Subject: Time Alignment
Posted by Spinjack on Tue, 03 Oct 2006 13:10:15 GMT
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When aligning drivers for time alignment of the sound waves, where on the drivers if the best place to reference.Cone drivers.Compression drivers w/ horn.Dome Drivers.I was thinking that the front of the magnet would be the logical place, since the cone attachs there, but that didn't seem to fit with done tweeters which generate their sound a bit forward of the magnet.Thanks

Subject: Re: Time Alignment
Posted by Wayne Parham on Tue, 03 Oct 2006 13:53:22 GMT
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The sound eminates from the diaphragm, so that's the reference point, not the voice coil or magnet. Of course, the diaphragm isn't usually flat unless the speaker is planar, and that's one of the reasons why perfect alignment isn't possible. Another is reactive elements in the system, such as inductors, capacitors, mass and suspension stiffness. Yet another is chaotic elements in the system, like cone flex, electro-magnetic and suspension non-linearities. You're shooting for

That's the goal, because that's what keeps summing true and makes the speaker sound natural.

Subject: Re: Time Alignment
Posted by Spinjack on Wed, 04 Oct 2006 18:11:34 GMT
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So, a quarter wavelength in all directions? I knew about the vertical relationship. But does the same hold true for the horizontal relationship (front/back)? Where is most of the sound generated on cone drivers? Its my understanding that dome tweeters generate 90% of their audible output along the outside edge. Some internet sides I've investigated allude to cone drivers generating most of their audible output toward the middle and with proportionally less as you move toward the outside edge.In terms of the mechanical effects of capacitors and inductors, an active crossover could relieve much of that. Could it not?So, when speaker compnaies calim time alignment in their marketing fluff, what are they really claiming?

Subject: Re: Time Alignment
Posted by Wayne Parham on Wed, 04 Oct 2006 20:01:12 GMT
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In my experience, use of the phrase "time alignment" has always been a marketing device. It isn't realistic to expect perfect phase alignment across the audible spectrum. On the other hand, it is important to have sound sources acoustically phased so that they do not cancel, which means

components and by electrical and mechanical properties of each driver. It is also affected by the acoustic properties of the speaker cabinet. Phase is a type of delay that is related to wavelength, and can be described as an angle from 0 to 360°. The delay can also be expressed as a percentage of cycle time, 180° phase shift being 1/2 cycle, for example. Driver position can cause a different kind of delay, one that is fixed rather than being a percentage of each cycle. If the tweeter is behind the woofer, then the sound reaching your ears is delayed by a fixed amount of time, according to the distance and the speed of sound.The two kinds of delay aren't the same thing, and so one can't necessarily be used to offset the other. If a sound source is phase shifted 90°, then the delay changes with respect to frequency. A 90° phase shift of a 100Hz signal is equivalent to about 2.5mS, which is how long sound takes to travel roughly 2.8 feet. From these calculations, you can see that as long as sound sources are within 2.8 feet of each other, they'll

shifted 90°, the equivalent delay is only 1.2mS and the equivalent offset is only 1.4 feet. At 1kHz the delay coresponding to 90° is 250µS having an equivalent offset of 3.4 inches. At 10kHz, it's 25µS and 0.34". So you can see that phase is different than fixed delay. If you have fixed phase offset, you have moving delay. Likewise, if you have a fixed delay, you have moving phase.All these facts notwithstanding, you can still design a speaker so that the maximum phase shift between two adjacent sound sources is 90° This can be accomplished using electrical phase shifts and/or delays, by physical placement or by a combination of each. It is not a trivial matter, and perfect phase alignment is not possible because of the physical properties of the system. But ideally, you can design a speaker so that overlapping sound sources are phased

placement of the drivers vertically aligned so that horizontal movement does not change the distance between the listener and the speaker drivers. Physical offset front to back is important as is crossover phasing, with drivers aligned vertically for uniform coverage along the horizontal plane.