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Subject: Choices and optimizations

Posted by [Wayne Parham](#) on Sat, 13 Sep 2003 04:28:25 GMT

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Remember that group delay is a function of rolloff slope. If you have a steep rolloff slope, then group delay is high. If the rolloff is gradual and slow, then group delay is small. Also understand that group delay goes up as cutoff frequency goes down. So to talk about group delay in isolation is meaningless. Unless you're comparing speakers with the same lower cutoff, you can't really compare group delay. The one with greater bass extension will tend to have greater group delay just because it is going deeper. Let's say you're comparing a two speakers with the same woofer. One is in a large box with deep flat bass response and sharp rolloff at cutoff. Another is in a smaller box with higher cutoff aligned to be slightly overdamped. There are some trade-offs with both designs; Each has its own strengths and weaknesses. The most noticeable real-world difference between the two is size. The little cabinet is much easier to carry and place, but the larger cabinet goes deeper. The little box doesn't go as deep, but its response is still pretty flat and being slightly overdamped makes it relatively insensitive to parameter shifts. In this speaker, response is good even when the woofer heats up at high power levels. It doesn't develop a peak from Qes going up as resistance rises. It also isn't going to be as likely to sound peaky in a small room with a lot of room gain. The larger box obviously has the benefit of deeper response. It also has more group delay, but that is a direct result of its deeper extension and steeper rolloff. You can't get the extension without the corresponding group delay so I'm not sure it is meaningful to judge the speaker by its higher group delay. The thing that I think is potentially more troublesome is the fact that most bass-reflex systems that are pushed for maximum extension are also much more sensitive to parameter shift. A speaker with a max-flat response curve also may not work well in a small room because it may pressurize the room too much and get peaky. I'm not talking about room modes here, although those may be a problem too. I'm talking about room gain, which is usually paired better with a speaker having a slightly overdamped response curve. Woofers that go down deep and then rolloff quickly usually work best outdoors or in very large rooms. All in all, I think there are different conditions that lend themselves to different alignments. I tend to prefer slightly overdamped bass-reflex alignments because they provide smooth response, are relatively tolerant of thermal shifts and environmental conditions and they limit bass excursion. They seem to work well in most cases. But if you need the deepest bass extension, then an alignment that pushes for max-flat response might be worthwhile. It will have a higher cutoff slope though, and the combination of deeper response and faster cutoff slope will make group delay be much higher.