Subject: Horn gain - directed sound or acoustic transformer?
Posted by Groove Tube on Thu, 16 Sep 2004 20:49:15 GMT
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I was told that horn gain is caused by directed sound focused to a small spot. That is what I always thought about horns. Just the other day I heard it called an acoustic transformer. Is there more going on than aiming the sound? Is it two ways of saying the same thing?

Subject: Both!
Posted by Magnus on Thu, 16 Sep 2004 21:45:28 GMT
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The magic with horns is that they are not merely focusing the sound like a parabola antenna compared to an omnidirectional antenna, but actually acoustically matches the driver to the air making it more efficient (acoustic transformer). These are two very different mechanisms.If you want an electrical analogy, again think of an antenna. Some gain comes from narrowing the dispersion pattern ("antenna gain") some comes from more closely matching the acoustic impedances (lowering back-reflected power i.e increasing SWR for an antenna)./Magnus

Subject: Re: Both!
Posted by Bill Fitzmaurice on Fri, 17 Sep 2004 18:31:20 GMT
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True, but don't put too much emphasis on the directional aspect of horns as a gain source. The primary reason for the apparant gain of a horn with respect to the directional pattern has to do with the physical size of the horn mouth, and the fact that once it hits a wavelength across the radiating pattern shifts to hemispherical, rather than omni-dirctional, and that gets you 6dB of increased on-axis sensitivity. However, you can accomplish the same thing with a direct radiator if you simply make the baffle a wavelength across. The effect of the baffle step as a tool for gain is obvious with horns since they tend to have large mouths compared to the baffles of direct radiators operating in the same frequency range. If you make the respective radiating planes of a horn and a direct radiator the same size, eliminating the horn's advantage as far as the baffle step is concerned, the horn still can easily exhibit 10dB or more of gain over the direct radiator using the same driver.

Subject: Re: Both!
Posted by Oberon on Fri, 17 Sep 2004 23:17:20 GMT

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"the horn still can easily exhibit 10dB or more of gain over the direct radiator using the same driver."A direct radiator in 1/8th space exhibits 9dB gain over the same radiator in open space so the directional aspect is significant.Just an observation. This is not to say the impedance matching aspect is not also significant for its own reasons.

Subject: Re: Both!
Posted by Bill Fitzmaurice on Sat, 18 Sep 2004 13:31:43 GMT
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'A direct radiator in 1/8th space exhibits 9dB gain over the same radiator in open space'So does a horn.

Subject: Re: Both!
Posted by Oberon on Sat, 18 Sep 2004 18:02:35 GMT
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The output of a 60x60 horn does not increase when radiating in 1/8th space because its pattern is already smaller than that. Only sound sources with a pattern wider than the radiation angle will see a DI increase when the radiation angle is made smaller.

Subject: Re: Both!
Posted by Bill Fitzmaurice on Sat, 18 Sep 2004 22:40:01 GMT
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I've never bothered to measure a mid horn corner loaded, but much of what's happening with a LF horn is that corner loading increases the effective path length and mouth area. However, if both the path length and mouth area are already at a full wavelength additional extension isn't going to make any difference, so the increase in SPL is frequency limited; the average bass horn won't see corner loading having much effect, if any, above 200 Hz or so. Your average mid or HF horn is going to have both the path length and mouth cross-section at least a wavelength through most of the passband, so additional length or mouth area will have little or no effect. Yes, the directivity aspect of both wall and corner loading is there, but here again that's only part of the equation, the rest being an improvement of the horn function itself.