

## Re: op-amps with wide open-loop bandwidth ?

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*Source:* <http://sci.tech-archive.net/Archive/sci.electronics.design/2006-03/msg02515.html>

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- *From:* "Kevin Aylward" <[see\\_website@xxxxxxxxxxxxxx](mailto:see_website@xxxxxxxxxxxxxx)>
  - *Date:* Sun, 19 Mar 2006 15:50:48 GMT
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Dave Moore wrote:

"Kevin Aylward" <[see\\_website@xxxxxxxxxxxxxx](mailto:see_website@xxxxxxxxxxxxxx)> wrote in message  
[news:7TRsf.210450\\$YJ4.75991@xx](mailto:news:7TRsf.210450$YJ4.75991@xx)

Dave Moore wrote:

I'm aware of opamp theory and I understand why some engineers think there's no reason to "sonically evaluate" opamps. However, I have my reasons for doing so and if anyone thinks me a fool for doing so, so be it. They ain't got'ta be so arrogant and snobbish about it however.

Dave Moore  
( Just a fool that gets results)

Not a fool, just a bit naive.  
You are giving little credit to other qualified people who have actually looked at these issues in depth.

You are making the assumption that \*they\* are the fools.

You're still absolutely clueless.

Oh?

Let me clue you in. I ask for some information, instead I get a bunch of mistaken presumptions about why I want the information and a slew insults to go along with the mistaken presumptions.

## Re: op-amps with wide open-loop bandwidth ?

I read your other replies in this thread, so I didn't make any assumptions. It appears that you believe that having an open loop BW at least equal to the audio BW is necessary/advantages to get a good sound. This is easily shown to be erroneous. It's pretty basic physics really.

Suppose we have an op amp design. Typically, this might even have a 3db BW of say, 100Hz! However, this is usually at enormous gain. This design would have an aspect of distortion characterised by an open loop value, divided/reduced by the loop gain. Suppose that we now simply added an internal resistor at the appropriate point to broadband the BW to 20KHz. You appear to be claiming that this new configuration might sound better just because it has better BW. This is very unlikely. All the open loop gain that is now thrown away at the lower frequencies, can now no longer be used to reduce the distortion at those frequencies. It always pays you (distortion wise) to have as much loop gain as possible over the widest frequency range.

Of course, if the amp is slewing prior to the audio BW, then...

And no, I am not making any assumptions about whether all engineers are the \*real\* audiophiles. I'm quite open minded. And I usually believe that people have valid reasons based on their experiences for believing the things that they do. One scientist looking at one set of data will draw one conclusion whereas another studying the same phenomena with a different but contradictory dataset may draw a completely different conclusion. In the end perhaps a new conclusion is reached due to the controversy and everyone is happy as they were all proved to be right.

Sure, but this open loop BW thing is a no brainer. It's not rocket science. By itself, the open loop BW is not relevant. It's not debatable at all. It's all very well understood. Very few physicists argue with the general theory of relativity, and damn less qualified EE's argue about the properties of correctly designed feedback amplifiers.

For example, some

actually have extensive professional experience in analogue design and pro audio, from both a technical point of view and as a musician. Some of these, after such extensive study, indeed conclude that there is no reason to listen to an amplifier in order to design a straight piece of wire with gain. It's purely a technical issue based on gains, distortion, bandwidth, noise etc.

## Re: op-amps with wide open-loop bandwidth ?

The fact that I'd rather prove this to myself doesn't mean that I don't respect the opinions of others. However there's a bit more to this story that might be of significance if anyone cared to find out first before popping off a few rounds and asking questions later.

The issue here, is that I have heard all this before from endless numbers of people. You have said nothing new. Its already a dead subject. You jsut are not aware of all the prio art on this matter.

I'm working on more than one front at once. Besides design, I also do repair and upgrades for a select handful of musicians.

With all due respect, what this tells me is that you are really a hacker/tech, not a qualified EE. You dont know what you are really dealing with.

Sure, when I was doing my degree I used to suplement my grant (UK) by doing repairs for a music shop. However, like, I'm going to do physical work with that sort of stuff for other people 25 years on?

However... A few weeks ago I did purchase a Marshall AVT150 combo. The bloody fools have an effects loop that is not inline. This means a volume pedal, or even a phaser won't work correctly. So, I emailed for the circuit diagram and modified the effects loop to work correctly. It even had an irritation of having the clean channel with significantly more gain then the distortion channel, making it hard to get maximum volume from the distortion channels when switching. So, sure, I fixed the gains. But this is all for me personally.

In some cases an upgrade might entail something as simple as swapping out the opamps in a unit. Under these circumstances there is indeed a quite noticeable difference in the sound from one opamp to another.

Maybe for a 709 to an op-37, but in general, little chance of hearing any difference. Been there mate.

Also, in the years that I have been doing this I have noticed (as well as the musicians themselves) very definite characteristics that always follow one particular opamp around regardless of which piece of gear it is plunked into.

Re: op-amps with wide open-loop bandwidth ?

Anecdotal meanderings. AB blind tests invariable show that this is all wishfull dreaming.

As I suggested, been playing guitar and messing with electronics audio both since I was 11. I'm not deaf, yet, so If there was any truth to this sort of stuff, trust me, I would have discovered it. I actually used to believe this sort of drivel until I \*really\* looked into it, in detail.

Ok, so I suppose someone is going to say at this point, well of course, because the opamps are being plunked into networks designed for other opamps. Let me address this. Firstly, sometimes it's not possible to get a schematic on a particular piece of gear. Also, often there is a diminishing point of returns to attempt to trace and draw out the schematic or reverse engineer the circuits from the PCB's themselves. So, the 'plunk in' option proves to be the viable alternative

Sure, some opamps might actually oscillate at VHF in the wrong circuit.

Let me give you a very recent example (like last night) of how this might go. I have one professional musician friend who is patiently waiting to pick up a completely SS circuit I designed that makes his opamp-plunked and capacitor-upgraded Pearce G1 SS amp sound like a tube amp. Also in his rig is a TC electronics DSP unit that sounds rather dull. I told him that I probably can do a few things to improve the TC. Well he needs the rig for a gig monday and told me to go ahead and do whatever I can before then. About the only thing I'm willing to do whithin those time constraints and no schematic towork from is an opamp-plunking. So how'd the plunking go? First off, I took my best guess at which opamps that I currently have on hand would best complement the unit. This entailed yanking the the NE5532 on the front end and replacing it with a THS2052 and yanking the NE5532 on the tail end and replacing it with an AD828. The result, (in guitar terms) much more detail & clarity on the high notes and much improved tightness and bounce on the low notes. OK, so now the A/B test.

Quite frankly, I dont believe you.

Re: op-amps with wide open-loop bandwidth ?

Put the NE5532's back in. Sure 'nuff. The sound is muddy again and it's difficult to pull out the low notes whilst finger picking.

I don't believe you. I have done these sort of tests ad-infinitum.

If there is truly a difference, its unlikely be due to the op-amps. Something has to be really bugged up with the circuit design itself.

So, next up, trying the unit with a number of different opamps with 'better spec's' than the NE5532's Result, all combinations produced better sound than the original 5532's as well as imparting quite predictably whatever flavor or characteristics I have observed to follow each particular opamp as they have been plunked into various units over the years.

All anecdotal meanderings. I have done the same, and it is in stark contrast to your claims. What's more, pro double blind tests on these \*type\* of tests \*always\* show no differences.

In the end I settled for the two opamps that I predicted would probably best complement the unit being that of the opamps I currently have on hand, they did just that, they best complemenbted the unit. So riddle me this. Hoiw did I know in advance that those two opamps were probably going to win the contest.

I suppose you also believe in fairies, palm reading, thor, tea cup reading, astrology?

I've also sat down with various musicians and let them decide which opamps they best like when plunked into their gear. 9 times out of ten they choose the same ones that would have chosen.

I dont belive you.

And this is without any pre-suggestion on my part.

So, as you can see, under these circumstances I have very legitimate reasons for wanting as large of a pool of spec-varied

Re: op-amps with wide open-loop bandwidth ?

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opamps that I can get my hands on and taking notes on just what sonic characteristics tend to follow them as they're plunked into one piece of gear after another.

I think you are simply deluding yourself. A shame really. You sound as if you could be more objective.

Sure to design a tube distortion circuit does require listening to it, but that's irrelevant to the design of the actual amplifier circuits.

I agree. When I design, I start with as clean of an amp as I can and dirty it up from there. And when it comes to designing a "clean amp" I truly do respect the skills of the more advanced engineers. But even here, since there is in reality no such thing as an ideal opamp, the issue becomes just how far which spec's need to go to disappear coloration.

As far as an audibly a straight piece of wire with gain, many op-amps are indeed ideal. You have probably been listening to 741s running at a closed loop gain of 100, where sure, that may well be a problem. Modern op amps are audibly perfect. That's just the way it is despite all this golden ears nonsense.

And this opens up another debate about how sensitive the ear is to coloration. My conclusion is that the coloration threshold is probably different for different people. Most of the more accomplished and talented musicians that I've worked with seem to have an extraordinary ability to hear subtle nuances.

They certainly claim they do, but in actual tests it all disappears.

Quite possibly this ability may be one of the reasons that they chose to become musicians.

Oh dear... now you really are getting out of your field of what knowledge you have.

People become musicians because, by and large, they were introduced to

Re: op-amps with wide open-loop bandwidth ?

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playing music at an earlier time. Its the copying or replication bit of Darwinian evolution (<http://www.anasoft.co.uk/replicators/index.html>)

Or perhaps some of it is a developed skill.

Well, yes.

Just as an EE becomes intuitively adept at analyzing a network from doing so repeatedly, I suppose a musicians hearing ability would improve with practice also.

Sure, but there is a physics limit.

Regardless, I've found that most musicians notice exactly the same differences that I do.

Oh...I don't, I'm a musician. Care to provide some credible documentable support for your "most musicians" claim?

You can claim what you like in this NG, but my experience is way different, so I dont believe you.

So in answer to Phil Assholesons question about whether I analyze sound for myself or for the masses, the answer would be for myself as I don't have time or the means to set up double-blind studies with mass participants and 9 times out of ten, my perceptions seem to be inline with those of the people I deal with.

I don't believe you. My experience is in direct contradiction to your claim. Do you want me to actually dig up some of the real tests that have been done on golden ear claims?

So, in short, respect is a two way street. I'll respect anyone that shows me some.by getting the full story before hurling stones.

The issue is that you are making claims, that are known to be erroneous,

Re: op-amps with wide open-loop bandwidth ?

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both technically and experimentally.

Kevin Aylward

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"There are none more ignorant and useless, than they that seek answers  
on their knees, with their eyes closed"

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