Subject: Do more sensitive drivers offer less distortion at "normal" listening levels?
Posted by akhilesh on Mon, 25 Oct 2004 11:44:16 GMT
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HI Everyone, I was just wondering if more sensitive drivers offer less distortion at levels around 90-95 DB.For example, would a lowther, fostex type cone driver (rated at say 100 db for the sake of example) offer less distortion, since it is being fed less than a watt? ANother example, would a horn-based compression driver rated at 95 db, without the horn, offer less distortion? thanx-akhilesh

Subject: Re: Do more sensitive drivers offer less distortion at "normal" listening levels?
Posted by GarMan on Mon, 25 Oct 2004 12:36:13 GMT
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Can't speak for the distortion from the drivers, but using more sensitive speakers do allow you to operate the amp at a lower level, thereby, reducing distortion from there.

Subject: Re: Do more sensitive drivers offer less distortion at "normal" listening levels?
Posted by Seeker on Mon, 25 Oct 2004 16:40:39 GMT
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Bi-amping your speakers will reduce distortion no matter the sensitivity, or the type of your speakers. I hate distortion of any kind, especially amp distortion in the lower frequencies. Marchand has a good range of active x-overs and I've used some of his products before; Audio Control's Richter Scale x-over / bass equalizer is what I prefer to use.

Subject: Re: Do more sensitive drivers offer less distortion at "normal" listening levels?
Posted by Wayne Parham on Mon, 25 Oct 2004 17:40:35 GMT
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Most harmonic distortion from speakers comes from asymmetry in the motor. Generally speaking, the less movement that's required, the lower the distortion. So since high efficiency speakers in horns don't have to move as far for the same SPL, they generally offer lower harmonic distortion.There are other tradeoffs and things to consider, as is true of all things. For one,

high-efficiency designs are generally reduced in bandwidth and sometimes response isn't as flat. If you optimize for efficiency, you generally de-optimize other parameters.Everything is a series of compromises.  You want top speed?  You might trade fuel economy.  You want max output?  You might lose some response at the extremes.  The best solutions I've found are those that give me many of the advantages of horns while not sacrificing too much in response.  My solutions all seem to be around 100dB/W/M in quarterspace or eighthspace, which is pretty high efficiency but not fully optimized in that direction.

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Subject: Re: Do more sensitive drivers offer less distortion at "normal" listening levels?
Posted by akhilesh on Wed, 27 Oct 2004 17:55:44 GMT
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Thanks Wayne. Makes a lot of sense! Maybe the high eff. drivers & speakers sound cleaner simply becuase of lower distortion? YOu know, the reason why people think a klipschorn or Pi speakers sound "live" is the freedom from distortion. What do you think?-akhilesh

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Subject: Re: Do more sensitive drivers offer less distortion at "normal" listening levels?
Posted by Wayne Parham on Wed, 27 Oct 2004 18:51:15 GMT
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Yes, I agree.  The two main benefits of high efficiency speakers, in my opinion, are low distortion and wide dynamic range.  Efficiency in and of itself is attractive, but it is their low distortion and wide dynamic range that I consider the most important benefits.

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Subject: Re: Do more sensitive drivers offer less distortion at "normal" listening levels?
Posted by Skip Pack on Thu, 28 Oct 2004 16:19:21 GMT
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There's a very interesting article in this Month's Sterophileby Keith Howard on Doppler induced distortion in speakers.This adds a wrinkle on the assymetry-based harmonic distortionthat Wayne is talking about. I have no means, insufficientknowledge, nor the time to seperate these effects and tiethem to real performance, but it all makes sense to me.

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Subject: Re: Do more sensitive drivers offer less distortion at "normal" listening levels?
Posted by akhilesh on Thu, 28 Oct 2004 18:34:07 GMT
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Thanks, Skip. -akhilesh

Subject: Another perspective
Posted by Earl Geddes on Fri, 24 Dec 2004 03:25:19 GMT
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After numerous studies of nonlinear distortion, in loudspeakers and otherwise, I have concluded that nonlinear distortion is not a primary factor in sound quality. This agrees with the work of Shawn Olive at Harman.What, IMO, does make a difference - directivity. Most High efficiency loudspeakers are more directional because they tend to be bigger. This directionality helps to minimize room refections and diffractions which are audibly very negative factors. But high directivity in and of itself is not enough, it must also be well controlled. Both the direct response and the power response have to be equal and this must be done with a high degree of directionality to achieve good imaging and presnce. but the room itself must also be done right or the loudspeaker won't make a whole lot of difference.No, I don't think that its the high efficiency of larger drivers and waveguieds that matter, but it is there inherent narrower directivity that is the primary factor.

Subject: Re: Another perspective
Posted by Wayne Parham on Fri, 24 Dec 2004 17:58:49 GMT
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Hi Earl,Good to see you here, and thanks for your opinions. I agree with you about directivity. I like cornerhorn speakers with all flares set for 90o horizontal dispersion because then directivity is matched throughout the audio band, and wall reflections are minimized. With narrow vertical directivity, floor bounce is reduced too. A 40x90 flare works nicely with mids and tweeters placed at ear level. The pattern angle drop from a 40o flare is one foot for every 33 inches, so if the midhorn is placed three feet from the floor, the floor bounce is about 8.25 feet out, and not particularly problematic. That's my favorite implementation.As for distortion, I can really hear the difference between a driver with a shorting ring and another similar driver without one. It makes about 20dB reduction in second-order harmonics. But that's harmonic distortion that I'm hearing. What kinds of non-linear distortions are you talking about? Things like breakup modes or non-linearities in the motor movement?Wayne

Subject: Re: Another perspective
Posted by Earl Geddes on Fri, 24 Dec 2004 20:47:51 GMT
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The problem with 40 x 90 is that direct radiating sources can't have this pattern and its hard to keep a constant coverage angle as the frequency goes down.The shorting ring is probably the only distortion (I'm only talking non-linear distortion here) in a loudspeaker that is highly audible at reasonable listening levels and this is easily explained. From my study of distortion (see my web site) I know that higher orders of nonlinearity are the most important (its not 2nd harmonic that you are hearing, more likeley 4th of higher) and the shorting ring acts on the full bandwidth of the signal, not LF dominated like any excursion related distortion. My point is simply that drivers in which nonlinear distortion is not a factor are readily available. I would never consider ANY driver without a shorting ring - its simply a given IMO.Another study that we did was on the audibility of distortion in compression drivers - both linear and nonlinear. Bottom line is (the deatils wil be published shortly) that nonlinear distortion in a compression driver is irrelavent - no one could hear any in any driver up to the drivers thermal limits - and these were 4" high power units. So at reasonable levels nonlinear distortion is irrelavent in compression drivers and most other drivers I would suspect. I always say that distortion in a driver is not the issue, overdriving it is. So long as it is not overdriven nonlinear distortion is negligable. If you can actually hear distortion then you have the worng speaker - too little output capability. Get a bigger one.

Subject: Re: Another perspective
Posted by Wayne Parham on Sat, 25 Dec 2004 14:10:56 GMT
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Hi Earl,There's one way to get 90o directivity from a single LF source, and that's to put it into a corner. Other than that, a free-standing basshorn can't because it isn't large enough. Room corners can provide 90o directivity because the walls are large enough to direct the wavefront.About distortion, I can always hear the difference between a driver with an effective shorting ring and I think you're right about the reason why. Even-order harmonics are suppressed well up into the midrange. Flux control rings aren't usually made big enough to do a particularly good job at very low bass frequencies, but they work great from midbass through the midrange. The power range I'm talking about is from about 1% to maybe 25% or so, maybe as high as 50%. For a 600 watt driver, between 10 watts and 100 watts, the difference between one with an effective shorting ring and another similar unit without a ring is clearly audible.Merry Christmas!Wayne

Subject: Re: Another perspective
Posted by Earl Geddes on Mon, 03 Jan 2005 04:20:58 GMT
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Sorry to take so long to reply, but holidays and all.I am not sure that I agree that a corner is a good 90° horn.  Sure it loads better at low frequencies, but at above about the Schroeder frequency I don't think that you can view a corner as a controlled directivty source.

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Subject: Re: Another perspective
Posted by Wayne Parham on Mon, 03 Jan 2005 04:50:32 GMT
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There are several things that I think make corner placement attractive, but one of the most obvious is that every room has them.  With the typical 8 foot ceiling height, I figure on corner boundaries being effective from about 35Hz up.  I can't see any reason why the Schroeder frequency would be any sort of upper limit for directivity control.  If anything, it's the very low frequencies where even the relatively large dimensions of the walls would become too small for pattern control.It's a mute point though I suppose because most voice-range systems aren't corner loaded, as they are too far from the corner apex.  It's the bass system, up to about 200Hz, that I'm referring to when I speak of corner loading.

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Subject: Re: Another perspective
Posted by akhilesh on Wed, 05 Jan 2005 20:54:55 GMT
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HI Earl,I wold love to read your website. DO you have a link?Hare are a few thoughts:1. Doesn't directivity apply mainly to horns? What about smaller cone speakers that are highly efficient, like the fostexes, and the older alnico speakers?2. Maybe it's the dynamic range of the speakers that makes them sound more live (the ability to jump from 95 db to 105 db on some recordings, without losing steam)?thanx-akhilesh

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