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Subject: One Pi Speaker

Posted by [mrkazador](#) on Wed, 13 Feb 2013 20:28:54 GMT

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Could I get the plans for the One Pi?

Thank you.

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Subject: Re: One Pi Speaker

Posted by [Wayne Parham](#) on Wed, 13 Feb 2013 21:11:12 GMT

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You've got mail!

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Subject: Re: One Pi Speaker

Posted by [mrkazador](#) on Thu, 14 Feb 2013 10:07:15 GMT

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Thanks! I have a question about the crossover if you don't mind. If I'm looking at the crossover correctly, there is 3 inductors. 2 for the woofer and one on the tweeter? and they all use the same value of 0.5mH?

What do you recommend for the resistor? A single or multiple resistors in series/parallel?

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Subject: Re: One Pi Speaker

Posted by [Wayne Parham](#) on Thu, 14 Feb 2013 14:20:42 GMT

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There is only one crossover coil, the 0.5mH inductor in series with the woofer. The other two coils on the schematic are the voice coils of the woofer and the tweeter.

Use a single 10 watt non-inductive resistor across the tweeter. And of course, a 10uF capacitor in series with the tweeter.

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Subject: Re: One Pi Speaker

Posted by [mrkazador](#) on Thu, 14 Feb 2013 19:42:36 GMT

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Thanks for clearing that up.

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Subject: Re: One Pi Speaker

Posted by [Wayne Parham](#) on Mon, 18 Feb 2013 15:56:38 GMT

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More information:

Surround voicing and matching the mains

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Subject: Re: One Pi Speaker

Posted by [mrkazador](#) on Fri, 22 Feb 2013 04:11:41 GMT

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Thanks, a good read.

What do you think about a sealed slanted enclosure for the one pi? I'm limited in height for surrounds, max is 15". The bass will roll off sooner and I don't mind crossing the surrounds at 100-120hz. Could the baffle width also be changed from 12.5" to something like 14-15"? or would that cause some problems?

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Subject: Re: One Pi Speaker

Posted by [Wayne Parham](#) on Fri, 22 Feb 2013 17:13:23 GMT

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Don't run high-efficiency midwoofers sealed. If they're just being used as midrange drivers, that's OK but if they are to be midwoofers, they really need the excursion reduction from port tuning. Besides, the phase change is in the modal region where we don't care, and it might even be beneficial. So I see no reason to ever use sealed cabinets for high-efficiency designs like these. If you're going to high-pass them, crossover at the Helmholtz frequency.

Bill Epstein tried a slanted enclosure and said it sounded weird. I don't doubt it, because the crossover is a first-order design, which marketing types would call "transient perfect", and this kind of crossover depends on the drivers' acoustic centers to be vertically aligned. Said another way, the forward axis is normal to the baffle, which means a slanted baffle makes the forward axis shift. It's basically pointed in a direction perpendicular to the baffle. This is not unlike other properly designed speakers, but my point is this crossover type requires the acoustic centers of the drivers to be vertically aligned.

As an aside, I always bristle at the marketing phrases "time aligned" and "transient perfect". My smaller speakers use first-order crossovers and those have been dubbed "transient perfect". But then again, the higher-order crossovers in my waveguide speakers provide a similar acoustic phase, e.g. quadrature or less shift, within 90°. So I suppose I could promote this, as so many

loudspeaker manufacturers do. But it always kind of rubbed me the wrong way. I like to speak in terms of the position of the forward lobe. Seems more appropriate, less like "marketing-speak".

I use first-order filters on my smaller speakers with dome tweeters because they have a little more excursion capability. This approach allows more overlap, which is helpful for maintaining the uniform horizontal pattern. Where the midwoofer pattern begins to narrow, it is blended with the tweeter pattern which is very wide. This provides nice uniform coverage, with the baffle setting the pattern at 180°, perfect for surrounds.

It may be useful to bring in a comparison with my larger waveguide speakers, since they are great main speakers too, but they are more commonly used as surrounds with my larger waveguide speakers as mains.

Voicing is similar between each model, with the midwoofers defining the body of the sound. My larger speakers use compression drivers on waveguides that are very natural and pure sounding, delicate but powerful at the same time. To me they sound a lot like an audiophile dome tweeter but with higher SPL capability. They are also more directional. But the narrower beamwidth of a waveguide, while attractive for mains, is a disadvantage for surrounds. So basically, I suggest is more suitable for surrounds.

As for the crossover differences, waveguides should not use first-order filters because compression drivers have very limited excursion capability. You really have to limit out-of-band signals, and the waveguide chosen should also provide acoustic loading. Both are important for proper use of a compression driver. But since the acoustic phase relationships of all my loudspeakers are similar - first-order crossovers in my smaller speakers and higher-order crossovers in my waveguide speakers - summing is good and the forward lobe is pure in each of them. They are all "voiced" similarly, so they match well with one another in a system. The biggest differences between my smaller 180° speakers and my larger 90° waveguide speakers are their directivities and SPL capabilities.

Back to the topic of compression driver excursion - another aside - I've seen DIYers over the years ignore this limitation, and I suppose when running flea power tube amps, it is OK but it is risky on any loudspeaker presented any reasonable amount of power. Some DIYers try to run the waveguides much lower than is appropriate, in order to "match" directivities at low frequencies where all sources are omnidirectional. Another mistake is to use a shallow waveguide that doesn't provide adequate acoustic loading. Some even use both approaches, using a shallow waveguide and low-order crossover, trying to implement a "transient perfect" first-order crossover.

I would argue strongly against these practices because they completely defeat all the strengths of the horn/waveguide approach, and leaves the compression driver vulnerable to over-excursion. It severely limits dynamic range to use a low-order crossover and/or too low a crossover point on a compression driver, or to use it with a shallow waveguide that doesn't provide adequate acoustic loading. Without the proper crossover and acoustic load, distortion rises and risk of damage is high.

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Subject: Re: One Pi Speaker  
Posted by [mrkazador](#) on Fri, 22 Feb 2013 21:06:04 GMT  
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Is this the post you're talking about?

[http://audioroundtable.com/forum/index.php?t=msg&goto=66231#msg\\_66231](http://audioroundtable.com/forum/index.php?t=msg&goto=66231#msg_66231)

I'm having trouble finding the right surround speaker that fits my space. Another option I was looking at is the JBL 8330 but I would have to build a whole new enclosure.

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Subject: Re: One Pi Speaker  
Posted by [Wayne Parham](#) on Fri, 22 Feb 2013 21:45:56 GMT  
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Yes, that's the one.

Don't lean it back like that. Keep the baffle normal (perpendicular) pretty much lined up with the listeners. The baffle normal is the centerline of the forward axis. Aim this at the listeners. Horizontal movement is fine, you can even be way off-axis in the horizontal. But don't angle it in the vertical. Keep that within about +/-15°. So you can rotate the speaker as much as you want left and right, but don't rotate it up and down.

As for box dimensions, I think you can probably modify the cabinet shape somewhat, because it is small enough that internal standing waves are pretty high in frequency. They are high enough that the insulation inside the cabinet damps them pretty well. That's the biggest problem with mods of the larger cabinets - if you change the dimensions or the positions of the woofer or port, internal standing waves line up differently and there is the possibility of having a pressure node fall on the port or woofer, which results in response ripple. So if the builder chooses to modify a larger cabinet, I usually tell them to measure it to make sure that doesn't happen, and if they can't make measurements, don't do the mods. But it's safer in smaller cabs because the standing waves are higher and the insulation effectively damps them.

Just don't make the cabinet larger than about two feet in any dimension. Don't make it a tower. If you want to make it short and wide instead of tall and narrow, that's probably OK.

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Subject: Re: One Pi Speaker  
Posted by [mrkazador](#) on Fri, 22 Feb 2013 22:36:56 GMT  
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This is the space that is giving me problems. The speaker in the photo measures 5.5 x 8.5".

This is why I want to slant the enclosure, I can't put the right surround at ear level. I was thinking of something like 15-20 degrees slanted.

Towers are not an option for me, kids love touching stuff

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## File Attachments

1) [20127461.jpg](#), downloaded 3847 times

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Subject: Re: One Pi Speaker

Posted by [JCDC](#) on Fri, 22 Feb 2013 22:49:46 GMT

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Hey Dude,

1 Pi's can be sized very small if you need to hide them (less bass but that's ok for surround). The Alpha 8 can work in cabs down to .5 cuft sealed so basically you make the front baffle just big enough to hold the drivers (with the proper driver spacing) and the cab just deep enough to get the back of the magnet off the rear of the cab!

Then toe them in (ie keep front baffle spacing). Or they could be on a swivel so they're against the wall for high WAF and then rotate out a few degrees for optimum movie sound!

If you want to go higher WAF or stealth you can paint the cab the same colour as the wall and use beige speaker cloth and it'll disappear into the wall.

Or if you really wanna get funky you could wall mount the 1 Pi! I'm assuming drywall and studs (double check that the alpha8's magnet will fit) ... just find a space between the studs that's closest to where you want the speaker and then cut a hole for the woofer and tweeter in the drywall using the 1Pi driver spacing, stuff the holes with some insulation if not there already. Caulk the drivers to the drywall (w screw to hold), drill a hole for speaker wires and then run them around the trim of the window and then down. Make a beige speaker grill for them and ... ahhhh! Beautiful sound but ... no speakers!

Cheers,  
Jeff

PS An ultrathin 1Pi might fit up in the corner of the window behind the curtains! (Just drivers on a baffle so open-baffle and like 4" deep) I had this in my old place and my wife didn't even notice for a week! Now that's high WAF!

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Subject: Re: One Pi Speaker

Posted by [mrkazador](#) on Fri, 22 Feb 2013 23:12:52 GMT

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Here is a mockup of what I was planning. Angle on the baffle is 15 degrees and internal volume is

about .65 cu ft.

Another thing I should mention is that I won't be doing any critical listening.

### File Attachments

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1) [aaavs.jpg](#), downloaded 3823 times

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Subject: Re: One Pi Speaker

Posted by [justphil](#) on Sat, 23 Feb 2013 01:28:04 GMT

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Couldn't you just build the box to its exact dimensions and add an angled "extra" back? Or just build the extra back into the enclosure as you go so it looks more 1 piece. Or how about building stands?

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Subject: Re: One Pi Speaker

Posted by [Wayne Parham](#) on Sat, 23 Feb 2013 02:54:39 GMT

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I think the angled/wedge idea would work pretty well, but I wonder how natural it would sound having the speakers up that high.

Let me offer a suggestion. Try both of these setups for a couple days, watch a few movies on each and see which you like best.

1. Put the speakers where you have shown in your photo, above the window, near the ceiling, facing downward towards the listening area.
2. Put the speakers behind the listeners on a stand, shelf or mounted to the wall. But set them only a couple feet above the listeners, each facing the ipsilateral wall such that the angle of reflection passes through the listening area.

I realize the curtains will be in the reflection path on my suggestion #2. Try it anyway, with the curtains open and closed and see what you think.

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Subject: Re: One Pi Speaker

Posted by [JCDC](#) on Sat, 23 Feb 2013 04:07:37 GMT

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I'm Old School and still follow the 5.1 spec for surround channels.

A few feet behind the listener.

3-6? ft above

Across the room (no toe-in, not pointing towards listeners)

I know they are full audio channels and considered more directional now but their use is almost always surround rather than discrete effects. So that's how I set them up.

It just so happens, your setup is perfect for this!

Being too close to the ceiling isn't ideal but it's better than being too low and close to the listeners.

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Subject: Re: One Pi Speaker

Posted by [mrkazador](#) on Sat, 23 Feb 2013 09:40:11 GMT

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Wayne Parham wrote on Fri, 22 February 2013 20:54

1. Put the speakers where you have shown in your photo, above the window, near the ceiling, facing downward towards the listening area.

2. Put the speakers behind the listeners on a stand, shelf or mounted to the wall. But set them only a couple feet above the listeners, each facing the ipsilateral wall such that the angle of reflection passes through the listening area.

I realize the curtains will be in the reflection path on my suggestion #2. Try it anyway, with the curtains open and closed and see what you think.

1. The mounting bracket I currently have installed won't allow me to point them downwards.

2. There is a small dining table right behind the main listening position. If that position were to work, I wouldn't be able to mount it there.

I'm going to go ahead and build the slanted enclosure, its my best option I think. The way my surround speaker is setup now sounds ok to me. A little high up but nothing I'm going to crazy over.

Subject: Re: One Pi Speaker  
Posted by [steve f](#) on Sat, 23 Feb 2013 14:23:48 GMT  
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I've already built a variant of your slanted surrounds for my son & daughter in law's system. ( the L & R are 1PI's, and the center is a 3/4 cu ft 1PI to fit a space constraint. ). My idea was similar to yours, but the boxes were slightly larger at 3/4 cu ft. I built them with the tweeters below the woofers to take advantage of the ceiling, and provide the dome tweeters with as much free space as possible. BTW, I did build vented cabinets. They simply sound better with lower distortion.

The Alpha 8" is an extremely flexible driver. I call it an "elastic" driver, because it can be used in a lot of different boxes, and sound good in all of them. ( I think Wayne's 1PI is a great speaker design. ) Please tell us about your final results.

Steve

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Subject: Re: One Pi Speaker  
Posted by [mrkazador](#) on Sat, 23 Feb 2013 21:31:07 GMT  
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I was thinking about inverting the speaker, tweeter on the bottom and woofer on top. Any input on this Wayne?

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Subject: Re: One Pi Speaker  
Posted by [Wayne Parham](#) on Sat, 23 Feb 2013 22:07:01 GMT  
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That's fine, in fact, I would suggest it if the speakers are mounted higher than the listeners. I've installed systems in clubs that way.

Just make sure the baffle normal is inline with the general listening area. We don't want the speaker rotated vertically with respect to the audience. It can be angled by way of mount or box shape, but do keep the baffle normal inline with the listeners.

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Subject: Re: One Pi Speaker  
Posted by [mrkazador](#) on Sun, 24 Feb 2013 04:32:02 GMT  
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Thanks for all the help guys. Just to make sure I get my order correct, are these the right crossover components?



<http://www.parts-express.com/pe/pshowdetl.cfm?&Partnumber=004-16>  
<http://www.parts-express.com/pe/pshowdetl.cfm?&Partnumber=027-568>  
<http://www.parts-express.com/pe/pshowdetl.cfm?&Partnumber=255-230>

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Subject: Re: One Pi Speaker  
Posted by [Wayne Parham](#) on Sun, 24 Feb 2013 19:33:56 GMT  
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Yes, those are the right parts.

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Subject: Re: One Pi Speaker  
Posted by [mrkazador](#) on Mon, 25 Feb 2013 09:07:06 GMT  
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Ordered! I don't know when they'll be completed because I'm also building my LCR speakers. Could be a month from now but I'll post some pictures and my thoughts on the surrounds. Thanks again.

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Subject: Re: One Pi Speaker  
Posted by [zheka](#) on Tue, 26 Feb 2013 18:43:51 GMT  
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Wayne Parham wrote on Fri, 22 February 2013 20:54

2. Put the speakers behind the listeners on a stand, shelf or mounted to the wall. But set them only a couple feet above the listeners, each facing the ipsilateral wall such that the angle of reflection passes through the listening area.

I've been running my surrounds this way for the last few day and am very pleased with the results. I know you do not recommend CD speakers for this kind of set up but that's what I have (CHT SHO-10) and to my ears they work well in my narrow room. It is easy to forget that the speakers are behind, in fact because of the controlled directivity, reflected sound may be louder than the direct one, and the effect is as if the speakers are on the sides but further away. Now even the seats close to the walls get decent surround experience which is something that was absolutely impossible before when the speakers were wall mounted.

Thank you very much.

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Subject: Re: One Pi Speaker  
Posted by [Wayne Parham](#) on Tue, 26 Feb 2013 19:02:14 GMT  
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I think the sidewall-reflection setup probably trumps the directional nature of the surrounds. Once you setup that way, it would tends to diffuse the sound field anyway.

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Subject: Re: One Pi Speaker  
Posted by [zheka](#) on Tue, 26 Feb 2013 20:39:08 GMT  
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Wayne Parham wrote on Tue, 26 February 2013 13:02  
I think the sidewall-reflection setup probably trumps the directional nature of the surrounds. Once you setup that way, it would tends to diffuse the sound field anyway.

when/if I have a pair of capable speakers with dome tweeters I will definitely try if I like them better in this set up.

how far from the side walls do you have your surrounds?

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Subject: Re: One Pi Speaker  
Posted by [Wayne Parham](#) on Tue, 26 Feb 2013 21:59:06 GMT  
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My surrounds are about six feet from the side walls, and about the same distance behind the listening area. They're about three feet above seated listeners, ear level if standing up. What I'm calling the listening area is about ten feet wide and the speakers are a couple feet outside that space, about twelve feet apart.

I reflect the surrounds off the side walls so the sound comes from the side more loudly than from behind. They definitely provide envelopment with this setup, because there is a considerable amount of energy coming from four places, behind-left, behind-right, beside-left and beside-right. It sort of blends into two very large "dispersed sources", left-beside/behind and right-beside/behind. I find it to give a very natural illusion of surround-sound ambience.

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Subject: Re: One Pi Speaker  
Posted by [zheka](#) on Wed, 27 Feb 2013 02:09:15 GMT

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Wayne Parham wrote on Tue, 26 February 2013 15:59

My surrounds are about six feet from the side walls, and about the same distance behind the listening area. They're about three feet above seated listeners, ear level if standing up. What I'm calling the listening area is about ten feet wide and the speakers are a couple feet outside that space, about twelve feet apart.

I reflect the surrounds off the side walls so the sound comes from the side more loudly than from behind. They definitely provide envelopment with this setup, because there is a considerable amount of energy coming from four places, behind-left, behind-right, beside-left and beside-right. It sort of blends into two very large "dispersed sources", left-beside/behind and right-beside/behind. I find it to give a very natural illusion of surround-sound ambience.

my room is only 12 feet wide. with 4 seats i have about 2 feet to the walls on each side. I am still trying different positions but it seems that 4 feet from the wall is as far as they can be placed and still have strong enough reflection to act as "side" surrounds.

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Subject: Re: One Pi Speaker

Posted by [mrkazador](#) on Wed, 06 Mar 2013 04:26:01 GMT

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I would like to flush mount the tweeter and woofer. The Alpha8 would need to be recessed about 3/8 and the tweeter about 1/4". Is this going to cause any problems? I'm going to add a mounting ring behind the baffle for the woofer mounting screws.

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Subject: Re: One Pi Speaker

Posted by [Wayne Parham](#) on Wed, 06 Mar 2013 05:26:08 GMT

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I like flush mounting mine too. No problems at all. We're talking about 1/8" difference in offset, much less than a quadrature alignment is sensitive to in this crossover band. So again, no problems, none at all. Looks good, sounds great.

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Subject: Re: One Pi Speaker

Posted by [mrkazador](#) on Fri, 05 Apr 2013 20:51:45 GMT

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Speakers are done! I did listen to a few clips of some movies and so far they sound pretty good.

Audyssey did set the crossover to 80hz. I would like to take a close mic measurement of the woofer to see the actual response but will do that sometime in the future.

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Subject: Re: One Pi Speaker

Posted by [skywave-rider](#) on Mon, 08 Apr 2013 04:14:32 GMT

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Nice work!

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