Subject: Re: Trying to understand bass "quality"....
Posted by tomservo on Wed, 08 Dec 2004 20:24:41 GMT
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HiIt would be hard to point at what makes your system sound the way it does in your room given the number of possible factors and not hearing it.I would bet however that if you measured the speakers outdoors, where the speakers are primarily the main influence, then you would see the response is rolled off.At low frequencies, indoor speaker measurement's can be better than nothing, but only if you constantly remind your self they are not the speaker but the speaker and room. Its kind of like trying to diagnose a possible noise in your car engine, it is a lot easier if you get out of traffic and stop, shut the radio and other noise sources off first, for a speaker, this is taking it outside. Like the car, this may not be the way you use it but it is the easiest way to find out what the speaker it self is doing and a key in identifying / fixing the problem. This way you know the problem either is or isn't the speaker.Also, like any kind of measurement, what ruler you use will govern the results to a degree. Here, there are several chances to be lead astray by the measurements.For example, a common place to be fooled is to take a measurement with the wrong type of microphone. To take proper acoustic measurements, one needs a "point source" pressure mic, most typical mics have a polar pattern (not an omni directional point source) and this factor usually makes the bass response distance sensitive. Proximity effect they call this and while good for vocals and recording, not good for measurements.For example, while a normal piston radiator's response can be measured in the very nearfield (like ¼ inch away from the radiator), it is a mistake to measure a horn or your speaker this way. The reason is that the larger speakers occupy some of the nearfield space at "up close" distances alters the response. Bass Horns often falsely measure much better at the mouth than at a proper distance. Your speaker has far field cancellation which is also less visible the closer you get to it.If one is concerned with real sensitivity etc, larger Bass speakers in general really need to be measured far enough away so that the measurement shows the actual acoustic output sans nearfield spatial distortion.I usually do it at 2 meters for speakers up to about 30inches max and then larger distances, up to 10 meters for say 2 - 4 large horns like the Bdeap's where I work.These distances result in measurement's which closely relate to the actual acoustic performance and there for are much more accurate for computer projections.Affordable Fractional octave analyzers were a break through in the 80's but here too one needs to be careful, a 1/3 octave device is a poor loudspeaker measurement tool.Adjusting the balance on a PA or stereo is not the same as measuring a speaker.For example, your ears have approximately a 1/6th octave resolution (in bands that for some reason are called a Bark), if one wanted to see a measurement that was equal or better to what one hears, then an even greater resolution is needed.I usually set the smoothing on my TEF machine to 10% usually which is 1/10 octave.Why does this matter?EQ can quite exactly "fix" the amplitude and phase response of a woofer or bass horn as measured outside. Any "lift" needed to flatten its response also corrects the speakers phase response which was also "wrong" due to what ever you fixed with the EQ.EQ is Great!!!! Right?On the other hand, lets say you were trying to fix the bass response of the speaker in the room.Here, the measured response is a mix of the speaker response acting on the room gain and a myriad of reflections and standing waves etc.Here a high resolution measurement would show the total response as being a series of very deep notches and more broad peaks with a general slope (room gain) added on to the speakers actual response.Deep notches are the "clue" of an out of phase reflected sound, one which arives N ½ wave lengths later and cancels the original signal, being out of phase. A deep LF notch could be possibly produced by the lf radiation of a speaker

being reflected off the rear or side wall, or ceiling fwiw. Its frequency would then be a function of the distance to the wall etc.Time problems like this are not "minimum phase" and so EQ is unable to fix them, worse, any attempt to do so causes more problems than it fixes. The reason is that the "hole" you are trying to fill (due to cancellation) is caused by the original signal being returned at X time delay so it is out of phase.Boosting the level at the notch frequency also boosts the cancellation signal so the notch depth is unchanged while the Q increased (filling in either side of the notch).When such a situation is viewed on a 1/3 oct rta, one does not see the deep notch, just a small dip. Boosting with an EQ to get back to "flat" on the rta does so while messing with the phase response. The reason is one is dealing with a non-minimum phase problem using a minimum phase device to try to fix it and measuring with something far too corse to see what matters. A rule of thumb in Live sound is to (in general, to avoid problems caused by trying to eq a non-minimum phase problem) only use a graphic eq to CUT peaks, not boost dips.That is to say the potential problem is the phase response of the eq is no longer the compliment to the speaker+rooms response even if the amplitude appears to be better on the rta.At low frequencies, such undesired phase shifts can represent a pretty large slice of time and even if the response was flat, such wild changes in time vs frequency are also audible (and such things are why eq's have a bad reputation and the reason for the thumb rule).It is the potential blessing and curse nature of EQ that makes its use not shall we say universal and with a nearly equal chance to do harm or good, it is important to know when to use it and what can be fixed and what cannot.I am not saying that this IS what you hear but assuming you have decent stereo ears, that any of these things could be at the root of the difference between what you measure and hear.Anyway, it would be interesting to temporarily switch to a sealed box (which is acoustically simpler) that was (according to its outdoor measurements) eq'd flat to 25 Hz and then see how it measured and sounded in your room.Fortunately there are free or nearly free computer programs available for measuring speakers, some MLS, swept sign and so on, most of which can tell much more about what is going on with a speaker than an RTA. Probably a number of people on this list can recommend one.If the weather and space permit (you do need to be 20-40 feet from a building etc), even measuring your speaker with an rta outside and eqing to "flat" or somewhat drooping response based on that may be helpful in tracking down your "in room" issue.Hope this helps.Tom Danley