
Subject: Possible answer

Posted by [Adrian Mack](#) on Sun, 22 Feb 2004 03:14:04 GMT

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I was modelling an Altec 409-8D 8" driver in Hornresp a few weeks ago and something happened that is similar to your situation. Horn length was only long enough to support a 300Hz F_c , but it had an 80Hz F_3 with a 3db dip at 150Hz and a little hump at 80Hz when there was no back chamber. A 17L back chamber showed the dip rise to 180Hz and the hump rise to 120Hz making the new low end F_3 100Hz, and efficiency in the 100-150Hz region raised overall by about 2db. Mouth size was a good 1600cm², similar results happened with a really large 2500cm² mouth, response was just flatter. My conclusion was that it was just acting simply as a closed box down that low (which it would anyway). But the driver was more different as it's got an F_s of 91Hz and a very high Q_{ts} of 1.54, so I thought that could be the answer. The high Q_{ts} tells me that any rear box volume is going to peak quite a lot at the closed box resonance. Modelling the closed box response of the driver in a simple box modelling program (like Boxplot) showed a good +4.5db peak at ~90Hz when in an infinitely large box (like an IB or dipole). In a 17L box (volume size equal to V_{as}), it shifted to the 120-130Hz region and peaking at resonance became even more pronounced at almost +7db. This corresponds to what Hornresp showed me comparing the horn with no back chamber (like a dipole, with Q_{tc} equalling Q_{ts} and the resonance equalling F_s) to the horn with a back chamber of 17L, the inclusion of back chamber shifting F_3 from 80Hz to 100Hz in the horn (because the 17L rear volume raises its Q_{tc} , so F_3 rises too). The increase of peaking at resonance from 4.5db to 7db accounts for the increase in efficiency on the horn of ~2 to 2.5db between 100-150Hz. The peaking of the back chamber was boosting the low end response around 100Hz, and this major peaking of the closed box combined with the horn response was enough to make the F_3 be at 100Hz. Response was within +/- 2.5db from 100Hz to 1KHz, so the high Q_{ts} made the output usable to 100Hz (although it required a lot more excursion at 100Hz than at 300Hz). If Q_{ts} was a lot lower, say 0.30, then I seriously doubt this would occur and low end cutoff would be 300Hz, as a horn length of 30cm supports, providing mouth is of adequate size. However you have said your drivers got a Q_{ts} of 0.40, so something else must be going on. If F_s was around 30Hz then with the V_{as} of 30L and Q_{ts} of 0.40 you may see some more output down low, but its not peaking or anything so I wouldn't expect it to actually be flat down low, you could see a step from 480Hz (F_c of 7" long horn) and then the step giving more output down low but at an attenuated level (like an EBS ported box style response at the low end, 150Hz to 480Hz on your horn). Is this what it looked like? Perhaps you've got some of the parameters wrong? M_{md} can never be less than M_{ms} seeing that $M_{ms} = M_{md} + M_{mr}$, so maybe theres an error in your inputs. M_{mr} (air load) for a typical 6" driver with 125cm² S_d is only 0.8grams. For reference, here are some M_{mr} approximations for different driver sizes: Adrian