Subject: Bill Fitzmaurice Folding Geometry
Posted by adavis464 on Thu, 05 Aug 2004 13:42:56 GMT
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You said your tuba18 is a sub?What parts of the folding geomerty causes the highend to roll off.Do the bends act as a series of filters that cause this?If so how aggressive can you get with the folding and what does it do to bandwith?You also said you did not use any particuler standard curve,did you just fudge the shape a little on design and how much can you simpifly the folding before it become a problem with bandwidth.Lots of questions I know but I value your thoughts.Thanks Tim

Subject: Re: Bill Fitzmaurice Folding Geometry
Posted by Bill Fitzmaurice on Thu, 05 Aug 2004 15:59:57 GMT
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The high end will roll off when you don't use rounded bends. Since this is a sub and I wanted the high end to roll off so I left the bends squared. In my DR horns, which are full range, I use rounded bends and they're good up to at least 2kHz, basically needing to be crossed over when off-axis response starts to deteriorate.My flare for subs has a much longer pathway to cross-section that the usual. This allows a far deeper extension and efficiency from a smaller package than is possible with standard flares. By and large you can do just about anything folding wise up to about 200Hz, but much above that you have go to round bends.

Subject: Folding, bends, reflectors, etc.
Posted by Ralph on Thu, 05 Aug 2004 19:49:17 GMT
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I did a search and found more info. re folding, bends, reflectors, etc.
http://www.audioroundtable.com/HighEfficiencySpeakers/messages/541.html

Subject: Re: Folding, bends, reflectors, etc.
Posted by spnman on Thu, 05 Aug 2004 20:31:11 GMT
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Low frequencies go around corners. High frequencies don't they're line of sight. A bass horn can have dead end 180 degree turns and the bass will go right through but midrange can't. Most people don't want midrange from their bass horns so dead end turns are OK.

Subject: Yes, but...
Posted by Bill Fitzmaurice on Fri, 06 Aug 2004 15:13:13 GMT
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high frequencies will go around corners if the corners are properly constructed. The Huygen's theoretical concept of flat reflectors at a 45 degree angle is inherently flawed; John Sheerin's modeling with rounded bends is correct, result verified in the real world by my Snail and DR horns.

Subject: Huygen's Principle...
Posted by spnman on Fri, 06 Aug 2004 16:11:56 GMT
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...isn't a theoretical concept but a description of observed facts. I appreciate your many excellent contributions but wish you would get off the "every theory is wrong and my horns prove it" kick.
http://www.pas.rochester.edu/~tipton/huygens.pdf

Subject: Re: Huygen's Principle...
Posted by Ralph on Fri, 06 Aug 2004 17:41:59 GMT
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His words may be a little strong but I've tested Bill's assertions and found them accurate. Maybe Huygen's theory isn't "flawed" but Bill applies it in a non traditional way.

Subject: Re: Huygen's Principle...
Posted by Bill Fitzmaurice on Fri, 06 Aug 2004 20:09:34 GMT
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Thanks, Ralph. Perhaps if Huygen's had access to a computer he would have had the same results as Sheerin. I stand by my assertion that his theories on the use of a flat reflector in a folded horn to maximize high frequency passage through the bend is flawed. High frequency sound waves simply don't work the way he postulated. If that doesn't agree with what some folks are teaching then maybe it's time they abandon the chalkboard for a while and spend some time behind a tablesaw. My claims are easy enough to either verify or refute, but with SPL meters, not abstract formulai. And wait 'til you see what I do when it comes to flares.

Subject: Simulation
Posted by Ralph on Fri, 06 Aug 2004 20:12:04 GMT
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Look at this simulation I found. It shows a wave being directed 90 degrees to a horn without using a curved waveguide or a reflector. Also notice the wave curving around the edge of the mouth. Interesting!
http://www.ifh.ee.ethz.ch

Subject: Re: Huygen's Principle...
Posted by spnman on Fri, 06 Aug 2004 20:40:31 GMT
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I'm sorry but I just don't agree. I don't want to make a big deal of this, I really don't. All I am trying to say is that round corners aren't the only answer, they're just the answer you found. I don't get it why you try to make like your horns defy the laws of physics or like you had found new properties. It is good enough that your designs work, no need to dilute the point by saying something ridiculous. Why do you insist that Huygen is wrong? Can't you see that wave travel through your horns acts just like Huygen says it does?

Subject: Re: Simulation
Posted by Bill Fitzmaurice on Fri, 06 Aug 2004 22:51:04 GMT
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That's exactly what you get with low frequencies. If the frequency is quite long compared to the size of the conduit it flows through quite unaffected. The situation changes when the wavelength is shorter. This shows why reflectors are unnecessary below 200-300 Hz, give or take, depending on the box size.

Subject: Re: Huygen's Principle...
Posted by Bill Fitzmaurice on Fri, 06 Aug 2004 23:06:40 GMT
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No, because it doesn't. Huygen's flat refectors and my round reflectors have nothing in common whatsoever except the fact that they are located in corners.The 'laws' of Physics change every day, if not more often. Fermi went to the grave not knowing if the electron was indeed the smallest

sub-atomic particle; that didn't make him any less of a physicist. Huygens made observations and assumptions based upon them according to what he had to work with at the time. That didn't make him any less of an audio engineer either. If you sincerely think he had it all figured out and there's no room to go beyond what he did, then fine. I've gone to the trouble of building horns according to Huygen's model and my own, and mine pass high frequencies on the order of two to three octaves higher than the Huygens models do. I feel safe in saying that you haven't done so. When you have ring me up again and we'll compare notes. If you really must hinge your opinions on art that's at least 20 years old before you'll believe in it take a look as US patent #4790408; I'm not the first to tread this ground, just the latest. If the internet had existed when this was published what I'm saying now would be old news.

Subject: Re: Huygen's Principle...
Posted by Wayne Parham on Sat, 07 Aug 2004 05:34:27 GMT
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Hi Bill,I think these guys are talking about Christiaan Huygens, a mathmatician/physicist who proposed wave theory. I don't know if that's the same Huygens you are talking about or not.I understand the point you are making. Curved ducts and flares pass sound through them if the ducts are dimensioned as to work as a waveguide.You can actually take a vacuum duct and bend it in a variety of ways and still clearly hear voice spoken in the other end. The curves and bends don't attenuate the sound, and that's the principle you are using in your horns. That's how the wave passes through them at frequencies where the duct acts as a waveguide.I also know from experience that angled reflectors are effective at high frequencies. The trick is positioning the reflector to direct the wavefront. If horn folds are angled so that reflected energies are directed towards the mouth, then the folds don't attenuate high frequencies, and instead, sound is directed outward.Most basshorns don't use reflectors because only low frequencies are wanted. The folds attenuate high frequencies. At low frequencies, wavelengths are large enough that the folds don't act as reflectors and the energy passes right through. As frequency rises, the walls at each fold become reflectors, but they don't reflect sound towards the mouth, so it is attenuated. It literally bounces back and forth inside until the energy is dissipated.Wayne

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Subject: Everchanging laws of physics
Posted by wunhuanglo on Sat, 07 Aug 2004 11:30:54 GMT
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seems kind of an extreme statement. Understanding does improve steadily though, even with something as old as wave interaction. It's only recently that the rouge wave phenomena was modeled sucesfully, but that didn't require any "new" physics.It seems to me two thing are fair to say:1. Huygens model describes the behavior of a plane wave, essentially of a single frequency since the diffraction and reflection effects will vary with the relative magnitudes of wavelength and obstruction. While useful as far as it goes, it's hardly "complete" in the real-world sense. Idealized

plane waves are hard to come by.2. You can't argue with the empirical result. You don't need a model for wave propagation to explain a meter reading (though it certainly helps to improve the meter reading).

Subject: Re: Huygen's Principle...
Posted by Bill Fitzmaurice on Sat, 07 Aug 2004 13:13:23 GMT
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The main principle Huygens is famous for, at least as far as folded horns is concerned, is the topology of a 45 degree reflector, as you state. Intuitively one would have the reflector placed so as not to constrict the pathway through the bend; Huygens made the reflector surface longer, so that a wave would see a 45 degree reflector across its entire front, and no reflective surface at 0 degrees that would send part of the wave back from whence it came, again as you note. This results in a constriction of the pathway at the bend but he showed, correctly, that any destructive action caused by that constriction was more than overshadowed by the improved passage efficiency of the wave. However, what Huygens did not address was the question of using a reflector versus a rounded bend. With a flat reflector segments of the incoming wave intersect with segments of the outgoing wave at various degrees of phase, with attendant dips and peaks in response; at higher frequencies the dips outwiegh the peaks to the point of serving as a low pass filter. Huygens made the flat reflector work as well as possible. However, a rounded bend, and not just a rounded bend but one with a rounded inner corner of relatively wide radius compared to the wavelength being passed, ideally allows the wave to pass without being reflected at all. If there are no reflections there are no interactions between an incoming and outgoing wave. This is what is seen in your vacuum duct analogy. The rounded pathway is not perfect by any means. It suffers limitations because the relationship between wavelength and bend radius is an inverse one; the higher the frequency the larger the bend radius required to pass the wave. Once the horn gets to a size adequate to pass a 5kHz wave without attenuation, for instance, the horn mouth is so large that the off-axis response is drooping anyway. Still, it is a better method of allowing high frequency waves to pass through a bend than a flat reflector, with the additional benefit of working just as well in a 180 degree bend as in a 90 degree bend.

Subject: Re: Huygen's Principle...
Posted by spnman on Sat, 07 Aug 2004 15:51:05 GMT
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So how many theoretical physics labs have you worked in, Bill? Never heard of the Fitzmaurice principle, must have missed it in my undergrad days. Geesh, give me a break!"The main principle Huygens is famous for, at least as far as folded horns is concerned, is the topology of a 45 degree reflector, as you state."Huh? Huygens is known for pendulum motion, centrifugal force, gravity and wave motion. He is famous for a lot of things."However, a rounded bend, and not just a rounded bend but one with a rounded inner corner of relatively wide radius compared to the

wavelength being passed, ideally allows the wave to pass without being reflected at all."A large bass horn is many wavelengths across at midrange so inside walls are reflectors. Midrange sound bounces all around in there. Get a clue.

Subject: Re: Huygen's Principle...
Posted by Adrian Mack on Sat, 07 Aug 2004 22:58:38 GMT
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"Huygens is known for pendulum motion, centrifugal force, gravity and wave motion. He is famous for a lot of things."Somehow I don't think basshorns were on Huygens mind. Don't think they had speakers back then.
