Subject: Dayton Audio/Eminence Full Range Single Driver
Posted by AudioFred on Tue, 12 Feb 2013 17:35:37 GMT
View Forum Message <> Reply to Message

This is a reboot of a topic I initially discussed on the LSAF 2013 thread. I don't want to hijack that thread with too much discussion about one DIY project, so I'm restarting it here. The speaker project incorporates open back Dayton Audio PS220-8 8" Point Source Full-Range Neo Drivers with H-Frame mounted Eminence Alpha 15's as subwoofers. A DEQX digital processor is used as the elctronic crossover and for equalization.

Here's a picture of the two speakers with the drivers mounted but not wired:

File Attachments
1) DSC01287.JPG, downloaded 15912 times

Subject: Re: Dayton Audio/Eminence Full Range Single Driver
Posted by AudioFred on Tue, 12 Feb 2013 17:41:42 GMT
View Forum Message <> Reply to Message

I wired them up this morning and connected them to the system. Just to get started I set the crossovers for 150hz, using a 48dB LR slope for the subwoofers and a 24dB slope for the full range drivers. Measurement revealed the full range drivers were about 5dB more sensitive than the subwoofers, so I added a 5dB boost to the subs. Here's the measured in-room frequency response of one speaker, on axis, with no equalization.

File Attachments
1) Dayton Eminence Full Range UNEqualized.bmp, downloaded 14221 times

Subject: Re: Dayton Audio/Eminence Full Range Single Driver
Posted by AudioFred on Tue, 12 Feb 2013 17:45:05 GMT
View Forum Message <> Reply to Message

Here's the measured response with some equalization added. The next step will be to get about 25 hours of time on them before further tweaking.

File Attachments
1) Dayton Eminence Full Range Equalized.bmp, downloaded 13899 times

Subject: Re: Dayton Audio/Eminence Full Range Single Driver
Posted by Wayne Parham on Tue, 12 Feb 2013 18:06:33 GMT
View Forum Message <> Reply to Message

Looks really nice, Fred!  Good job!

Will be interesting to see the response after some break-in time.  My experience has been that the Eminence drivers don't change much, but I have used some drivers that did.  Most (all) change at various drive levels too, some more than others.

Subject: Re: Dayton Audio/Eminence Full Range Single Driver
Posted by AudioFred on Tue, 19 Feb 2013 21:14:49 GMT
View Forum Message <> Reply to Message

I've decided to try something different, and so far I like what I'm hearing. These speakers sound very good using the DEQX for equalization and crossover, but realistically how many people have that kind of equipment? If I can make them sound good with no digital equalization and a couple of subwoofer plate amps on the subs, then they become a very affordable alternative for somebody wanting to try an open back full range single driver speaker that has impressive bass.

While there's no way to achieve the flat response in the second graph above, anything that can be done to reduce the level of that broad peak centered about 3.6khz will make them less in-your-face bright, and far more listenable. Many single driver builders incorporate a bsc circuit to balance the bass with the upper midrange and treble, but this has the unfortunate effect of reducing the speaker's sensitivity by several dB, not a good option if you're planning to use them with a flea power tube amp. With these speakers the bass is handled by the subwoofers, so there's less need for baffle step correction, and a simple notch filter can be incorporated into the full range driver's signal path to reduce the unwanted peak. This I did, using a 6.8uF cap, a 0.2mH air core inductor, and a 12.5 ohm resistor, all wired in parallel, and inserted into the positive lead to the full range driver. Works like a charm.

For subwoofer amplification I used a couple of buyout 100W amps that Madisound was selling for $25/ea a few years ago. I bought four and still had two stashed away in the man cave. One hundred watts (70W into the Eminence's 8 ohm impedance) doesn't sound like much power, but this isn't a speaker you would build to listen to Metallica or Mahler, and it works fine.

I'll post some measurements plus some listening impressions after I've had a few days with them.

Subject: Re: Dayton Audio/Eminence Full Range Single Driver
Posted by Wayne Parham on Tue, 19 Feb 2013 22:41:49 GMT
View Forum Message <> Reply to Message

Sounds like a worthwhile approach.

As an aside, I've always said baffle step compensation is a one-dimensional treatment of a three-dimensional problem, so I'm generally not for it. The two things don't match: BSC tailors uses electrical equalization to improve on-axis response, but since the "baffle step" is actually a side-effect of increasing directivity, this kind of equalization is done at the expense of off-axis response. It's a circuit that makes power response worse, which is not good in any respect for a speaker used indoors. Power response has as much influence on the percieved sound as on-axis response because the reverberent field is so powerful compared to the on-axis sound.

But the truth is I think people often mislabel what is essentially loudspeaker voicing and call it BSC because that has become a DIYers buzzword. Whatever a person calls it, I think if a speaker is a little bit shouty, then some response shaping is probably in order. So what I'm saying is that if a filter were truly implementing BSC, it would make the speaker sound worse. But when it is actually just voicing the speaker, that may very well sound better. Kind of a semantics thing, but an important distinction, I think.

I think that applies here too. If the humpty-dumpty response is too much, then give it a filter to make it better. There's a sort of balance, I think, between a little bit of voicing and what's too much. Some designs clearly go too far in the quest of ruler-flat on-axis response and the speaker sounds dead and lifeless. I think this is largely due to reduced dynamic range and also due to uneven power response. That's common for mini-monitors with a few dozen components in the crossover for response shaping.

Your speaker clearly doesn't fit that description. It's a high-efficiency design with enough dynamics to spare a few decibels for response shaping. That's no different than what is required for CD equalization of a compression driver. Sometimes electrical filters (in addition to the basic crossover splitter filters) are really important in the overall design.

All that to say I think you know what you're doing and have a pretty good handle on it. Should be a killer speaker when you're finished.

---

Subject: Re: Dayton Audio/Eminence Full Range Single Driver
Posted by AudioFred on Wed, 20 Feb 2013 11:58:07 GMT
View Forum Message <> Reply to Message

Wayne Parham wrote on Tue, 19 February 2013 16:41

If the humpty-dumpty response is too much, then give it a filter to make it better. There's a sort of balance, I think, between a little bit of voicing and what's too much. Some designs clearly go too far in the quest of ruler-flat on-axis response and the speaker sounds dead and lifeless.

That's what I've found with dsp equalization. You can create any number of filters and make the response +/- 1dB or less, but that doesn't mean it will sound better. Quite often when I completely

equalize out a peak, I find I prefer the sound with that peak only partially eliminated. For example, that 6dB peak at 3.6khz is going to sound really bright, but the speaker might sound more lively and more involving with that peak reduced to only 3dB rather than completely eliminated.

---

Subject: Re: Dayton Audio/Eminence Full Range Single Driver
Posted by AudioFred on Thu, 21 Feb 2013 13:57:00 GMT
View Forum Message <> Reply to Message

Here's a frequency response graph, with the mic positioned at ear level (35" from floor), 40" from the Dayton driver, about five degrees off axis, without the notch filter, using 1/6 octave smoothing.

File Attachments
1) Dayton Eminence w sub.frd.bmp, downloaded 13786 times

---

Subject: Re: Dayton Audio/Eminence Full Range Single Driver
Posted by AudioFred on Thu, 21 Feb 2013 13:58:25 GMT
View Forum Message <> Reply to Message

The same, but with the notch filter installed.

File Attachments
1) Dayton Eminence w sub & notch filter.frd.bmp, downloaded 13757 times

---

Subject: Re: Dayton Audio/Eminence Full Range Single Driver
Posted by AudioFred on Wed, 27 Mar 2013 21:50:41 GMT
View Forum Message <> Reply to Message

Finally put some lipstick on them.

File Attachments
1) DSC01302.JPG, downloaded 13304 times

---

Subject: Re: Dayton Audio/Eminence Full Range Single Driver
Posted by Wayne Parham on Wed, 27 Mar 2013 22:56:14 GMT
View Forum Message <> Reply to Message

Wow, nice touch!