Posted by Wayne Parham on Wed, 08 Jul 2009 21:46:46 GMT
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I've been working with the TD12S woofer for a week now and I have some preliminary test data to report.

In short, the woofer looks good. Not only is it well constructed, it also measures and sounds good. Looks very nice too, a high quality part.

couldn't ask for better electro-mechanical parameters. I haven't done high power testing yet so I don't know how much drift there is at higher temperatures, but my expectation is that drift will be lower than normal due to the attention AE has paid to thermal performance. They use aluminum

noticed though that impressed me right away is the T/S specs are pretty close to what's quoted, right out of the box. Most woofers aren't.

The impedance curve is just like AE shows, smooth and flat up to the stratosphere. It doesn't rise until tweeter territory. From that, I knew to expect the Zobel would be reduced if even needed. Turned out, you just throw the Zobel away. That was weird for me, all woofers need conjugate filters, so I sort of wanted to leave it in place with a smaller capacitor. But you just don't need it, and it really shouldn't be there. The impedance is flat through the crossover band and well above it. So ditch the Zobel. It's a waste of money and response is improved without it when using this woofer.

The tweeter high-pass filter is the same as other models, third-order with mass-rolloff compensation but the woofer low-pass filter needs to be second-order. In fact, the crossover needed is almost exactly like what we were using in the 1990's and early 2000's. So if you have

work right out of the box. Just toss the Zobel.

Naah, if you're going to splurge and get the new good woofer, swap out the crossover too. Get the new PCB and populate it with 15 guage coils and other good parts.

Anyway, here are the components you'll want:

B&C DE250 tweeter (note reverse tweeter leads, black to positive)
AE TD12S woofer (red to positive)

* tweeter crossover
C2 6.8uF
L1 1.0mH
C3 20uF

* tweeter compensation

C1 0.47uF

* woofer crossover
L2 1.5mH
C4 20.0uF
L3 (jumper wire)

No Zobel, so nothing in positions R3 or C5

Here's a little video I did that shows some of my tests, and where the vertical nulls are on this model with the crossover described above:
Vertical NullsWatch the response curve on the laptop computer, lower right of the video. The S&L measurement system is sending a series of bursts to the speakers, and the microphone captures the signal. When the microphone is positioned anywhere between the vertical nulls, the response curve is basically flat. (Unless I'm talking, of course)

When I move the microphone to the bottom edge of the speaker, you'll see a notch form in the response curve. That is the lower null. Later, I move the microphone to a position beyond the top edge of the speaker. Watch the response curve as I move the microphone, you'll see it remains flat until I reach the upper null, where a dip again forms.

You might also notice that when I moved the microphone to show the lower null, I moved it just a smidge too far - just past the deepest part of the null. But you can still clearly see the upper and lower nulls, and the smoothness of response in between. Pay attention to the response curve as I move the microphone, you'll see it stays nice and smooth all the way between nulls, over a wide vertical range.

I also want to do some distortion measurements, just to compare the TD woofer with JBL 22xx woofers. Both are really nice, and I think we have a winner either way. But I'd like to see how these two family of woofers stack up in terms of harmonic distortion, because that is an indirect measurement of motor linearity.

More to come...

Posted by Docere on Thu, 09 Jul 2009 06:43:33 GMT
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Hi Wayne

I have been quietly waiting on this.

Glad to hear of the positive results. I was hoping to be able to use one of the AE drivers in my upcoming speaker project - I think I now know what the project will be. It sounds from your

description that the 3 Pi with the AE driver would be (very) SET amp friendly, yes?

The AE vs JBL comparo would be interesting. I will be waiting quietly for the results of this as well. Would I be assuming correctly that you have no plans for using AE drivers as an upgrade path for the 4 Pi? Or, have recent tests on the AE encouraged you to possibly look into it further?

Thank you for all your effort in researching and sharing results with us, and also for brining quality hi-eff designs within reach of us mere mortals

Kind regards
Raymond

Posted by Wayne Parham on Thu, 09 Jul 2009 16:56:08 GMT
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No, I don't have plans to replace the 2226 with a TD15 as an upgrade option. But I wouldn't rule out adding one of the AE woofers as an alternate upgrade option. The thing is, my time is at a premium right now and I don't know when I'd find time to do the R&D. So for right now, the AE

choices without a lot of tradeoffs going either way. Sort of like picking between two different flavors, both very good.

Posted by Docere on Thu, 09 Jul 2009 21:42:17 GMT
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Hi Wayne

Thanks for that. I am more than pleased with what you have done thus far; and AE option for the 4 Pi would have just been an indecent indulgence (perhaps)

I understand that you must have many constraints on your time and am amazed at the quality and quantity of your output, both regarding your products and the information/help you provide on this forum. Thanks again.

Cheers
Raymond

Subject: AE TD12S
Posted by spkrman57 on Sun, 12 Jul 2009 18:33:19 GMT
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Wayne,

Found this thread and wondering if you have a link to the AE TD12S speaker specs and pricing/availability.

I did a quick google search that netted me very little info.

And I agree that for 15" duty (4-Pi pro) that the JBL 2226 will reign as the best driver for the price.

Regards, Ron

Subject: Re: AE TD12S
Posted by Wayne Parham on Sun, 12 Jul 2009 18:56:08 GMT
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Here 'tis:
AE Speakers Lambda TD12S

Subject: Re: AE TD12S
Posted by spkrman57 on Fri, 17 Jul 2009 17:35:53 GMT
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Thanks Wayne for the link!

That's a nice driver, my only problem with it is the efficiency of 93.2 db/watt is kind of low for my tube amps.

It has a hefty price tag too!

I'm sure there are some speaker builders for which it will be a great driver to work with.

Regards, Ron

Subject: Loudspeaker sensitivity and boundary loading
Posted by Wayne Parham on Fri, 17 Jul 2009 18:35:27 GMT
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I wondered about the sensitivity too, and how much padding I'd need to match the tweeter. What I found is you don't pad down the tweeter any more than you do with the Delta 12LF. It's acting like its more like 95dB-96dB when baffle mounted. I am anxious to measure the system outdoors with LMS to get an accurate SPL number.

I'm betting the 93dB figure from AE is a freespace value (which makes sense for a raw driver). But you'll never realize this level in actual use. Eminence and JBL list half-space sensitivity mounted on a baffle (which is OK too, it's clearly stated).

Speaker cabinets the size of these transition from freespace to half-space (baffle step) approximately at the same frequency as the room's Schroeder frequency. The baffle sets radiation to half-space through most of the passband. So everything above the Schroeder frequency is radiated half-space, and below that you have boundary conditions and room modes, lots of stuff going on. So basically, the speaker in the box really can't radiate freespace. It would have to be in a tiny box with no baffle front area.

I haven't had a chance to measure outdoors, anechoically. My work so far has been crossover design, setting the frequency and slope to get good response on and off-axis through the crossover region. That means I really don't have any bass measurements yet. But I did use the Smith & Larson WTPro system to measure T/S and in-box impedance, which can then be used to make a very accurate model, estimating system response at low frequency.

The WTPro measures the T/S specs of the woofer and then can measure the impedance of the woofer in the box too. I have to do that to get the ZMA file for the ICD. One of the other cool things it does is to do a BoxPlot style bass response simulation, but with the added accuracy that it is using actual measurements of the woofer in the box. This is what it shows:

I expect anechoic will show a little more rolloff below 200Hz because of collapsing directivity as the baffle starts to transition to half-space. I don't ever use BSC because in room, the power response tends to dominate. Actually, room modes dominate but you know what I mean. In room there's a lot more going on than just collapsing directivity from the baffle transition. I see BSC as more of a way to voice a speaker than anything else. Still, anechoically, I expect some extra rolloff from collapsing directivity due to baffle dimensions.

Boundary conditions almost always make the speaker act like its operating in half-space to quarter-space, even if not on the ground and directly back up against the wall. Only if stand mounted in the middle of a very large room does the speaker act like its in freespace, and even then the baffle reduces directivity to half-space over most of the audio band.

Bottom line is I'll bet the TD12S is more like 96dB in the box. It's matching the tweeter in the crossover region, and that's around 96dB/M. Notice how well the woofer and tweeter are matched in the "Vertical Nulls" video in the first post of this thread. Since we know the padded tweeter is 96dB/M, that tells me the system is probably around 95dB-96dB. I'll know for sure when I get the LMS results.

Subject: Re: AE TD12S
Posted by Docere on Sat, 18 Jul 2009 05:33:36 GMT
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Hi guys

The more I read about the 3 Pi developments the more I like.

The TD12 series seem price equivalent to (or a little less expensive than) the equivalent JBL (2206?). Perhaps the need to purchase the TD12 from the manufacturer and have it transported may increase the price? This is not so much an issue for me as I would need to either shipped. The asking price seems reasonable if it lives up to its claims and AE's reputation. Here's hoping.

Wayne, I understand that you are very busy - and that subjective opinions can be of limited value - but would you be able to very describe the different flavours of speaker: 3 Pi with AE vis-à-vis 4 Pi with JBL?

Regards
Raymond

Subject: Re: AE TD12S
Posted by Wayne Parham on Sat, 18 Jul 2009 15:21:45 GMT
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I haven't had a chance to live with them, and to me, that's as important as the first hour or two of listening. But to be honest, I probably won't post subjective opinions comparing the JBL to the AE models. I like and respect both too much to set them against each other in a subjective comparitive review.

I will tell you this: Both are top-notch, doesn't-get-any-better-than-this speakers. One is from a large company that has the resources to model, test and design to the Nth degree. The other is from a small niche company that makes quality machining, fit and finish - and sound - a highly personal labor of love. Both hit the target, dead-on bulls-eye, in my opinion. They make my job easy, designing a good loudspeaker with these parts, because they act as expected and there are no anomalous "warts" to design around.

the discerning audiophile choose their favorite "flavor". You can't go wrong with either one.

Subject: Re: AE TD12S
Posted by Docere on Sat, 18 Jul 2009 21:53:17 GMT
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Hi Wayne

I understand and respect and your position. I would feel similarly. Personally, I do not put much stock in most subjective reviews etc. and feel they can often be more hindrance than help.

I was not so much looking for a better - best type of comparo; I was seeking a greater understanding of the two flavours. You have provided that to the point you are comfortable. Thank you for your help.

Cheers
Raymond

Subject: Re: AE TD12S
Posted by dB on Tue, 21 Jul 2009 11:42:59 GMT
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Should I say that, maybe it's important for some people and this does not affect the sound, ae/12S has a foam surround (like the e/LAB12). Do you think this is an important detail/decision for some people, like me - it's my opinion, saving money in the long run and keeping its (speaker) resale value. Note: the only one that doesn't have a foam surround is the Lambda Series TD12M.

Posted by Norris Wilson on Sat, 25 Jul 2009 00:06:02 GMT
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Looking forward to measurements of Three Pi with TD12S woofers, especially true efficiency numbers.

Thanks for all of your hard work. You have brought another high quality speaker option to the masses in your Three Pi with TD12S.

Norris

Posted by Champion on Tue, 04 Aug 2009 10:27:48 GMT
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Hi Wayne,

Is your TD12S with or without the Apollo upgrade? Any idea if it worths the extra $100 each?

Thanks.

Posted by Wayne Parham on Tue, 04 Aug 2009 14:18:30 GMT
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I bought (and tested) the TD12S with Apollo upgrade. One of these days, I'd like to test standard TD12S woofers to compare, but since I haven't, I can't say how much improvement is gained from the upgrade. I wanted this design effort to focus on the premium part first.