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Subject: Driver selections

Posted by [JakobR](#) on Fri, 25 Mar 2011 21:51:15 GMT

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Hello,

I'm new on this forum. I've been into DIY for some time, using mostly JBL components. I would like to try out the 4pi speakers and have some drivers I would like to use. Preferably JBL 2227 or ME150 and 2451. These drivers differs from the 2226 and for ex. the JBL 2426. Has anyone tried these drivers with the 4pi crossovers? Would it be able to tweak the networks to fit the new drivers without being an engineer? I have measuring capabilities so if I just know witch components to laborate with, I think I'll be fine. Just interested if someone have any input before I go ahead and buy the crossovers.

Thanks,

Jakob

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Subject: Re: Driver selections

Posted by [Wayne Parham](#) on Sat, 26 Mar 2011 01:47:09 GMT

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Yes, we used the JBL 2227 for some time. We also used the JBL 2426 for many years. But neither of those drivers have been used in any of our current models for quite some time. I've

top-of-the-line midwoofer is the 2226 and the tweeter is the DE250.

There was a time about ten years ago when I supported a handful more drivers, some with different sized cabinets and crossovers. But I have narrowed the selections to those I thought were the very best in the price/performance point they're designed for. Naturally, the crossover is optimized for those specific parts.

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Subject: Re: Driver selections

Posted by [JakobR](#) on Sat, 26 Mar 2011 07:12:33 GMT

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Thank you for your quick reply. This kind of support is one of the things that made me interested in the pi speakers. That, and of course the fact that so many like the way they sound.

Are todays crossovers not even close to the ones using JBL 2227 and 2426? If they are similar I'll buy a pair and modify. If not, is it possible to buy a layout of the old? Soundwise, are the ones with JBL 2227 and 2426 better or worse, or just different? I know the 2227 is thin in the bottom, but on

the other hand has very high sensitivity and good mids.

I made a quick search here before I posted and it seems some people have made successful changes when it comes to drivers. I hope some of them will chime in. Would be very interesting to hear what they did and what the outcome was.

Once again, thank you for the quick answer.

Regards, Jakob

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Subject: Re: Driver selections

Posted by [Wayne Parham](#) on Sat, 26 Mar 2011 15:00:41 GMT

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The 2426 can be used interchangeably with the DE250. It is a smooth high-quality driver that used to be what I put in my fully upgraded top-of-the line systems. The thing is, it rolls off fairly early giving you what most audiophiles would call a "polite" top end. If that's what you like, then go for it. But it just isn't as good as the DE250, in my opinion.

The JBL 2451 is a 1-1/2" compression driver, so can't be used with this design. It has even less top end than the JBL 2426, so even if it could be made to fit, I wouldn't be satisfied with its performance. I personally don't like to go with larger compression driver because the top-octave isn't as good. In most cases it isn't there and even in the better drivers with Beryllium diaphragms (that do have top-octave output), throat dimensions make the top octave beamy, basically set by the internal throat angle (about 10°). Bottom line, only 1" exit drivers can be used in any of my designs.

As for the 2227, it can be used in place of the 2226 but it cannot be made to work as well. It's not terrible, and in fact, has some advantages, specifically, greater max SPL from better thermal control. So if you are looking for high SPL applications, you might consider using it. You'll definitely need subs with that driver, but really, you need subs with the 2226 too.

The problem with the 2227 is in the crossover region. It has a fairly pronounced on-axis rise around 1kHz. It's not bad at all off-axis, and so with the crossed-axes setup it sounds pretty good. The overall power response isn't too bad because up that high, the off-axis response is falling off, matching the horn. But still, it doesn't match as well as the 2226, which is why I no longer offer it for my top-of-the line systems.

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Subject: Re: Driver selections

Posted by [JakobR](#) on Sat, 26 Mar 2011 22:20:03 GMT

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Thank you for your input.

Where does the 2426 start to roll off with this design? Will I need a tweeter? For comparison, in the JBL 4430 the 2426 starts to roll off at 16kHz if I remember right. I don't feel a need of a tweeter listening to it.

I guess I will try the 2227 and the ME150 (2227 core with an aquaplasted cone and approx. 96dB) and see if I like them, otherwise I'll go for the 2226.

When choosing horns, are there alternatives?

Regards,

Jakob

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Subject: Re: Driver selections

Posted by [Wayne Parham](#) on Sat, 26 Mar 2011 23:31:20 GMT

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The horn used is the H290. That's what the design is optimized for. Measurements of the speaker are at the following link:

out to 16kHz - and they do - but it's with gentle rolloff. I've also seen some designs that boost the top-octave with peaking coils to bump up the response at 16kHz. Either way, you're dealing with a pretty good driver, but one that should only be expected to reach 14kHz or maybe 16kHz with an extra peaking circuit.

Here are some measurements (pay attention only to 4kHz upwards because of the conditions of the test):

JBL 2426 on H290 without top-octave compensation

That's actually a very nice curve for a compression driver. The downward trend you see is typical, a textbook-case 6dB/octave slope from mass-rolloff. The thing is, at 12kHz or 13kHz, the next filter function kicks in, that of voice coil inductance. That's the beginning of the end for this driver.

Here we see the response with the crossover providing 6dB/octave boost to counter for mass-rolloff. That makes it nice and flat up to 12kHz or so, but then it starts rolling off.

You can read more about compression drivers and why they act this way in the whitepaper below. It's written to help the reader understand speakers like these, the crossovers, horns and drivers in them, and why we make the design choices that we do.

High-Fidelity Uniform-Directivity Loudspeakers When I use the JBL 2426, I use the same basic crossover design I use with all my other speakers. You could use a peaking coil tuned to 14kHz or so to boost another 6dB/octave up there. But even with the added complexity of the extra peaking circuit, you only gain a smidge more high end, like maybe 2kHz. You push the upper -3dB point from 14kHz to maybe 16kHz. It's dropping like a rock up there, and I don't see much benefit in pushing the power to the driver trying to eek out that extra air. It's just not worth it to me.

Don't misjudge the sound quality by what you see in the graphs. The 2426 sounds very good, even with the rolloff at 14kHz. Personally, I prefer the sound of the 2426 with mass-rolloff compensation and without any extra boost. I've tried it both ways, and with the extra boost, I think the driver sounds artificial. It sounds very effortless and smooth with the stock crossover, and has plenty of sparkle.

On the other hand, if you don't already own the driver, I wouldn't spend \$300 to get it, I'd go with the DE250 instead. I think it is an even better driver, and doesn't cost as much. That's why I stopped using the 2426 and went with the DE250. It's very smooth, has better extension and costs less.

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Subject: Re: Driver selections  
Posted by [JakobR](#) on Mon, 28 Mar 2011 16:33:03 GMT  
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I've ordered a pair of crossovers and can't wait until I get them to begin the try-outs. I guess the R1/R2 values should be altered to better match the 2227's higher sensitivity?

When it comes to horns: Is throat design, dispersion, length and width what You should look carefully at when searching for suitable alternatives to H290? It's an esthetics thing...

Very interesting information in the papers You provide. Thank You.

Regards from Sweden!

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Subject: Re: Driver selections  
Posted by [Wayne Parham](#) on Mon, 28 Mar 2011 17:33:45 GMT  
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I wouldn't alter the R1/R2 values when using the 2227 in place of the 2226. The reason is most of the increase is above 500Hz. The octave between 500Hz and 1kHz is a little hot with the 2227, but I don't think I'd increase the tweeter to match the higher levels. I'd rather leave the tweeter at the lower ~500Hz levels.

As for horn differences, you could really write a book on that subject. Please consult the

"High-Fidelity Uniform-Directivity" whitepaper I mentioned in my last reply.

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Subject: Re: Driver selections

Posted by [JakobR](#) on Thu, 31 Mar 2011 18:05:17 GMT

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It's time to start planning the building of the boxes. I'm considering one box for the woofer and the H290 on top. I would like to put the boxes on top of my 18" subs. I can't find dimensions of the 4pi on the forum. How big should the boxes be and to what frequency should they be tuned (how long ports)? Do the ports need to be on the front for this design to sound it's best?

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Subject: Re: Driver selections

Posted by [Wayne Parham](#) on Thu, 31 Mar 2011 19:11:13 GMT

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You can put the tweeter horn on top as long as the woofer/tweeter distance is maintained. The way to do this is basically to flip the box upside down. But honestly, I wouldn't do this when using the H290. When using a wood horn, you can do it for aesthetics but I don't think it makes sense with the H290. When using the H290, it's better to mount it on the baffle, in my opinion. Baffle mounting actually smoothes response just a smidge.

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Subject: Re: Driver selections

Posted by [JakobR](#) on Fri, 01 Apr 2011 19:16:59 GMT

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I recieved the plans, thank you very much.

I also got the H290's today. I just tried mounting them to my 2426H but had a hard time to reach the skulls of the three screws to attach the driver. It is very tight between the horn and the screws. My screw skulls are 11mm wide, is this bigger than normal? What kind of tool do you use?

Kind regards,

Jakob

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Subject: Re: Driver selections

Posted by [Wayne Parham](#) on Fri, 01 Apr 2011 20:13:18 GMT

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That is a tight fit when you use the three-hole mounts instead of the two. When using the two hole mounts, it's easy. But the three hole mounts are right up close to the body. I use an open end socket wrench to tighten these bolts.

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