Subject: Re: Symetrical Array (and crossover issues...) Griffen? Craig?
Posted by Duke on Mon, 22 Oct 2007 22:34:50 GMT
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Rather than me telling you where I think a crossover ought or ought not to be, I'll show you my source. Click in the link below.An extremely good indicator of where the ear is most sensitive is the Fletcher-Munsen curve, and at the link below is a modern revision of their work presented as a family of curves. Where the curves dips lowest is where the ear is most sensitive to sound pressure level, and sensitivity to distortion tracks that pretty closely above 500 Hz or so. Notice the dip centered around 3.5 kHz to 4 kHz, indicating where the ear is most sensitive.As you can see, there's a small bump in the curves around 1200 Hz that in my opinion would make sense for a crossover frequency from a psychoacoustics standpoint, all else being equal. That being said, in my opinion put the crossover where the drivers match up well, even if it's where the Fletcher-Munsen curve dips lowest. If necessary you can "cheat" and design in a dip in the crossover region. Unfortunately, a midbass driver on either side of the tweeter will not squeeze the tweeter's radiation pattern at all. Devices that squeeze radiation patterns are called horns or waveguides, and in order to be effective they need to be at least 1/4 wavelength long and 1/4 wavelength wide. For example, the front baffle of a typical loudspeaker is a 180 degree horn, and below the frequency where this 180 degree horn is 1/4 wavelength long we have the phenomenon known as the "baffle step". The baffle step begins at the frequency where the baffle is 1/2 wavelength wide, or in other words the frequency where the path length from the center of the driver to the baffle edge (which would be the "mouth" of our 180 degree "horn") is 1/4 wavelength long.Look at the size horns in Wayne's speakers, and the crossover frequencies. That's the width you need to control radiation pattern down to the crossover frequency he uses. A line array with good radiation pattern control down into the midrange region would require some serious ingenuity. You see, the width you need to get radiation pattern control imposes so much horizontal center-to-center driver spacing that you'd get severe lobing.I don't know how a GOOD designer selects crossover frequency and slope, but I can tell you how I do it: I eyeball a lot of different driver combinations with my end goal in mind, then I model the ones that look most promising, then I buy the parts that modelled the best and start working on a crossover that blends them the way I want. I usually have an idea of what ballpark crossover frequency I want and what slope might work well, but I can't design the actual crossover until I've taken measurements. And even then I never get the crossover the way I want it in the first draft.Back to the line array. I'm not a line array designer, but if I were to try one I'd probably just shoot for smooth first-arrival sound and smooth power response, and concede that the radiation pattern that gives me this will probably be pretty darn wide. Which isn't necessarily a bad thing.Duke
Equal loudness curves