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iFi Audio USB iPurifier2

hi-finews
 EDITOR'S
 CHOICE

Inspired by technology developed for military use, iFi Audio's in-line 'purifier' claims to reduce noise and improve the signal on USB connections. But is its effect audible?

Review: **James Parker** Lab: **Paul Miller**

The idea of *horror vacui* – nature abhors a vacuum – clearly still pertains when it comes to hi-fi accessories. As soon as there's a perceived gap in the market, many will rush in to fill it. That's been true all the way back to record cleaning devices and tube dampers, through green pens and sticky foils and weighted discs said to improve the playback of CDs, until we come to attempts at making the most of USB connections between computer and DAC.

This year AudioQuest has a new 'widget' commanding worldwide attention from budget-conscious audio enthusiasts playing music from their computers: the E39 JitterBug [HFN Oct '15]. It's another USB dongle, a little smaller than its DragonFly DAC, but this time with a Type A jack and socket at either end.

JITTER BUSTING

Now if you thought you saw entrenched opinions in the old vinyl vs CD debate, which has raged for more than 30 years, you ain't seen nothin' 'til you engage with the conflict between 'digits is digits/it's all 1s and 0s' and those who swear by the benefits of, say, a better USB cable.

Into this arena comes the little iFi Audio iPurifier2, selling for £90. It's designed to treat the signal between computer and DAC with a combination described as 'REclock, REgenerate and REbalance', and claims to reduce jitter, line and PSU noise.

THE RISE OF IFI AUDIO

When we looked at the Nano iDSD DAC/headphone amp [HFN Dec '14], it was part of a small range from iFi Audio, itself an offshoot of Abbingdon Music Research, which had started in 2012 with just four products. Since then, the brand has undergone rapid expansion, and now has more than 25 models in its catalogue. Having launched into the portable market, it now has devices for home use, a complete hi-fi system (the Retro Stereo 50), and power and signal conditioning products. As well as the USB versions mentioned in the review, there's also an S/PDIF iPurifier, and a DC iPurifier designed to remove noise from power supplies. The company's iPower plugtop power supply is offered as a 'quieter' replacement for the 'wall-warts' used for many devices from DACs to NAS units: developed from the company's original 'Ultra-Low Noise' adapter of three years ago, it's available in versions from 5V all the way up to 15V.

It comes from a company last seen in these pages with its Nano iDSD DAC/headphone amplifier [HFN Dec '14]; since then the iFi range has expanded to include all sorts of products, including cables and power supplies – as you can read in the boxout, below.

It's not the first 'jitter buster' designed for this purpose, from the entry level AudioQuest JitterBug up to more complex reclocking devices such as the Mutec MC3+ Smart Clock USB, which will set you back around £600.

The active, USB hub-powered iPurifier2 differs from the passive JitterBug filter as it's designed to be used at the 'DAC end' of a USB cable, whereas the 'Bug plugs into the computer. In fact, the iPurifier2 comes in a number of versions, to suit a variety of USB DACs. In every case the input is a square USB Type B socket, used on most 'full-size' DACs, but at the other end there's a choice of Type A or B, and mini or microUSB plugs.

The input is USB 3.0/2.0-compatible, and the output USB 2.0, the connections are iFi's own solid aluminium designs, and the whole enterprise, while small at just 6.2cm long and less than 2cm wide and deep and



LEFT: The USB iPurifier2 is a hub-powered device providing regeneration and active noise cancellation of the data signal. Micro LEDs show USB power and asynchronous signal lock

weighing a mere 30g, feels robust and well finished in its silver-grey metal casework.

Two little indicators light to show power and signal are being received – but what's going on inside the compact housing? Well, there's noise reduction inspired by the stealth system used on the Dassault Rafale jet fighter, cancelling out power supply noise by generating its 'mirror image'. Plus USB reclocking and regeneration, reducing jitter, and a 'rebalancing stage' to remove any DC offset and output an optimised USB feed.

EYES AHEAD

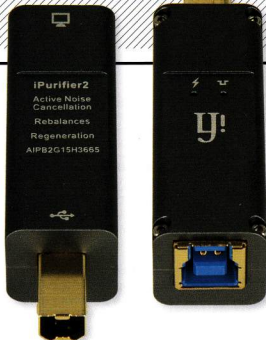
The lab report opposite tells its own story, of improvements in the data 'eye pattern' but less consistent results when it comes to DAC jitter further down the line, and it seems the measured effect of the iPurifier2 can vary according to the type of DAC with which it's used. Editor PM leans to the view that improvements may be diminished when the iPurifier2 is used with USB hub-powered DACs, which will necessarily draw their power through the device.

I listened to the iPurifier2 with a variety of DACs, both USB- and mains-powered, fed by a dedicated computer

IFI AUDIO USB IPURIFIER2

This innovative little product is a very different proposition from AudioQuest's passive JitterBug [HFN Oct '15], the latter filtering both the V_{bus} and differential USB datalines to remove spurious RF, particularly from the latter, and offering a subtle influence over the response and waveshape of the data signal. By contrast there's nothing subtle about the impact of iFi Audio's USB iPurifier2 on the digital data waveform [see Graph 1 and 2]. Powered by the 5V USB V_{bus} , the iPurifier2 asynchronously reclocks and regenerates the incoming data, and employs an active anti-phase reduction/cancellation of common-mode RF noise. The output is also buffered, removing any DC offset, and restores the USB standard 90ohm ($\pm 15\text{ohm}$) source impedance. Employing the same process described for our USB cable group tests [HFN Jul '13 and Jul '14], the data eye-pattern for a standard 2m length USB cable is shown below [see Graph 1] where the 19.57nsec risetime is only just within the upper 20nsec limit defined in the Universal Serial Bus Specification (Revision 2.0). In this instance the Vp-p was measured at 3.6406V. With the iPurifier2 added between the cable and the DAC's USB Type B socket, there's a clear improvement to the received data waveshape [see Graph 2] where the risetime has improved to <9nsec and the Vp-p marginally lifted to 3.7438V.

Deterministic jitter, on the edges, is significantly and visibly reduced, ostensibly easing the task of the USB receiver's data slicer, reducing the potential for timing errors in recovery and also reducing the circulation of RF noise through the DAC. Interestingly, however, evidence of this clear difference in data waveshape translating into reduced jitter and/or noise in the final post-DAC analogue signal was more difficult to obtain. In fact I discovered that jitter was more likely to increase, albeit very marginally, with a hub-powered plug-in 'headphone DAC' like the new DragonFly Red from AudioQuest (160pssec versus 90pssec direct) as it drew power via the Purifier2 rather than directly from the hub V_{bus} . Mains-powered or standalone DACs including the Audiolab DAC+ [HFN Jun '16] and Pro-Ject DAC Box2 ultra [HFN Jul '16] were not measurably influenced, perhaps because what little jitter remained was induced after the USB input receiver. A fascinating accessory, nonetheless. PM



LEFT: Equipped with USB Type B (female) input and (male) output sockets, the iPurifier2 inserts between the destination end of the USB cable and Type B input on your outboard DAC. iFi Audio also offers alternative versions with USB A, C and micro connectors

via an AudioQuest Carbon USB cable [HFN Jul '13] and, well, not very much changed, actually. Repeatedly playing the same tracks, in everything from CD-quality WAV and FLAC all the way up to DSD128/5.6MHz, I found it very hard to detect a reliable difference between the sound with the iPurifier2 in place and that without. Indeed, the two words appearing most consistently in my listening notes were 'perhaps' and 'maybe'.

Only when I forced the issue by using a laptop computer as the USB source, connected into the system using a 5m cable, could I hear what I thought were repeatable differences. However, even these were very subtle in nature, extending to a little more sparkle on atmospheric recordings such as Brian Wilson's *No Pier Pressure* in 96kHz/24-bit [Capitol 0602547215239] and letting the bass lines on Chaka Khan's *Soul Diva Live* set [Sawndrew Metronome download] drive with just a little more conviction.

BUG BITES

Switch back to the iPurifier2 and, again, I wasn't sure whether the differences were real, or indeed which 'version' I preferred. I have to say I found myself rather more confident in identifying the cleaner, more focused sound I encountered when leaving the iPurifier2 out and putting an AudioQuest JitterBug between the PC and USB cable.

Back to the 'optimised' computer set-up, and pianist Cristian Budu's glorious 96kHz/24-bit set of Chopin and Beethoven [Claves CD1602] and, listening very closely through high-quality headphones, including Oppo's PM-1 [HFN Jul '14], it was

possible to detect just a little more resonance in the instrument with the iPurifier2 *in situ*, along with a slightly enhanced sense of the recorded acoustic.

But it's a close-run thing, with not a hint of proverbial veils being lifted or windows flung open, etc. That's just not what the iFi device does. At best its effect is subtle, and it's probably best considered for a set-up where other strategies for keeping the USB signal clean are impossible, or have failed to deliver the results desired. ☹

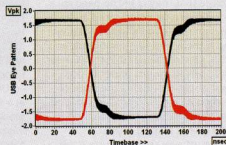
HI-FI NEWS VERDICT

A fairly low score, despite the very affordable price, simply because it was hard to draw consistent conclusions between 'with' and 'without' when used in a set-up with simple optimisation strategies already in place. If you must use a computer for your music and other tasks at the same time, this device might give some piece of mind about signal purity; however, I fear many will need rather more convincing.

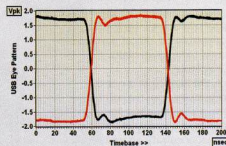
Sound Quality: 75%



'There's tech inspired by the Dassault Rafale jet fighter'



ABOVE: USB eye-pattern via 2m of legacy USB cable, terminated by 90ohm receiver without the iPurifier2



ABOVE: USB eye-pattern via 2m of legacy USB cable, terminated by the iPurifier2 and 90ohm USB receiver

HI-FI NEWS SPECIFICATIONS

USB signal risetime	19.6nsec <9nsec (with iPurifier2)
USB signal gain	+0.25dB
Dimensions (WHD) / Weight	19x20x63mm / 30g