

From the designer of

Kinshaw

2005 Phono Stage



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Kinshaw Perception Phono Stage



Kinshaw Electronics Ltd was the company formed to encapsulate designs from the company's founder. The earliest products to become available are also some of the most sought after, even today. Amongst these is the Phono Stage, whose origination started as far back as 1989.

The basis of all the Kinshaw products was to use appropriate engineering to solve the real world problems encountered within an audio system. Unfortunately there were, and still are, many instances of technical issues being ignored or over simplified. Within the domestic audio industry this leads to misinformation and products that may perform less well.

There are many favourable reviews of the Kinshaw Perception which support the view that engineering does not erode musicality. Indeed, engineering should become the transparent servant of an emotional involvement with the presentation.

An upgrade to the Perception, known as the "SA", was the result of a request for a phono stage that remained on the RIAA curve down to 10-12Hz. The extended frequency response has little to do with bass extension, although there may be some on a handful of records. The acoustic result is one of increased openness, greater transparency with the neutrality and quiet background for which the Perception is famed.

Continued interest in the Perception Phono and a shortage of original parts has created a demand for something new. The 2005 Phono Stage combines this heritage with more recent evolution.



2005 Phono Stage



At this point in time the Phono Stage is in a feasibility phase. Given sufficient demand there will be a fully fledged product, with bespoke case work.

The 2005 Phono Stage continues with some of the major attributes of the original Perception:

- Balanced input architecture
- User selectable cartridge loading
- Moving Magnet & Moving Coil compatibility
- Accurate RIAA equalisation

... But it also adds to these:

- Mute switch
- Balanced line audio outputs
- Double regulated power supplies
- Separate final regulators for left & right channels
- "SA" type performance as standard
- Broader range of cartridge compatibility (inc. high output MC)

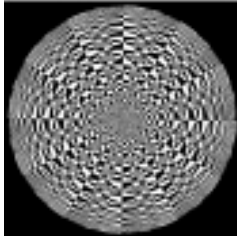
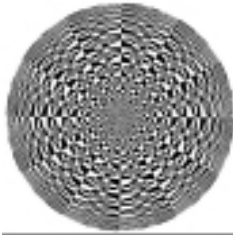
... And changes from "standard" active equalisation to "mutually opposed", passive equalisation or POEM for short (yes, there is licence!)

POEM

The benefits of the last feature may take a little explanation. Vinyl records and the mechanical recovery of their musical information does not allow for complete independence of left and right channels. However, it is the independence of the channels that is fundamental to stereo imaging.

In addition to any imaging issues, the signals within a phono stage are at best small, ranging from 5mV (0.005V) down to 150µV (0.00015V) for a 1kHz tone at 1cm/sec. Musical information extends way below the "full scale" figures just given, often requiring 1/1,000th of these values, 5µV – 150nV (0.000005 - 0.00000015V), to be carefully handled. To make matters worse, bass frequencies are recorded on vinyl at 1/1,000th of the high frequencies.

This means that imaging and authoritative, dynamic sound are readily diminished by even minor effects within a phono stage. The "standard" approach uses active equalisation and two channels operated "in-phase". This is expedient and, if properly done, can produce excellent results.



The difficulties with the standard approach lie in:

- the enormity of the active equalisation task
- the ability of one channel's information to affect the other

Active equalisation requires that a circuit uses the negative feedback path to feedback differently for different frequencies. In a naturally dynamic music signal, the active element must behave beyond reproach. Additionally, the dynamics within the filter are complex. Circuit elements rarely behave beyond reproach, even if they are very good and complexity is a recipe for problems, even if they are little ones.

Operating two discrete channels next door to one another can be a cause for concern. The usual method of reducing any such ailments is to use "dual mono" construction. This may help reduce any cross-channel issues but does not reduce the total disturbance created by the channel itself. Circuitry operates in an environment that relies very heavily on a common reference point, especially in a device such as a phono stage.

Dual mono construction can reduce total disturbance from 2 channels down to 1 channel. A 50% reduction or 100% improvement is worth having. However, a system that allowed channel disturbances to almost cancel could produce about 90% reduction or 1,000% improvement.

The new phono stage uses this cancellation process. As a by product any cross channel issues subtract rather than add, allowing the new phono stage to support stereo image rather than erode it. Cross channel coupling is carefully kept to an absolute minimum but this added poetic twist does tend to offset a cartridge's natural tendency to have poorer separation at high frequencies.

Creating an accurate passive filter is fairly straightforward and its operation is inherently simpler too. However, the technical price for this is that the preceding circuitry must remain distortion free and totally "linear" whilst handling a wide range of frequencies and signal levels. A so-called 500 μ V MC cartridge could produce in the region of 5mV at 20kHz, which must be amplified with the same high gain required for MC.

The sonic benefits of considerable engineering and fine tuning individual sections of the design with an Audio Precision test system are apparent from the moment the first record is played.



Summary of features and benefits

Feature	Benefit
Balanced input architecture	Cartridges are naturally balanced devices, although not helped by some tone arm wiring and the wide use of RCA phono connectors. A balanced input structure can greatly assist in the reduction of hum and interference, especially when combined with a balanced wiring system.
User selectable cartridge loading	Cartridge loading is not an absolute science. There are guide lines which sometimes require fine tuning by trial and error. A change of cartridge does not require the return of the phono stage to the manufacturer/retailer for adjustment.
Moving Magnet & Moving Coil compatibility	The Perception catered for both MC & MM but did not allow for "balanced" coupling of MM cartridges. MC cartridges tended to only have low outputs in 1990's. Now high performance MM cartridges are far more common, deserving balanced inputs. MC cartridges are often 250-500 μ V which could overload lesser phono stages, especially at high frequencies.
Accurate RIAA equalisation	This is at the heart of a phono stage's purpose. Lack of accuracy results in tonally inaccurate reproduction. Acoustically, poor equalisation can appear to remove the natural nature of sound. Accurate equalisation is achieved by engineering and is essential to art and emotion of music.
Mute switch	Many users leave phono stages on 24/7 so that stable operational conditions are maintained without warm up. Such high gain can cause damage to other parts of the system if they are powered at the same time. The mute switch allows power to remain connected all parts of the phono stage but leave the signal disconnected from the remainder of the system. Muting is achieved through a fully independent regulated 5V circuit that operates high precision signal relays, with very short signal paths.
Balanced line audio outputs	More pre-amps are available today with balanced line inputs. Some are just for show, others work very well. The use of balanced line is still not widespread in domestic audio but properly applied it has inherent benefits to overall sound quality and noise rejection.
Double regulated power supplies	Regulators are able to reduce the amount of pervasive 50/60Hz noise and ripple from the mains by as much as 60dB. This is very useful but in a circuit that has such high at these frequencies it may not be enough. Theoretically double regulation offers 120dB ripple reduction. In practice this may not be achieved in full but a substantial improvement adds to the "solidarity" of the sound and a freedom from mains hum.



Separate final regulators for left & right channels	Regulators also help to stop signal related information from reaching other parts of the power supply chain, which is a common route for cross channel interference. Separate regulators move towards "dual mono" type operation with high levels of stereo definition, whilst allowing for the cancellation capabilities of POEM to operate.
"SA" type performance as standard	Users of this calibre of phono stage demand high end performance. The majority the Perception Phono stages have been modified over the years to SA status. Despite a money back guarantee, no one in 10 years has ever asked for it. SA performance mans that the RIAA curve is followed down below 10Hz preserving signal integrity at "normal" bass frequencies, which is heard as more powerful (not overblown/bloated) controlled bass with an air of naturalness and authority.
Broader range of cartridge compatibility (inc. high output MC)	The world of cartridges and turntables has moved on. Improved Moving Magnet (MM) cartridge designs mean that the highest levels of performance are demanded equally by MM users and Moving Coil (MC). MC cartridges are also available now with much higher output signals than was possible in the past. This is mostly a positive step but the phono stage has some sizeable signals to deal with internally when such cartridges are used.



Figure 1 **Three quarter rear view**

Showing (looking from left to right):

Isolated/"balanced" input RCA connections, ground reference post, output RCA connections, output balanced XLR connections, mains input (IEC), power switch (on/off)



A word on measurements



Audio Precision¹ is generally recognised as setting the standard in audio test and measurement. The SYS-2722 is the flagship of Audio Precision's line up and the model used by Goingon in all designs since 2002.

Specifications can be a useful way of gauging a product's capability or the calibre of its engineering. Unfortunately, it can also be a means of trying to "hype" product by offering fantastic numerical results, with no context or caveat as to how they were obtained.

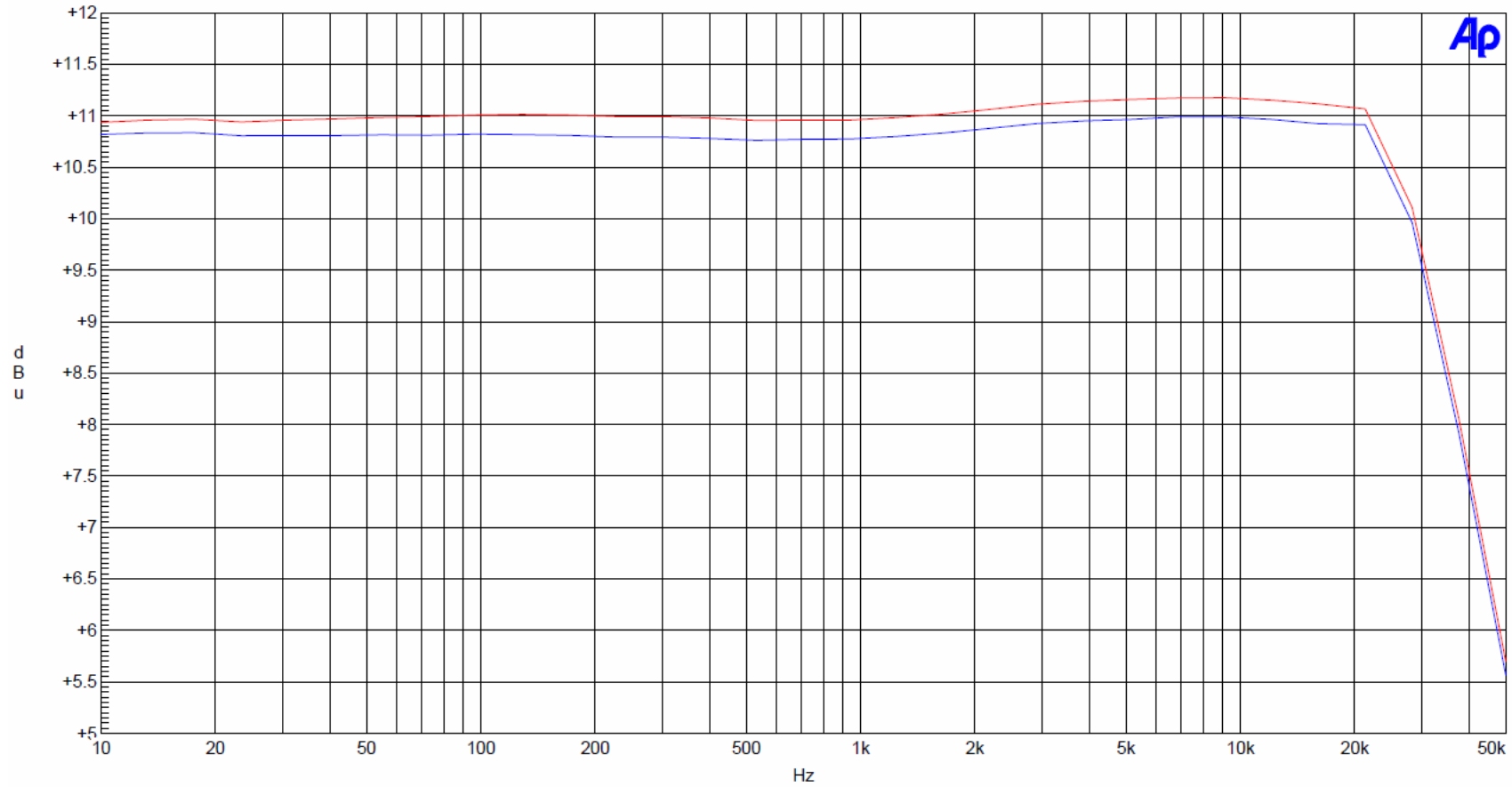
Many specifications are offered over limited bandwidth to reduce apparent noise. Another technique is to use "weighted" filters (and then cynically not mention their use). Weighted filters, when used and mentioned, are a valid way of showing relevance but give figures that appear better than unweighted measurements.

Other techniques are to use scales on any plot that tend to minimise any deviations. Plots that are meant to be flat can be made to look super flat if the scale is reduced.

The approach taken by any open minded investigator/engineer is the reverse of a hyped marketing pitch. Noise measurements are made with no weighting or bandwidth limitations. Scales are increased so that even the flattest wave has some form of bend in it. This way, the harsh truth, that nothing in this world is perfect, becomes visible. This way always allows products to be developed to their maximum potential.

Measurements on the Phono Stage are made in this super critical manner and presented for the information they give. Idle comparison with other manufacturer's marketing figures may well lead to disappointment because very few manufacturers wish to show anything but the best possible "numbers".

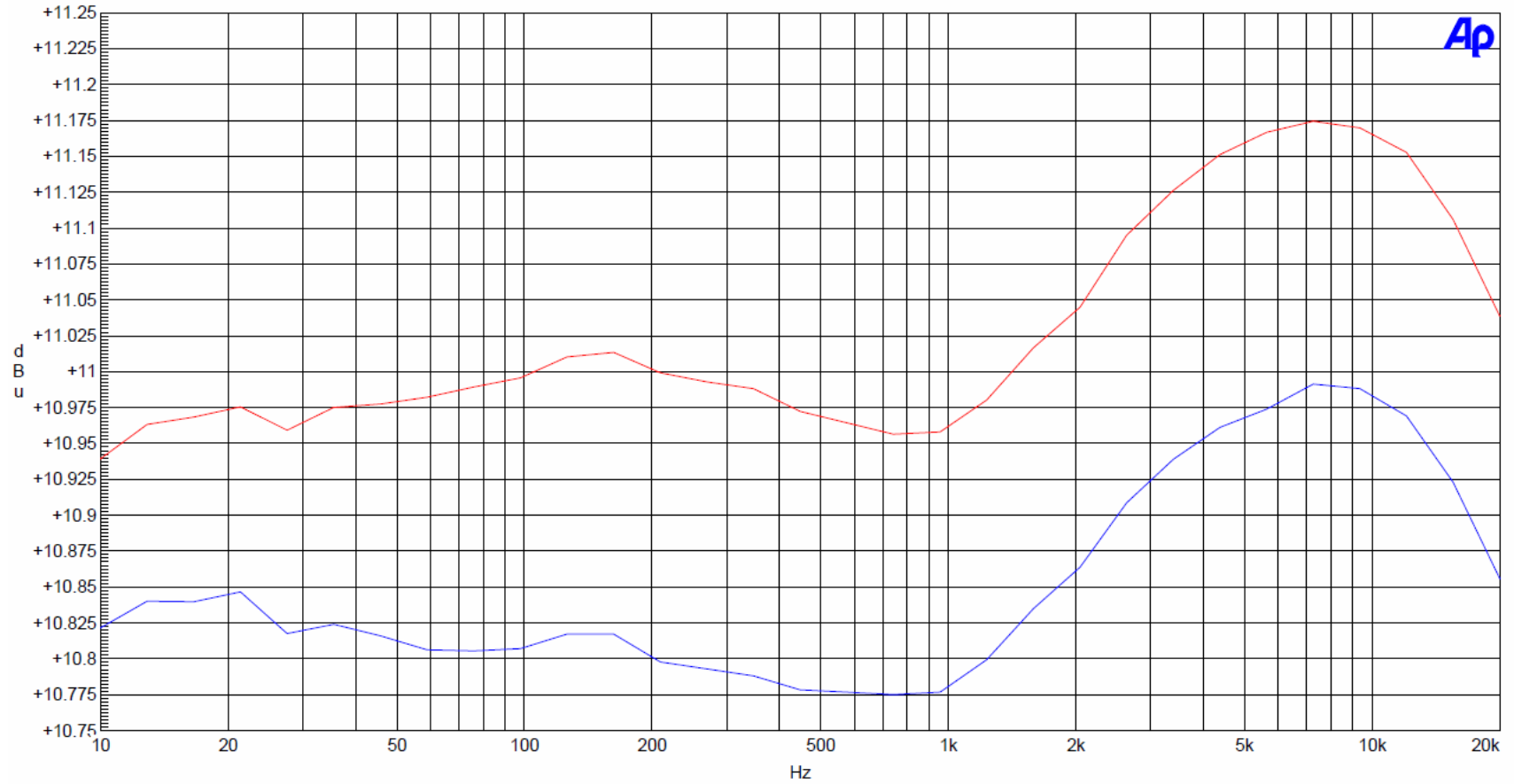
¹ Audio Precision is a registered trademark of Audio Precision, Inc.



Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Blue	Solid	1	Anlr.Level A	Left	
1	2	Red	Solid	1	Anlr.Level B	Left	

2005 Phono Stage Prototype (final values)
500uV input (MC) 100R load "balanced" but standard unbalanced RCA leads

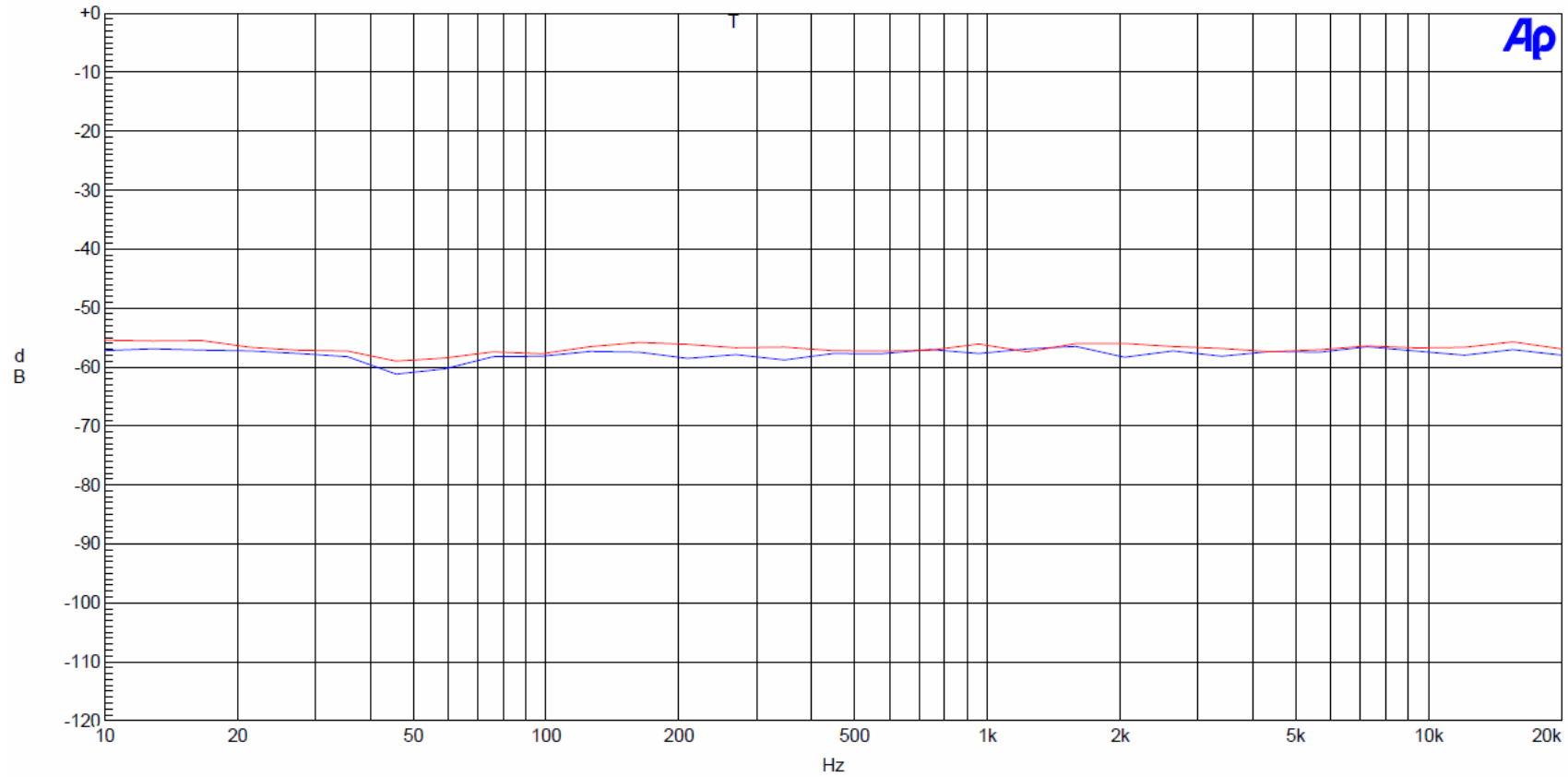
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Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Blue	Solid	1	Anlr.Level A	Left	
1	2	Red	Solid	1	Anlr.Level B	Left	

2005 Phono Stage Prototype (final values)
500uV input (MC) 100R load "balanced" but standard unbalanced RCA leads

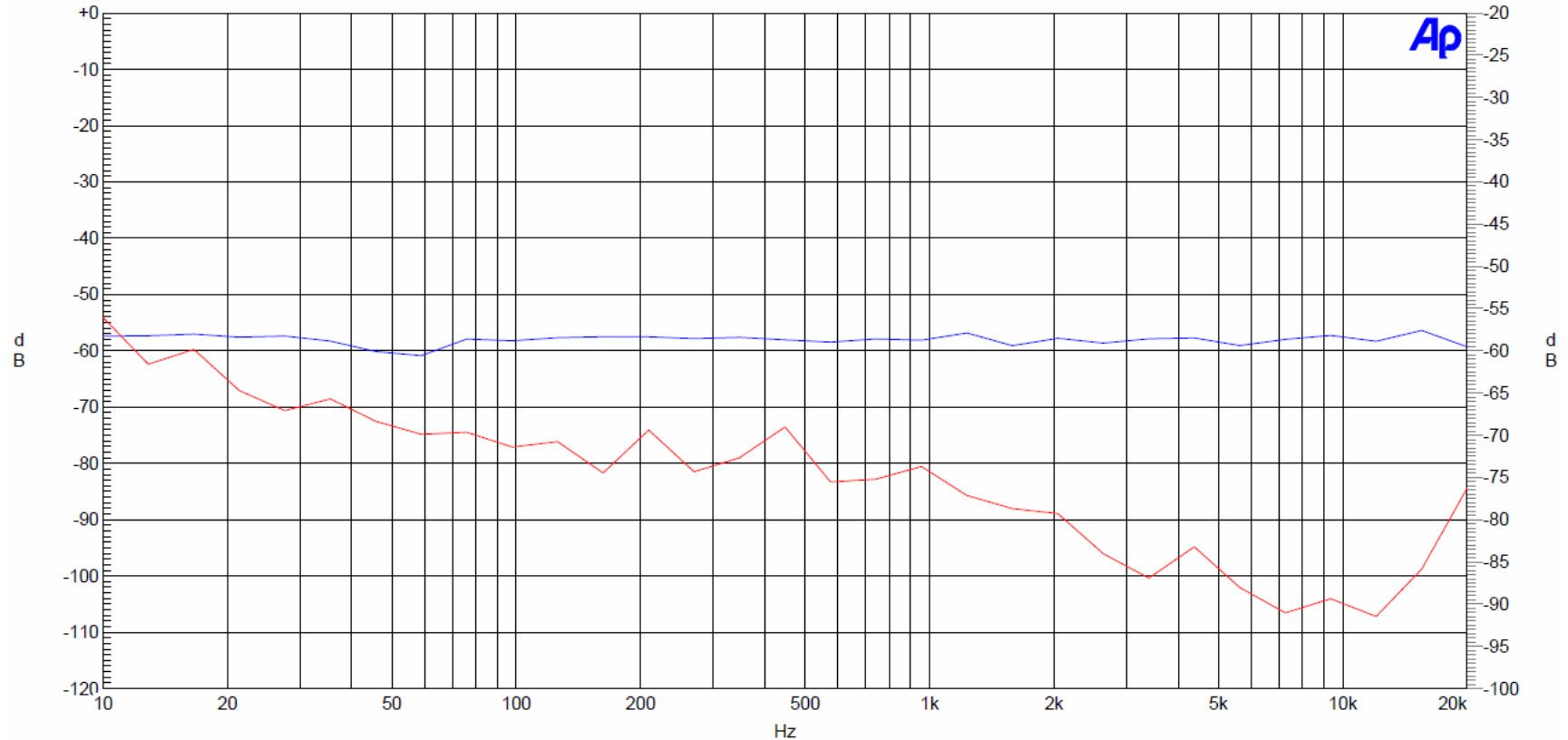
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Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Blue	Solid	1	Anlr.TH+D+N Ratio	Left	
1	3	Red	Solid	1	Anlr.TH+D+N Ratio	Left	

2005 Phono Stage Prototype (final values)
500uV input (MC) 100R load "balanced" but standard unbalanced RCA leads
Whole range (wideband measurement) based on noise (affected by input leads)
Effect at 50Hz is attributable to mains

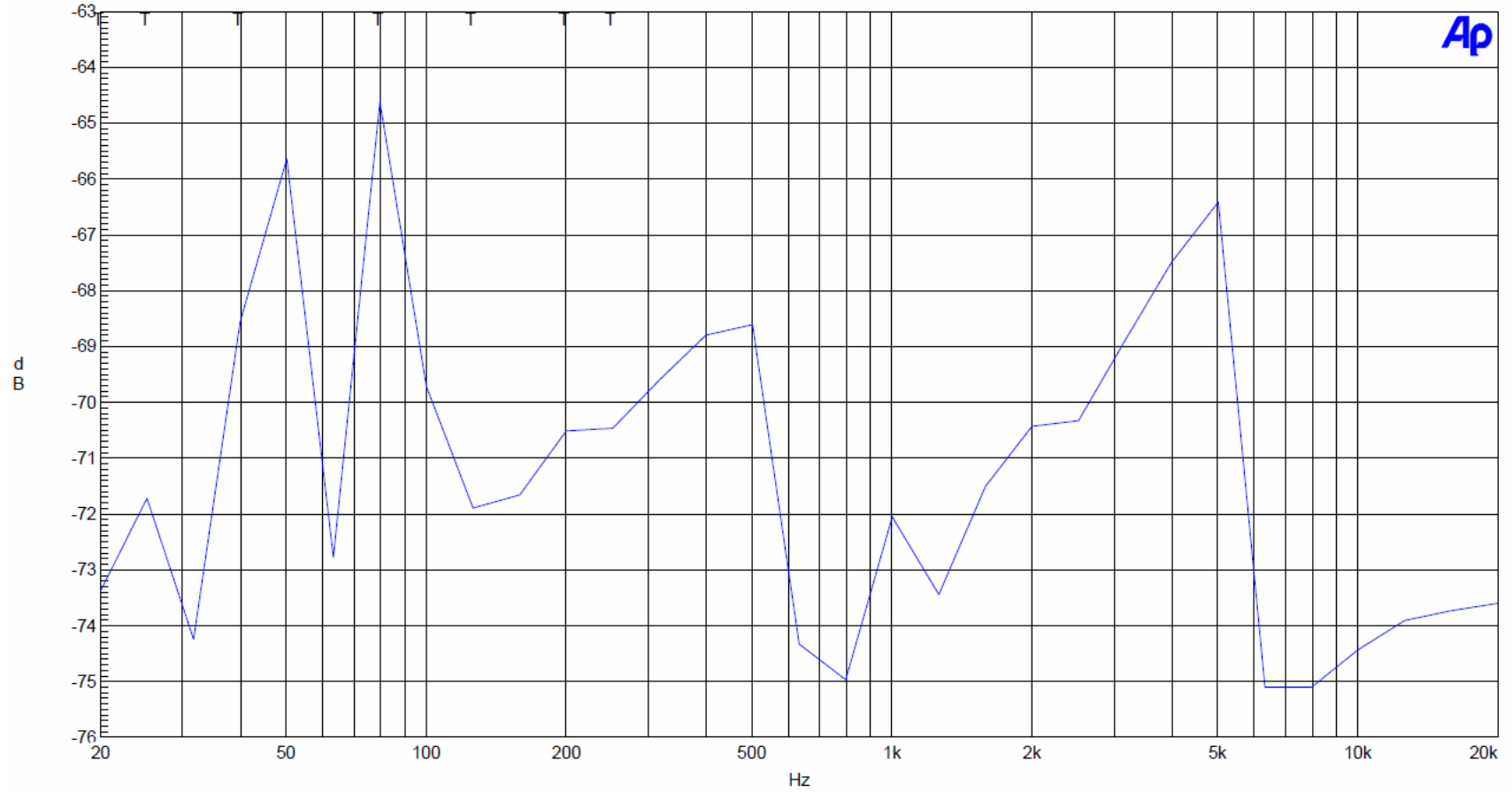
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Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Blue	Solid	1	Anr.TH D+N Ratio	Left	
1	2	Red	Solid	1	Distortion.Ch.1 Harm Sum1 Ratio	Right	

2005 Phono Stage Prototype (final values)
 500uV input (MC) 100R load "balanced" but standard unbalanced RCA leads
 Comparison of THD+N (top trace) and harmonic distortion only (bottom trace)
 Harmonic distortion rises with frequency in general amplifiers...
 but drops here from 10Hz to 15kHz due to the increasing size of the input waveform (RIAA curve)

Phono_2005%Final%Values%THD+N02.at2c



Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Blue	Solid	1	Anlr.Crosstalk	Left	

2005 Phono Stage Prototype (final values)
500uV input (MC) 100R load "balanced" but standard unbalanced RCA leads
Scale expanded to show full extent - effects of RIAA curve/signal level visible

Phono_2005%Final%Values%X-talk01.at2c