Subject: Bipole cabinet loading effects?
Posted by Norris Wilson on Sun, 02 Dec 2007 03:19:15 GMT
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Silly questions:When loading two efficent drivers in a bipole configuration, back to back. What would the effect be on the needed cabinet volume?Would this be like a push pull, where the needed cabinet volume would halve?Or, do I have this wrong, and the cabinet volume would be the same as needed for a single driver, since they are firing out of phase?And if this push pull effect is posible, effectively halving the needed cabinet volume, how close do the drivers physically need to be mounted from each other back to back?In a Bipole configuration, I have noticed a somewhat difuse imaging characteristic similar to a dipole panel type speaker.Is this to be expected from all Bipole speakers due the cancellation effect of the back wave? Or, can the speaker be modified to where it will images more like a point source design?I like the ambient sound effect of panel, OB, and bipole speakers in general, they sounds fuller to me. But, it would be nice to have a pinpoint imaging ability as well.There I go again, wanting it all in a speaker. ThanksNorris

Subject: Re: Bipole cabinet loading effects?
Posted by real_one on Sun, 02 Dec 2007 22:14:54 GMT
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There is a difference between isobaric and push/pull. Isobaric has two woofers face to face and the cones move in the same direction. Push/pull has one woofer facing out and one facing in but the surface of both cones is exposed. Isobaric is used to effectively double up on the specs of a woofer (drive force, mass, etc) and it cuts the needed cabinet size by half. Push/pull is the same as two forward facing woofers but one is turned around and electrically reversed (so the acoustic phase is the same). You can mount the woofers push/pull on an open baffle or H-baffle, a la Linkwitz to achieve cancellation of even order distortion. The link below has good information about push/pull and dipole woofers (look through all the links contained therein):
Push-pull woofers

Subject: Re: Bipole cabinet loading effects?
Posted by Duke on Tue, 04 Dec 2007 06:04:06 GMT
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Briefly, two woofers in a bipolar configuration require twice the internal volume as a single woofer would to get comparable bass extension. It's actually a bit more complex that that once you start factoring in level-matching between bass and midrange, and in practice you can usually get away with a bit less than double the internal volume.Bipolars typically don't have the "baffle step" which can reduce the lower midrange and upper bass energy, so they often sound "fuller" than a

comparable monopole speaker. Since both the front and rear woofer are pressurizing the room at the same time, the one doesn't cancel out the other except for a wrap-around dip that can occur at the frequency where the rear-firing woofer's output arrives at the listening position one-half wavelength later than the front woofer's output. This can be minimized by several different approaches (I use cabinet geometry - hence my relatively wide, shallow enclosure), and in any event those frequencies are too low to be an issue in sound image localizaton.Your observations about imaging are correct in my experience. All else being equal there is a tradeoff relationship between precise imaging and envloping ambience, and it has to do with the relative energy density in the reverberant field. In general, reverberant energy degrades clarity and imaging, but can add richness and lifelike texture. Diff'rent strokes, you know.Duke

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Subject: Geat info guys, Thanks!
Posted by Norris Wilson on Tue, 04 Dec 2007 22:14:37 GMT
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Duke,Thanks for clearing up the bipolar mounted woofers and their cabinet loading effect. For some reason I thought if they were closely coupled. That they would load the cabinet like an isobaric design. At least I thought they would only need a cabinet the size as required by one woofer, duuhh. I really should study more.I see from your statement about woofers mounted is a bipolar configuration. That there is an issue of increased upper bass and lower midrange energy over a similar monpole design due to the lack of the baffle step effect.What would be the best technique in reducing this energy to equalize these dominant frequencies for a more balanced sound without removing to much of its ambient effect, fullness?Also, would the lower bass frequencies have a similar effect of increased output that would need to balanced as well?Does this reverberant energy from both sound fields, from the front and rear firing woofers that effects imaging, mostly dominate the upper midrange and treble region? I think this region is where most of the precise imaging occurs, please correct me if wrong there?Thanks real_one for the link clearing up the push pull and isobaric cabinet loading effects. From what I got from the article, the isobaric is only usable in the bass region, not for fullrange. So, that techniques would be out in trying to build a compact efficient fullrange two-way.I have learned that there are more compromises in audio than I could have ever imagined.And that in order to obtain a simple efficient two-way speaker that has an in room frequency response of 30Hz to 20khz, it will require some cabinet realestate. Realistically this would require at least a 9 cubic feet, or so, cabinet to obtain an in room 30Hz, ugh.Maybe I should go with an OB three-way with some horse power to drive the bass speaker with, and settle for an in room 35Hz or above.You can't fool mother nature. But, you sure as heck can get dizzy trying.We are all a work in the progress.Norris

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Subject: Re: Geat info guys, Thanks!
Posted by Duke on Wed, 05 Dec 2007 05:47:58 GMT
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Hi Norris,Let me come at this from a bit different angle that hopefully will address your questions along the way. A monopole speaker and a bipole speaker (in this example the bipole having the same kind of drivers as the monopole, but twice as many) will both have the same power response - that is, the same summed omnidirectional response. So at a great enough distance in a very large reverberant or semi-reverberant room, they'd sound the same.Nearfield, the monopole may have the baffle step and the bipole may have the wrap-around dip. Of the two, the baffle step is more audible. Nearfield the bipole will have a couple dB more bass which may or may not be a good thing (depending mainly on room acoustics). Since imho a bipole belongs out in the room a ways (where there's less boundary reinforcement) to allow a fairly long time delay for the reverberant energy bouncing off the back wall, this nearfield bass boost is often beneficial. I would not want to equalize away the increased lower midrange energy that the bipole has, as it is restoring the proper tonal balance that should have been there without the baffle step. I would not want a bipolar speaker equalized to sound like a monopole - might as well start out with a monopole. Note that some monopoles are equalized to compensate for the baffle step in the nearfield response - but the result is too much lower midrange and bass energy in the power response. In some cases it's a desirable tradeoff, but not always. And, note that with a wide speaker the baffle step is often inconsequential anyway.Now in normal home listening rooms, the listening distance is usually somewhere in between these two extremes - in between farfield where the power response is totally dominant, and nearfield where the on-axis response is totally dominant. In other words, for most of us they both matter. In my opinion the bipole is more likely to produce a reverberant field that has the same spectral balance as the first-arrival sound, first because the baffle step is avoided, and second because the rear-firing drivers help maintain correct upper frequency balance in the reverberant field. But there are monopoles that do a superb job in this respect. Wayne's 7 Pi corner horn is among the finest speakers ever made as far as matching up the spectral balance of the direct and reverberant energy. That's one of the reasons why it's such a relaxing speaker to listen to long-term.But the goal of a bipole isn't about frequency response - it's about producing a reverberant field that is hopefully more like what we experience at a live performance. In my opinion, getting the spectral balance of the reverberant field right is the first step but a bipole also produces a more densely energized, relatively late-arriving reverberant field than can normally be produced by monopole speakers in a home listening room. This more closely replicates the relative balance of direct and reverberant energy of a live performance (which I'll admit varies enormously). And the price is, we trade off some imaging precision and (in theory) some clarity (I say "in theory" because in a blind test I conducted, most listeners said the bipole had better clarity than the monopole - which puzzles me). There is also a tradeoff relationship between richness and clarity (including sound source localization) from one live performance venue to another (think small jazz club vs symphony hall)- this tradeoff is a general characteristic of psychoacoustics, and not one that's specific to loudspeakers. Just at no one performance venue "does it all", so too no one speaker "does it all".You are correct that the extra reverberant energy that's effecting imaging and ambience is in the midrange and treble region. In my opinion, if possible the arrival of this extra reverberant energy should be at least 10 milliseconds later than the first-arrival sound, which implies that bipoles and dipoles and such are more demanding of how they are setup in the room. Obviously there are other schools of thought that consider bipoles and their relatives (dipoles, omnis, quasi-omnis, and such) as going off in the wrong direction (ah, no pun intended). Different speaker designers have differing ideas as to what constitutes "the wrong direction" - hence the huge variation in approaches to the seemingly simple task of converting an electrical signal into an acoustic one. Different types of speakers do a better job at capturing different aspects of a live performance, because in the real-world there are tradeoffs. The job of the marketing department

(which is not constrained by something as trivial as reality) is to make you believe with their product there are no trade-offs, and that their design is the one and only that maximizes every aspect of performance. By way of example, some cars may be more elegant or innovative than others, but is there one car that maximizes every aspect of automotive perfomance? No - we pick the car whose set of attributes best fits our requirements (like zero down and low, low monthly payments). The process with loudspeakers is a fuzzy version of that - we have to figure out which attributes we most want and which ones we can live without, and then we have to decipher which loudspeaker(s) will meet our criteria. Dukeanother work in progress

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Subject: Re: Geat info guys, Thanks!
Posted by Norris Wilson on Wed, 05 Dec 2007 20:30:12 GMT
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Thanks Duke for taking time out of your busy day to answer my questions in a detailed and understandable way.I hope you will have great success with your new speaker designs.I, as many others are anxious to hear more from you about these new designs as they unfold.Norris

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