz, -60dB	20kLPF	111.8dB	111.8dB
DR	1kHz, -60dB	20kLPF, A-weighted	114.5dB	114.4dB
S/N	No input	20kLPF, A-weighted	114.5dB	114.4dB

fs=96kHz

Parameter	Input signal	Measurement filter	Results	
			L ch	R ch
S/(N+D)	1kHz, -1dB	40kLPF	101.0dB	101.5dB
DR	1kHz, -60dB	40kLPF	107.6dB	107.6dB
DR	1kHz, -60dB	40kLPF, A-weighted	114.3dB	114.2dB
S/N	No input	40kLPF, A-weighted	114.3dB	114.2dB

fs=192kHz

Parameter	Input signal	Measurement filter	Results	
			L ch	R ch
S/(N+D)	1kHz, -1dB	40kLPF	100.8dB	101.4dB
DR	1kHz, -60dB	40kLPF	107.5dB	107.4dB
DR	1kHz, -60dB	40kLPF, A-weighted	113.8dB	114.0dB
S/N	No input	40kLPF, A-weighted	113.8dB	114.0dB

3. DAC

fs=44.1kHz

Parameter	Input signal	Measurement filter	Results	
			L ch	R ch
S/(N+D)	1kHz, 0dB	20kLPF	99.8dB	96.7dB
DR	1kHz, -60dB	20kLPF	113.0dB	113.0dB
DR	1kHz, -60dB	22kLPF, A-weighted	115.2dB	115.2dB
S/N	"0" data	22kLPF, A-weighted	115.3dB	115.3dB

fs=96kHz

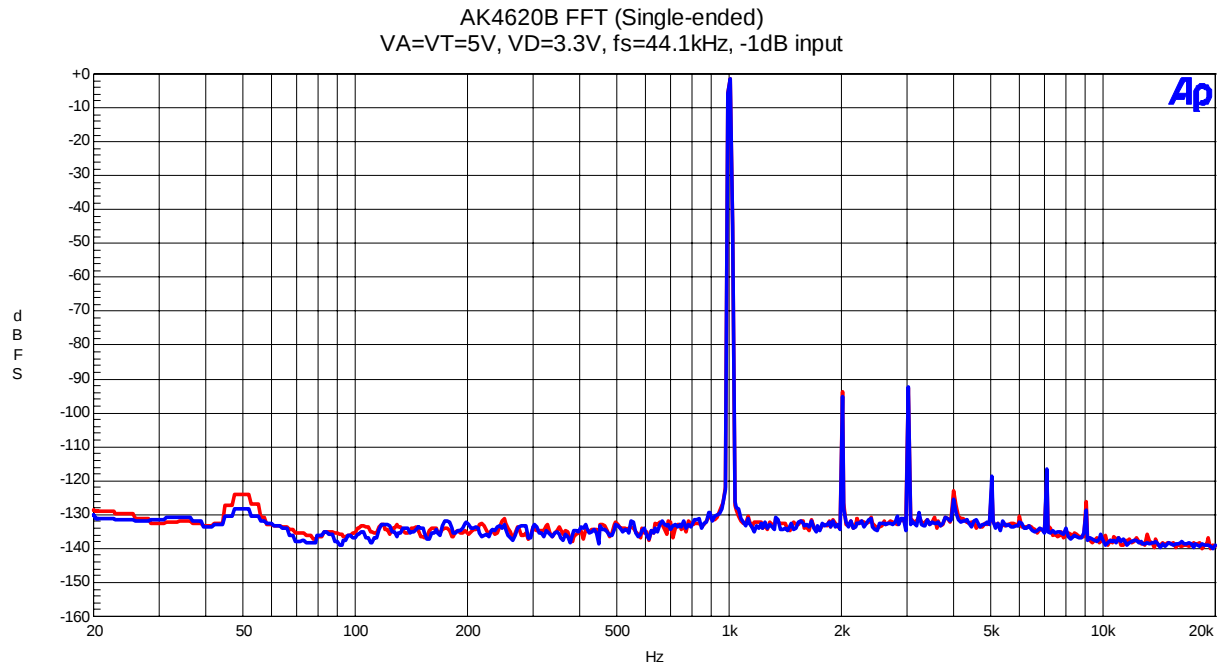
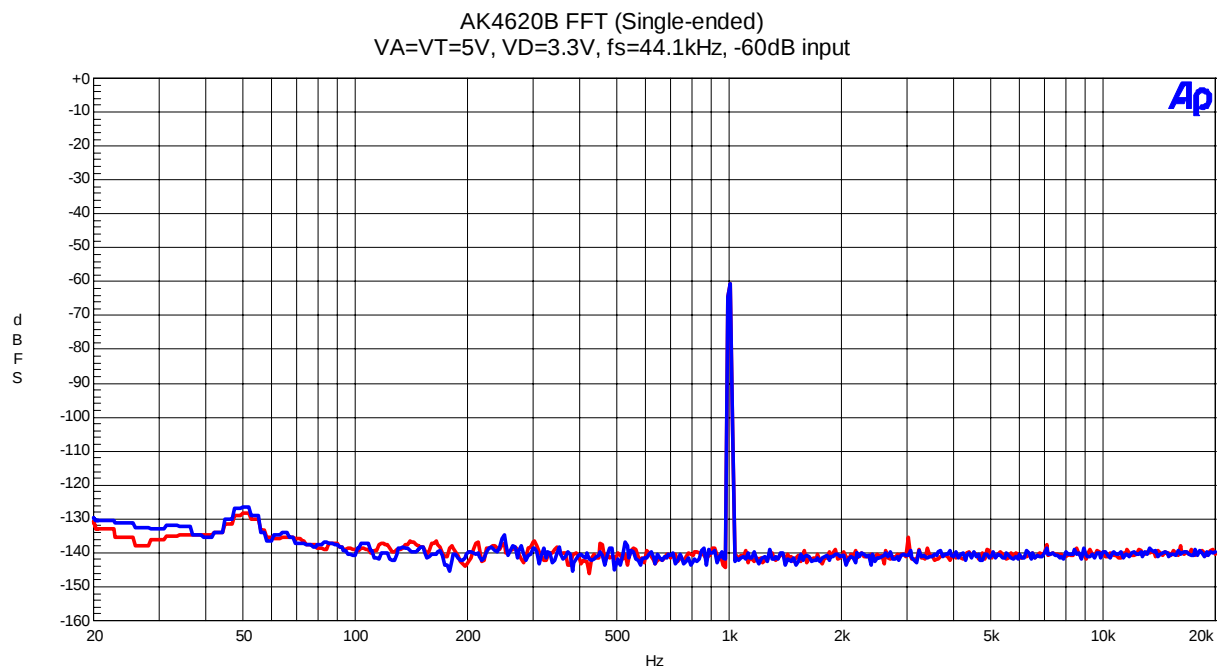
Parameter	Input signal	Measurement filter	Results	
			L ch	R ch
S/(N+D)	1kHz, 0dB	40kLPF	99.3dB	96.8dB
DR	1kHz, -60dB	40kLPF	110.3dB	110.4dB
DR	1kHz, -60dB	40kLPF, A-weighted	115.3dB	115.3dB
S/N	"0" data	40kLPF, A-weighted	115.3dB	115.4dB

fs=192kHz

Parameter	Input signal	Measurement filter	Results	
			L ch	R ch
S/(N+D)	1kHz, 0dB	40kLPF	98.6dB	96.3dB
DR	1kHz, -60dB	40kLPF	110.0dB	110.0dB
DR	1kHz, -60dB	40kLPF, A-weighted	114.9dB	114.9dB
S/N	"0" data	40kLPF, A-weighted	115.3dB	115.3dB

[Plots]**ADC (Single-ended)**

(fs=44.1kHz)

**Figure 6. FFT (fin=1kHz, Input Level=-1dBFS)****Figure 7. FFT (fin=1kHz, Input Level=-60dBFS)**

(fs=44.1kHz)

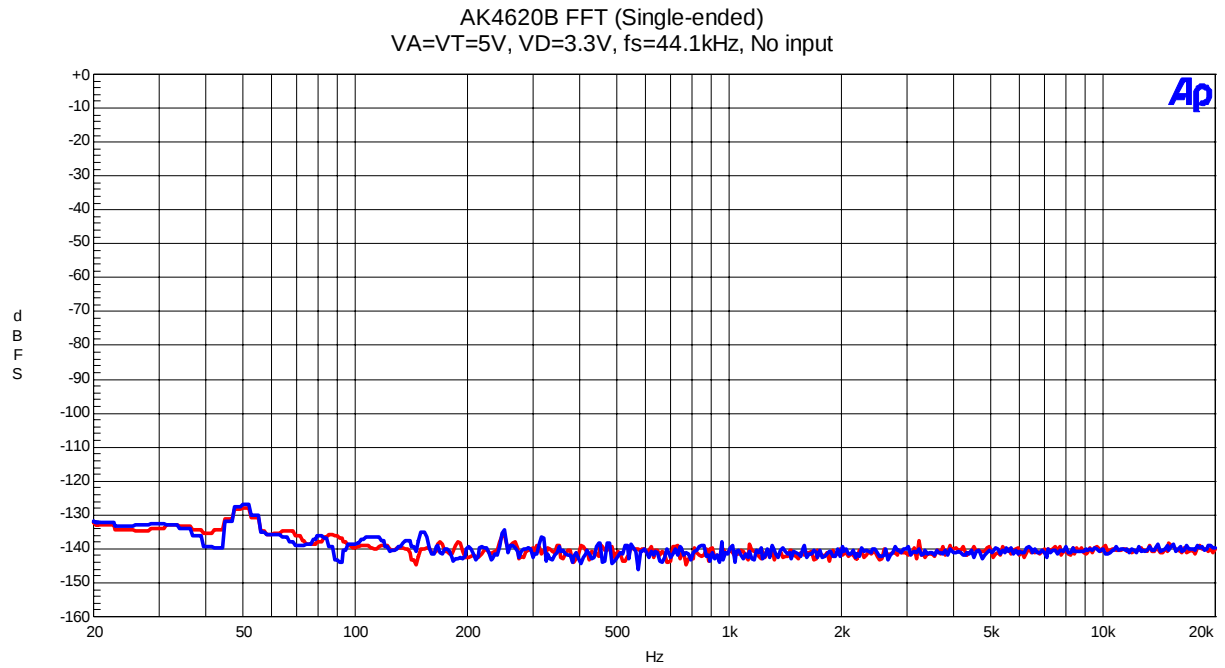


Figure 8. FFT (Noise Floor)

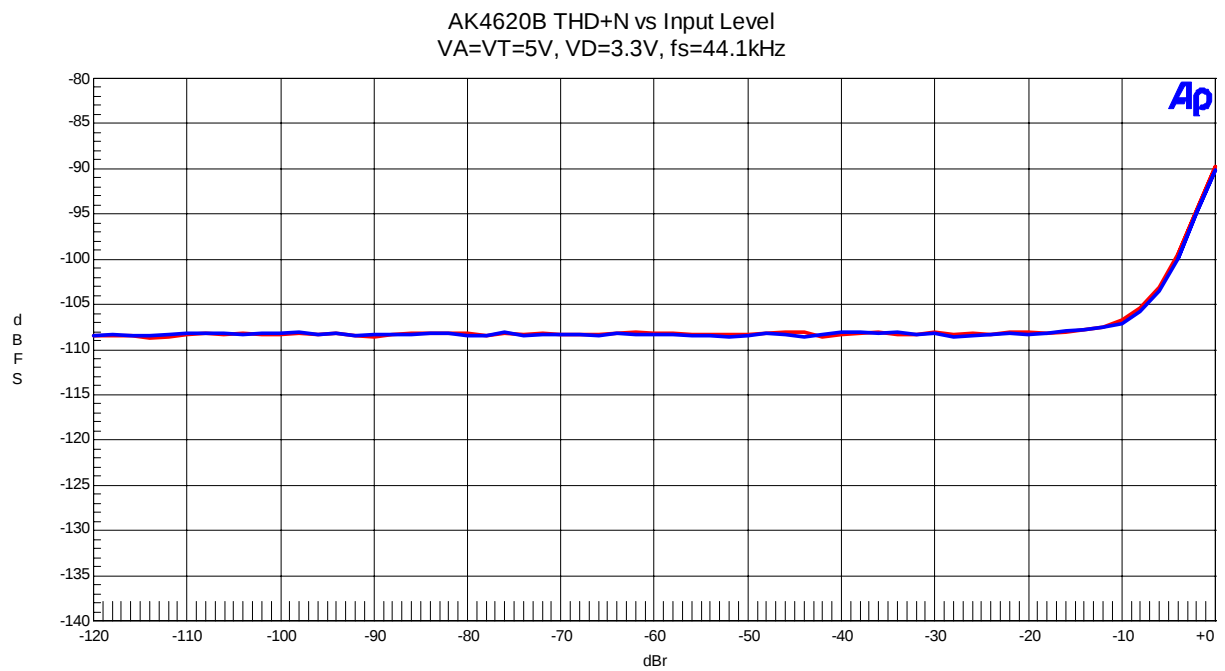


Figure 9. THD+N vs. Input level (fin=1kHz)

(fs=44.1kHz)

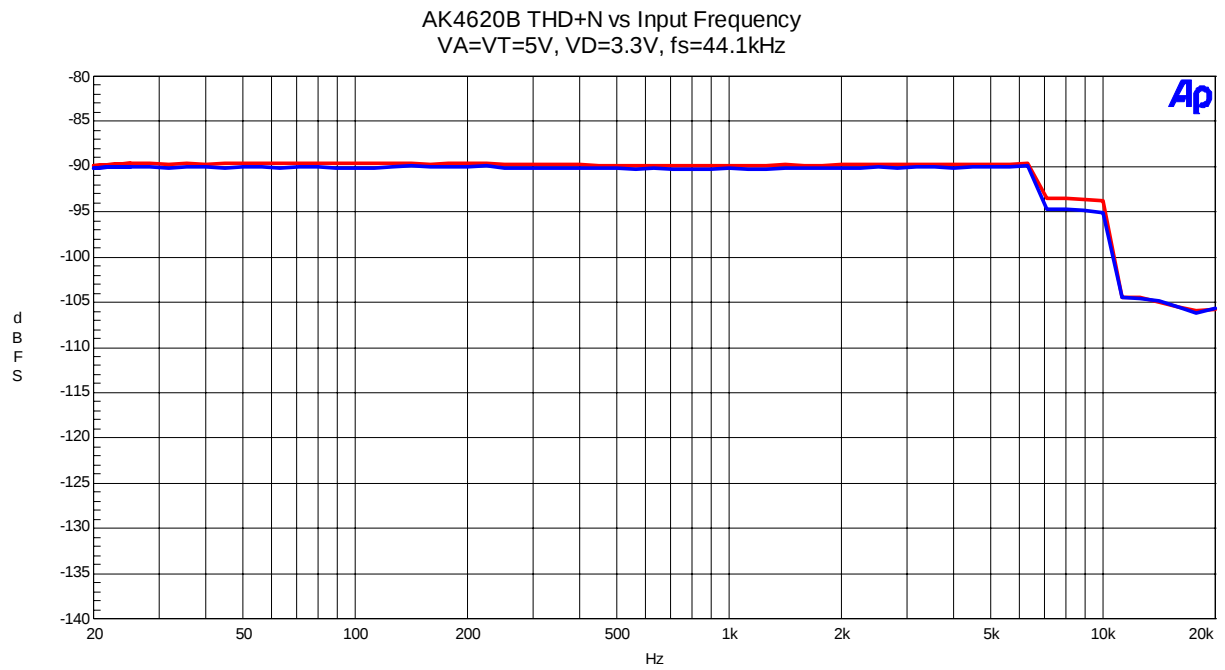


Figure 10. THD +N vs. Input Frequency (Input level=-1dBFS)

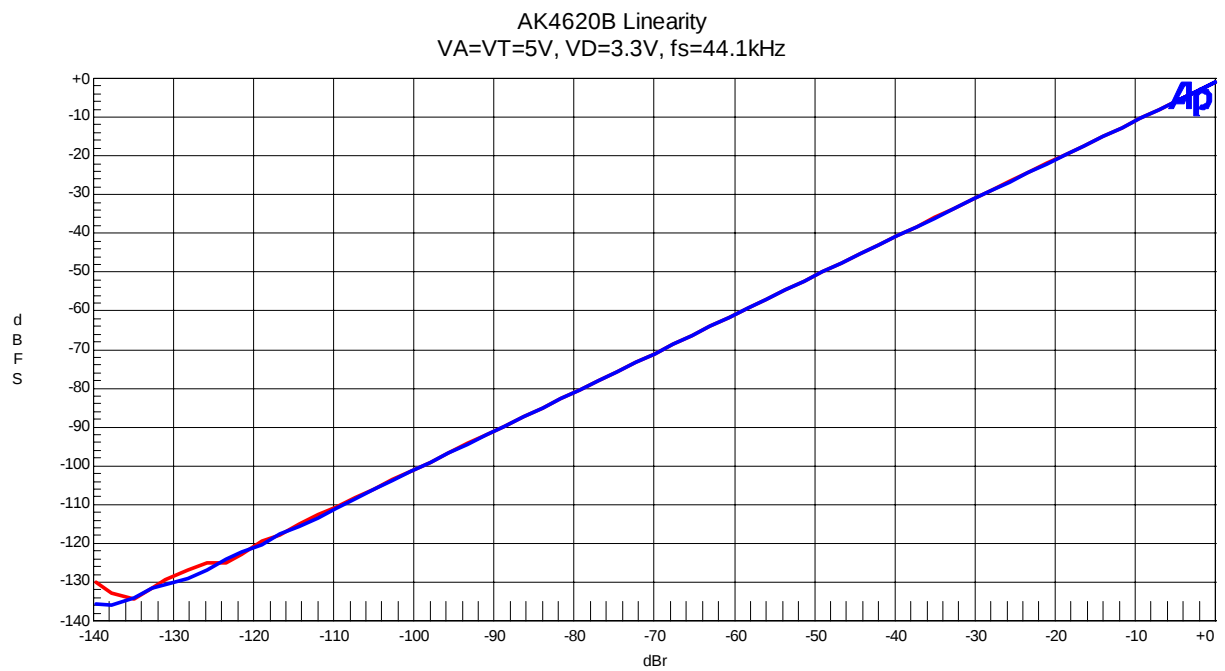


Figure 11. Linearity (fin=1kHz)

(fs=44.1kHz)

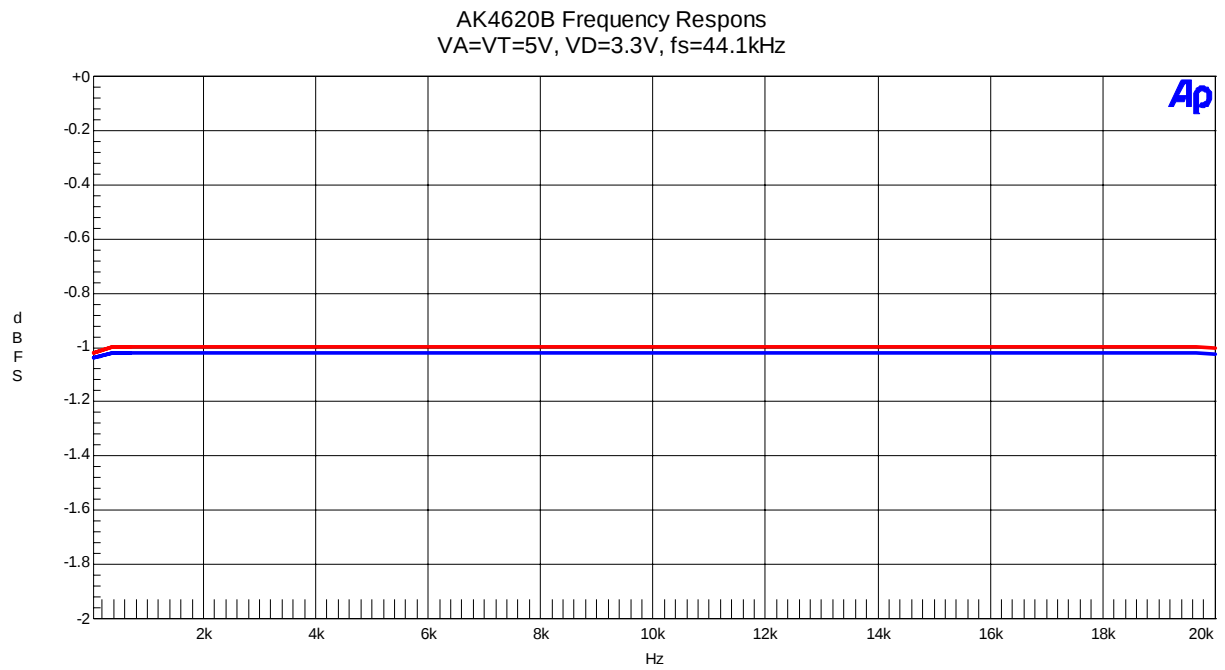


Figure 12. Frequency Response

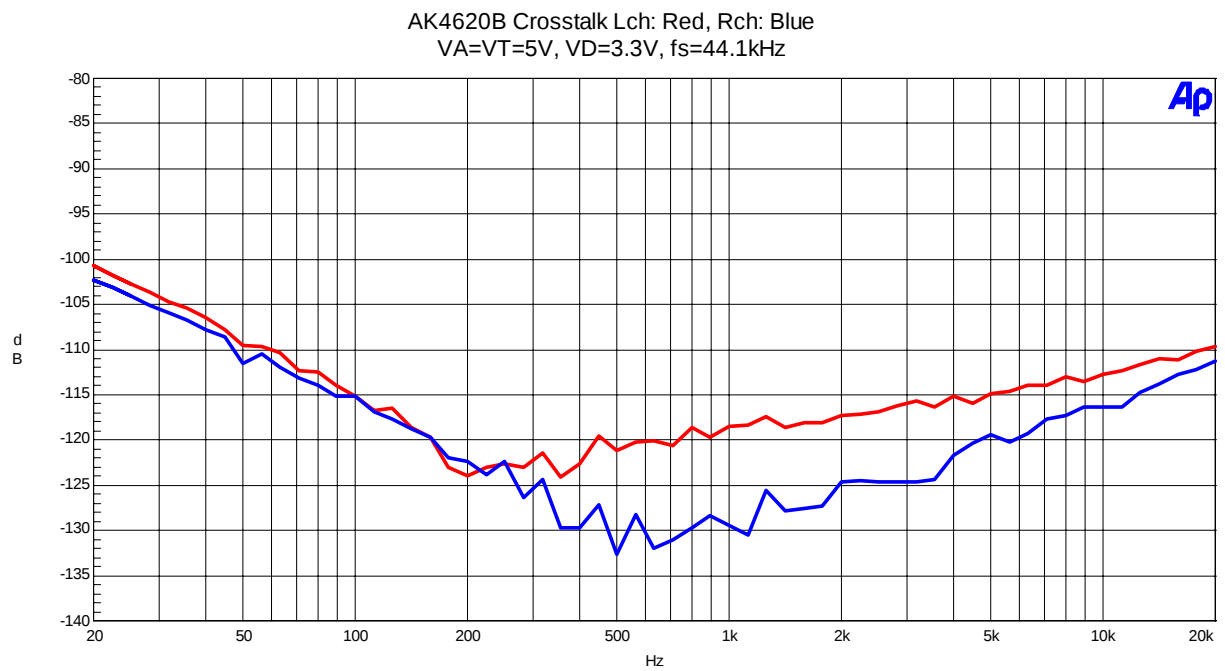
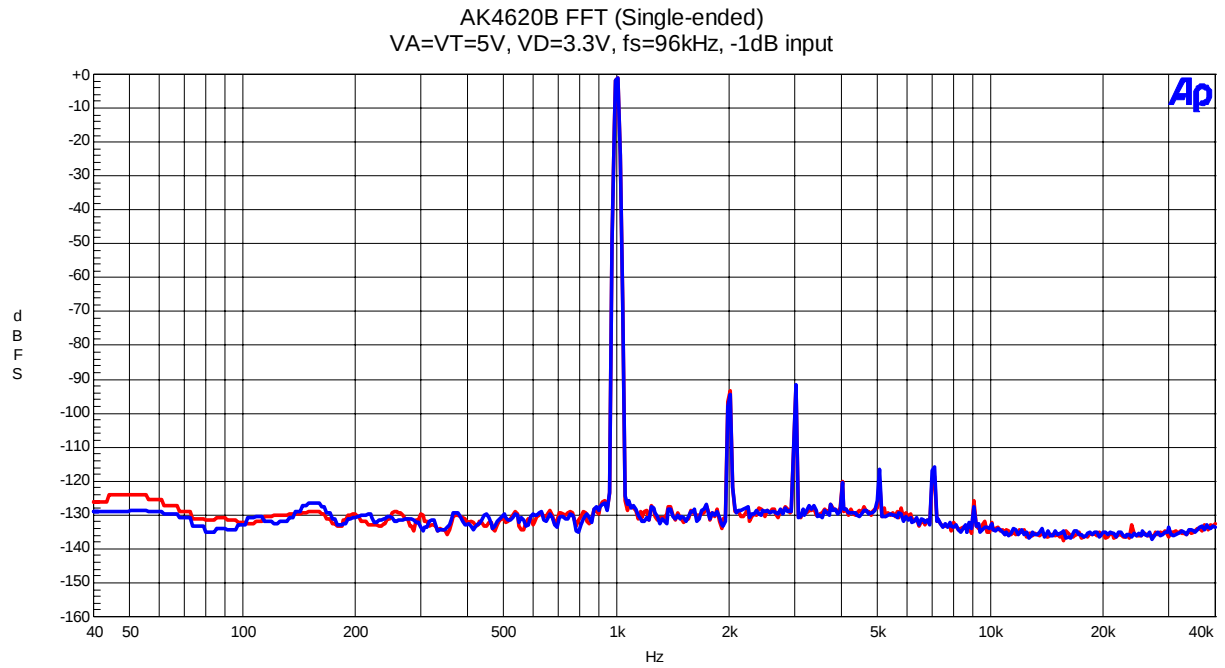
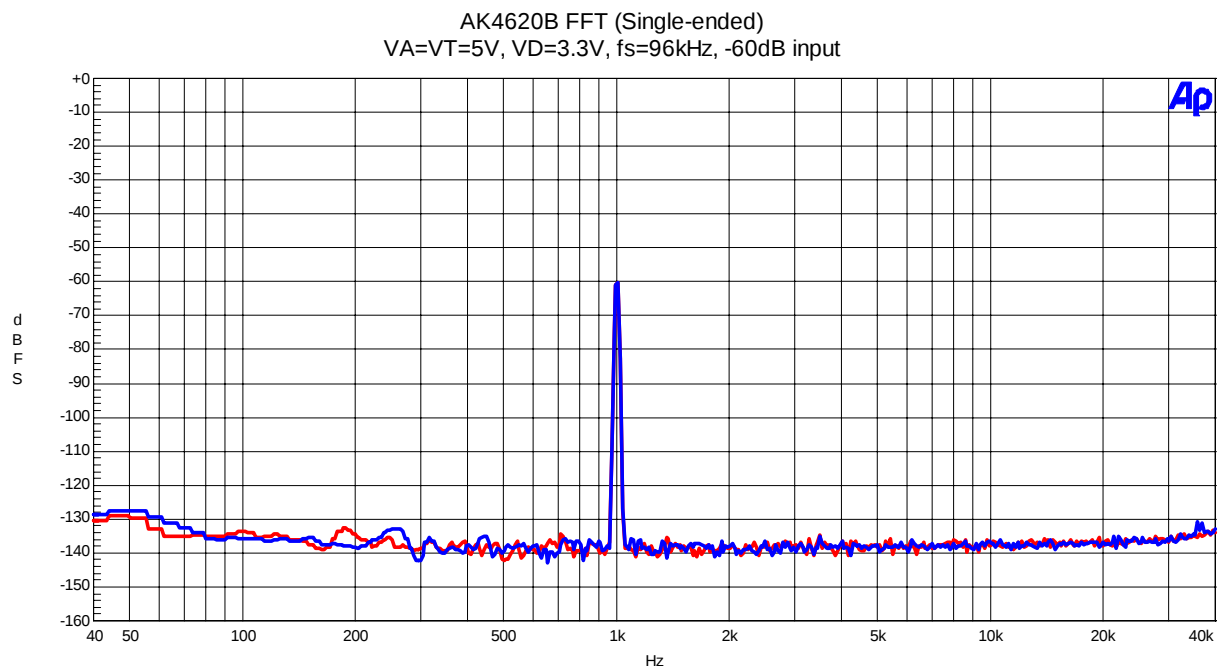
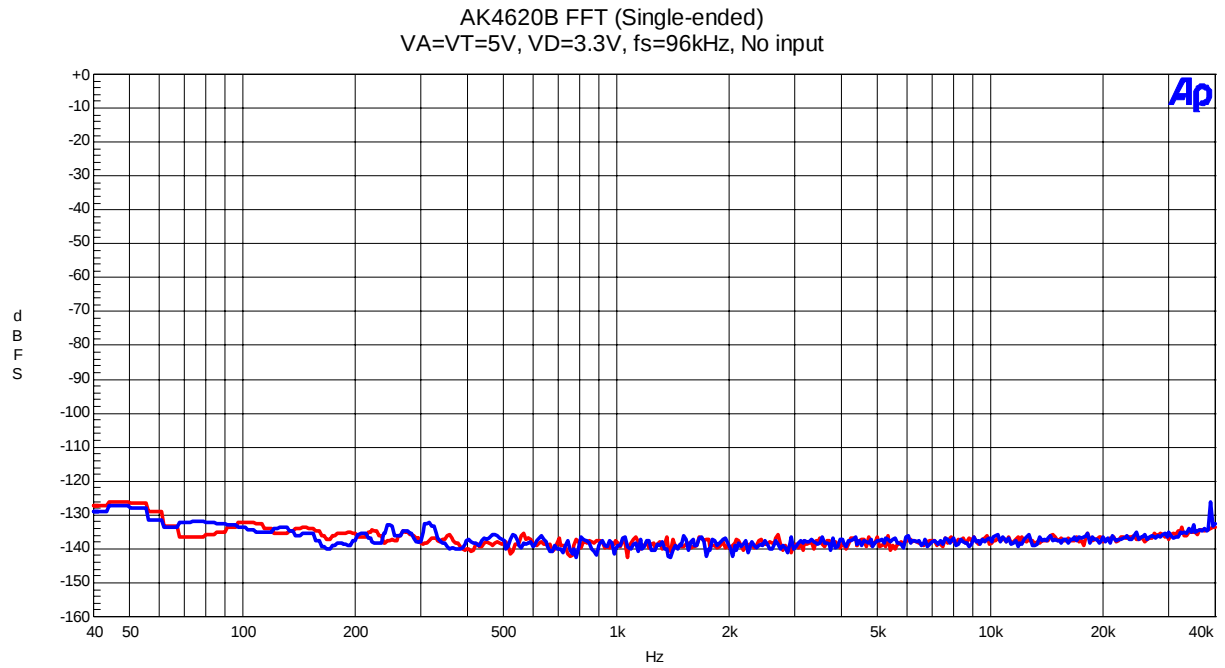
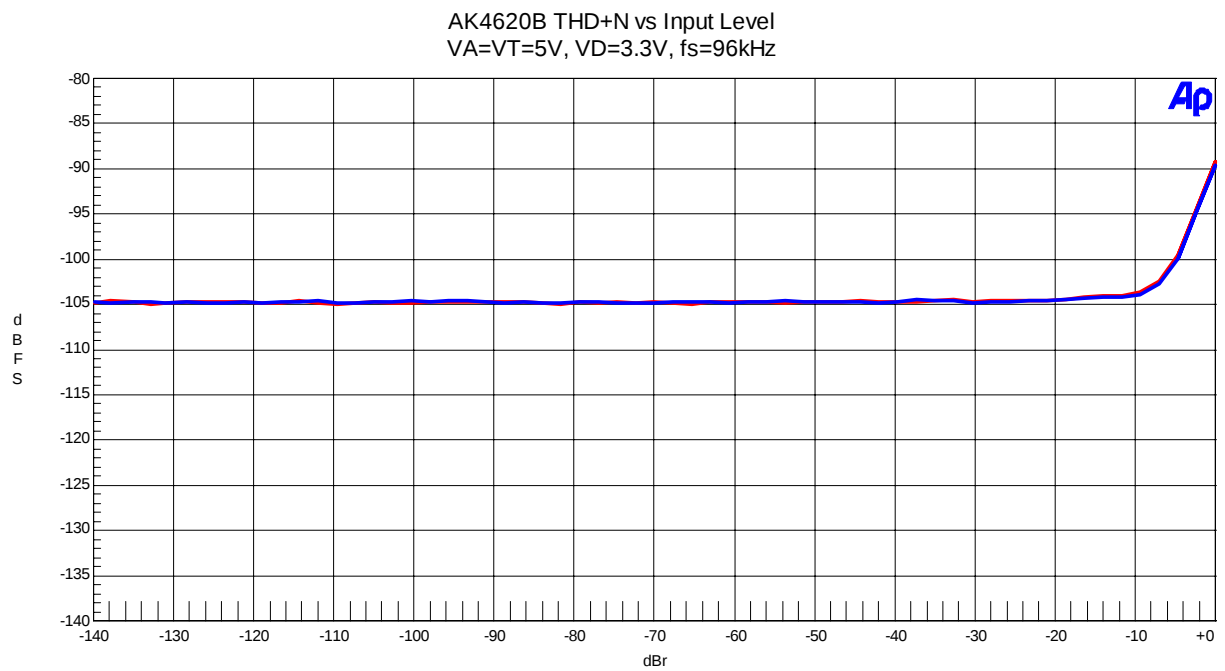


Figure 13. Crosstalk

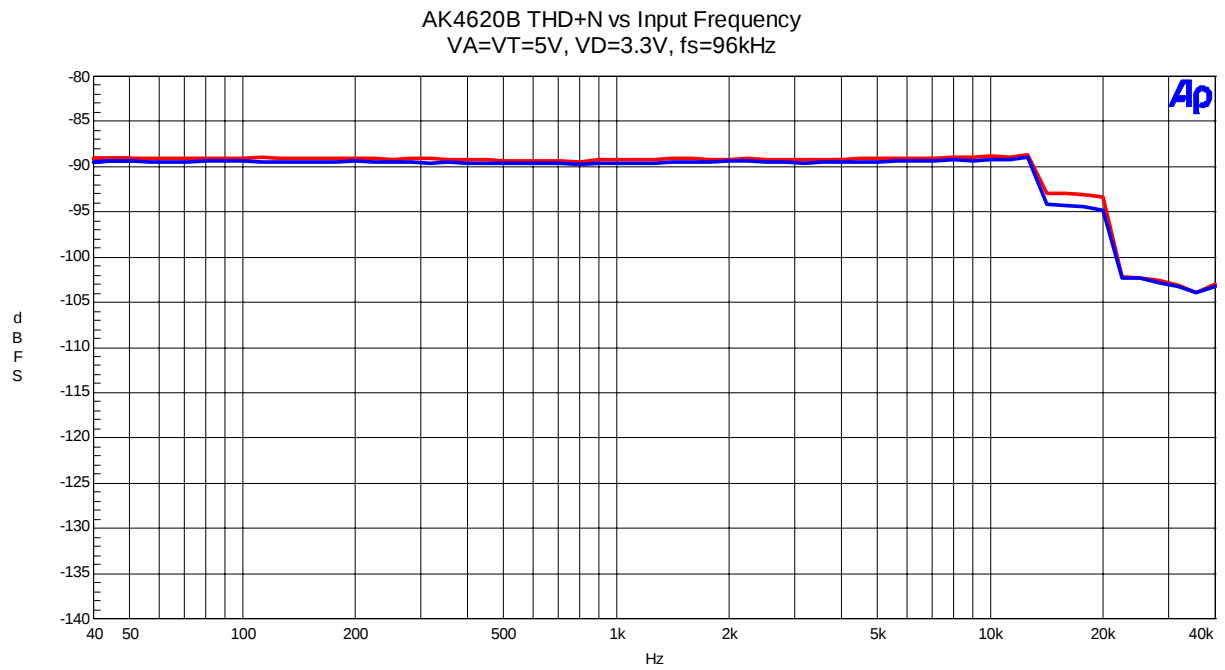
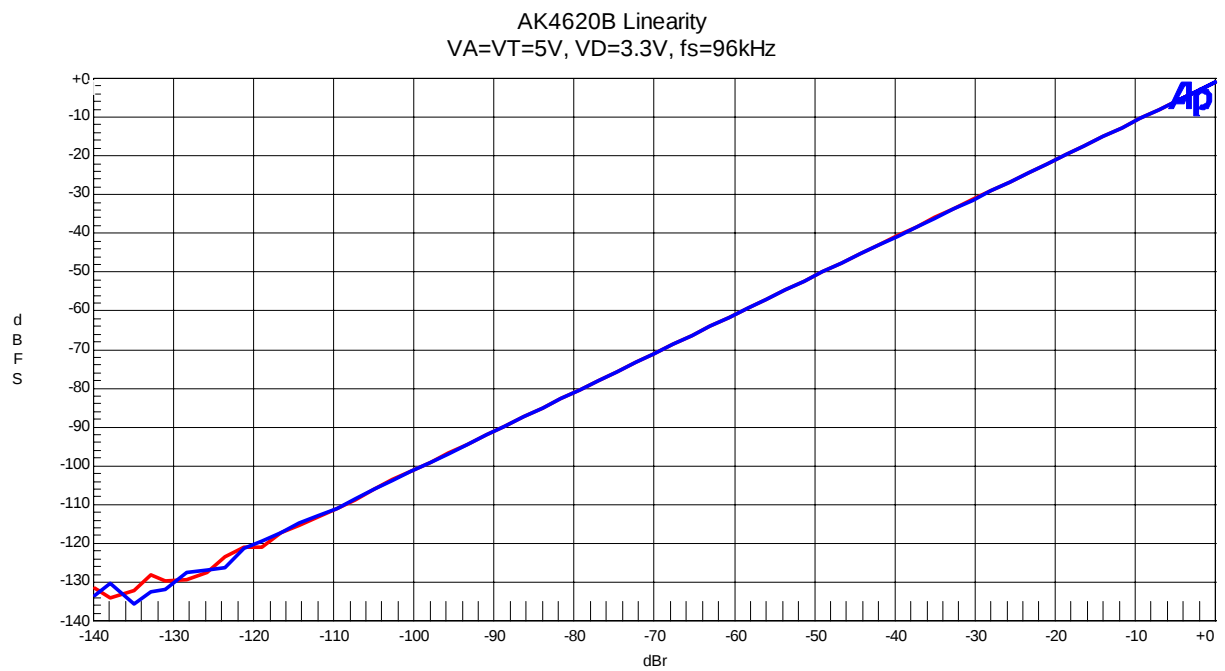
(fs=96kHz)

**Figure 14. FFT (fin=1kHz, Input Level=-1dBFS)****Figure 15. FFT (fin=1kHz, Input Level=-60dBFS)**

(fs=96kHz)

**Figure 16. FFT (Noise Floor)****Figure 17. THD +N vs. Input level (fin=1kHz)**

(fs=96kHz)

**Figure 18. THD +N vs. Input Frequency (Input level=-1dBFS)****Figure 19. Linearity (fin=1kHz)**

(fs=96kHz)

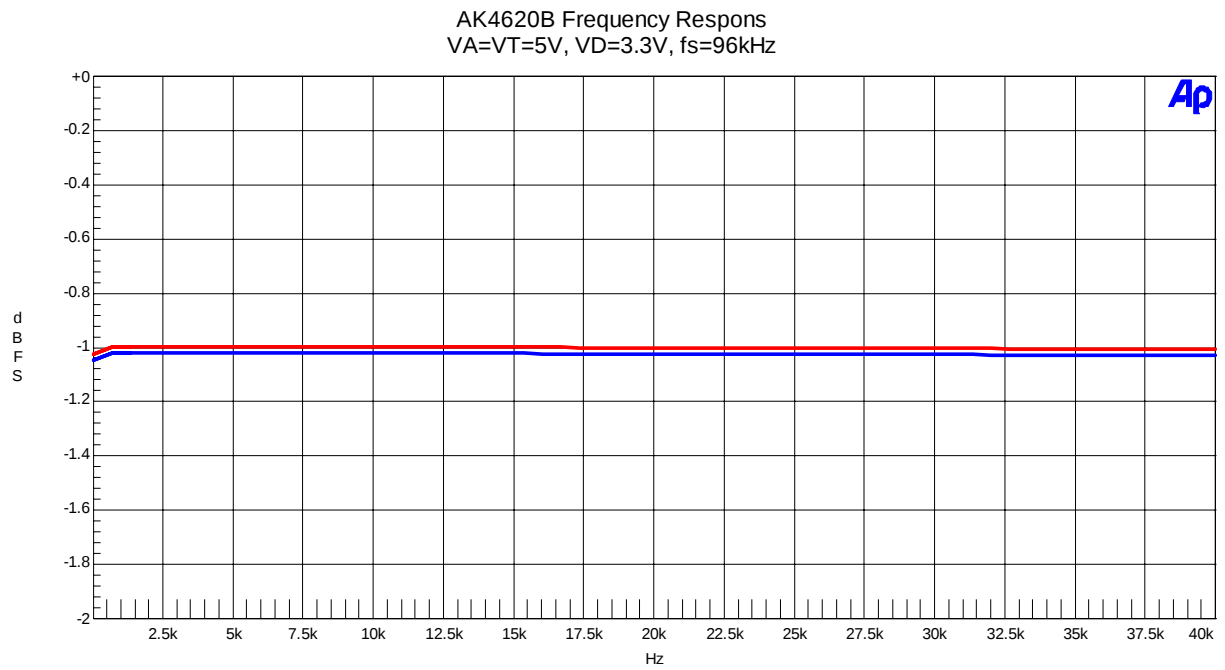


Figure 20. Frequency Response

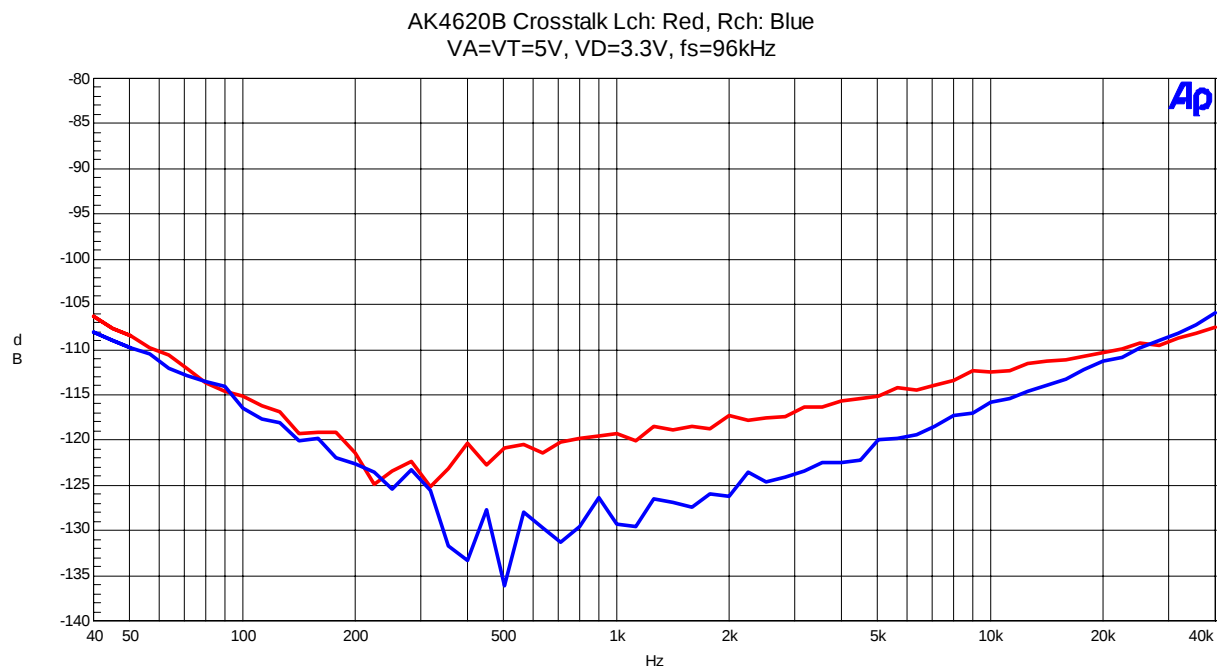


Figure 21. Crosstalk

(fs=192kHz)

AKM

AK4620 FFT (Singl-ended)
 VA=VT=5V, VD=3.3V, fs=192kHz, -1dB input

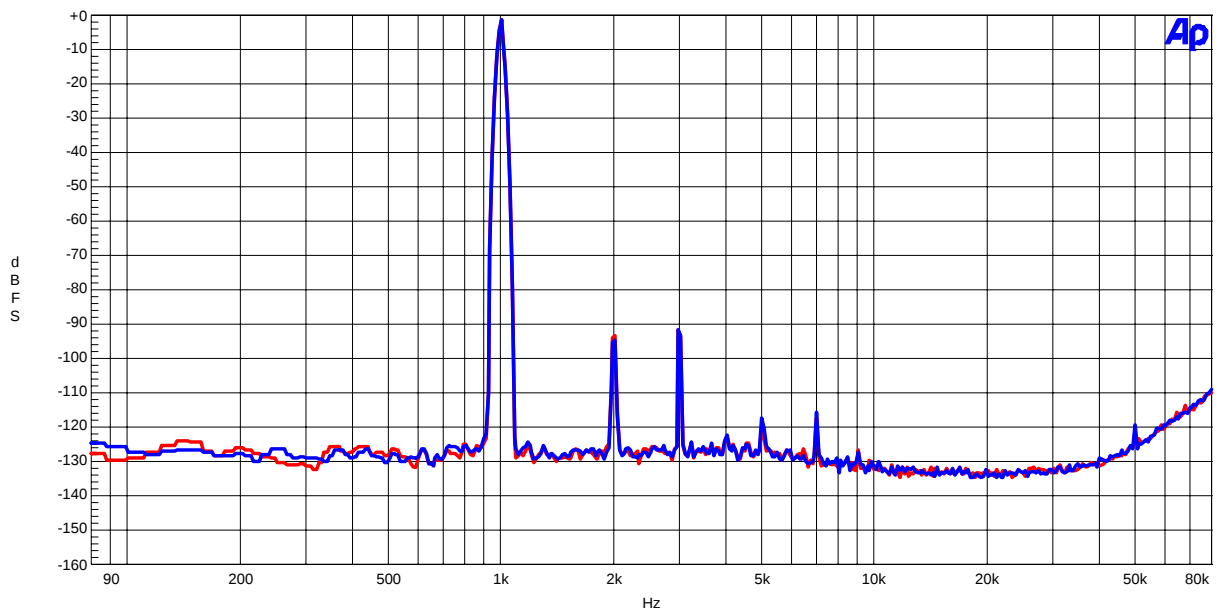


Figure 22. FFT (fin=1kHz, Input Level=-1dBFS)

AKM

AK4620 FFT (Singl-ended)
 VA=VT=5V, VD=3.3V, fs=192kHz, -60dB input

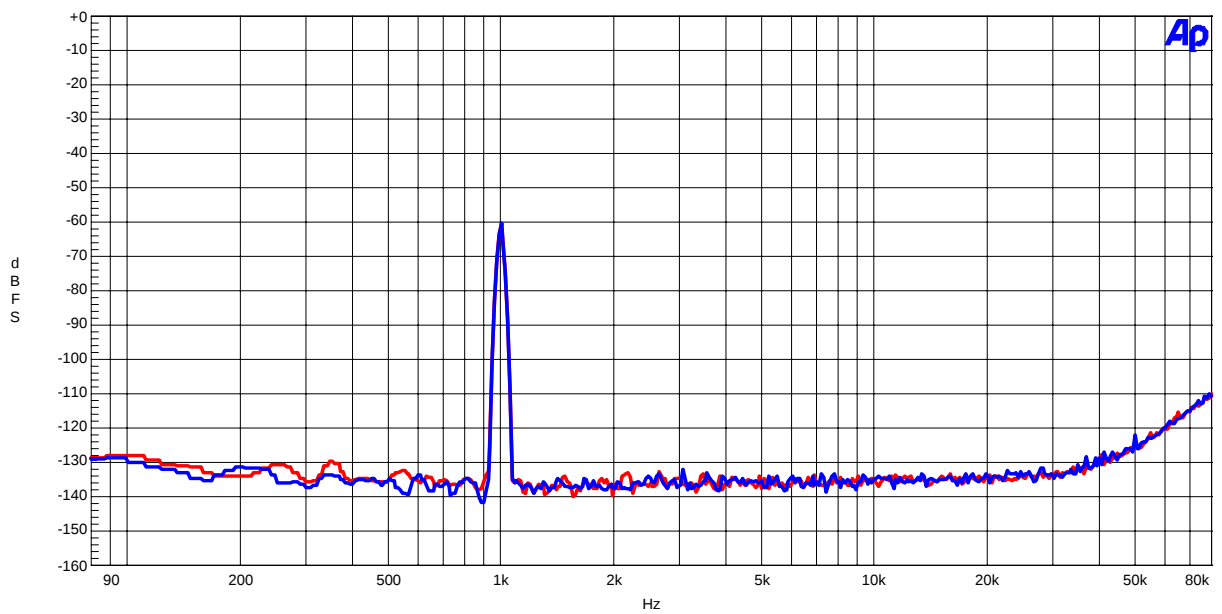


Figure 23. FFT (fin=1kHz, Input Level=-60dBFS)

(fs=192kHz)

AKM

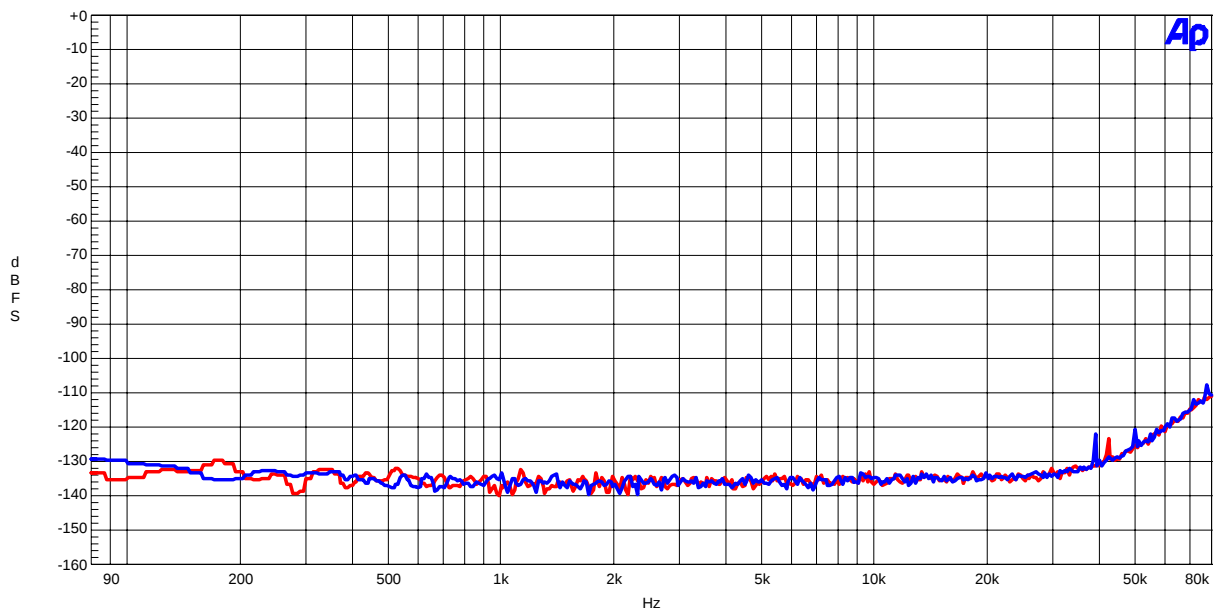
AK4620 FFT (Singl-ended)
VA=VT=5V, VD=3.3V, fs=192kHz, No input

Figure 24. FFT (Noise Floor)

AKM

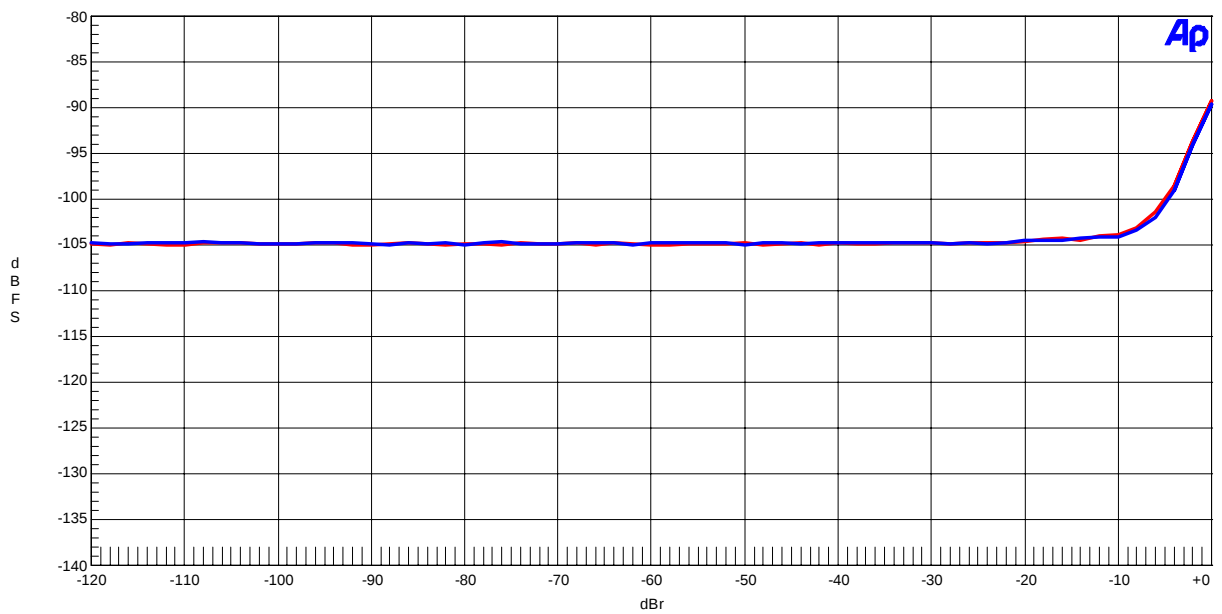
AK4620 THD+N vs Input Level
VA=VT=5V, VD=3.3V, fs=192kHz

Figure 25. THD+N vs. Input level (fin=1kHz)

(fs=192kHz)

AKM

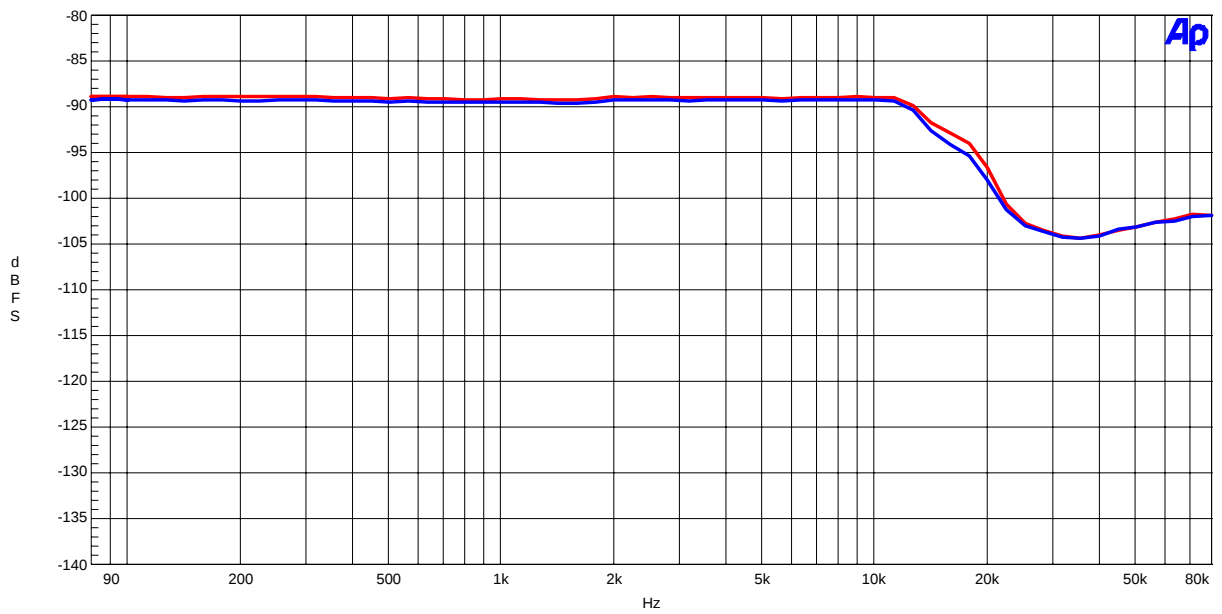
AK4620 THD+N vs Input Frequency
VA=VT=5V, VD=3.3V, fs=192kHz

Figure 26. THD+N vs. Input Frequency (Input level=-1dBFS)

AKM

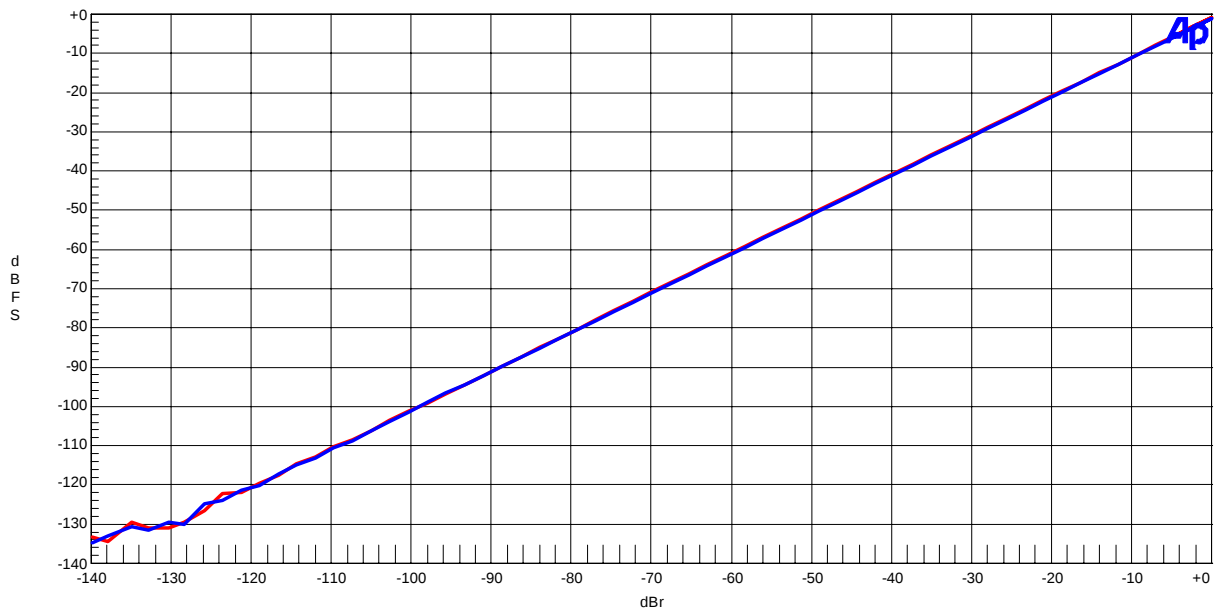
AK4620 Linearity
VA=VT=5V, VD=3.3V, fs=192kHz

Figure 27. Linearity (fin=1kHz)

(fs=192kHz)

AKM

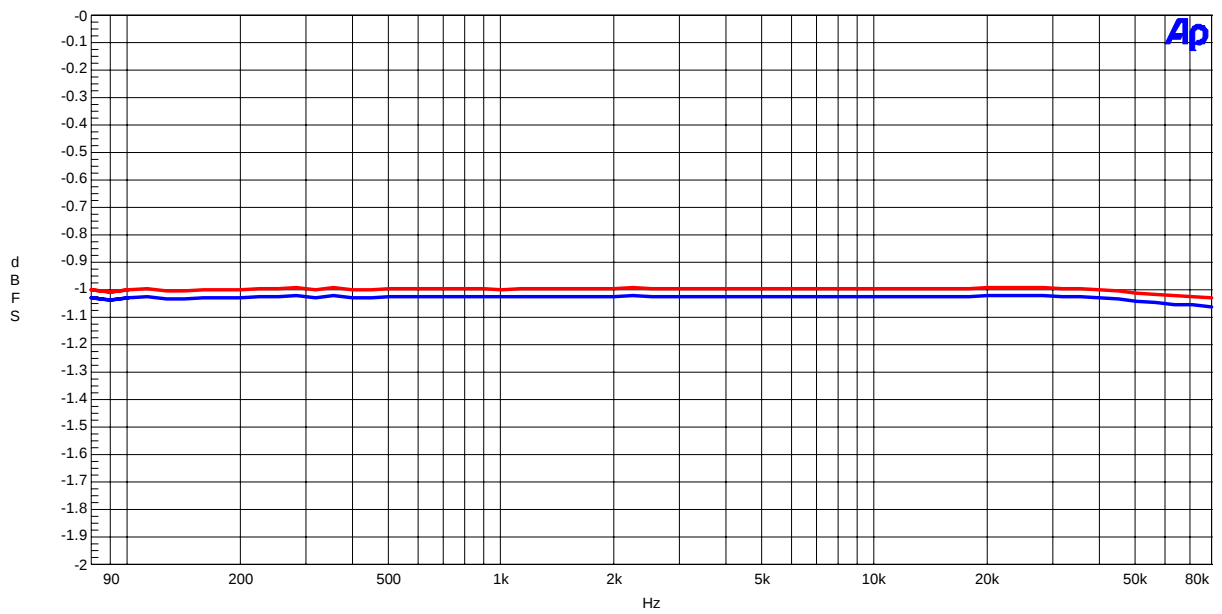
AK4620 Frequency Respons
VA=VT=5V, VD=3.3V, fs=192kHz

Figure 28. Frequency Response

AKM

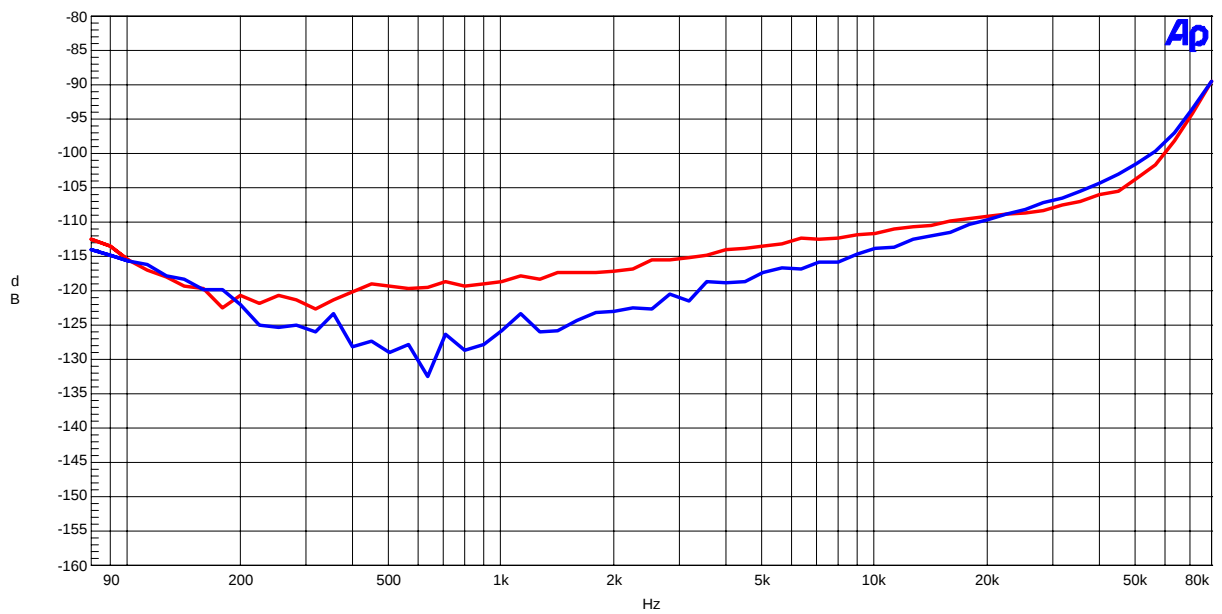
AK4620 Crosstalk Lch: Red, Rch: Blue
VA=VT=5V, VD=3.3V, fs=192kHz

Figure 29. Crosstalk

ADC (Differential)

(fs=44.1kHz)

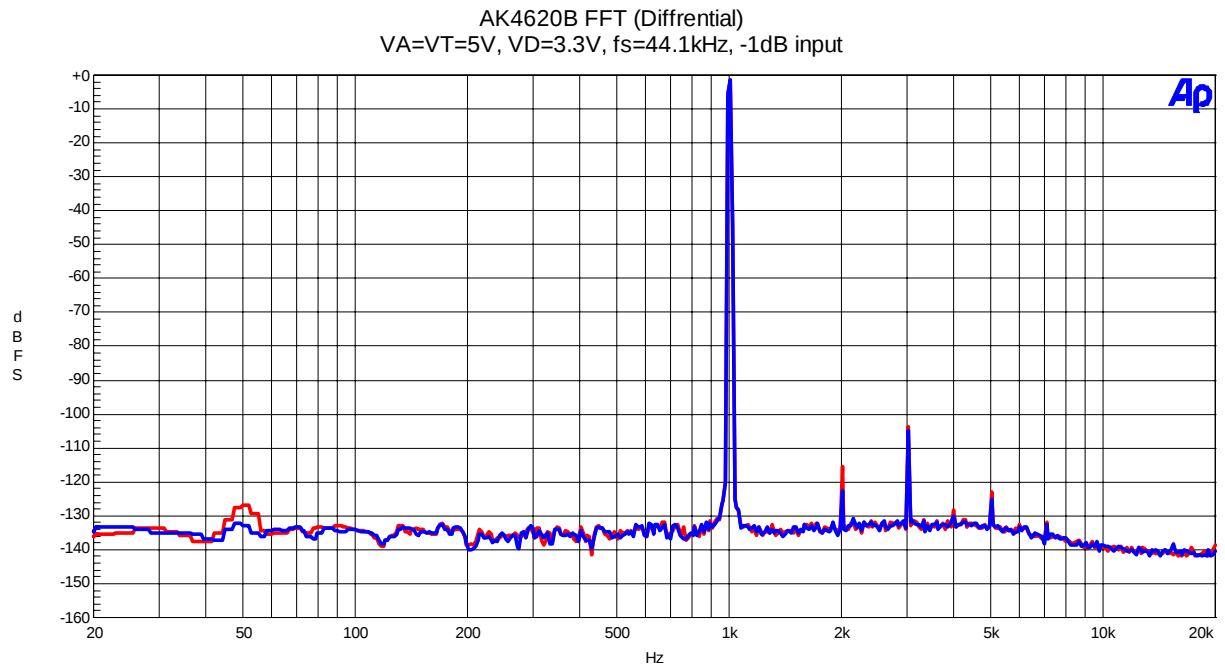


Figure 30. FFT (fin=1kHz, Input Level=-1dBFS)

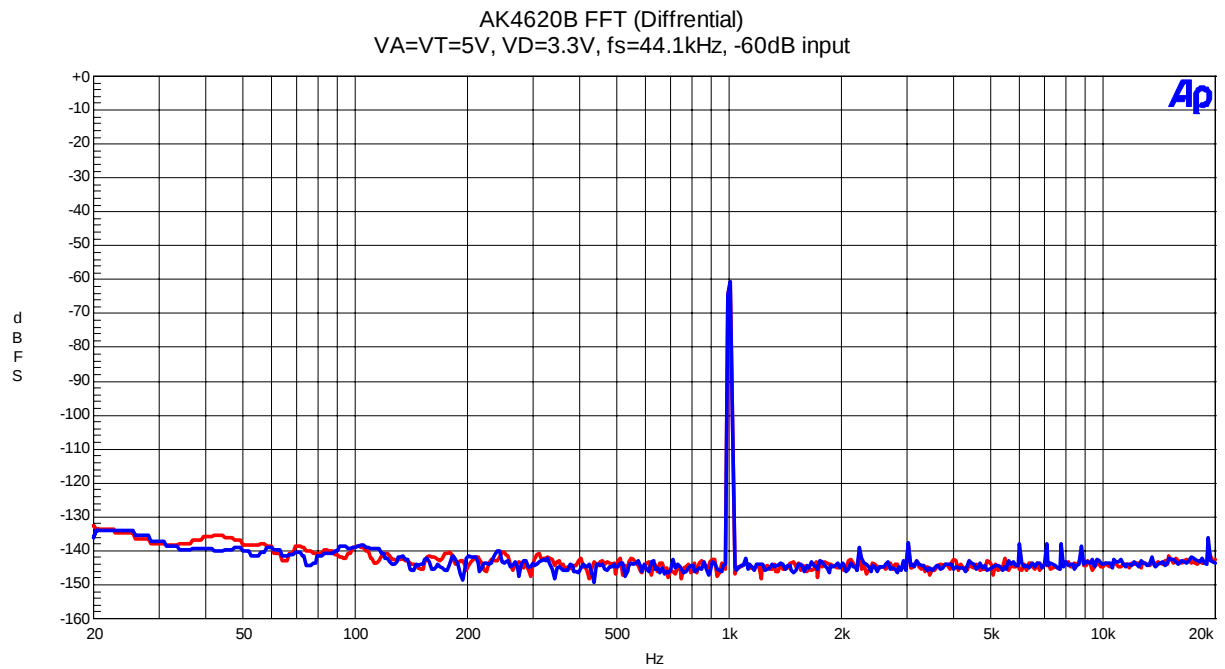


Figure 31. FFT (fin=1kHz, Input Level=-60dBFS)

(fs=44.1kHz)

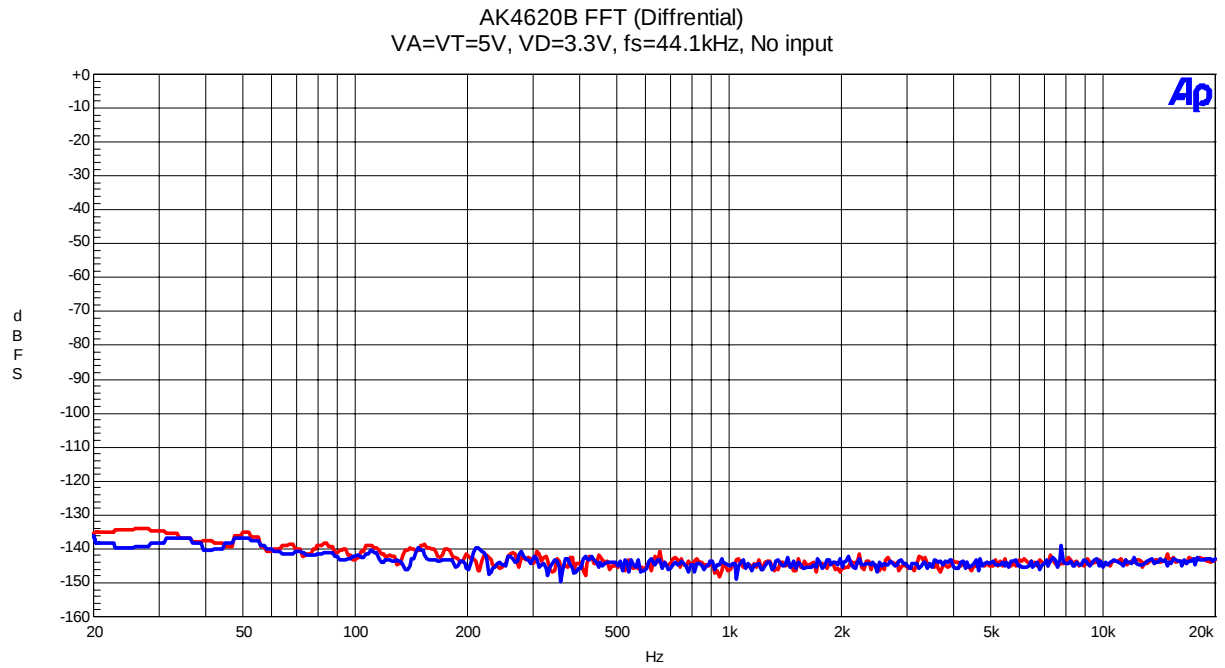


Figure 32. FFT (Noise Floor)

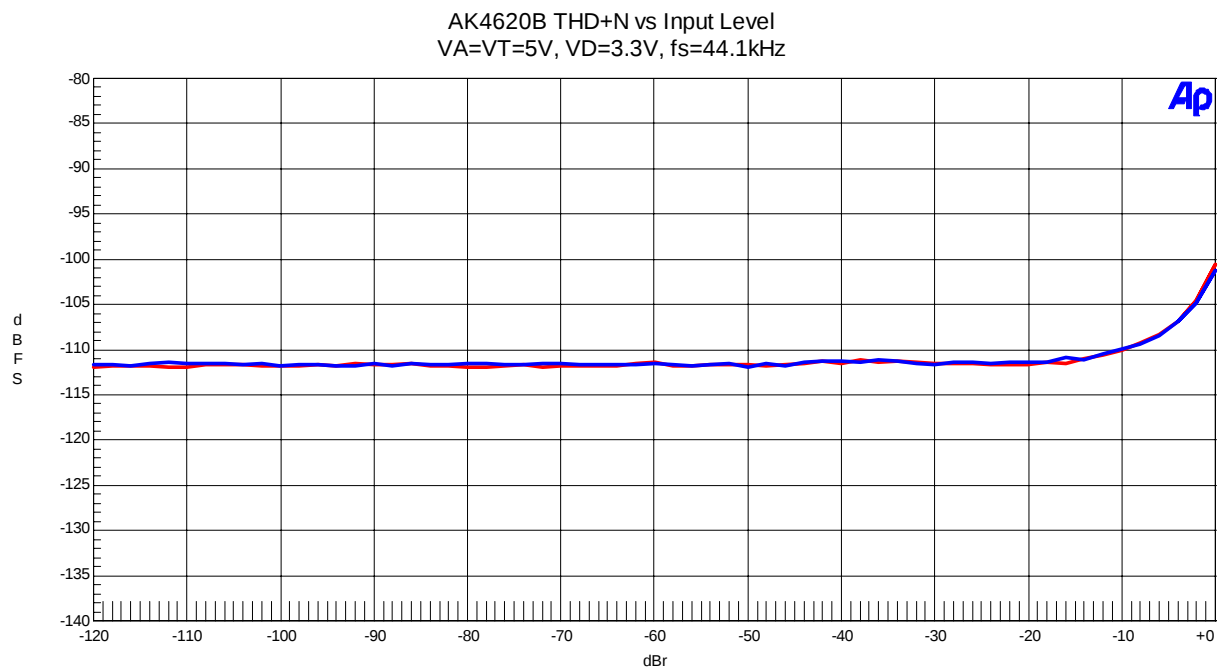


Figure 33. THD+N vs. Input level (fin=1kHz)

(fs=44.1kHz)

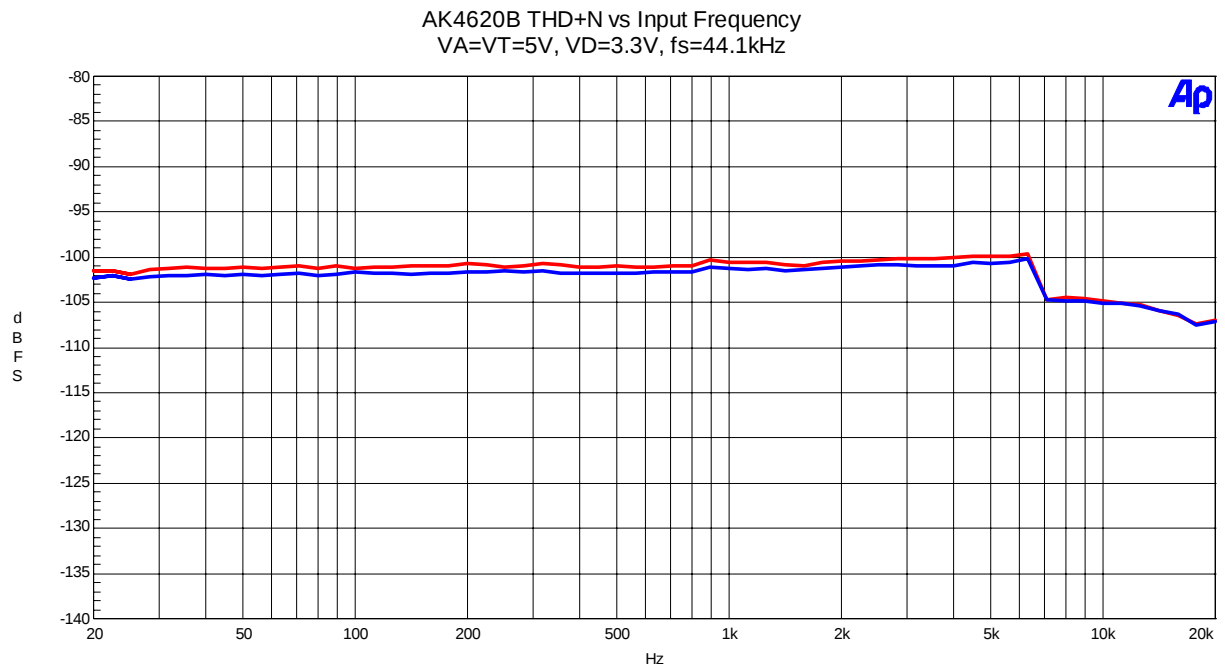


Figure 34. THD +N vs. Input Frequency (Input level=-1dBFS)

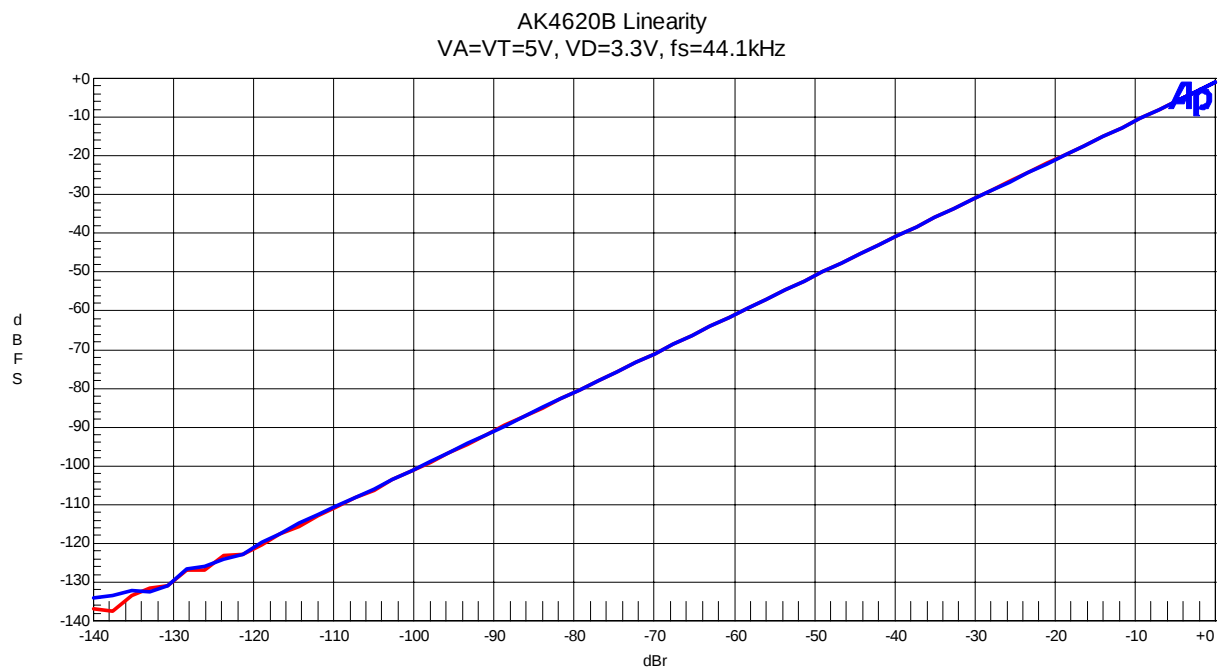


Figure 35. Linearity (fin=1kHz)

(fs=44.1kHz)

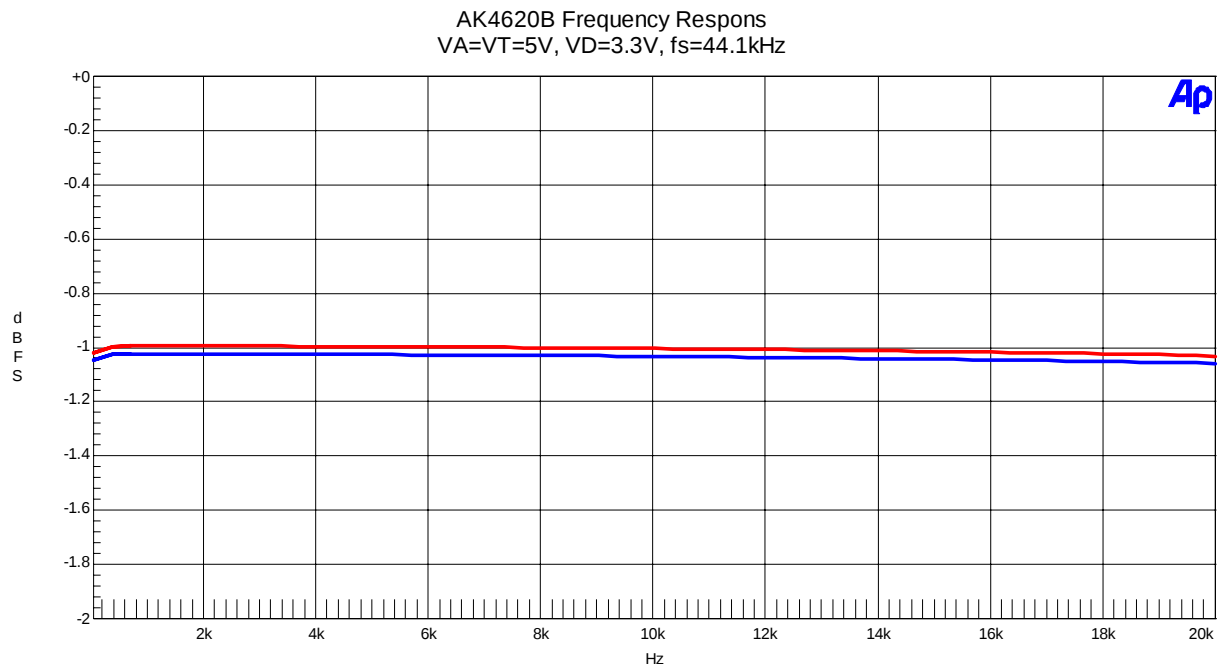


Figure 36. Frequency Response

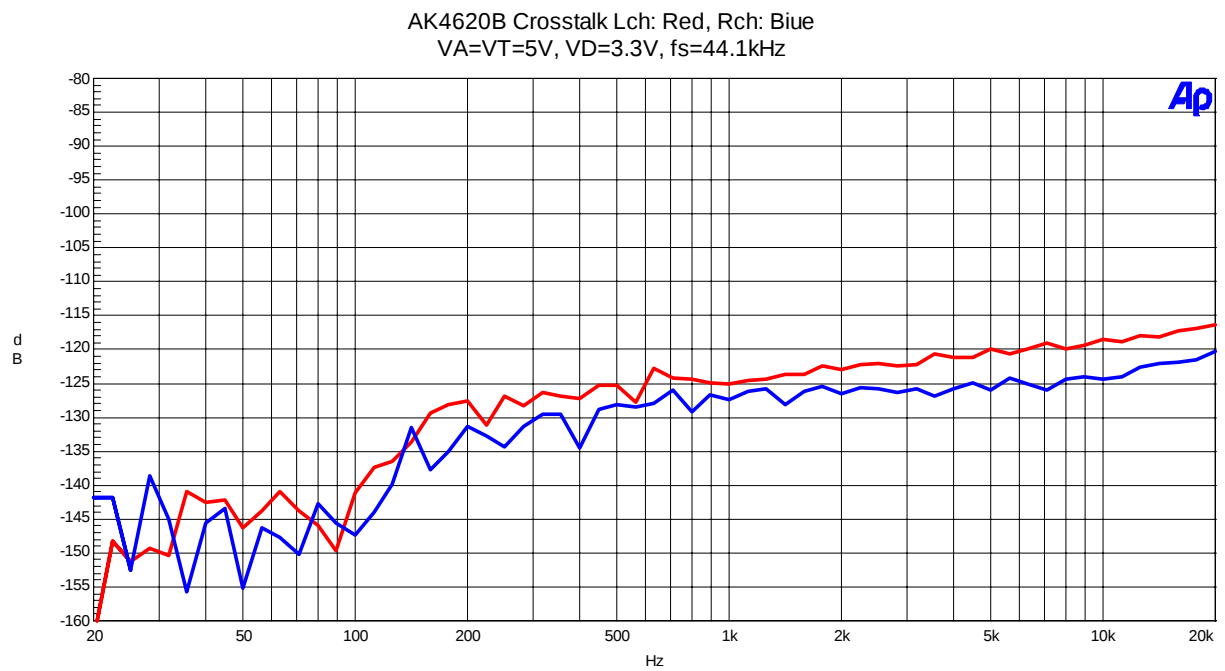
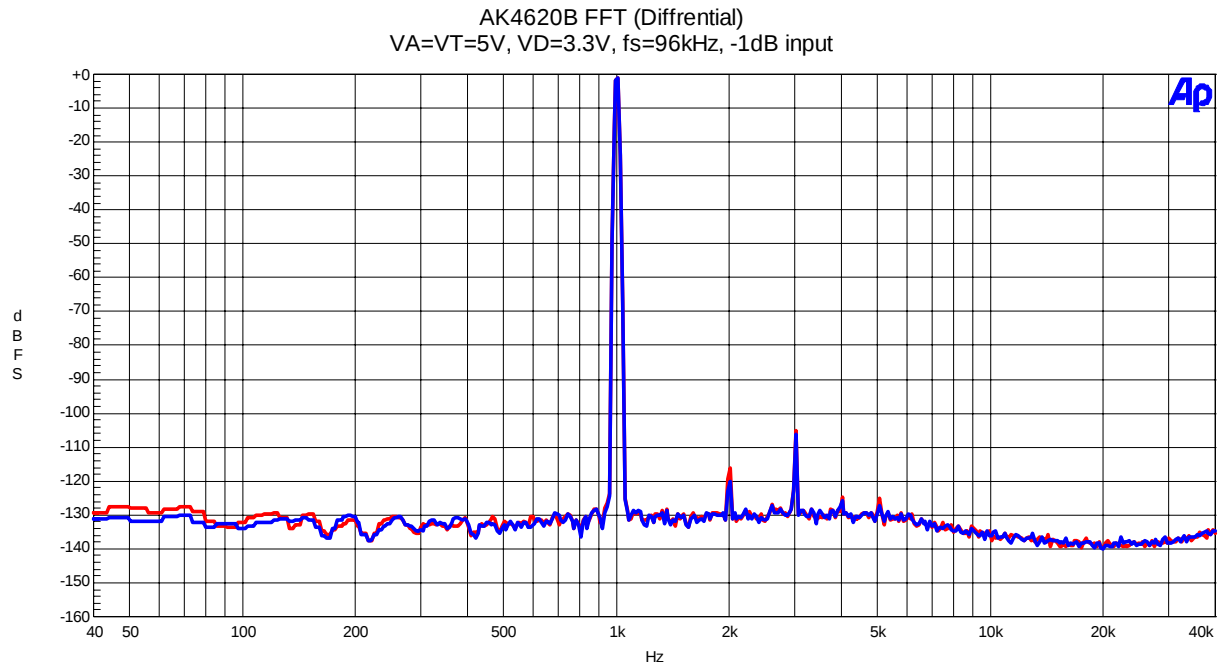
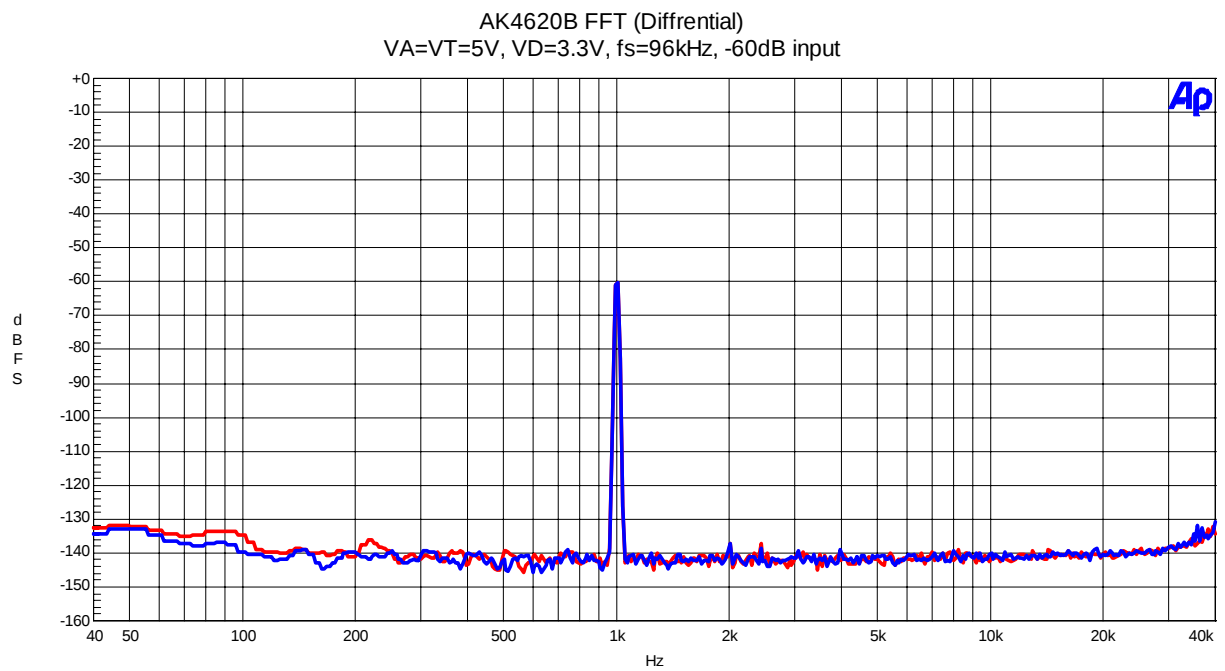
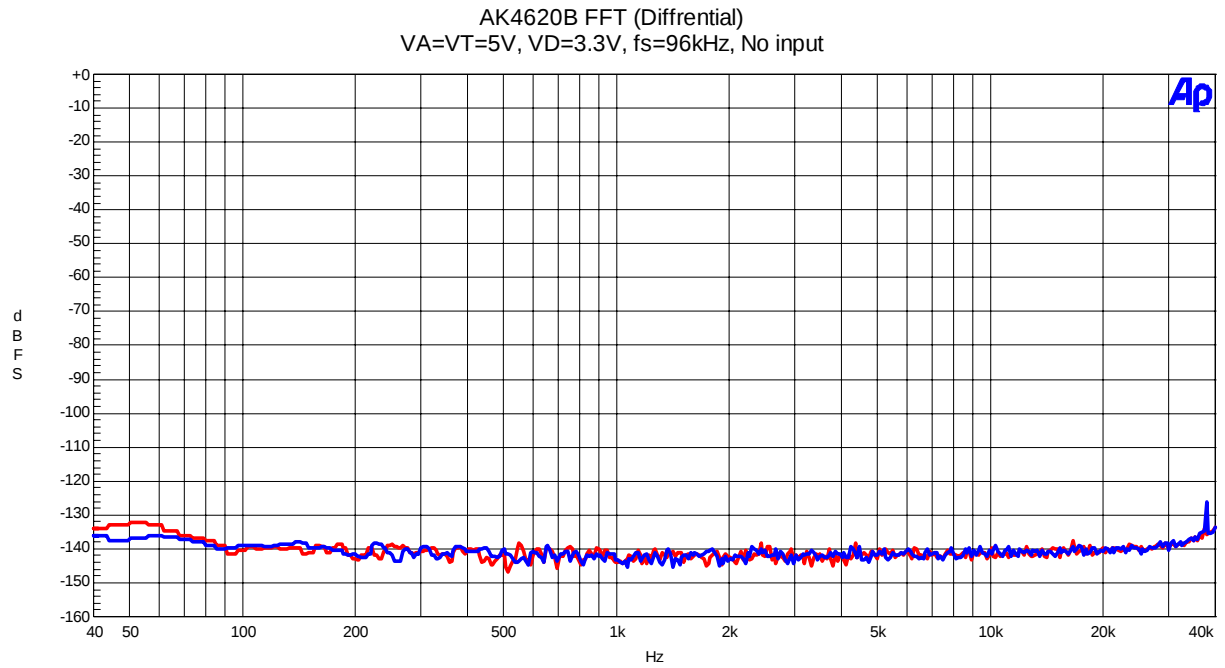
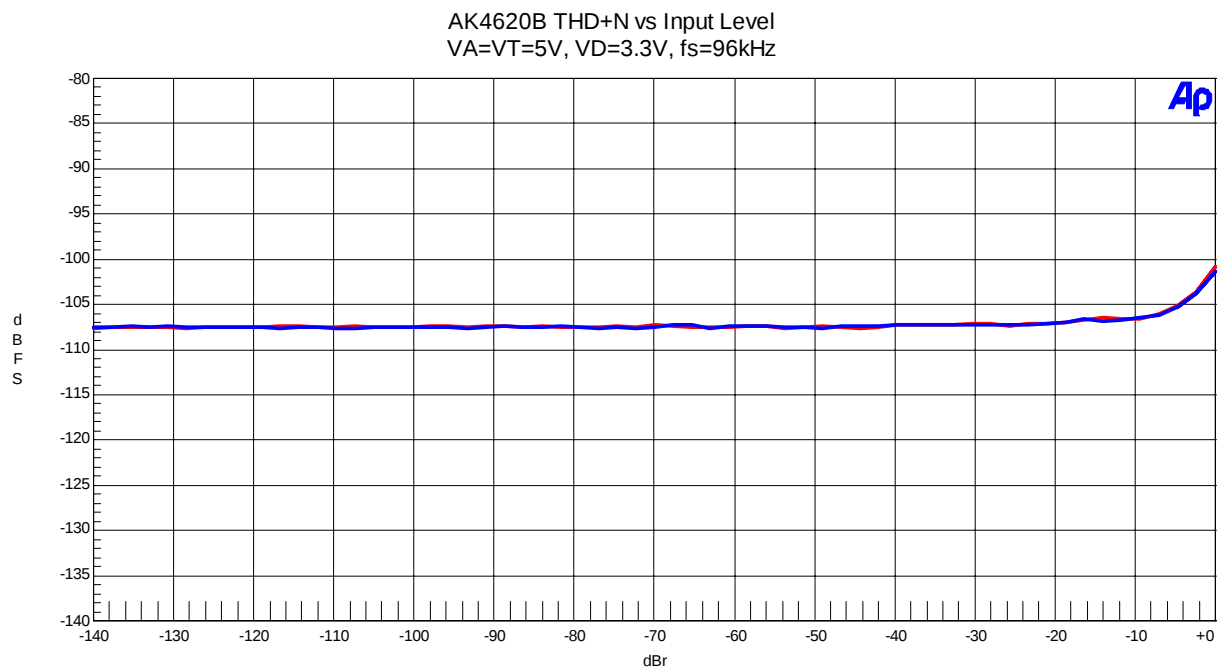


Figure 37. Crosstalk

(fs=96kHz)

**Figure 38. FFT (fin=1kHz, Input Level=-1dBFS)****Figure 39. FFT (fin=1kHz, Input Level=-60dBFS)**

(fs=96kHz)

**Figure 40. FFT (Noise Floor)****Figure 41. THD +N vs. Input level (fin=1kHz)**

(fs=96kHz)

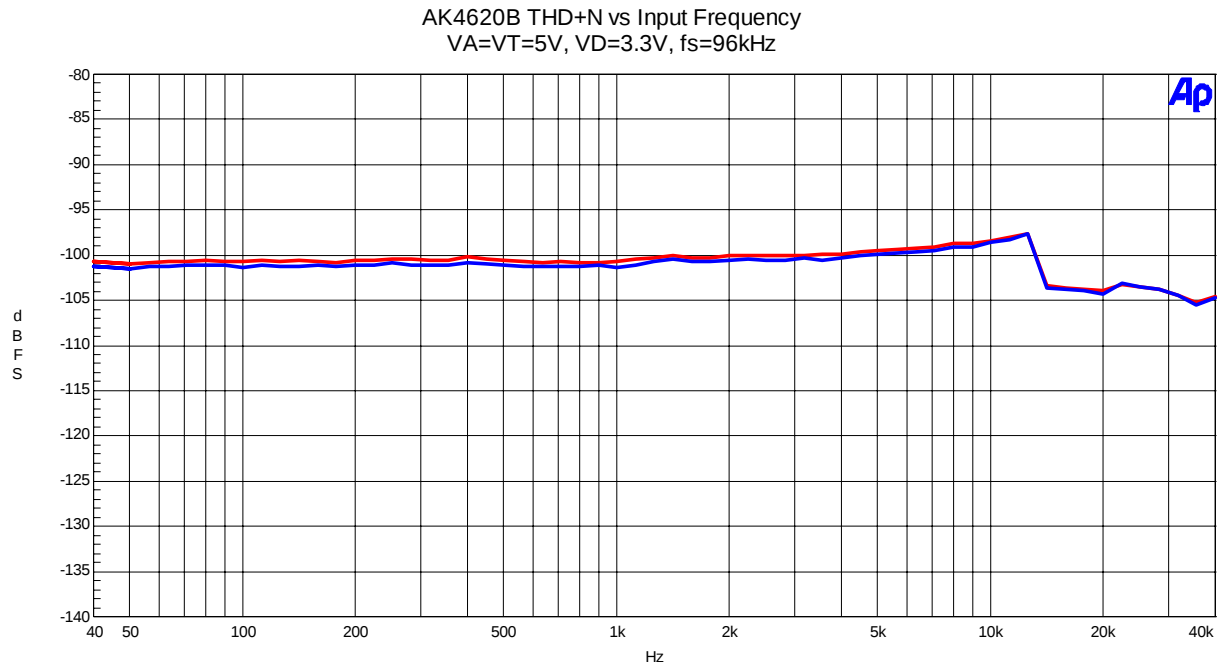


Figure 42. THD +N vs. Input Frequency (Input level=-1dBFS)

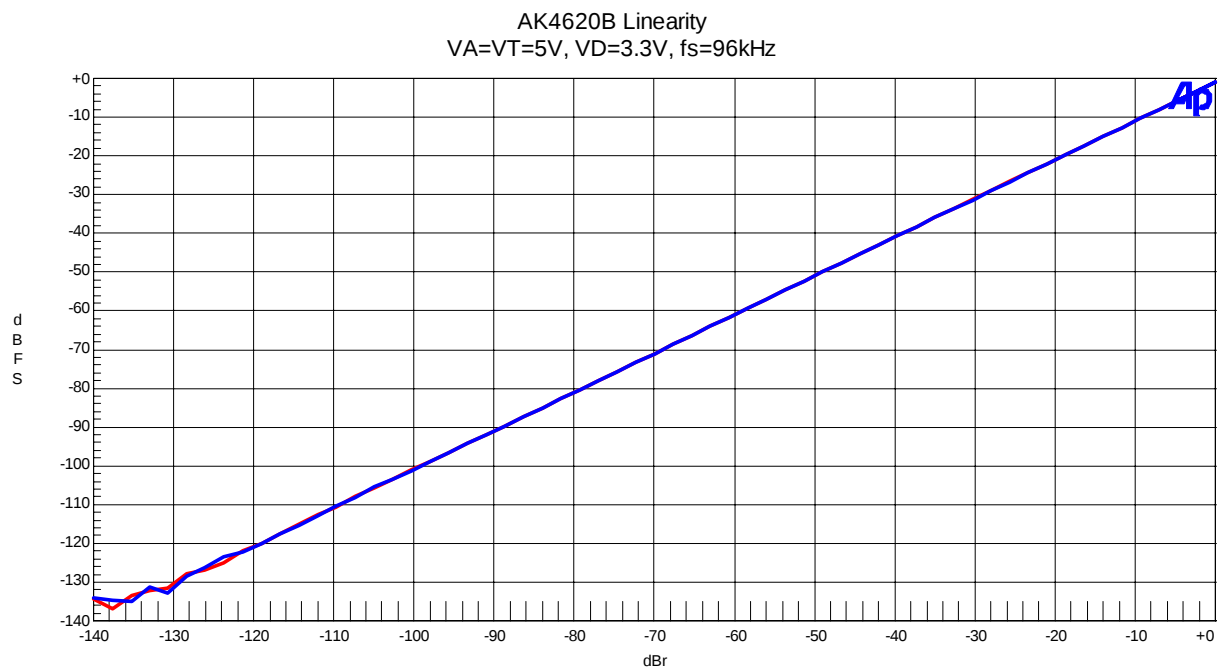


Figure 43. Linearity (fin=1kHz)

(fs=96kHz)

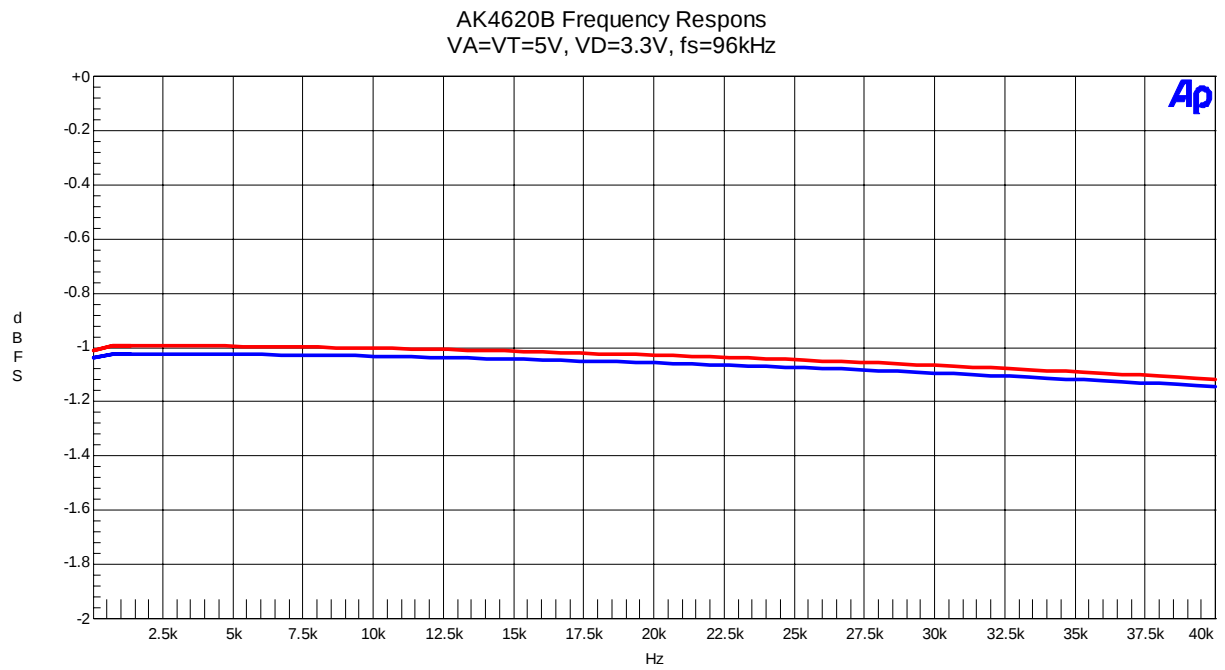


Figure 44. Frequency Response

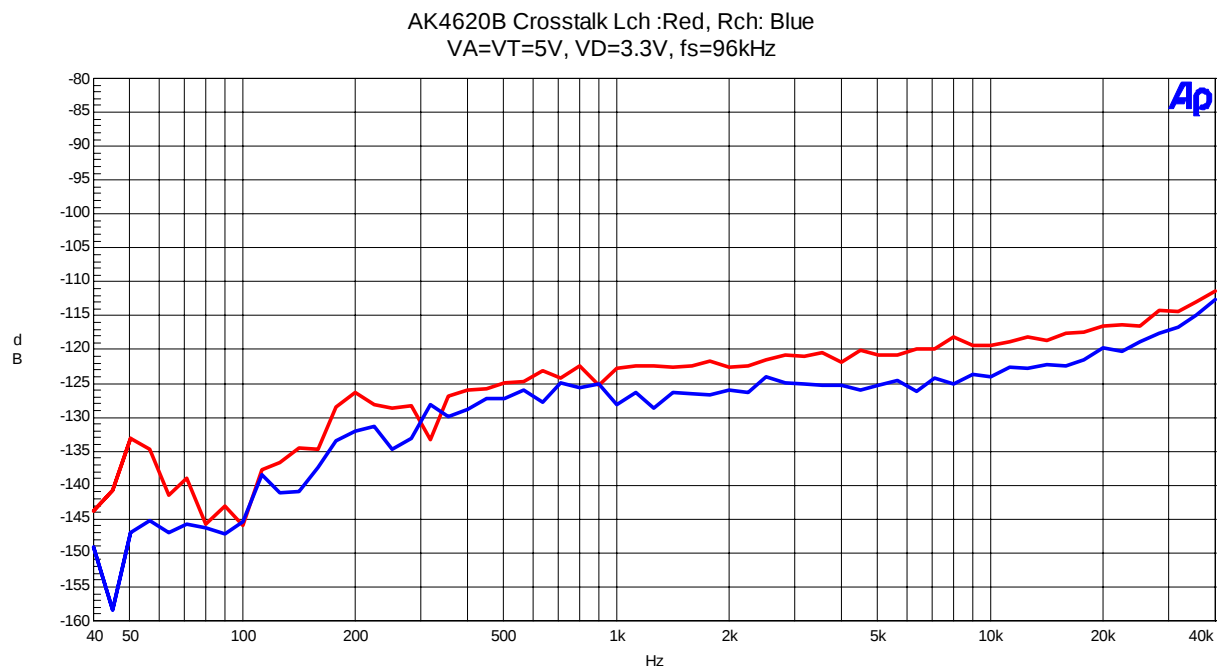


Figure 45. Crosstalk

(fs=192kHz)

AKM

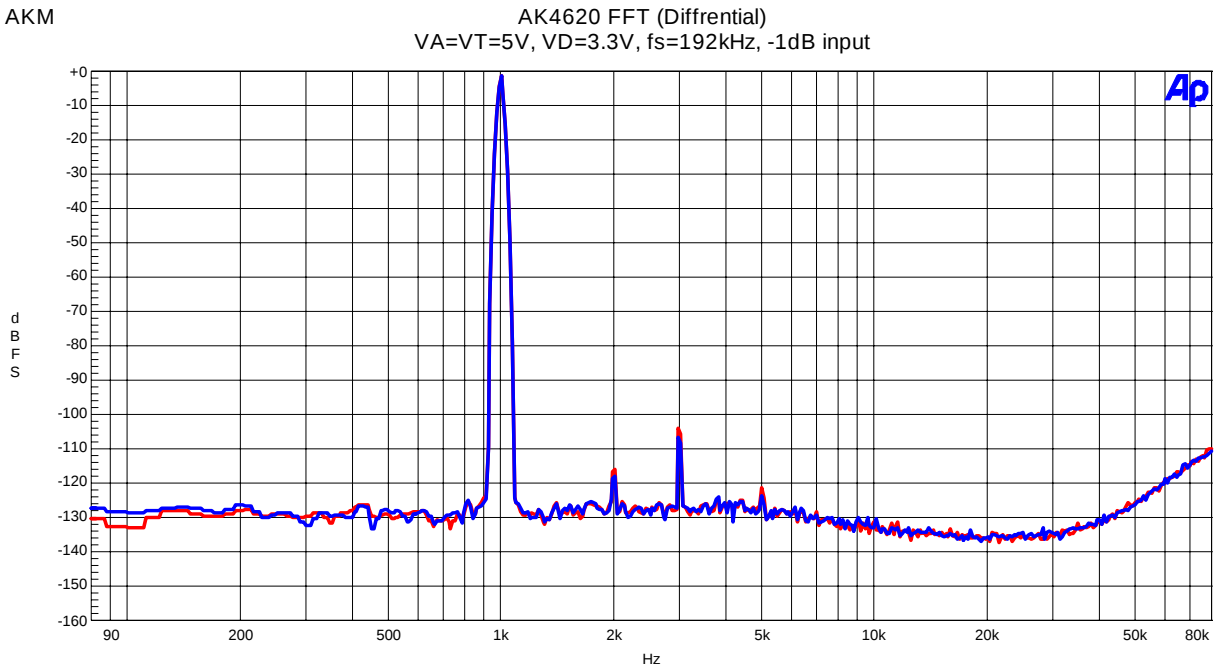


Figure 46. FFT (fin=1kHz, Input Level=-1dBFS)

AKM

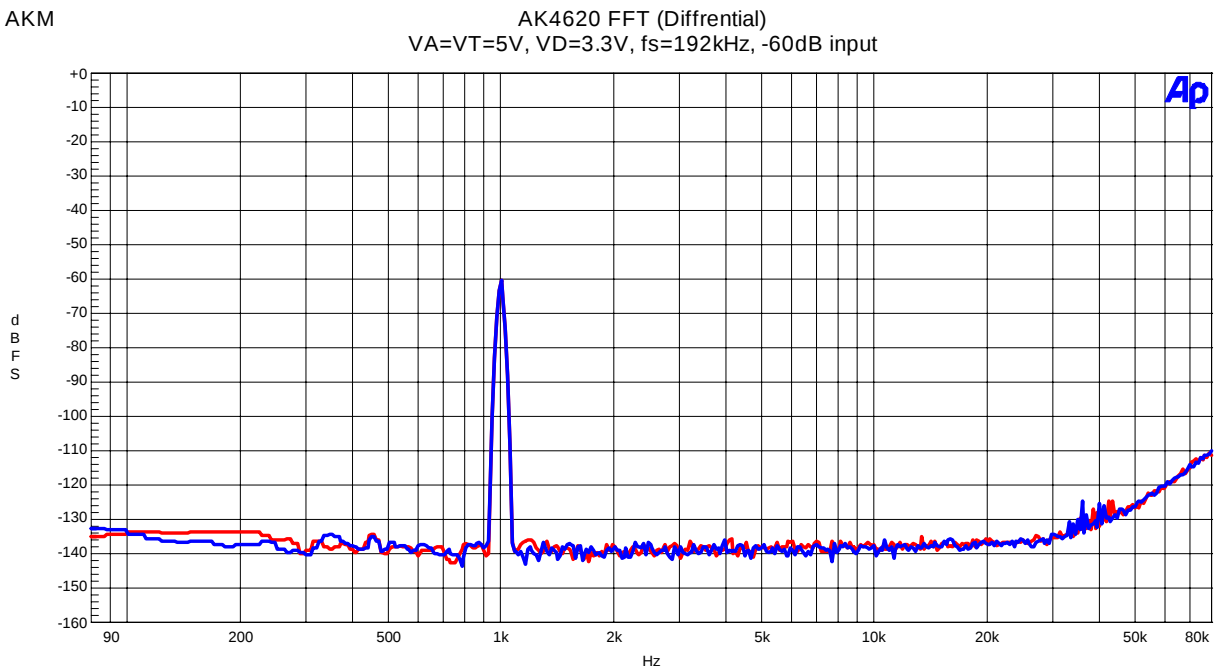


Figure 47. FFT (fin=1kHz, Input Level=-60dBFS)

(fs=192kHz)

AKM

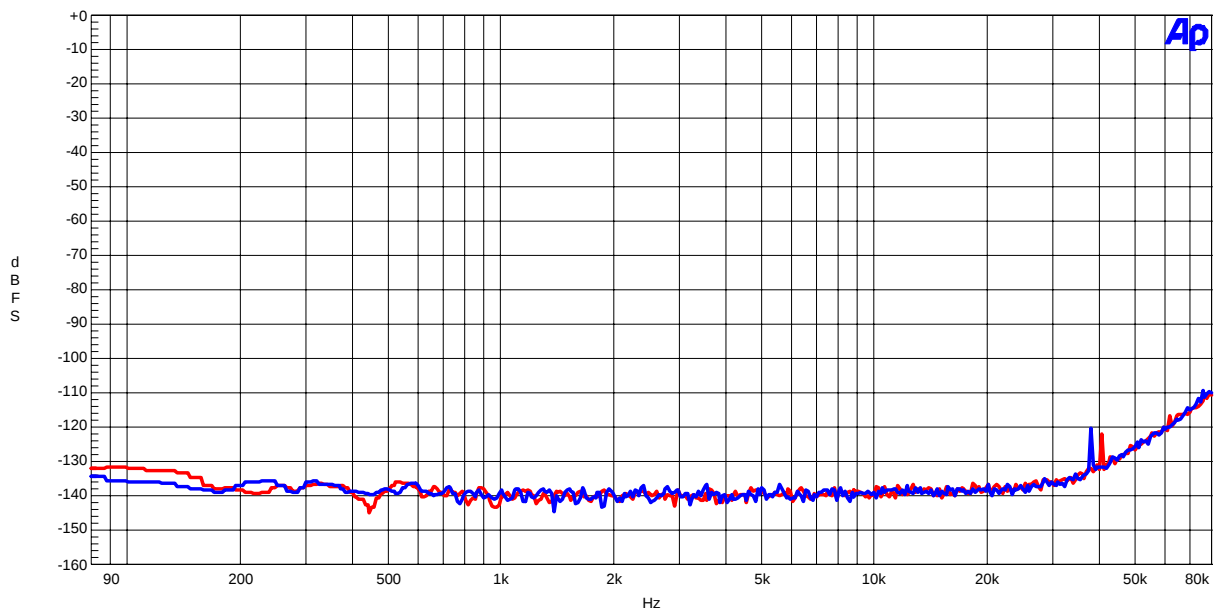
AK4620 FFT (Differential)
VA=VT=5V, VD=3.3V, fs=192kHz, No input

Figure 48. FFT (Noise Floor)

AKM

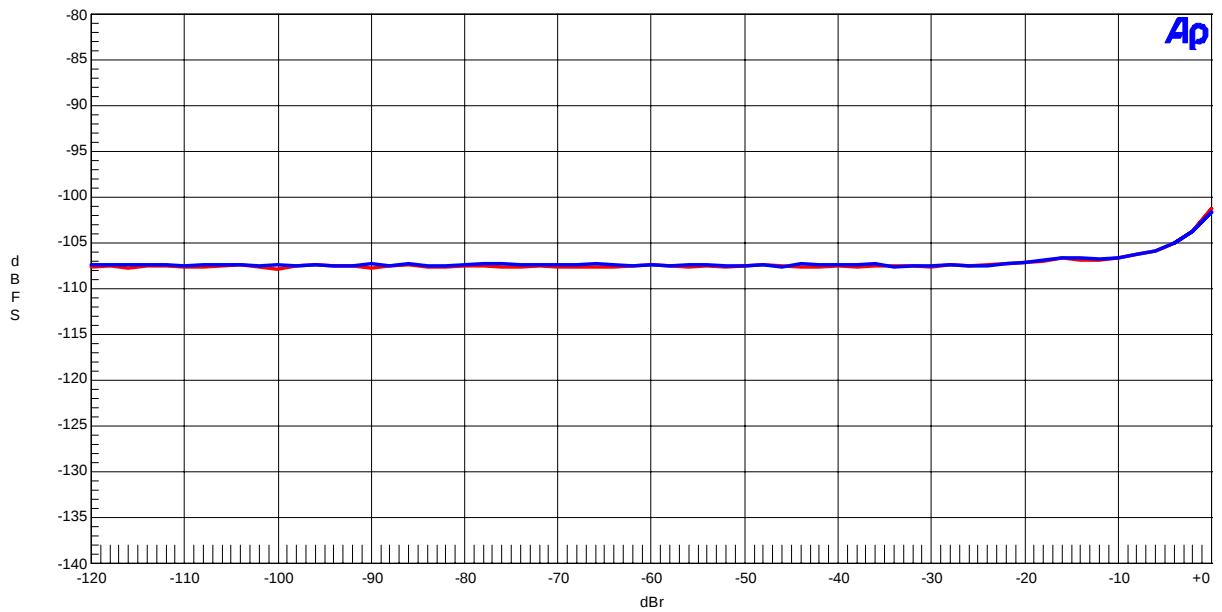
AK4620 THD+N vs Input Level
VA=VT=5V, VD=3.3V, fs=192kHz

Figure 49. THD+N vs. Input level (fin=1kHz)

(fs=192kHz)

AKM

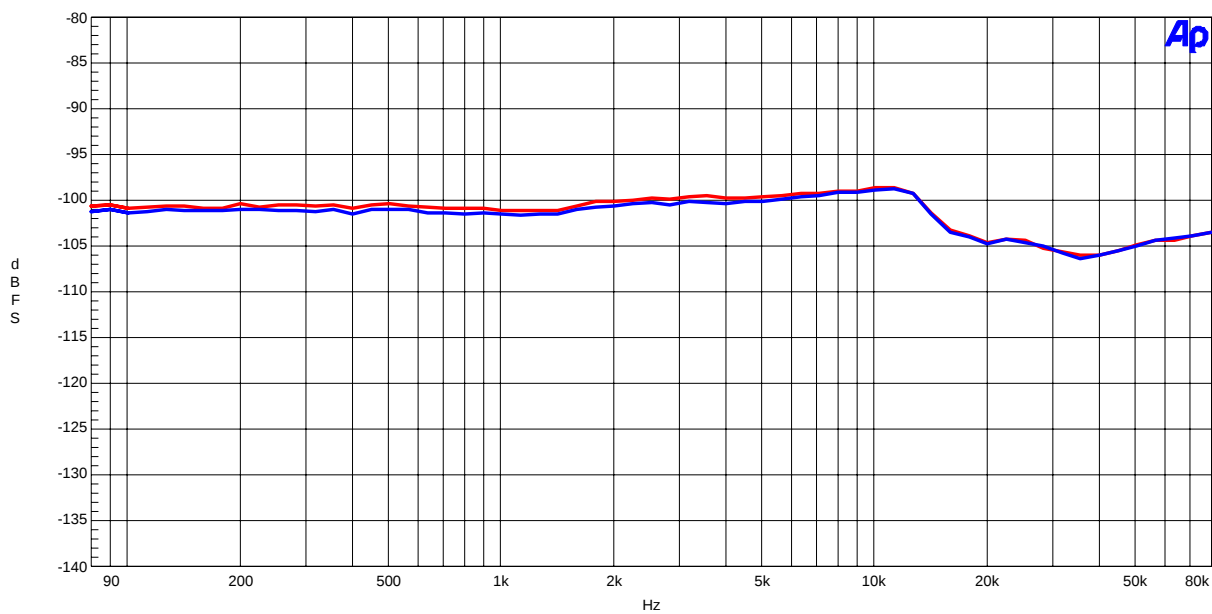
AK4620 THD+N vs Input Frequency
VA=VT=5V, VD=3.3V, fs=192kHz

Figure 50. THD+N vs. Input Frequency (Input level=-1dBFS)

AKM

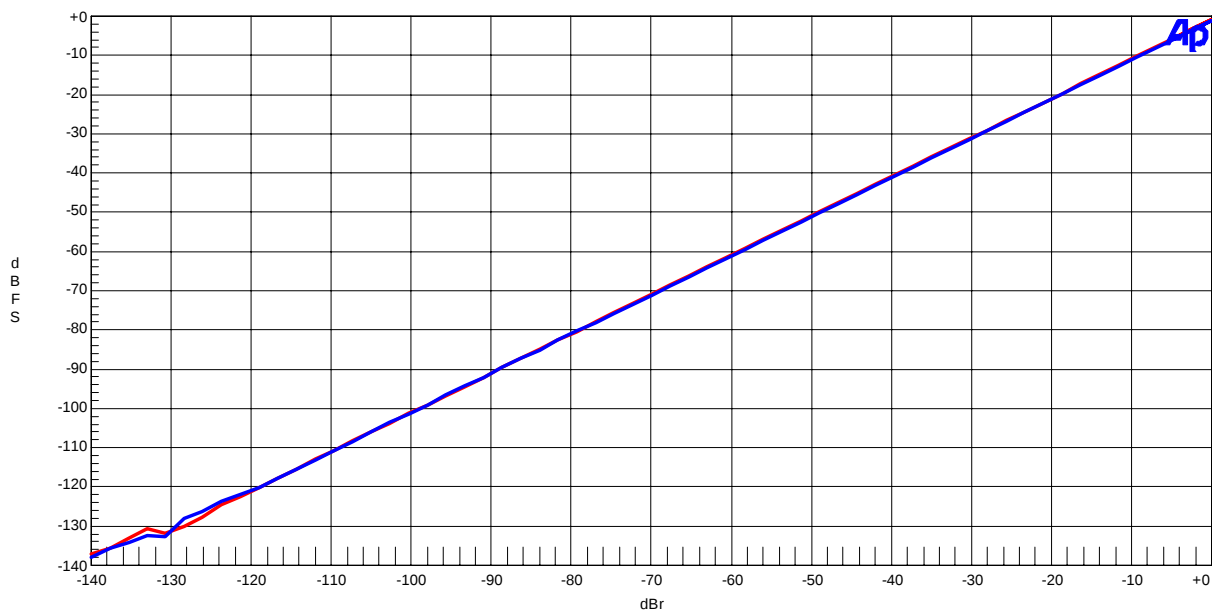
AK4620 Linearity
VA=VT=5V, VD=3.3V, fs=192kHz

Figure 51. Linearity (fin=1kHz)

(fs=192kHz)

AKM

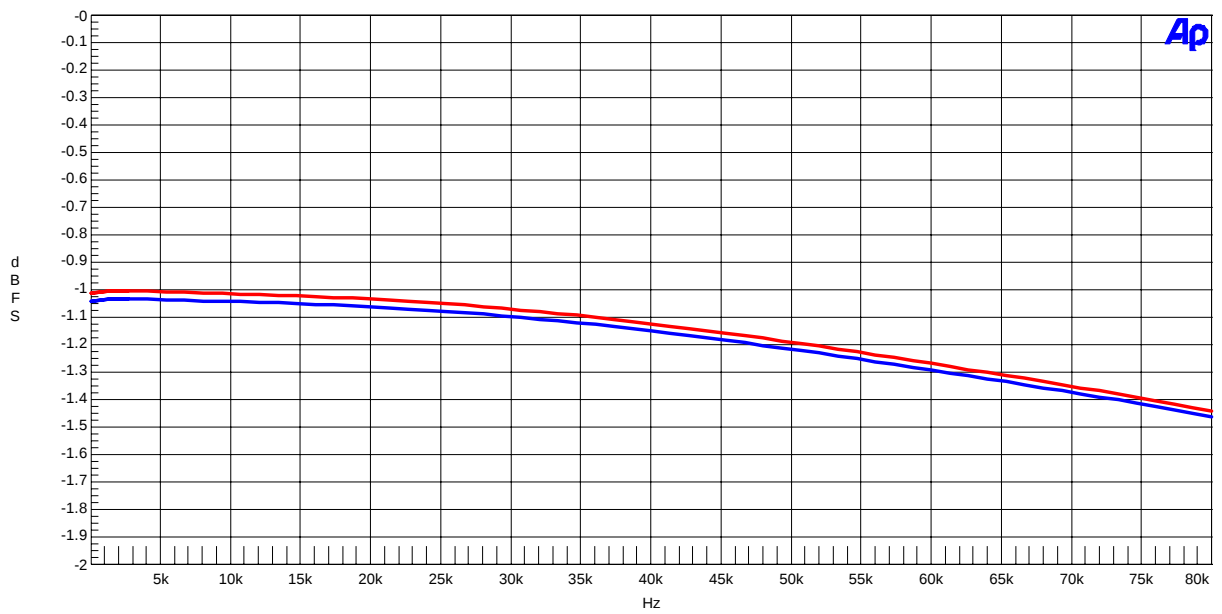
AK4620 Frequency Respons
VA=VT=5V, VD=3.3V, fs=192kHz

Figure 52. Frequency Response

AKM

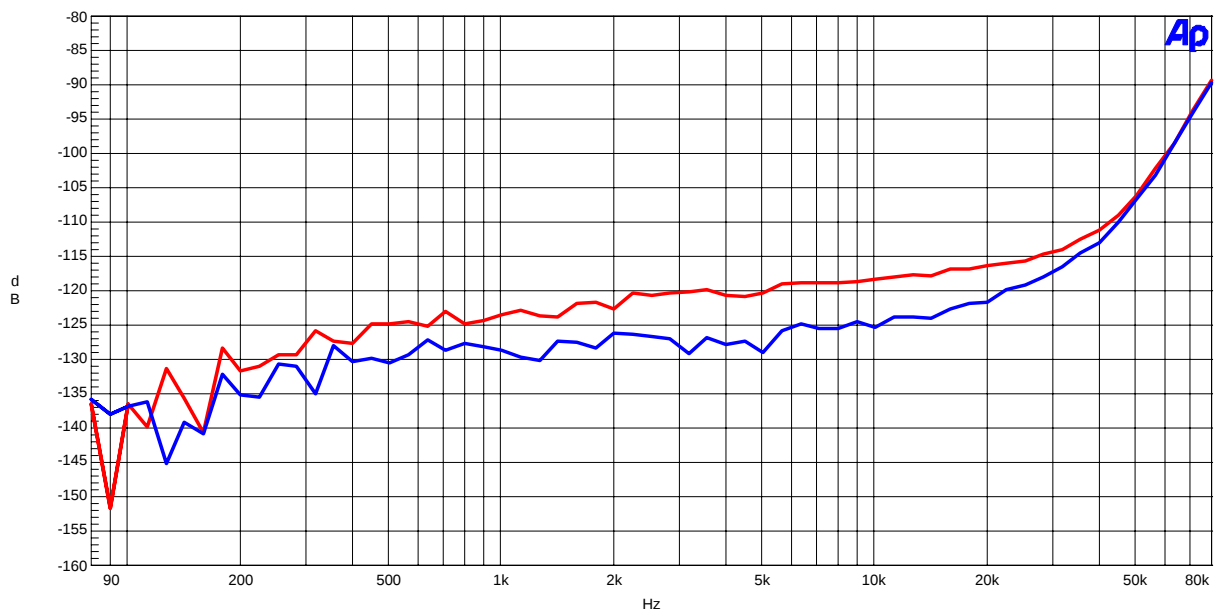
AK4620 Crosstalk Lch: Red, Rch: Blue
VA=VT=5V, VD=3.3V, fs=192kHz

Figure 53. Crosstalk

DAC

(fs=44.1kHz)

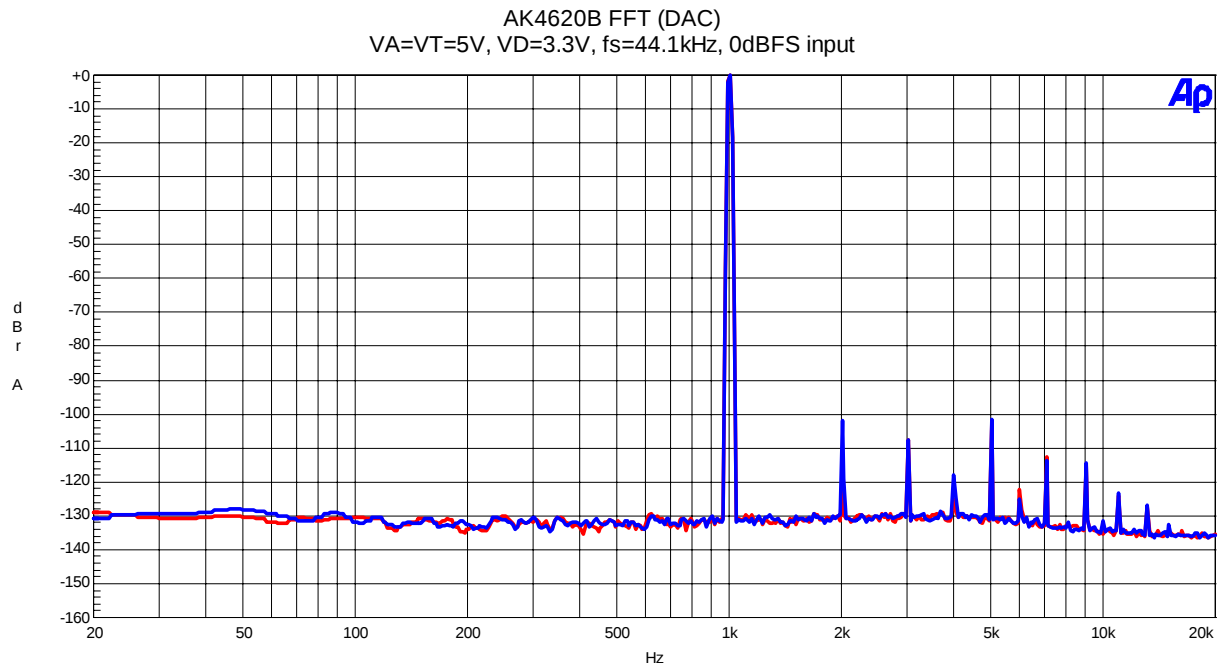


Figure 54. FFT (fin=1kHz, Input Level=0BFS)

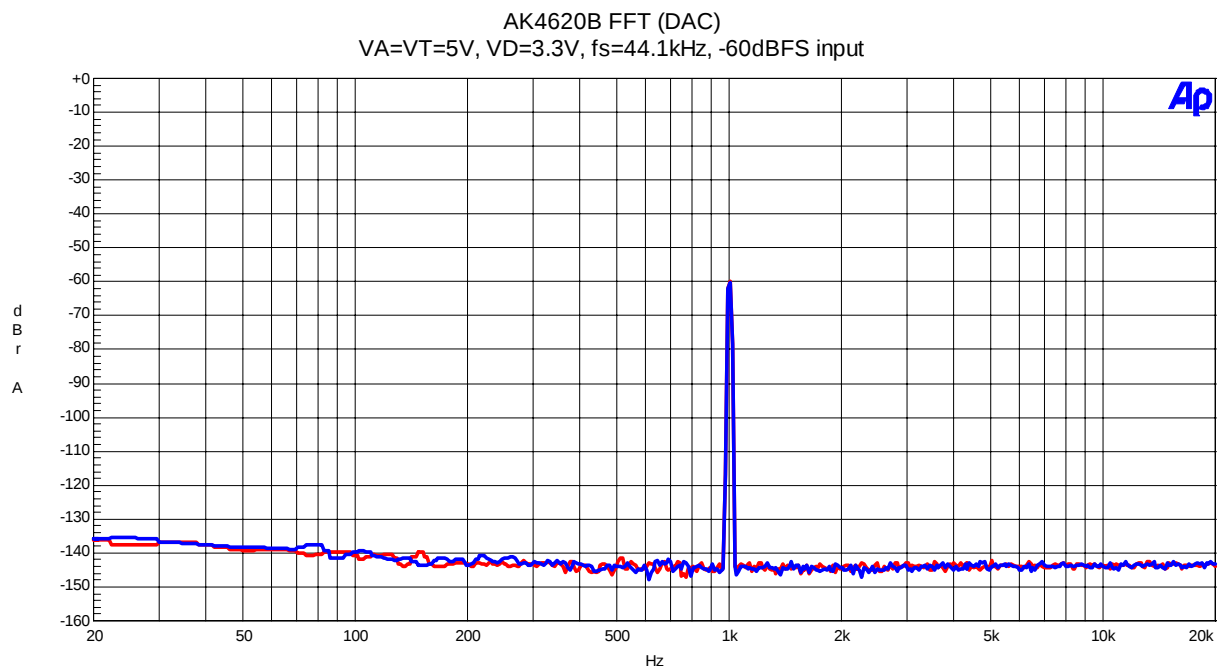
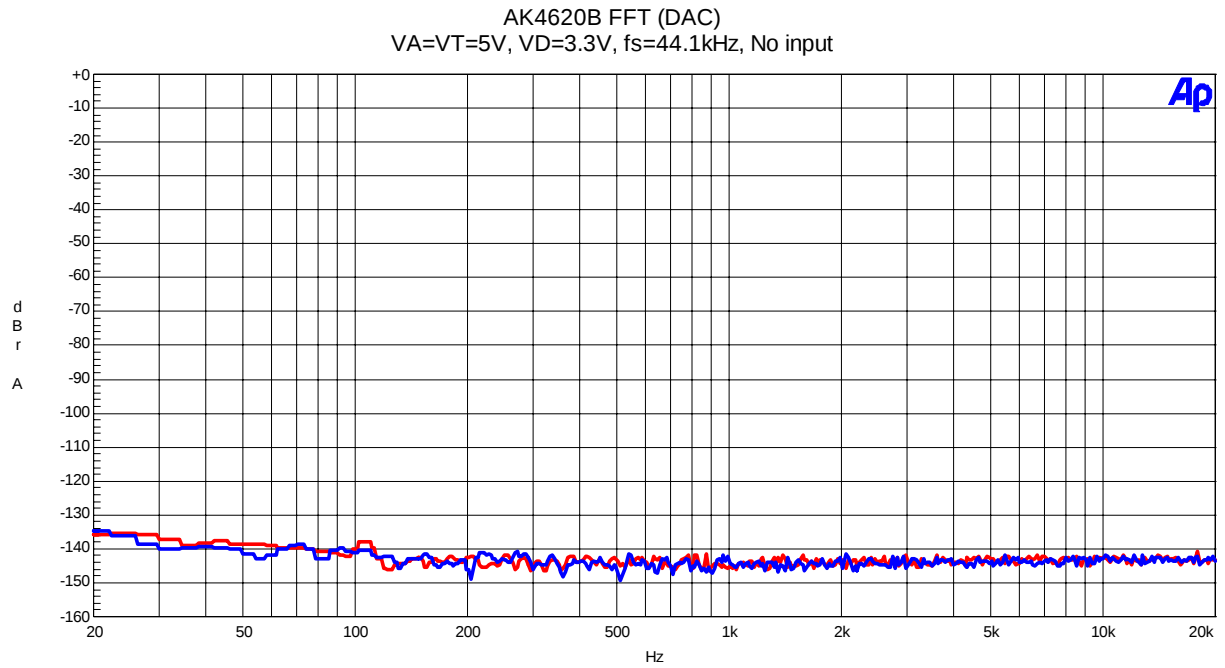
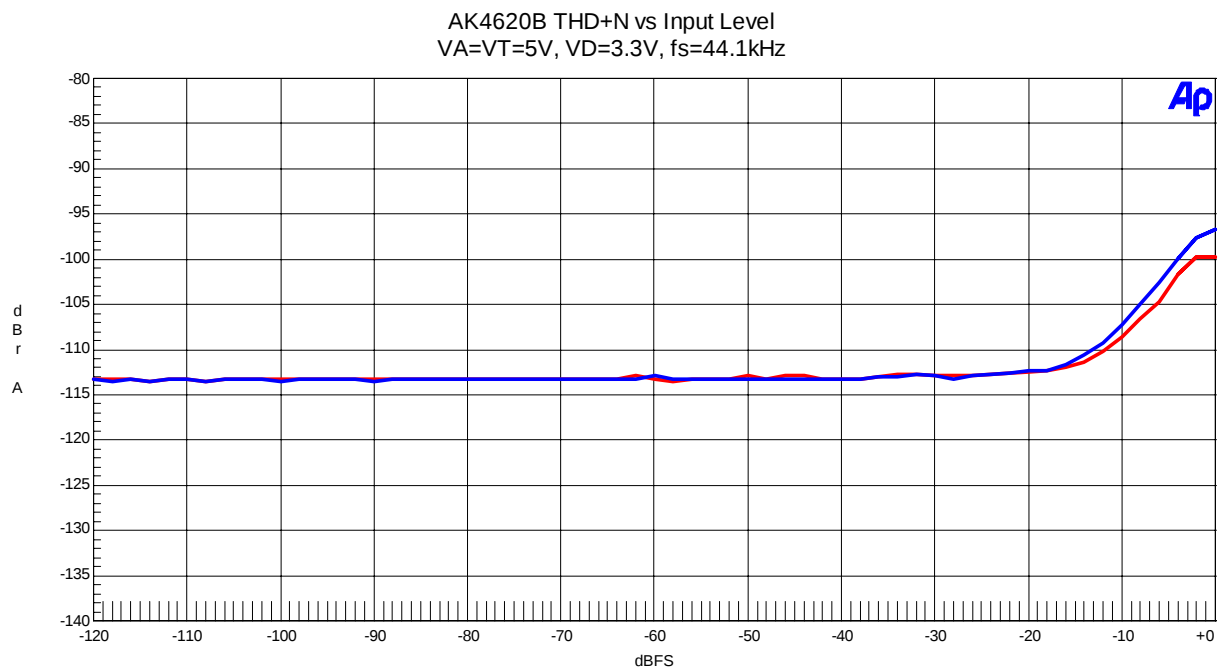


Figure 55. FFT (fin=1kHz, Input Level=-60dBFS)

(fs=44.1kHz)

**Figure 56. FFT (Noise Floor)****Figure 57. THD+N vs. Input level (fin=1kHz)**

(fs=44.1kHz)

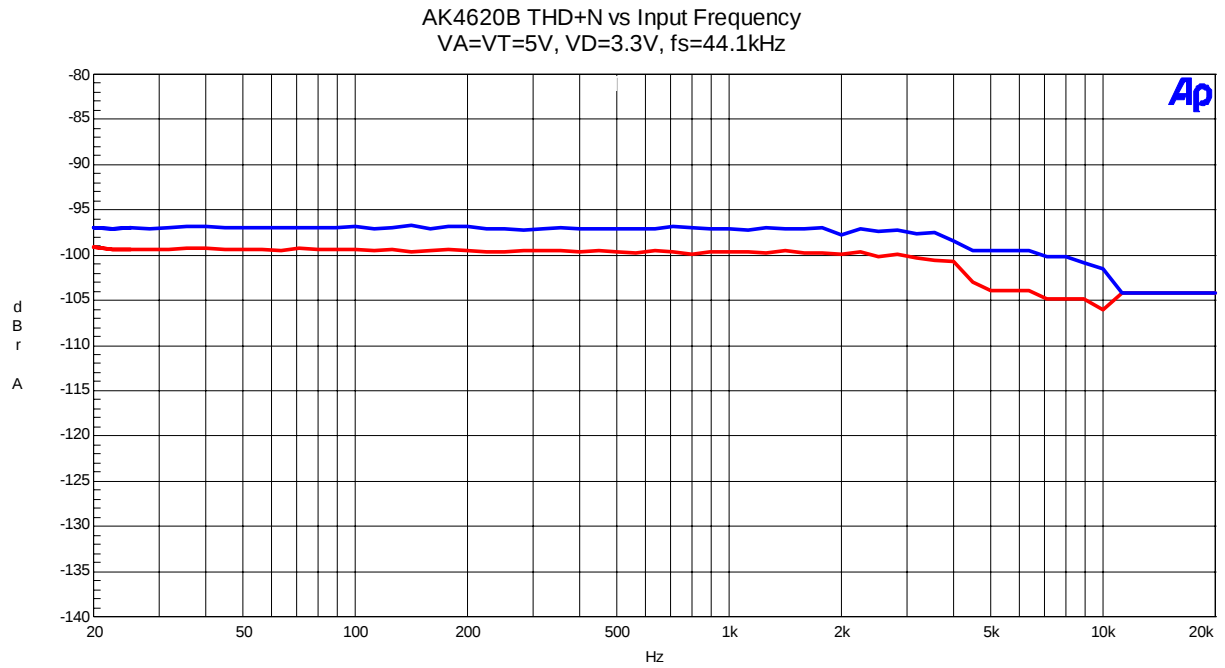


Figure 58. THD +N vs. Input Frequency (Input level=0dBFS)

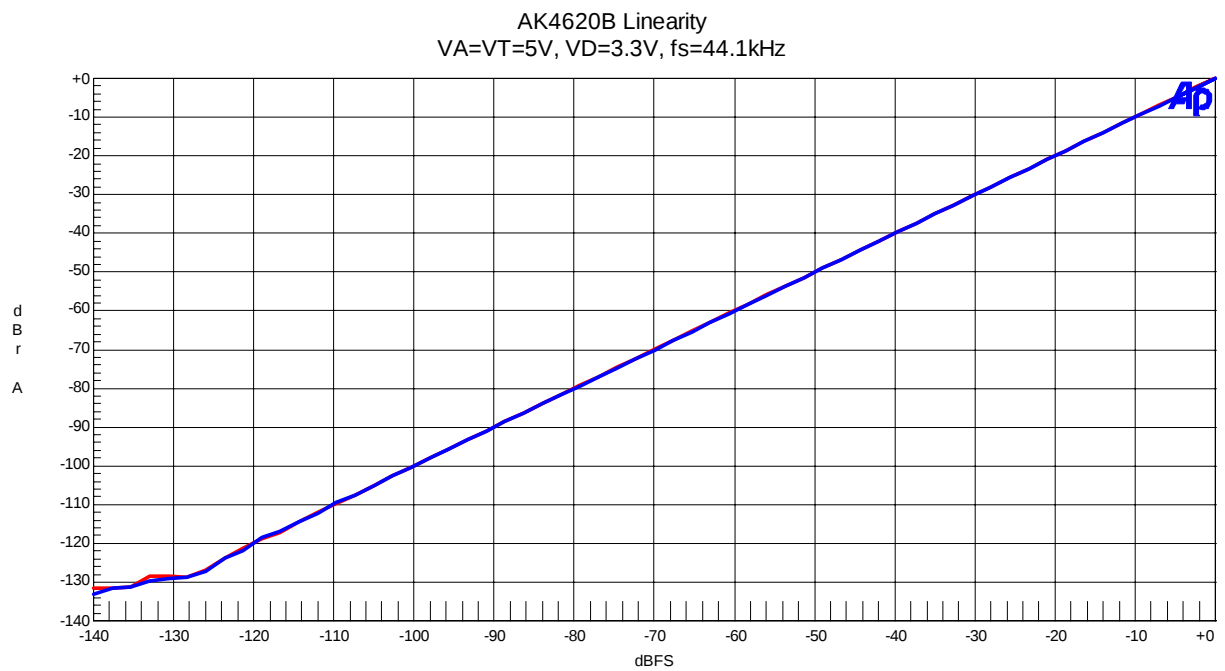


Figure 59. Linearity (fin=1kHz)

(fs=44.1kHz)

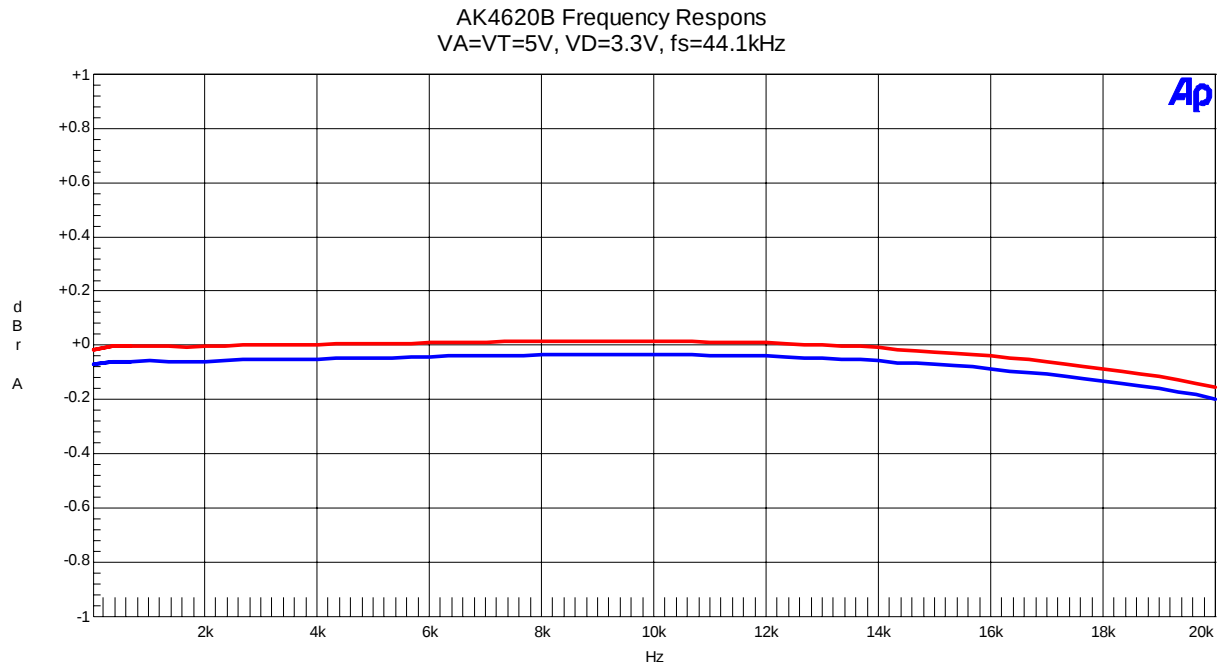


Figure 60. Frequency Response (Input level=0dBFS)

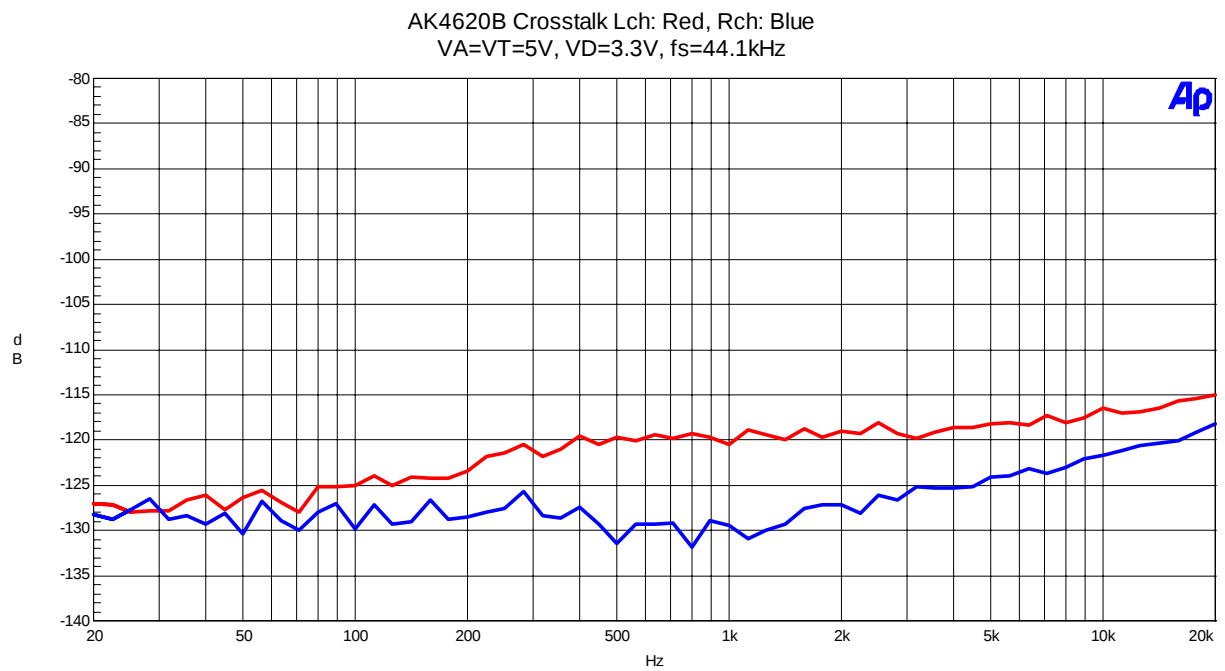
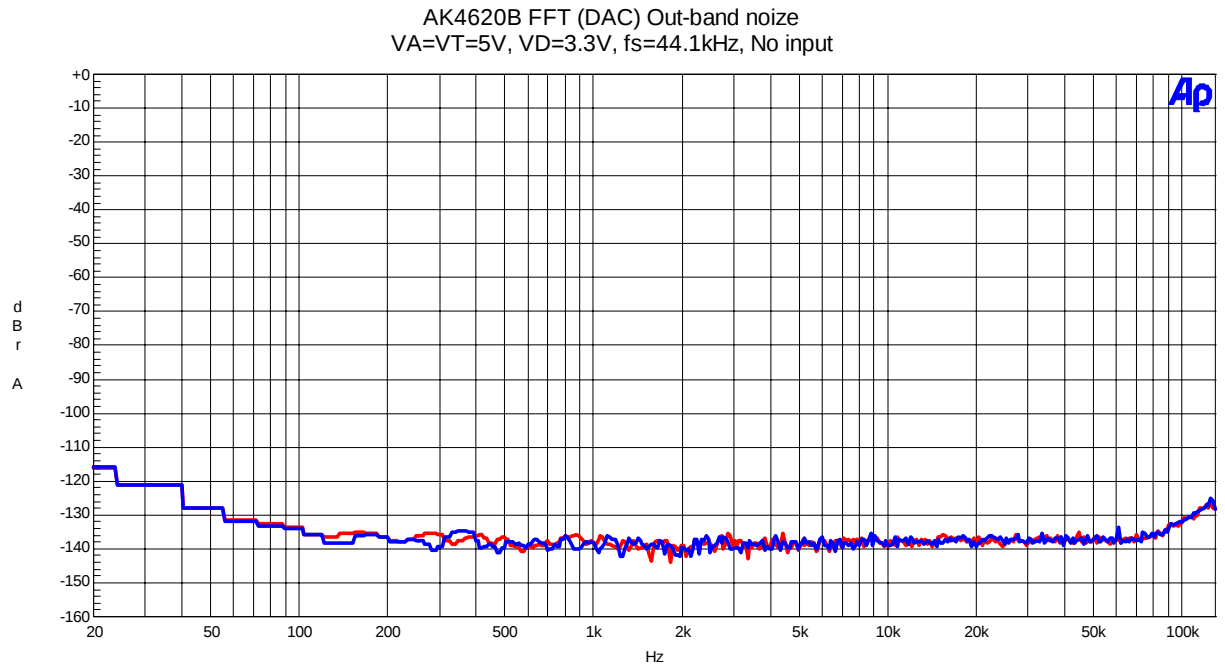


Figure 61. Crosstalk

(fs=44.1kHz)

**Figure 62. Out-of-band Noise**

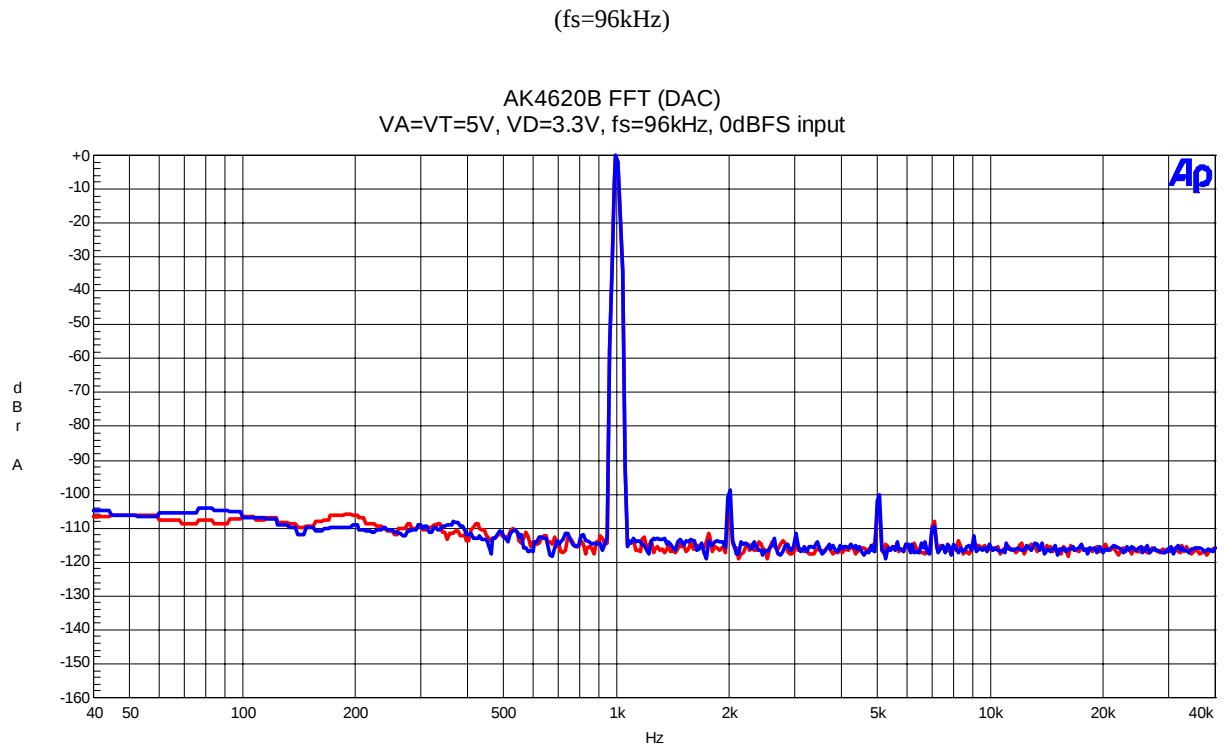


Figure 63. FFT (fin=1kHz, Input Level=0dBFS)

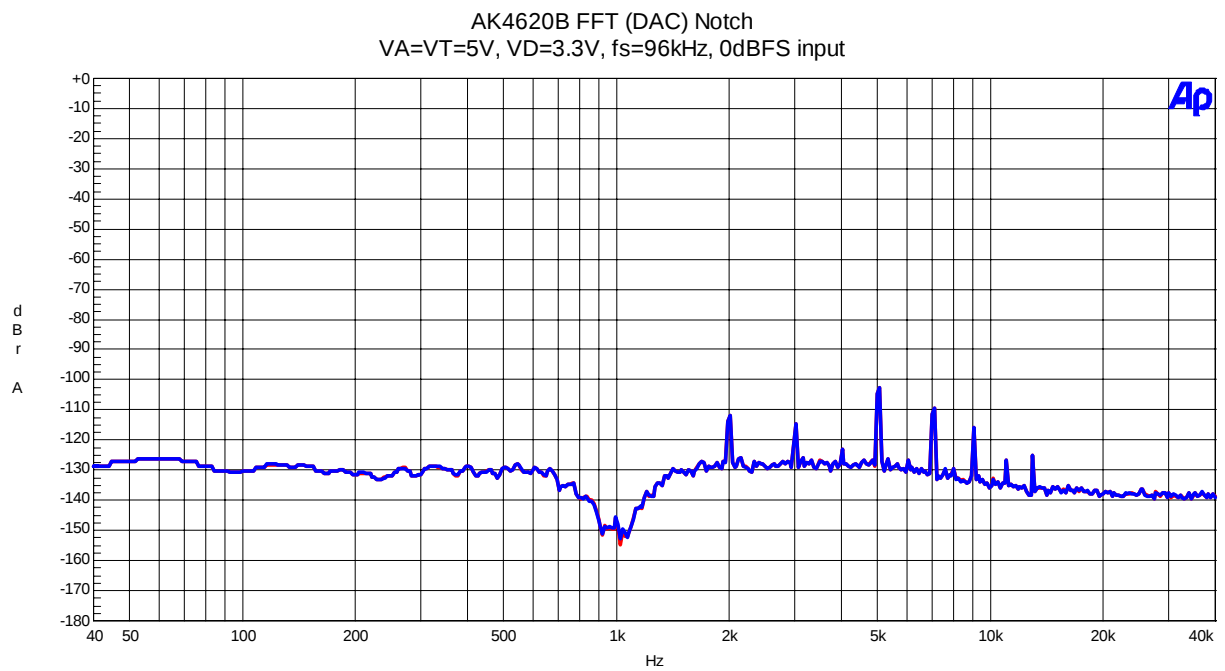
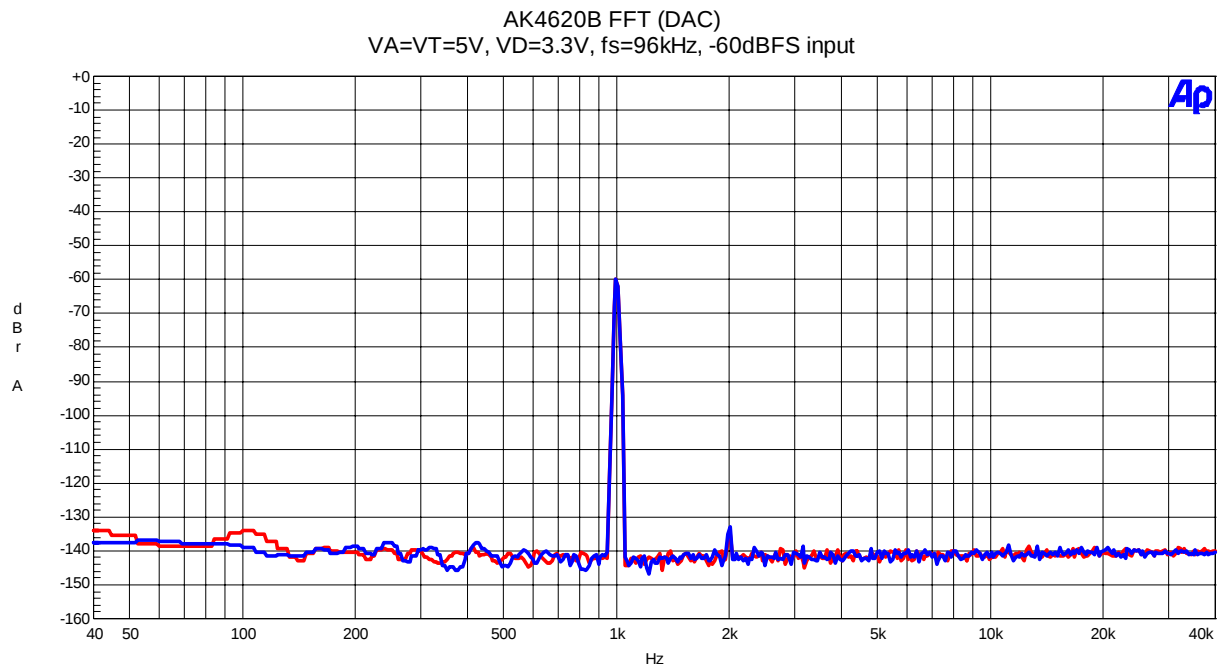
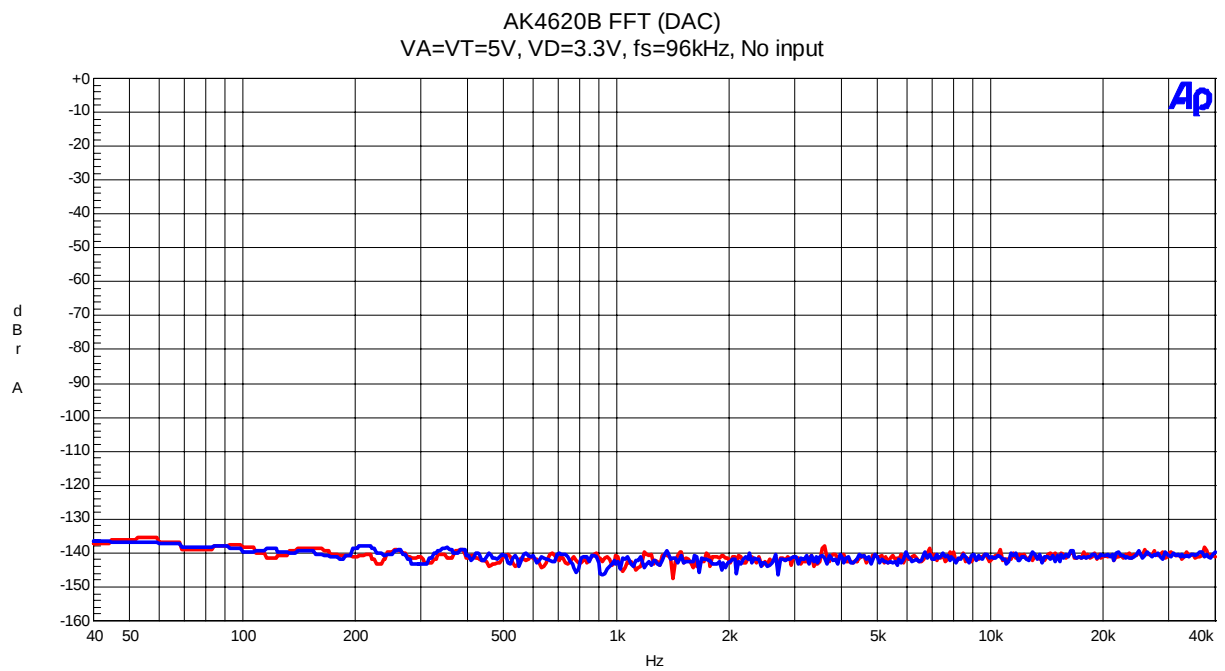
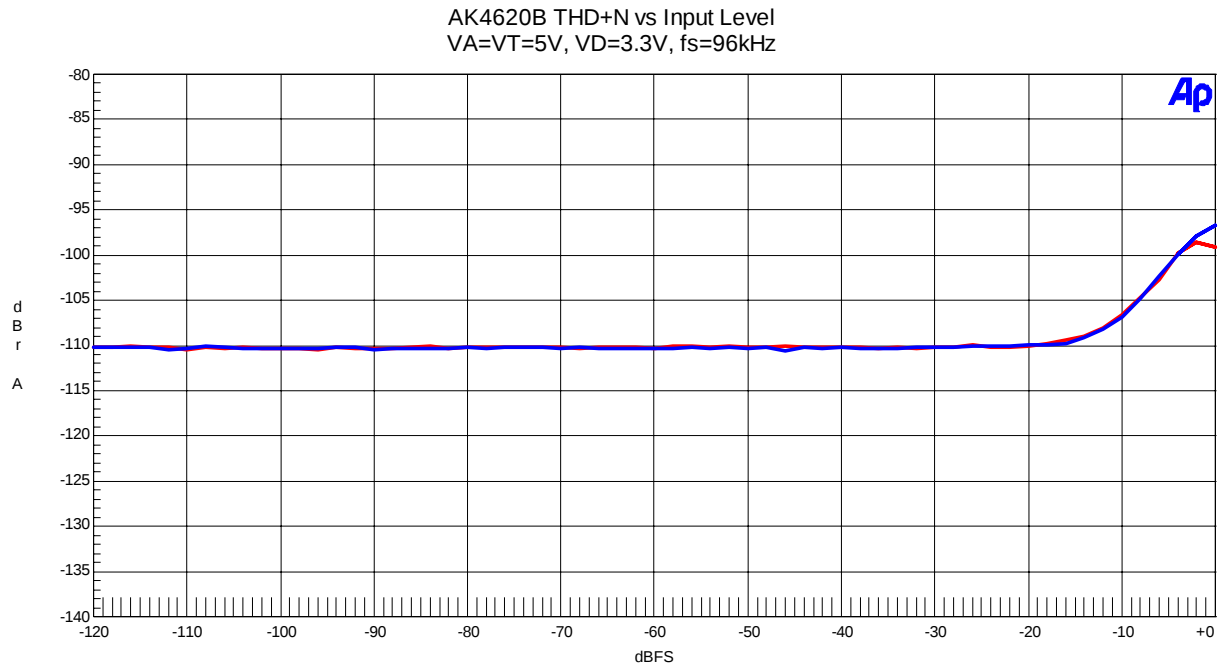
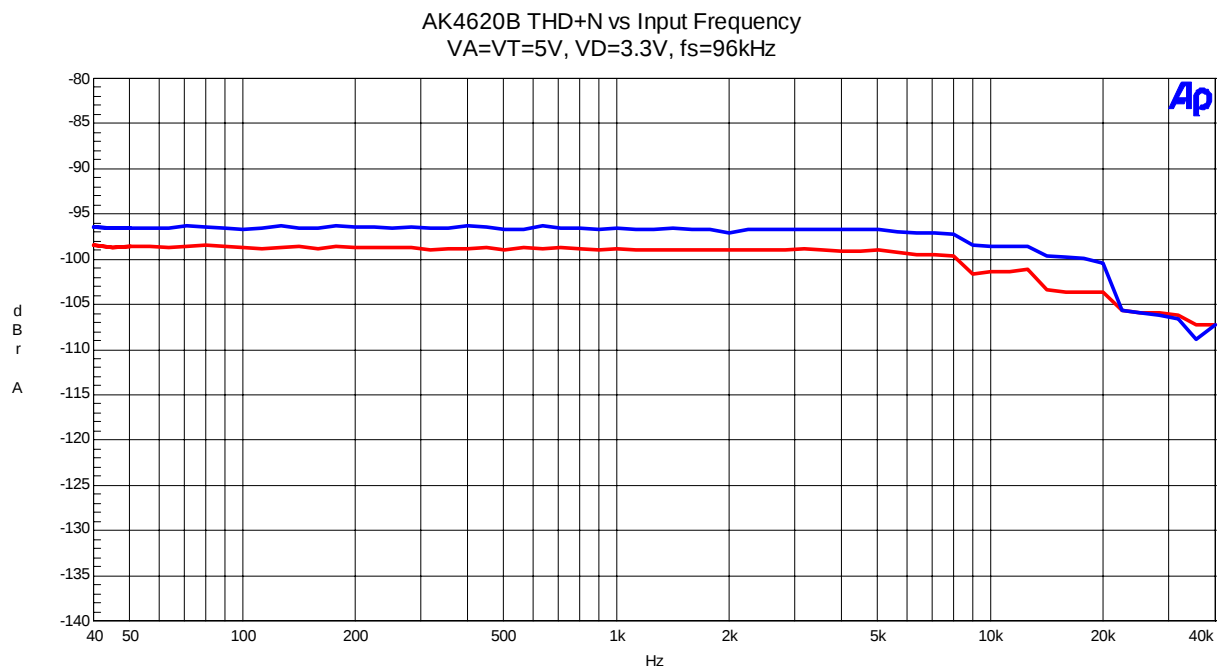


Figure 64. FFT (fin=1kHz, Input Level=0dBFS, Notch Filter)

(fs=96kHz)

**Figure 65. FFT (fin=1kHz, Input Level=-60dBFS)****Figure 66. FFT (Noise Floor)**

(fs=96kHz)

**Figure 67. THD +N vs. Input level (fin=1kHz)****Figure 68. THD +N vs. Input Frequency (Input level=0dBFS)**

(fs=96kHz)

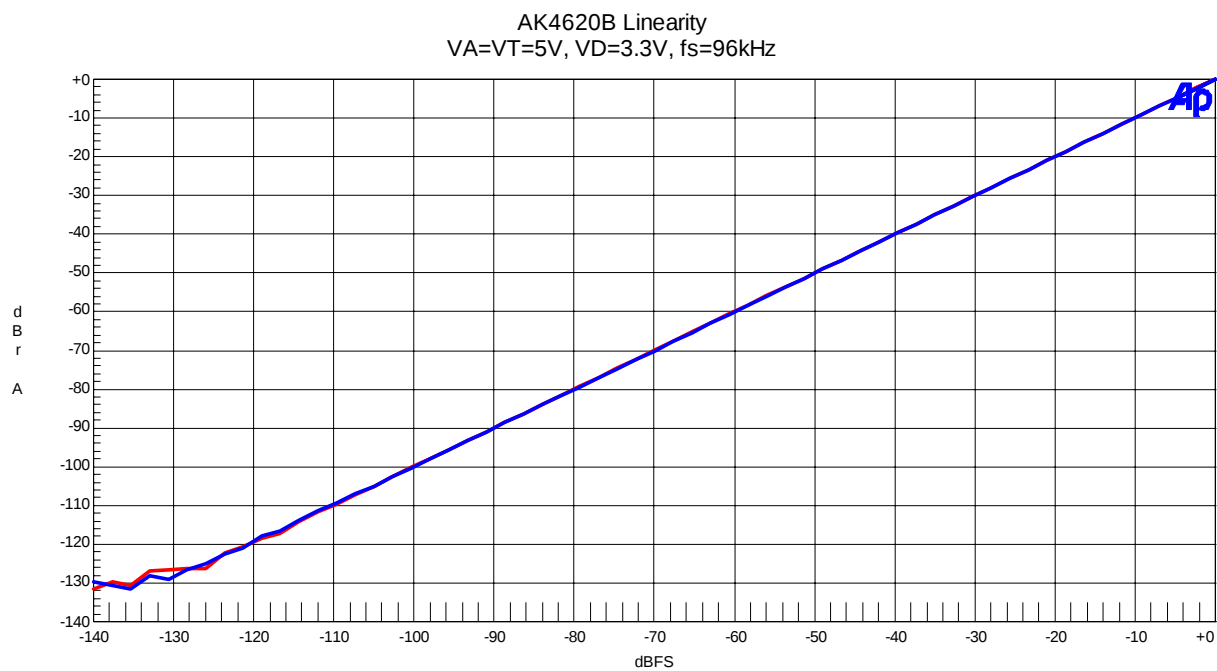


Figure 69. Linearity (fin=1kHz)

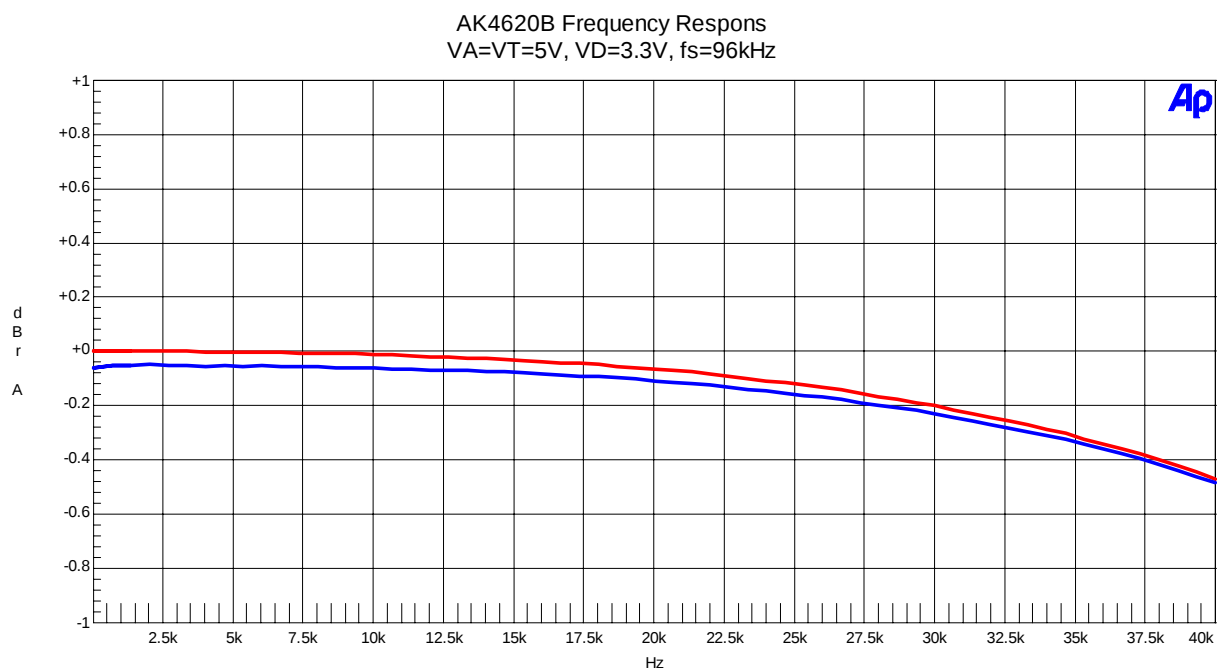
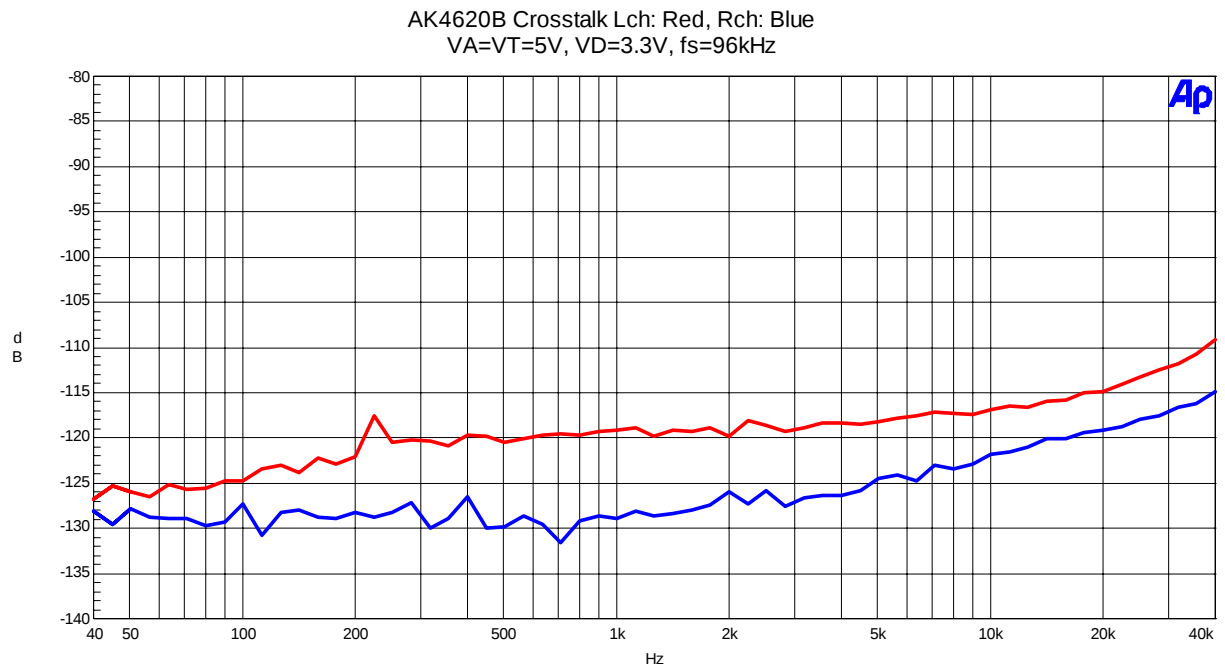


Figure 70. Frequency Response (Input level=0dBFS)

(fs=96kHz)

**Figure 71. Crosstalk**

(fs=192kHz)

AKM

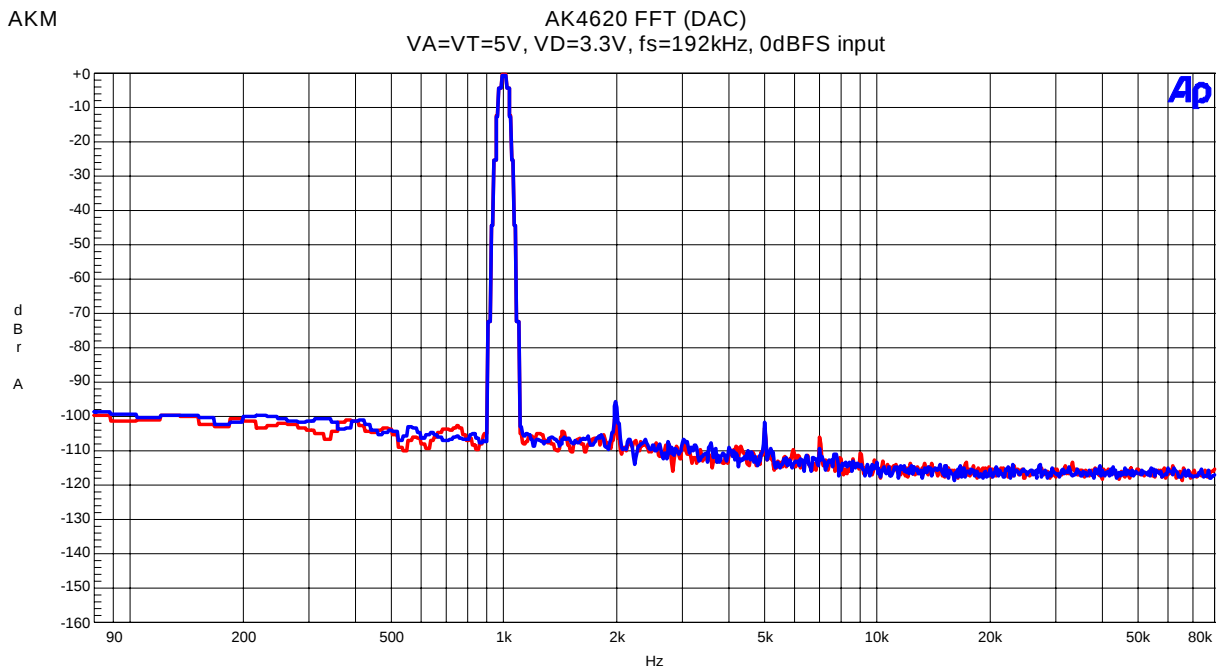


Figure 72. FFT (fin=1kHz, Input Level=0dBFS)

AKM

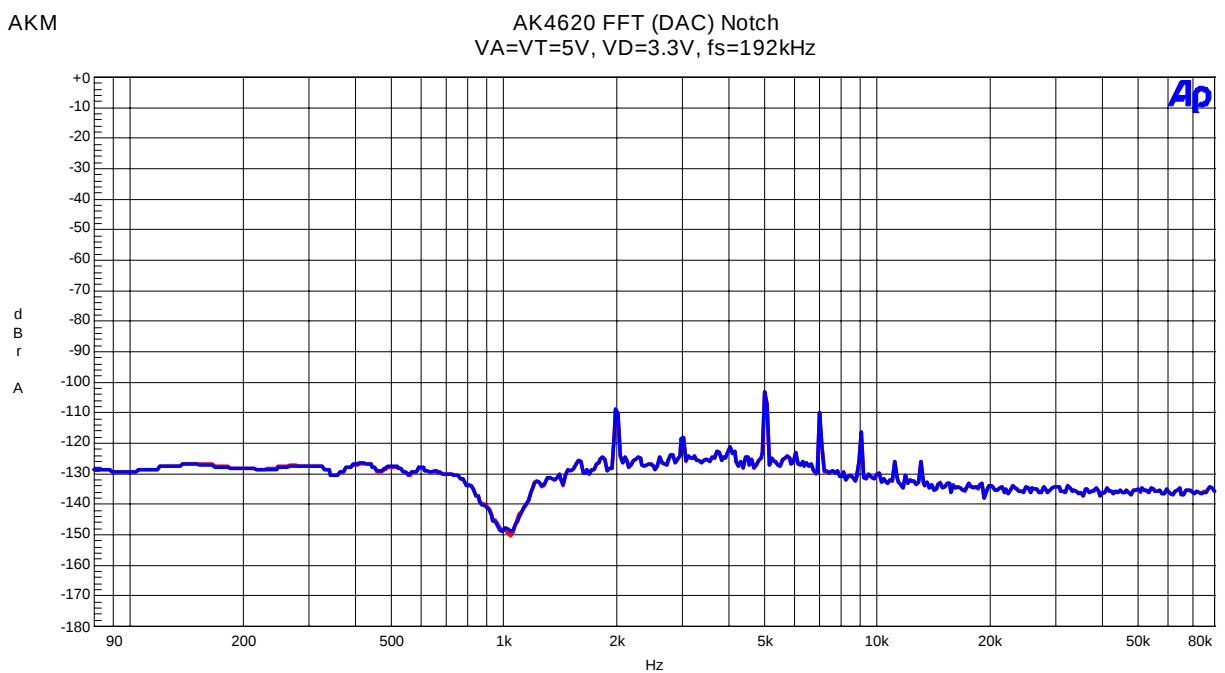


Figure 73. FFT (fin=1kHz, Input Level=0dBFS, Notch Filter)

(fs=192kHz)

AKM

AK4620 FFT (DAC)
 VA=VT=5V, VD=3.3V, fs=192kHz, -60dBFS input

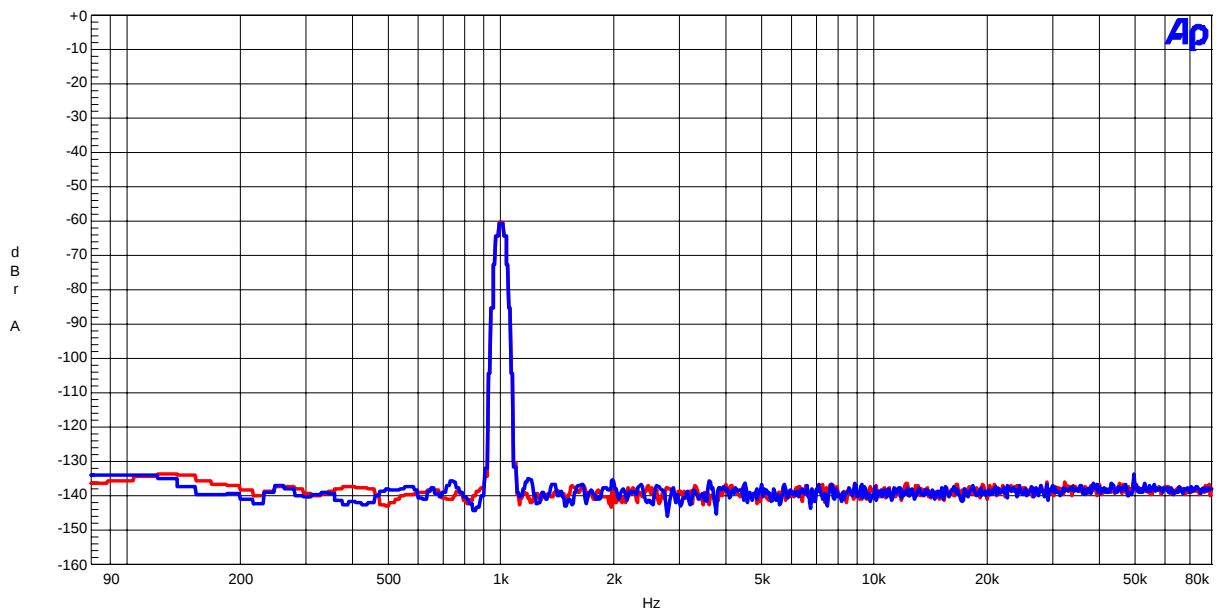


Figure 74. FFT (fin=1kHz, Input Level=-60dBFS)

AKM

AK4620 FFT (DAC)
 VA=VT=5V, VD=3.3V, fs=192kHz, No input

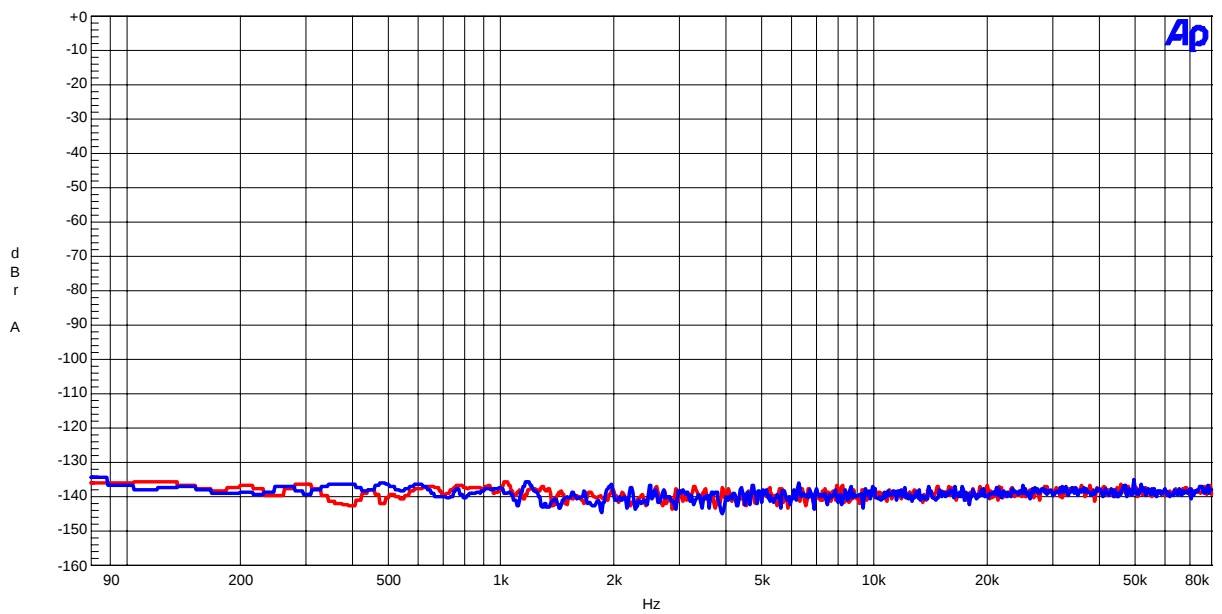


Figure 75. FFT (Noise Floor)

(fs=192kHz)

AKM

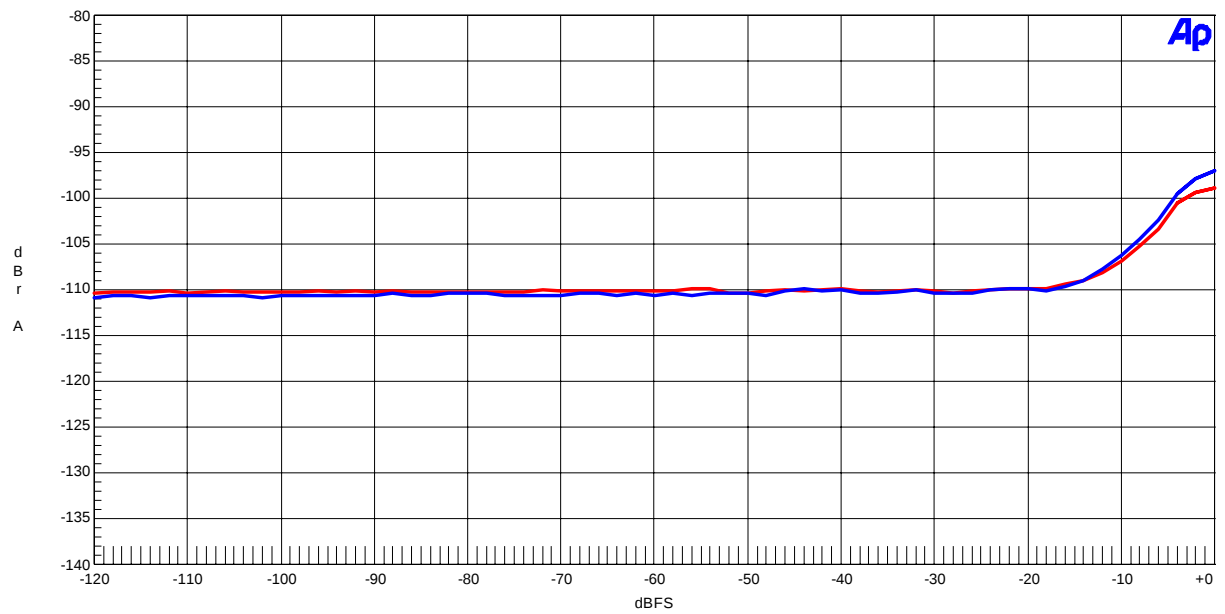
AK4620 THD+N vs Input Level
VA=VT=5V, VD=3.3V, fs=192kHz

Figure 76. THD+N vs. Input level (fin=1kHz)

AKM

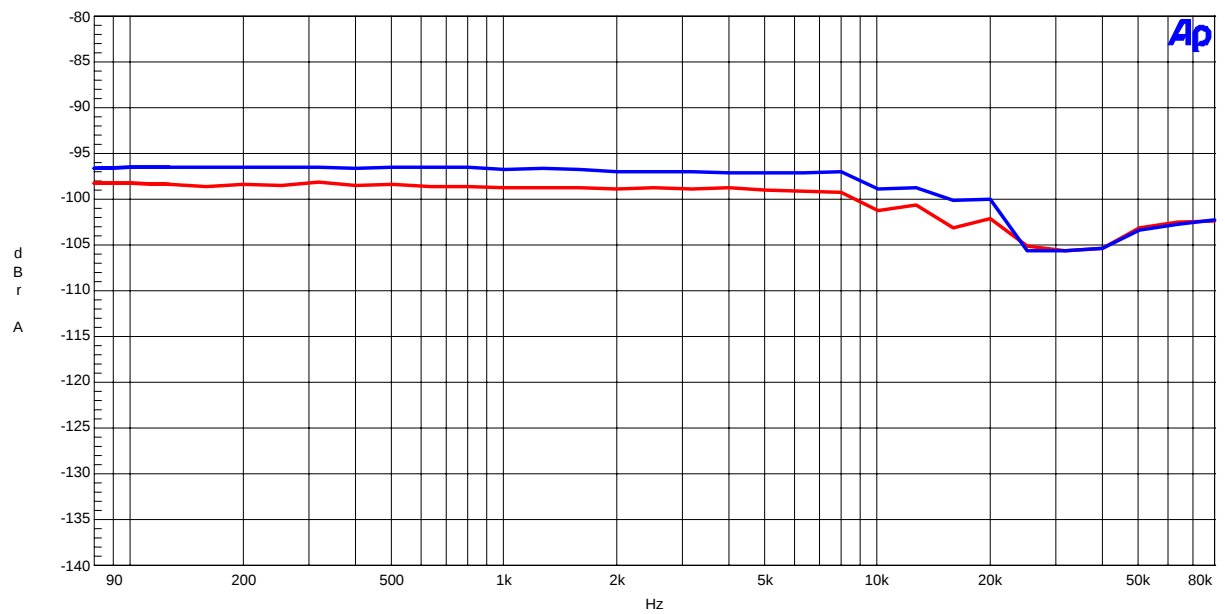
AK4620 THD+N vs Input Frequency
VA=VT=5V, VD=3.3V, fs=192kHz

Figure 77. THD+N vs. Input Frequency (Input level=0dBFS)

(fs=192kHz)

AKM

AK4620 Linearity
VA=VT=5V, VD=3.3V, fs=192kHz

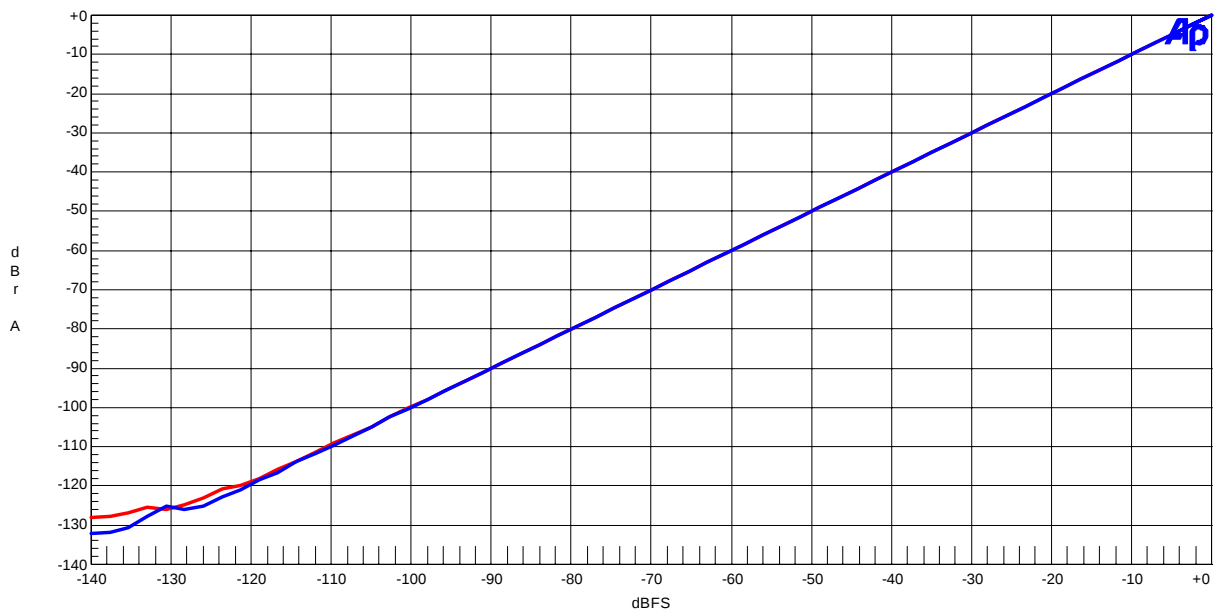


Figure 78. Linearity (fin=1kHz)

AKM

AK4620 Frequency Respons
VA=VT=5V, VD=3.3V, fs=192kHz

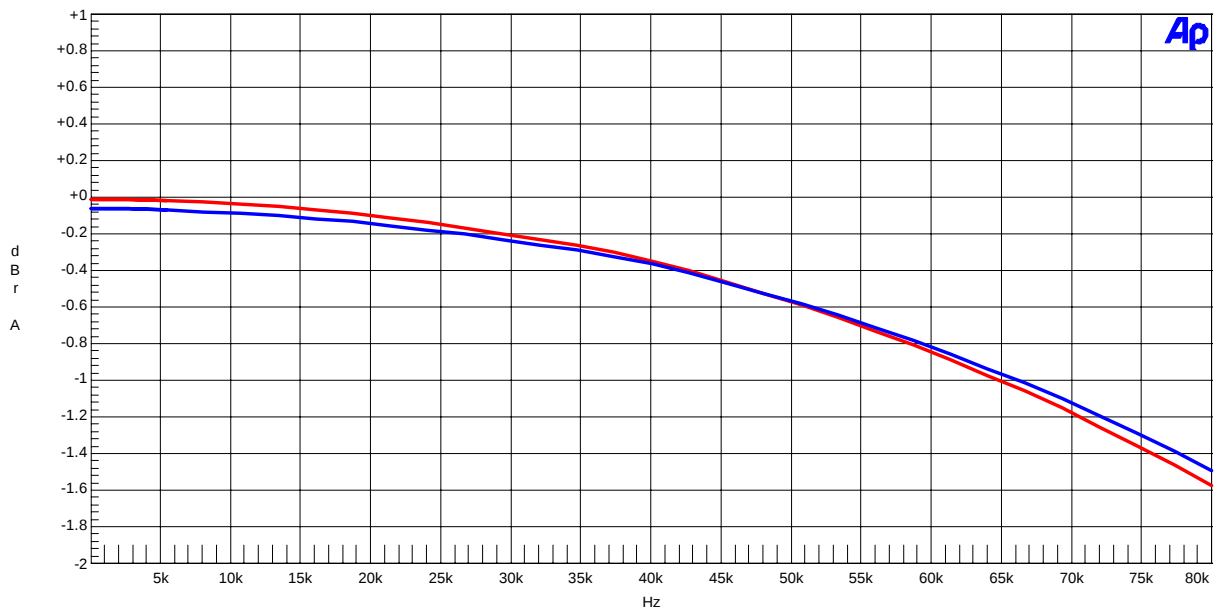


Figure 79. Frequency Response (Input level=0dBFS)

(fs=192kHz)

AKM

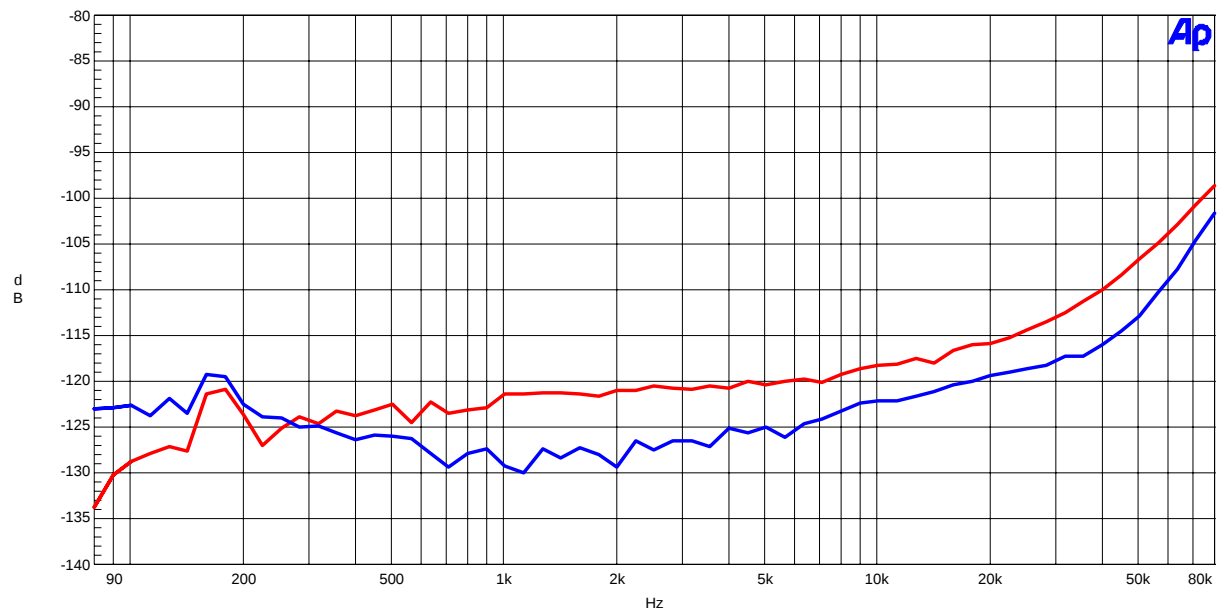
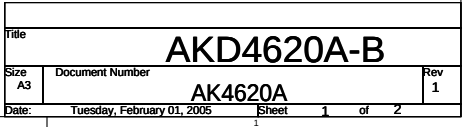
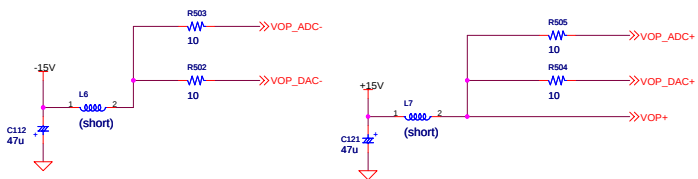
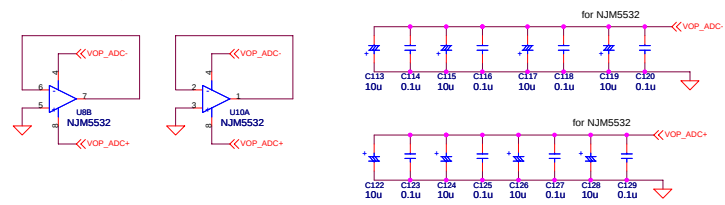
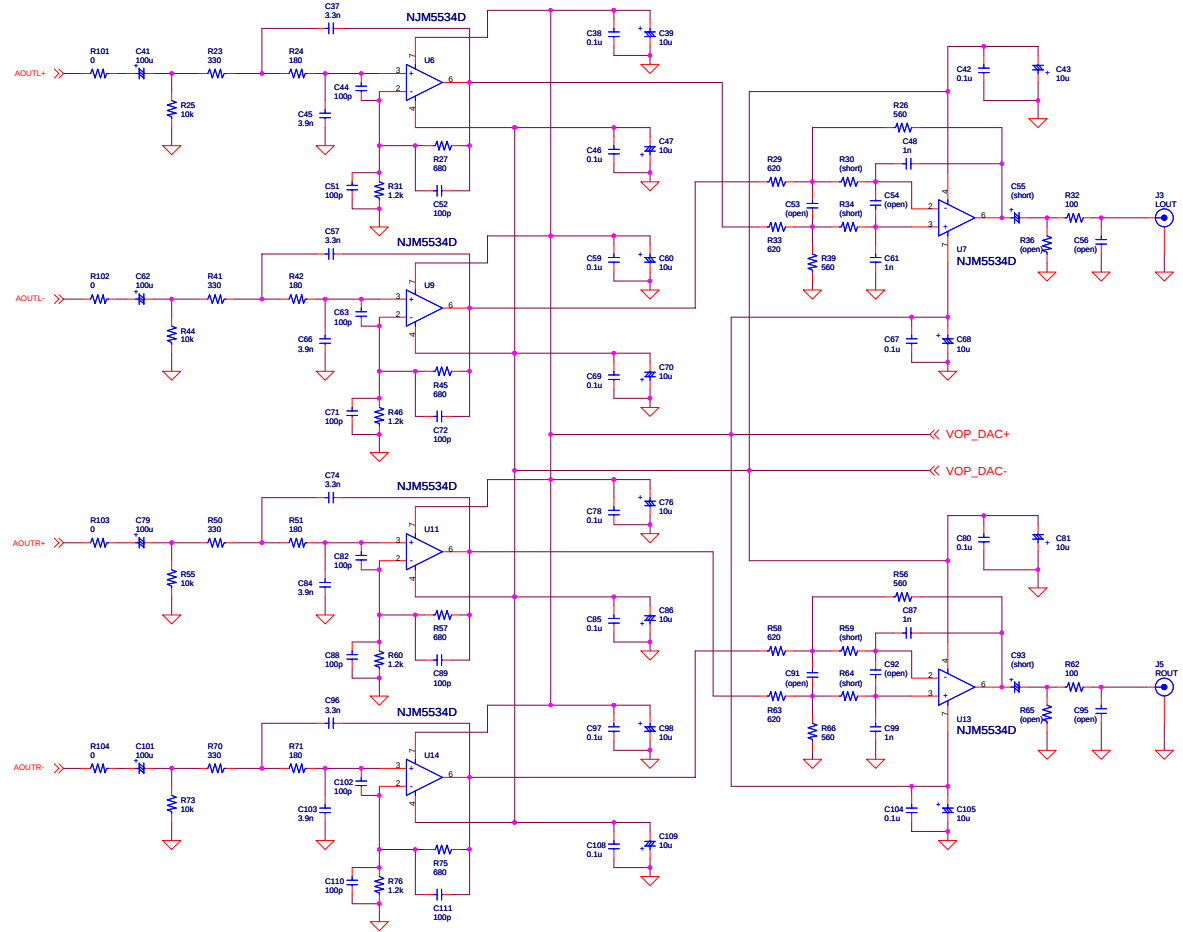
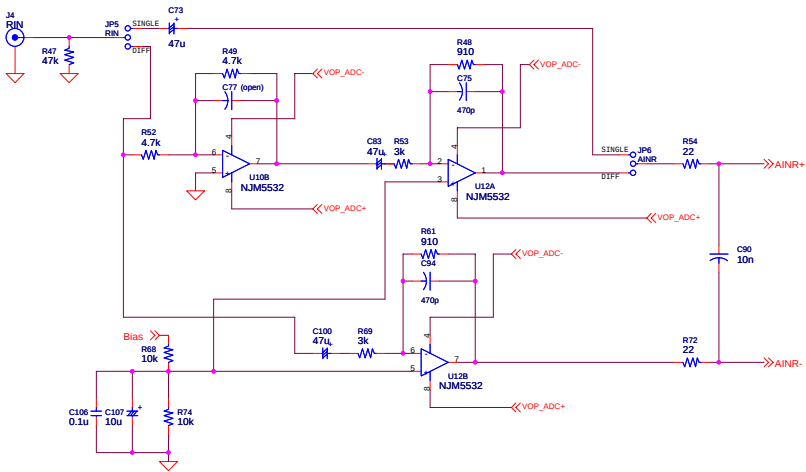
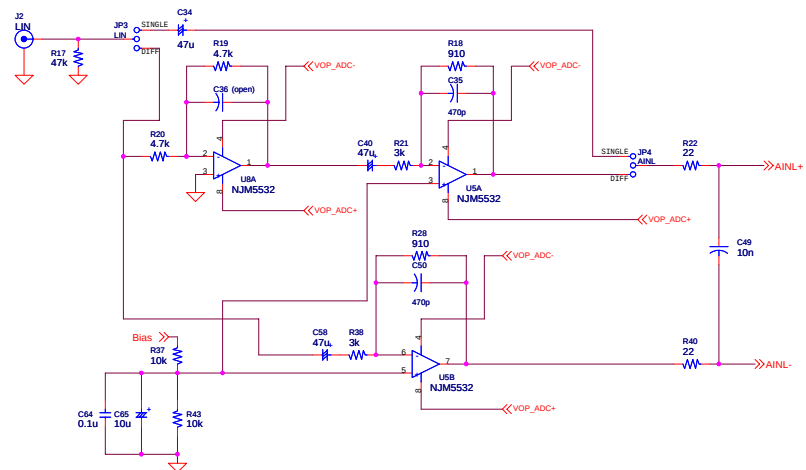
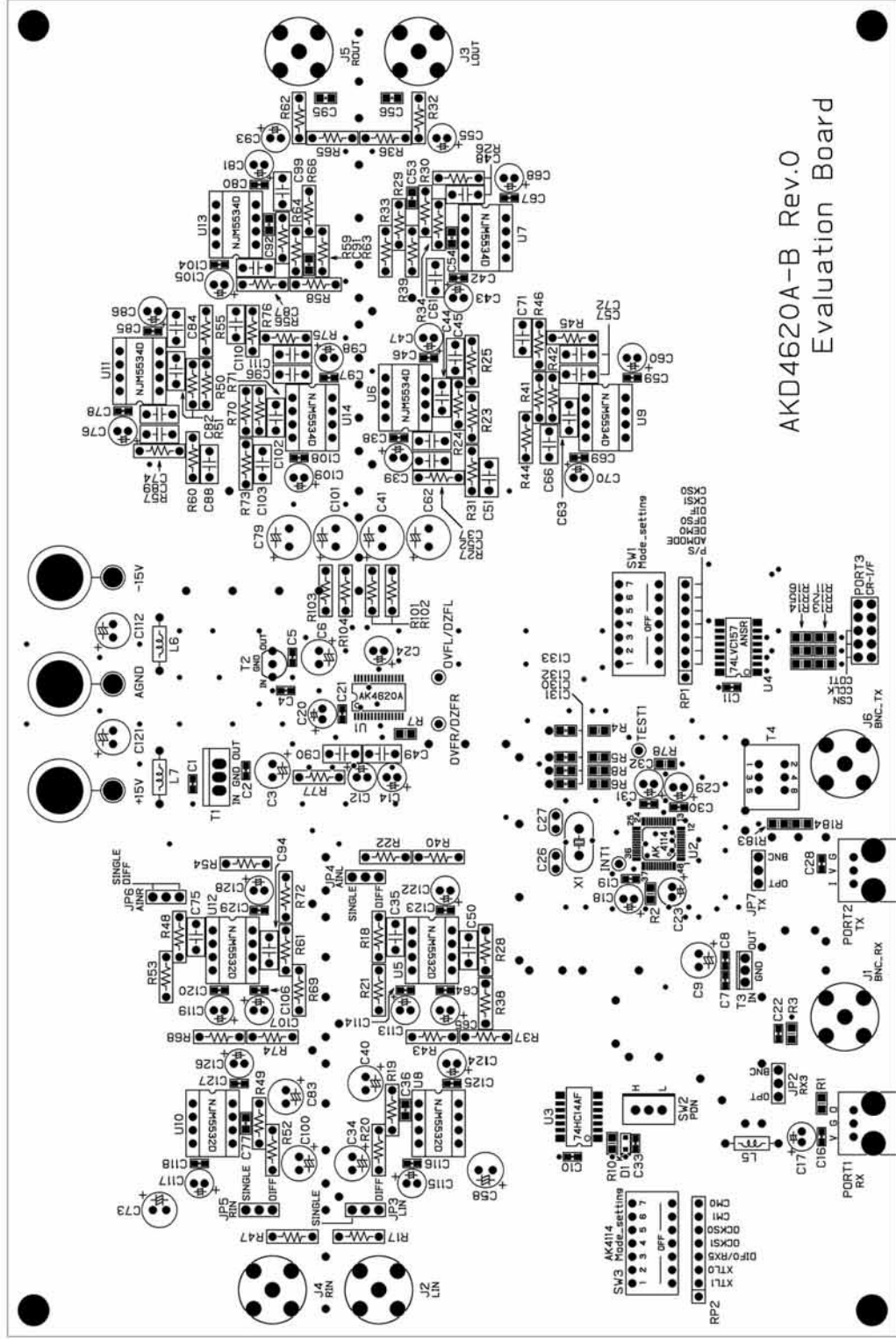
AK4620 Crosstalk Lch: Red, Rch: Blue
VA=VT=5V, VD=3.3V, fs=192kHz

Figure 80. Crosstalk





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