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Subject: The right waveguide

Posted by [Chano](#) on Mon, 07 May 2012 19:26:58 GMT

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Hi, while investigating waveguides I started reading the papers by Wayne. I appreciate his competence and teaching skills. I was convinced by the Econowave concept to the point of having bought drivers already. At an expo, my listening experience with a SEOS 12 did not match the expectation. I was really impressed by [www.avantgarde-acoustic.de](http://www.avantgarde-acoustic.de) because it's spherical horn has a superb sound : my wallet said no. Looking at the seven pi speaker, has anyone made a comparison with an Econowave system ( 18" waveguide) particularly in the middle frequencies ? Would it be possible to build a seven pi speaker with a Beyma CP380M and BEYMA 15G 450/N woofers, and would it mean huge modifications ? Which 10" woofer is intended for the kit ? What is included in the kit apart from the crossover material and instructions ? The enclosure looks like premium quality - how difficult is the cabinet building ? Thanks a lot.

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Subject: Re: The right waveguide

Posted by [Wayne Parham](#) on Mon, 07 May 2012 20:32:01 GMT

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As much as I like the Econowave concept, which is a derivative of my three Pi and four Pi loudspeakers, it is no match for constant directivity cornerhorns. The problem is not every room has the right corners. So for rooms that can't support constant directivity cornerhorns, a set of three Pi or four Pi main speakers with flanking subs is the next best thing.

The SEOS waveguides look really nice. In fact, I considered using them for a while. However, on closer inspection I found the SEOS12 is much too shallow, being only 3.5" deep. This doesn't provide enough acoustic loading, and the source location isn't right. In fact, a horn this short will be reactive in the passband so the source location will appear to shift. It will also suffer excessive ripple, and possibly higher distortion. Further, the flare profile isn't purely oblate spheroidal, most of it is a secondary flare, an arbitrary radius. So even though it's a pretty shape, it's not the right shape. At least not for me.

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Subject: Re: The right waveguide

Posted by [Maxjr](#) on Mon, 07 May 2012 22:42:17 GMT

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Wayne, for surround speakers, what do you think of using a waveguide paired with 2 - 4 6.5" high sensitivity drivers. Have you seen the center channel, dubbed "Malcom" (for Malcom in the middle) <http://www.diysoundgroup.com/forum/index.php?topic=11.0> It looks like a derivative of this would make great surrounds when the drivers and waveguide is flipped upside down and mounted high up in wall to ceiling corners and angled down.

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Subject: Re: The right waveguide  
Posted by [Wayne Parham](#) on Tue, 08 May 2012 04:04:42 GMT  
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I'm not a fan of horizontal arrays. The polars are awful.

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Subject: Re: The right waveguide  
Posted by [Chano](#) on Tue, 08 May 2012 10:14:07 GMT  
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Thank you both for your comments.

IMHO, the SEOS 10 + BMS 4550 delivers a loud, dry and direct sound, I would not use it for surrounds.

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Subject: Re: The right waveguide  
Posted by [Wayne Parham](#) on Tue, 08 May 2012 17:58:40 GMT  
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I agree with Chano, surrounds speakers are best with wide patterns, and so as much as I like waveguides, I would not use them for surrounds.

Beyond that, the SEOS devices are prone to standing wave modes in the passband, which is not something I would want. The SEOS12 is only 3.5" long, so has resonant peaks at fairly high frequencies, some over 2kHz. All waveguides will have resonant modes, but ideally, they are below the passband or at least right at the bottom edge.

Some of that you can damp in the crossover, but some of it, you can't. Amplifiers with low damping - like tube amps - will tend to exacerbate these peaks because they act something like current sources. And it makes it vulnerable to parameter shifts, like running at high power levels, because they heat up the voice coil and increase resistance.

I actually considered using SEOS waveguides at one time. But that was before I realized how short they were. That told me they couldn't have a true oblate spheroidal flare profile. I assumed they SEOS horns were elliptical oblate spheroidal horns when first looking at them, but upon learning more about them, I realized they couldn't be that, because they're too short.

I have been making a pure oblate spheroidal waveguide from wood for about ten years now that offers excellent performance. It is fairly expensive though, so I decided to have a mold made, to provide an inexpensive plastic implementation, designed for baffle mounting. This new H290C waveguide culminates my experience with conical horns and waveguides over the past 30 years. I believe it is the best waveguide on the market for this application.

For more information on our H290C waveguide, see the link below:  
H290C Horn/WaveguideAnd for a comparison of the two waveguides, see the following links. These charts show amplitude response and second and third harmonics. They were made under the same conditions - halfspace, anechoic (outdoors) - using the same measurement system. Each waveguide was mounted in the center of a 1 meter square baffle and the measurement microphone was placed 1 meter from the baffle, on-axis. The compression driver used was the same unit, a B&C DE250, serial number 03120711.

H290C versus SEOS12 at 2.83v drive voltage (1W/1M)

H290C versus SEOS12 at 14.15v drive voltage (25W/1M)

H290C versus SEOS12 at 28.3v drive voltage (100W/1M)Note that the H290C is flat +/-1.5dB from 1.5kHz to 10kHz. It stays between 104.5dB and 107.5dB through this entire span, and there is no periodic ripple.

Now look at the SEOS12 over the same range. It's between 102.5dB and 107.5dB, about twice as much ripple. And the ripple is periodic, with peaks at 1kHz, 2kHz and 4kHz, which is an indication of strong internal standing waves.

The SEOS12 averages about 3dB less sensitive than the H290C too, so it needs twice as much power to reach the same SPL. This allows speakers with the H290C waveguide to generate less distortion than those having the SEOS12.