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Subject: Dynamic range

Posted by [Wayne Parham](#) on Tue, 09 Mar 2004 16:19:52 GMT

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Dynamic range is the single quality I find most attractive from the use of horns. I think it's important to consider dynamic range for a moment before looking at the option of using a horn tweeter with a direct radiating woofer. So let me digress for just a moment. Dynamic range is simply the range of output levels between highest and lowest. In an amplifier, the lowest level is usually defined as the point where the noise floor (hiss) masks the input signal. But a loudspeaker doesn't usually generate this kind of noise, so the lowest level is zero. This means that dynamic range for a speaker is set by its upper boundary. A preamp is measured in very small power levels, and an amplifier in larger levels. But dynamic range is measured in ratios or decibels. If either the amp or the preamp is capable of 160dB dynamic range and the other only 120dB, then the system is limited by the smaller of the two, in this example, to 120dB. In a typical home sound system, the power amplifier is usually the device with smallest dynamic range, but pretty often it is the loudspeakers, particularly designs that are rated below 90dB/W/M. A typical 90dB/W/M speaker is generally capable of only about 105dB SPL, one meter away. But an average high efficiency speaker is capable of 120dB dynamic range, at one meter, on axis. Notice that I haven't mentioned specific power levels. That is obviously important if amplifier power is scarce. If that is the case, then the speaker's sensitivity becomes important. But that's another issue. It's relevant, but it is a separate issue. Tweeters are generally the parts of loudspeakers most prone to fail at high output levels. There is a requirement that they be physically small in order that they work at the frequencies they're designed to work at. This then makes it difficult for them to handle a lot of power. One way around this problem is to make them in a configuration that doesn't require a lot of power to provide a lot of output. This makes a horn attractive for a tweeter. This is why I don't find it particularly unattractive to use a horn loaded tweeter with a direct radiating woofer. The horn tweeter is going to need 10x less power than the woofer for the same output. So be it. At least you'll be able to keep the tweeter from spitting its diaphragm out onto the ground trying to keep up with the woofer at high power levels. It isn't difficult to find a good high efficiency woofer that is capable of 120dB output at one meter as a direct radiator. And most compression horn tweeters will deliver 120dB/M somewhere between 10 and 50 watts, which is a safe power level for them. The woofer's max power is about ten times that of the tweeter but the woofer's sensitivity is about ten times lower, so both have approximately the same dynamic range. That makes them a pretty good match, each hitting about the same SPL at their respective maximum power levels.