Subject: Earl Geddes chapter on Measurements now online
Posted by Duke on Tue, 31 Jan 2006 05:07:28 GMT
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Earl has recently posted the fourth chapter of his forthcoming book online. Earl looks at measurements from the point of view of the loudspeaker designer, rather than that of the marketing department. Most real-world measurements that give genuinely useful information will probably never be seen by us because they look awful compared to the oversmoothed on-axis curves that have been our steady diet for years now. Earl examines many different measurement techniques and topics.Of enormous interest to me was the information on polar response, directivity index, and power response. As you will see, Wayne has been barking up the right tree all along with his emphasis on matching up the directivity indices. He's taking an acoustic solution, which is worlds better than relying on equalization alone because equalization cannot fix problems that are fundamentally acoustic.In particular, take a look at Figure 4-6 and Figure 4-10. The first shows two very similar-looking on-axis response curves. The second is the power response curves for the same two speakers. As you will see, the problems introduced by inattention to directivity issues are huge, way beyond what a bit of digital EQ can begin to address.Enjoy!Duke
Online chapters of Earl's book

Subject: Re: Earl Geddes chapter on Measurements now online
Posted by Wayne Parham on Tue, 31 Jan 2006 14:41:44 GMT
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Neat stuff. Ask Earl if he'd like to do a seminar at the Great Plains Audiofest this year. I've already booked the conference room and we'd love to have Earl speak. And be sure and ask Lori to bring more of those cool vapor lamps!

Subject: Re: Earl Geddes chapter on Measurements now online
Posted by akhilesh on Wed, 01 Feb 2006 13:33:27 GMT
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Looks good, Duke. I was wondering if the issue of correlation of measurements to subjective likes and dislikes is touched on in the chapter. In other words, if certain measurements don;t seem to have any impact on subjectie liking or disliking (in exxence are "inaudible") then should we be pursuing them. I find that aspect fascinating. I know Floyd Toole did a lot of work in this area. I was wondering if this issue is addressed by Earl. thanks-akhilesh

Subject: Re: Earl Geddes chapter on Measurements now online
Posted by Duke on Wed, 01 Feb 2006 21:37:23 GMT
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Hi Akhilesh,Earl focuses more on measurements as a means to get enough useful information about what a loudspeaker is really doing, but he does give some interesting psychoacoustic information along the way regarding audibilty of THD and group delay. Apparently loudness level plays a significant role in the ear's detection of distortion. But Earl doesn't talk about things like how the skewing the frequency response or power response this way or that is perceived. One of the concepts that was new to me is "Transfer Characteristic", or TC, which (if I understand) is basically all of the changes that a loudspeaker does to the input signal. It's very complicated and varies with both frequency and loudness level. Earl does talk about the relative audibility of distortions as they relate to the transfer characteristic. Apparently looking at (and understanding the psycohacoustic implications of) the transfer characteristic predicts that soft clipping is subjectively benign while hard clipping is quite objectionable, and that the very small glitch in Class A/B amplifier operation as the voltage swings through the zero point ("crossover distorton") is especially irritating.Duke

Subject: Re: Earl Geddes chapter on Measurements now online
Posted by Duke on Wed, 01 Feb 2006 21:47:20 GMT
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Will do, thanks Wayne! I don't think Earl is planning to attend, but we'll see. Duke

Subject: Re: Earl Geddes chapter on Measurements now online
Posted by akhilesh on Thu, 02 Feb 2006 02:41:57 GMT
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THanks Duke!-akhilesh

Subject: Re: Earl Geddes chapter on Measurements now online
Posted by Wayne Parham on Thu, 02 Feb 2006 04:58:20 GMT
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I'm anxious to see you and Lori, hopefully Earl will fly in too. Good friends, good tunes, we'll definitely have some fun. And the goodwill that comes from it is enormous.

Subject: Chapter on perception
Posted by Earl Geddes on Fri, 17 Feb 2006 21:09:33 GMT
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There is going to be a chapter on perception. How we p[erecieve sounds and what aspects of design and mesasurements are impacted by how we perecive sound. This will be an important chapter because th8is is hardly ever discussed, but critically important. Like don't waste your time with THD measurements - things like that.

Subject: Re: Chapter on perception
Posted by akhilesh on Fri, 17 Feb 2006 23:51:42 GMT
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Sounds good Earl. Look forward to it. I think what is critically missing is an article that simultaneously:a) is based on, and cites, peer reviewed studies that have been published in journals or proceedings,b) is readable by advanced hobbyists with limited technical backgroundc) presents a comprehensive list of measurements that actually do effect subjective perception (again backed up by real studies). Such an article would be very difficult to write, and has not been done because of the abundance of comerical interests and scientifially challenged manufacturers/dealers, not to mention reviewers. Peter Aczel attempted such articles many times, and I think came quite close, though he pretty mcuh only cited his own & his associate's experiences, and his data was never published anywhere, except the audio critic of course. To hi credit, he is the only person I know who actually introduced scientists like Floyd Toole to the general audience. thanks-akhilesh

Subject: Re: Chapter on perception
Posted by Wayne Parham on Sat, 18 Feb 2006 16:32:49 GMT
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I think what you're saying is that the term "total harmonic distortion" is somewhat ambiguous, so measurements of this value don't mean much. They don't tell us what levels of each harmonic is present, just the combined total. If that's what you mean, I think maybe I'd agree that an ambiguous number is a waste of time.But to me, harmonic distortion is one of the most offensive commonly occuring anomalies created by audio reproduction equipment. The most offensive is response anomalies. Things like a complete loss of treble or a large peak in the midrange, that sort of thing. That bothers me the most. But clipping is definitely high on the "ugly" list, and it is characterized by exaggerated amounts of odd harmonics.Certainly, low levels are imperceptible. I doubt anyone can hear a response anomaly of 0.1dB and few can hear 1dB, but most everyone can hear a 10dB swell or dip in a particular band. Midrange is easier to notice, just like the phon curve shows. Same must be true of distortion. Probably nobody can hear harmonics that are -50dB, but -10dB is another matter. And same as the phon curve, the band which harmonics fall

in is important, as is their relation to the fundamental.So what I'm saying is that I think reductions in harmonic distortion are some of the best improvements one can make in an audio system. The figure of "total harmonic distortion" might not be particularly relevant, but I am certain that moderate to high distortion levels are very offensive, and probably one of the worst things a component in an audio system can cause.

Subject: Re: Chapter on perception
Posted by Earl Geddes on Sun, 19 Feb 2006 02:22:25 GMT
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Thats a tall request especially a) and b). Hobbiests are not going to care about references. c) I will attempt to do in my book.

Subject: Re: Chapter on perception
Posted by Earl Geddes on Sun, 19 Feb 2006 02:29:11 GMT
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No, I'm saying that all the current evidence points to there not being perceptable nonlinearity in loudspeakers. Its just not an issue. Read our latest paper in Dec AES for a test which showed that the nonlinear distortion in a high performance compression driver was inaudible even up to its thermal limit (about 124 dB in a PWT).Most other studies by us (see AES convention Oct 2003) and Dr. Moore (see AES Nov. 2005) are pointing to the same thing.Of course clipping is audible but thats just plan misuse and doesn't count. As long as loudspeakers are not misused nonlinear distortion appears to be irrelavent.Now we do hear "stuff" at higher SPL's thats clear, but its not nonlinear distortion. Its a nonlinear perception in our hearing system that we interpret as nonlinear distortion.

Subject: Re: Chapter on perception
Posted by akhilesh on Sun, 19 Feb 2006 14:55:38 GMT
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Scientifically inclined hobbyists will care, or should care about references, since that indicates that it's not just the writer's opinion but rather data based inferences espoused in a scientifically valid publication. I didn't mean to pressure you at all and didn't mean to indicate you should do that. I just think there is a need for that, and to the extent it can be filled, it would be a good thing. I agree with you that the typical "audiophile" will not care or will not know enough to care. But it may be a good thing to expose everyone to sound information, and let whoever wants read it. -akhilesh

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Subject: World peace would be a "good thing" too.
Posted by Earl Geddes on Sun, 19 Feb 2006 15:09:04 GMT
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Subject: Re: Chapter on perception
Posted by Wayne Parham on Sun, 19 Feb 2006 17:52:23 GMT
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What do you think is responsible for the difference in sound between a cheap driver and a good one? Think of a B&C 15PL100 or JBL 2226 compared to a cheap Chinese copy. Swap out the woofer in one of your speakers with the cheap Chinese woofer. They don't sound the same, even when used in a loudspeaker system with crossover that sets bandwidth the same. Even when run at a moderate 10 watts or so, you can clearly hear the difference. Response curves are about the same, no huge breakup modes, so something else causes the difference. What do you think it is?

Subject: Re: Chapter on perception
Posted by Earl Geddes on Sun, 19 Feb 2006 20:06:24 GMT
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WayneThat question is far too wide to get into in depth. But I have found that the drivers make a whole lot less difference than the system design. We tried several different manufacturers drivers in the Summa and in blind tests they were not found to be statistically different by 16 listeners. Although the price tags were an order of magnitude different and in unblind tests the results for the more expensive drivers were astounding. Kind of like "hearing" the color of the CD.

Subject: Re: Chapter on perception
Posted by Wayne Parham on Sun, 19 Feb 2006 20:48:51 GMT
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Not to be contentious, but I don't see how 16 people could have missed a cheap driver in your speakers. I'm reasonably certain we could swap in a cheap copy of the B&C midwoofer and we'd notice. Even one that was made reasonably well having the same electro-mechanical specs. I mean, I agree with you for the most part, many components are interchangeable. But the motor structure is one place where quality and engineering counts, materials geometry and configuration are important. Cheap drivers usually skimp in that area.

Subject: IDEA
Posted by akhilesh on Mon, 20 Feb 2006 00:04:05 GMT
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Let's do a blind test on swaping drivers, and maybe digital components as well at the GPAF. WE could use hte seminar rom for it. What do you think Wayne?WE'll mathc the sound levels etc of course?I'm game to help in this effort. Let's answer this once and for all to our satisfaction.
-akhilesh

Subject: Re: World peace would be a "good thing" too.
Posted by akhilesh on Mon, 20 Feb 2006 00:05:14 GMT
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No really?A Chapter on that too?With references?kidding, Earl. -akhilesh

Subject: Re: IDEA
Posted by Wayne Parham on Mon, 20 Feb 2006 00:45:27 GMT
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Great idea, Akhilesh. Maybe we could offer door prizes for those that accurately guessed the good parts from the cheap ones in a blind test. I think we'd give away a lot of door prizes.I agree with Earl for the most part. I think a lot of what people percieve is psychological, especially when they expect an improvement. Sometimes, gains are much to small to be percieved, and sometimes there are no gains at all. There are lots of "tweaks" that fit this description. A guy buys an upgrade part or "mod" and puts it in, thinks he hears an improvement but measurements don't show anything. That's a case of expectations influencing perception, something that a blind test would show for what it is. Earl is saying that some things just aren't perceptible, and I am sure he's right. No surprise really.But loudspeaker components are where I hear the most difference. If I use a good woofer with a shorting ring and replace a cheap one with a plain asymmetrical-flux ferrite structure, I can hear it right off. I can hear it as soon as I hit the door, just enter the room and I'll know, completely blind. So I know for sure I'll identify the JBL 2226 from the Chinese copy. I'd know the difference with a blindfold on from the next room over, it's that apparent. I'm pretty sure that's the case for all but the most casual listeners. Maybe some people that listen only to getto blasters and cheap car stereos might not hear a difference, but I'm pretty sure that everyone attending GPAF would be able to tell.

Subject: Re: IDEA
Posted by Earl Geddes on Mon, 20 Feb 2006 15:18:22 GMT

This may sound like a good idea, but unless you do things right you will get more noise back than results.And Wayne, you are missing my point, and miss reading or miss interpreting what I said.None of the components were "cheap" they were all very well designed and built units, nothing Chinese. They still differed in price by about 5:1.And I also never said that no one could hear a difference, they probably could. But you seem to be confusing audibility with preference, which is quite common. They are most distinctly NOT the same thing. Audibility is the much easier thing to test for than preference. I do not doubt for a minute that you could tell the difference between a JBL driver and a cheap Chinese copy. I do doubt that you could consitantly rank order your preference for three different systems where only the compression driver changed between three different manufacturers of hi-end products - like JBL, B&C and TAD. You and maybe others could probably tell they were different, but I doubt that there would be a statisticaly significant rank ordering of the results.There is no point in your doing a blind subjective test yourself if you can so causually throw out the results of others, like ours. You either accept blind results or you don't. You don't get to pick and choose the ones you accept and the ones that you don't.At Ford we did a blind test of three sound systems and asked our eight "expert listeners" to rate them in four categories. Of the eight only two could be relied upon to yield consistant results in a statistical sense.So while I support blind tests, you guys are going into this thing with a nieve point of view. It's highly unlikely that you will be able to "put this thing to rest" and very likely that you will mess up something making the results null or questionable. These are not trivial things to do and of the tests that I have seen, few have been done to an acceptable standard to be called "scientific." And almost none of them "put things to rest".

Subject: Re: IDEA
Posted by akhilesh on Mon, 20 Feb 2006 16:31:55 GMT

Let's talk seriously about doing it, Wayne. We can discuss the testing protocol, and components we can use. We'll talk soon. I agree with you, we may have to give out a lot of door prizes!Maybe just get people to do it becuase they want to be right...in a crowd like at GPAF that is motivation enough not to mess up the test deliberately!Heck, we can test drivers and even caps if you want. At the very least, we can test drivers and digital sources..maybe get Biob Brines's portable CD player, and compare it to a decent Sony unit. It'll be fun, and we'll make it as scientific as we can!-akhilesh

Subject: Re: IDEA
Posted by Wayne Parham on Mon, 20 Feb 2006 18:58:11 GMT

Yes, I understand your points. I agree that when the drivers chosen are all of good build quality,

the differences between them become more a matter of preference than of performance.

Subject: Another point I'd like to make
Posted by Earl Geddes on Thu, 23 Feb 2006 16:52:50 GMT
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Not only does one have to be careful to distinguish between "audible differences" and "preferences" one has to be carefull with the concept of "sonic accuracy".For example, two speakers could be inaudibly different, or they could be audibly different. Now just finding out that they are audibly different does not say which one is prefered, that takes another type of test. But just saying that one speaker is prefered, does not say which speaker is more accurate.All too often listening tests are performed badly and the results are questionable, but then they can be performed correctly, but the results don't say anything about preference or accuracy. Its trival to test for differences, difficut to test for preferences and an extremely difficult test to test for accuracy.People will most certainly not always pick the most accurate speaker as the one that they prefer. Preference is not accuracy.Subjective space is very shaky ground - thats hwy I prefer the objective which is far less prone to these pitfalls. But then whenever you quote the objective data someone says "Yea, but it sounds good to me."
