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Subject: Basshorns - Pro and Con

Posted by [Wayne Parham](#) on Thu, 13 Jan 2005 20:15:23 GMT

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I recently made a post about basshorn folding methods, and it prompted a discussion about the pros and cons of basshorns in general. While I realize that they have their strengths and weaknesses, my earlier post was really comparing folding patterns and not comparing horns with other types of enclosures. But I'd like to enter into that discussion here. My position has long been that basshorns are too small to support the lowest frequencies unless they are huge things, built-in to the room. After all, bass frequencies are dozens of feet long. You really can't even have a 1/4 wave resonator working at the bottom of the bass range unless it's over ten feet long. So to have a horn be of sufficient length and area to really support the bottom octave requires a structure that is literally as big as a house. Still, you can make a scaled down version and gain some of its benefits. A truncated horn will work pretty well in many ways, particularly when the room corner is used. But the point is that it isn't realistic to think that a portable basshorn cabinet can support the deepest bass frequencies. Every one I've seen becomes more and more like a quarter wave resonator down low, and then reverts to being a bandpass or direct radiator. That's fine, nothing wrong with that. But it does mean that the lowest frequencies have 10x less power. The response curve isn't flat. What is happening at the bottom frequencies is direct radiation. You can either EQ it back up or limit output to the passband and forget about the range down low. To me, it was always ironic that some of the most vocal hifi horn proponents - those that dismiss the use of a direct radiating woofer - were often using equalization of their basshorns to increase power for the deepest bass notes. What that really means is that their basshorn system is actually a hybrid, being used both as a direct radiator down low and a horn higher up. There's no problem with that approach, none at all. But that means the talk of "all horns or no horns" is actually just talk because in fact, the basshorn is not fully functioning as a horn. Still, if what you want is maximum SPL, a horn is the way to go, even a truncated horn. Over the range where efficiency is increased, distortion is decreased. Even if it loses this ability down low, the benefit is gained over the horn's passband and that sometimes makes it worthwhile. As long as you have the real estate, because even a highly truncated basshorn is pretty large. Those are some of my thoughts. What are yours?

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Subject: Re: Basshorns - Pro and Con

Posted by [Bill Wassilak](#) on Thu, 13 Jan 2005 20:49:24 GMT

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>>The response curve isn't flat. What is happening at the bottom frequencies is direct radiation. Your right about bass horns operating down low. To get the Lab subs operating at a nearly flat response curve down to 30Hz, Tom Danley says you have to have 6 of them. And even then the mouth area still a little small to support 30Hz wavelengths.

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Subject: Slightly off topic

Posted by [pgolde](#) on Thu, 13 Jan 2005 22:14:12 GMT

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I have a 20' x 40' inground pool in my backyard that needs a new liner, I have been considering filling it in with dirt. I have also been thinking this 20x40 concrete foundation would be a waste to just bury. I think 20ft might be wide enough for a true bass horn mouth, or maybe I've completely lost touch.

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Subject: Re: Slightly off topic

Posted by [Wayne Parham](#) on Thu, 13 Jan 2005 22:20:43 GMT

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Yup, that'd do it.

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Subject: Re: Basshorns - Pro and Con

Posted by [Earl Geddes](#) on Fri, 14 Jan 2005 02:40:20 GMT

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This is a classic mis-discussion. I mean are we talking living rooms or stadiums here? There is a pretty big difference in how one approaches the two problems and trust me they are not the same. I do a lot of pro sound work, but in all honesty, they don't really care about quality. Its all SPL, flying and trucking. And oh yea, if it also sounds good, thats OK too. I live for small rooms, currently home theaters, where quality in the sound is what its all about. In that space I prefer NOT to have a horn in a region where it does not provide an advantage. In a small room below about 200 Hz. its not about the kind of enclosure, closed, ported, horn, whatever, its about how many. I recently had dinner with a group of home theater specialists and we all agreed that in the very LF domain its all about numbers - at least four, six is better. I have five. And they don't need to be powerful - hell there's five of them! So LF SPL from a single source in any of my small rooms is irrelavent. So much for large horn enclosures. Now when we can strt to control directivity and the ear/brain combination starts to tell us where the sources and refections are THEN directivity control becomes everything - it controls the sound quality in small rooms at the mid -> HF. Keep your LF horns, give me six woofers, three monopoles and three ported.

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Subject: Re: Basshorns - Pro and Con

Posted by [Adrian Mack](#) on Fri, 14 Jan 2005 14:27:20 GMT

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Thats pretty much what I think too. I personally dont like the idea of EQing the botttom end of a basshorn, it is against the very benefits a horn offers. I like to have the longest path length possible but with a somewhat undersized mouth for a home, as the eighth space location generally lifts up the bottom end lost from the undersized mouth.

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Subject: Re: Basshorns - Pro and Con  
Posted by [pgolde](#) on Fri, 14 Jan 2005 16:36:57 GMT  
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How do you deal with cancellation from the 5 different LF sources?Are they all placed in the same location?

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Subject: Re: Basshorns - Pro and Con  
Posted by [Earl Geddes](#) on Fri, 14 Jan 2005 19:44:19 GMT  
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Of course they are not all in the same location. That would be the same thing as having one speaker 5 times bigger. No they are placed around the room. There is a lot of discussion about "where" to place them, but my opinion is that placement is not critical. Reagrding cancellation, look at it as a problem in probability, which is what it really is. What is the prbabilty that I will have five vectors - each sources magnitude and phase - that add up to zero? Its just about nil - doesn't happen. With two sources, it is highly likely to happen at some frequency and with one source it is guaranteed to happen when the source is at a node. But with five sources, it virtually can't happen. Thats really the point. The five sources will always have a smoother average than any lessor number. Its simple statistics.

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Subject: Re: Basshorns - Pro and Con  
Posted by [Wayne Parham](#) on Fri, 14 Jan 2005 23:39:40 GMT  
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Good point. Have you seen what Toole writes about it?  
Loudspeakers and Rooms for Multichannel Audio Reproduction - Getting the Bass Right

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Subject: Re: Basshorns - Pro and Con

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Posted by [Earl Geddes](#) on Sat, 15 Jan 2005 01:53:34 GMT

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Yes I have seen Floyd's discussion. This is basic Acoustics 101. His analysis assumes perfectly rigid walls and even their studies were done in fairly rigid rooms. I do not build my rooms like this. You see, if the walls are limp and well damped at LF then the room appears to be free space, or very close to it. But of course we don't want to be in a free space room at higher frequencies so the walls must be rigid at those frequencies for a good room ambience and spaciousness. The construction techniques are well outlined in my texts. Floyd was most interested in my construction techniques when he read my book as he had never tried them. Please remember that I did my PhD thesis on small room acoustics, and that was more than 20 years ago, so my concepts are based on some pretty substantial theory. Far more in depth than the simple acoustics theories allow.

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Subject: Re: Basshorns - Pro and Con

Posted by [pgolde](#) on Sat, 15 Jan 2005 07:24:53 GMT

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I am sorry if I sound like an moron, but most of what I have read, makes a good argument for a single LF source. Well, the drivers and wood are cheap enough, so I guess I better get to work on 5 Autotubas instead of just one. I can furnish the room with them, lamp table, coffee table, end tables.

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Subject: Dont waste!

Posted by [Mike.e](#) on Sat, 15 Jan 2005 08:23:34 GMT

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youve got space why not use it ! Are you familiar with the royaldevice.com ? Im unsure if its still there,it was 2 x 8 18" woofers ,8 on each channel,powered by a valve CDP and valve amp of a few watts :PCheersMike.e  
Gjerstad horns

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Subject: Re: Basshorns - Pro and Con

Posted by [Earl Geddes](#) on Sat, 15 Jan 2005 13:36:13 GMT

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First, if you read my posts often, you will find that I agree with almost no prevailing philosophy. But, I think that you will also find that I have just about as much background in audio as anyone alive, so my opinions do have some weight behind them. What exactly is the "good argument for a single source" other than its cheaper? I would, and do, use relatively cheap subwoofers. When I say that I have five, I am including the three woofers in my front three channels. I do not use small speakers here and the front three speakers have very good low end capability - down to about 35 Hz. There are two subwoofers wired into the LFE channel, one at the front near the three mains and one at the rear. So at LF, with the Dolby selection for the front set to "large" I do have five woofers. The front right and left are closed box full range, the center is port, and the subs should be bandpass. Also keep in mind that this kind of low end power can easily overpower the response if the room is not well damped at LF. It is almost impossible to do an optimum loudspeaker design that is independent of the room. So when discussing "right and wrong" we should always consider the room when talking about the speakers.

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Subject: Re: Basshorns - Pro and Con  
Posted by [Wayne Parham](#) on Sat, 15 Jan 2005 15:09:24 GMT  
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Floyd's paper may be basic stuff, but I think it's really intended for widespread readership. He did a great job of illustrating the issues, in my opinion. Helps show why placement is important, how the sound sources interact and where subwoofers might be placed when using 1, 2 and 5 radiators.

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Subject: Re: Basshorns - Pro and Con  
Posted by [Wayne Parham](#) on Sat, 15 Jan 2005 15:22:01 GMT  
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Hi Earl, I see that you sell books and software on your [www.GedLee.com](http://www.GedLee.com) website, and I gather that you do consulting work too. Do you sell completed loudspeakers, kits or components? Wayne

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Subject: Re: Dont waste!  
Posted by [pgolde](#) on Sat, 15 Jan 2005 15:33:54 GMT  
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Awesome horns. What kind of driver would be ideal for a true bass horn that large?

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Subject: Re: Basshorns - Pro and Con  
Posted by [pgolde](#) on Sat, 15 Jan 2005 15:57:37 GMT  
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I currently have an old pair of old EV front mains with the active eq which gives me flat resp to around 32Hz. The bass is pretty good but I can do better. I have been wondering if I should loose the eq and let the bass roll off for the subs to take over, fearing cancellation. From what your saying, it would be better for me to keep the bass out of the main as low as possible and add more subs. You prefer bandpass over sealed? I have read all of your posts on the boards I frequent, and I want to thank you for lending your valuable time to these forums.

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Subject: Re: Basshorns - Pro and Con  
Posted by [Earl Geddes](#) on Sat, 15 Jan 2005 21:02:32 GMT  
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I think my point was that it is too simple to take as gospel. As a basic introduction it is very good, but as a reference for the best way to do bass in a small room it is somewhat lacking. Are we here discussing fundamentals or are we beyond that? I thought that these sites were places for discussing the nuances of the state-of-the-art. The basic stuff is available elsewhere - like the Bass list, which is very basic and likes it that way.

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Subject: What GedLee does:  
Posted by [Earl Geddes](#) on Sat, 15 Jan 2005 21:17:07 GMT  
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Well, all of the above, except maybe components, I'm not really into that. The speakers that I designed came about as my attempt to make a loudspeaker that really did not exist. That is a cinema speaker - like the classic JBL and Altec stuff - but brought up to date with the newer components and theories of waveguides that have become available since those older designs. I wanted a state-of-the-art, no compromise loudspeaker for my home theater customers (I also do custom home theater installations) - and my own theater since I was using 20 year old JBL systems. The speakers that I came up with turned out to be so good that a friend in New Orleans - Duke LeJune - asked if he could be a dealer and sell them. We are just getting this off the ground now. The speakers have been extensively evaluated both with measurements and subjective analysis, all of which point to them as being some of the best loudspeakers available at any price. Best of all, I am not into hocus pocus, magic dust, mythical sound character, and all that mumbo jumbo that is only really a ploy to justify the ridiculous prices that these systems ask. Apparently there are enough success stories out there to justify this approach. No, my speakers will be quite reasonable by comparison. I have a dealer price, that is the price that I need to get to pay for the construction, but I don't want to quote an exact dealer price at this point. The dealers will need to determine that. But let's just say that I would not allow a dealer to mark them up beyond about

\$2500.00 each and I could see how they could easily go as low as \$2000 and do quite well. This is not cheap by all means, but I would put these speakers up against anything at any price. About kits, I am fully willing to sell the parts of my design, as well as the drawings, to interested customers. But, as I said, my prices to the consumer for the systems are so competitive that the most that one would save by buying the components from me is about 25%, which is a paltry amount when you consider the assembly work involved. The speakers were designed to be mass produced and they are the most cost effective when that is done. Well that's enough about my loudspeakers. I also do training. My loudspeaker course has been very successful and attended by some pretty well known people like Vance Dickason, and Patrick Turnmire. As I said Harman sent about 6 engineers.

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Subject: Re: Basshorns - Pro and Con  
Posted by [Earl Geddes](#) on Sat, 15 Jan 2005 21:27:33 GMT  
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Question: How did you measure the response down to 32 Hz to know that it was flat? Let's examine the pro's and con's of closed versus bandpass. Closed - LF limit at  $f_s$  of speaker in box, HF limit that of the driver itself, or the LP crossover. Bandpass - LF limit as much as 1 octave below  $f_s$  of the speaker in the rear box, HF limit no more above  $f_s$  than the LF limit is below. In other words the bandpass (single ported) has a symmetrical response centered on the driver's  $f_s$  in its rear enclosure. So, unless the closed box is going to be at a HF limit above that for which the bandpass is capable of, the bandpass wins hands down. But the bandpass loses when one wants a response greater than about 1 1/2 octaves. As I so often say, there is no single choice in any of this you have to look at the big picture. In a home theater for the LFE channels (the .1) anything but a bandpass is not the ideal - because this is already a band limited channel.

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Subject: Re: Basshorns - Pro and Con  
Posted by [Wayne Parham](#) on Sun, 16 Jan 2005 03:26:28 GMT  
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This forum, I think, is both for novices and experts alike. When someone comes in and asks a basic question, I like to give them any help I can without making them feel uncomfortable. When I have a moment to reply, I try to do so. Sometimes it's just a matter of looking up something in the archives and making a link. I don't want people to feel stupid when asking a question. After all, a person with a PhD in medicine may not know Ohms law, so it is understandable if they don't know how to calculate electrical things. So it's nice to lend a hand. I also like it when experts can kick ideas around. It's especially nice because I feel like people here listen to one another, as opposed to trying to trip each other up in order to win an argument. So in that way, we really do have a nice way to address both needs, helping the new guy with a hobby project or system, and allowing experts to discuss the finer details of audio and sometimes even break new ground together.

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Subject: Re: Basshorns - Pro and Con  
Posted by [Earl Geddes](#) on Mon, 17 Jan 2005 18:19:35 GMT  
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This situation always causes problem though. If I answer a question with the "real" answer then it is over the readers head and I am accused of being elitist and arrogant. If I answer with the "common" answer, then I am not really adding value since a lot of people can do this. So you see that the only meaningful thing that I can answer with is the answer that I know to be the right one even if this does just blow past the reader. To do otherwise is really just a waste of time. The Floyd Toole article is a classic example. His article was aimed at the common understanding not at the current state-of-the-art thinking. But then I always get follow on questions and critics that my answers don't agree with "the experts" of "common understanding/knowledge". I understand where you might want both answers on your site, but I will probably never answer with the "common" answer. So when you see one of my answers you can probably expect it to be contrary to the common one.

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Subject: Re: Basshorns - Pro and Con  
Posted by [Wayne Parham](#) on Mon, 17 Jan 2005 18:47:30 GMT  
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Sure, if someone asks how fast a rock falls, you could go into the matter of the Earth's rotation and being in orbit around the Sun which is also in motion. You could make the point that the rock isn't really falling and that its motion isn't a straight line. You might describe the effects of wind resistance and aerodynamics. Or you could just tell them that the rock will accelerate towards the ground at the rate of 9.8m/s/s.

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Subject: Re: Dont waste!  
Posted by [Mike.e](#) on Mon, 17 Jan 2005 23:03:08 GMT  
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I havent built one of this size, But Something with decent BL, preferably high cone angle for strength and moderate Fs. A Lot of typical pro sound drivers that are strong with powerful magnets and low Qes specs. High Xmax is nice too... Flux shorting rings to reduce midrange distortion are bonuses. Designing the horn is easy-its putting it into practise thats difficult! an 18" or two like this perhaps... 18LW1400 - eighteensound  
18sound

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Subject: Re: Basshorns - Pro and Con

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Posted by [mikebake](#) on Tue, 18 Jan 2005 02:10:41 GMT

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"So when you see one of my answers you can probably expect it to be contrary to the common one."Why, is the common one wrong that often?

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Subject: Re: Basshorns - Pro and Con

Posted by [Earl Geddes](#) on Tue, 18 Jan 2005 03:04:11 GMT

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Well let me just give you a list of "common beliefs" that I have found wrong in the last year alone:1) THD and IMD indicate perceived distortion - wrong! In a widely quoted subjective test we showed that there is no correlation between THD or IMD and the perception of distortion in an audio system.2) Compression drivers have too much distortion for quality sound - wrong! In a recent, as yet unpublished, psychoacoustics study of compression drivers no one, out of 45 subjects, could detect any level of nonlinear distortion in any of three different makes of compression drivers - all the way up to the thermal limit of these high end pro units. There is NO perceptable nonlinear distortion in a compression driver - none!3) Horns and compression drivers cannot be made with "audiophile" caliber sound quality because of their distortion - wrong! In a double blind subjective study of my designs using a waveguide and a compression driver, 15 subjects rated this system equal to or better than a high end "audiophile" system using audiophile "Danish" components. (And costing \$4500 each I might add!)I have long held the belief that small rooms should be very live - completely contrary to popular opinions. I point my speakers in board - I don't listen on-axis.Basically, I have come to at least question every "common knowledge" aspect of audio until it has been proven through statistically significant double blind psychoacoustic tests. So I may not disagree with everything but I accept nothing based on "experince", measurements, etc. If it ain't been proven in a valid double blind test it ain't necessarily so.

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Subject: Re: Basshorns - Pro and Con

Posted by [Albert AG](#) on Tue, 18 Jan 2005 16:44:24 GMT

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What do you think of Bart Locanthi and his designs? What about TAD and their speakers? Think they're "audiophile" caliber sound quality?

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Subject: Re: Basshorns - Pro and Con

Posted by [Earl Geddes](#) on Tue, 18 Jan 2005 18:48:26 GMT

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Bart was a good friend. While he was alive, he used to call me up all the time to talk about cars! Of all things, because I worked at a car company and knew quite a bit about them. All I wanted to talk about was audio, but that was work to him. SO we talked a lot, but not usually about audio!TAD was my preferred driver - until recently. I wanted to test whether or not the TAD drivers could really out class a lessor expensive set of drivers in a well designed system. A subjective test was run with 16 subjects comparing TAD's to B&C's in identical systems (optimized crossovers of course). The results did not indicate that the TAD's were worth the extra cost. In fact they even indicated the opposite although there was not enough data to be sure of that conclusion.So now I believe that once one has a truely good system design, the actual components, as long as they are of good quality, don't really enter into the equation.This is once again not the prevailing philosophy, and until recently was not even mine. But I am not going to ignore the mounds of data that have accumulated indicating otherwise.

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Subject: Double Blind

Posted by [Mike.e](#) on Tue, 18 Jan 2005 23:36:33 GMT

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Hi EarlTo me double blind testing seems the only way to do it!This is a fact based not a faith based system of science!Some did attempt to argue that ABX testing is flawed,but Ive yet to see proof or reason why.To me abit of sanity[reason] in the audio world,is like an oasis in the desert!CheersMike.e

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Subject: Re: Basshorns - Pro and Con

Posted by [mikebake](#) on Sat, 22 Jan 2005 16:41:54 GMT

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Well, much of what you say is music to my ears, as I like compression drivers and horns! How would I go about hearing your creation? I am in west central Ohio.

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Subject: Re: Basshorns - Pro and Con

Posted by [mikebake](#) on Sat, 22 Jan 2005 16:44:24 GMT

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I like JBL's servo-whizzo speaker listening/testing setup, where 3-4 pairs can nearly instantly be moved mechanically into position and fired up, while the ear still "hears" the previous system.

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Subject: Re: What GedLee does:  
Posted by [mikebake](#) on Sat, 22 Jan 2005 16:46:09 GMT  
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What 20 year old JBL system had you been using?

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Subject: Re: Basshorns - Pro and Con  
Posted by [Earl Geddes](#) on Sat, 22 Jan 2005 18:20:31 GMT  
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Thanks for the interest. I Hope not to be too comercial here, but you asked.The manufactur of these systems is in its infancy. I have no dealers yet and the only places that they exist are in private homes - some of which are available for audition. My is the easiest for you, here in Ann Arbor. You are welcome to audition them at my home. They are in an ideal setting, a room that I designed and built.The other location will be in New Orleans. I am building those speakers now and will deliver them on February 19th. Anyone interested in hearing them there or participating is a subjective evaluation on February 20th should let me know.

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Subject: Re: Basshorns - Pro and Con  
Posted by [Earl Geddes](#) on Sat, 22 Jan 2005 18:22:07 GMT  
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Its wonderful!! Several hundred grand and you could have one too!In the meantime I'll do the best that I can with what I have.

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Subject: Re: What GedLee does:  
Posted by [Earl Geddes](#) on Sat, 22 Jan 2005 18:22:57 GMT  
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JBL 4430's - I'll sell them! Otherwise I am going to use the drivers in my own design.

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Subject: Re: Basshorns - Pro and Con  
Posted by [mikebake](#) on Sun, 23 Jan 2005 14:34:02 GMT  
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For those that haven't read about it.....Anyone got a good picture of it?  
<http://www.reed-electronics.com/tmworld/article/CA475937.html>

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Subject: Re: What GedLee does:  
Posted by [mikebake](#) on Sun, 23 Jan 2005 14:38:59 GMT  
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Hmmm; nice units. Do you know "Giskard", of the Lansing Forum?I may be interested; I'll email you.....

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Subject: Re: What GedLee does:  
Posted by [Earl Geddes](#) on Sun, 23 Jan 2005 17:40:16 GMT  
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No I don't know "Giskard". Should I?

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