

The taper rate of a LaScala is 100hz, The mouth area is good for 125hz. Below this it is a big woofer in a small sealed box. If we plug the T/S parameters for the K33E into a box program we will see that the $Q_{tc}=.85$, the $F_c=82.5\text{hz}$, and the $F_3=70.9\text{hz}$. If we close in the back of the high frequency cabinet and open the woofer rear chamber up into this volume and fill with fiberglass we now have $Q_{tc}=.577$, $F_c=58.2\text{hz}$, $F_3=73.6\text{hz}$.

Bessel= $Q_{tc}=.577=D2$ gives the best transient response and the least group delay of all the sealed boxes. At 30hz the $Q_{tc}=.577$ has 4.5dB more output than the $Q_{tc}=.85$. Compared with sealed enclosures, the transient performance of the best vented enclosure is worse than the best sealed box enclosure. Since we have made great gains in performance some may elect to stop here. But please read on. The next step is to port it. The K33E is not the optimum woofer for this but it works pretty good. With the box size optimized for a D2 we can port the stock woofer to an SC4. The transient response of an SC4 while not as good as an SBB4 (more on this later) is better than the more common QB3. Unequalized the $F_3=49\text{hz}$ and has 3dB more output at 30hz than the D2. The response curves are parallel with the D2 the only difference being the F_c being a half octave lower with the SC4 and the output being 3dB higher from 30~70hz. The output of the SC4 does not drop lower than the D2 until you go below 17hz. Again this may be a stopping point for some.

But by adding a simple two pole high pass filter ahead of the power amp we can now have a C6 with a -3dB point of 31hz. Since this is the F_b of the system there is no increase in cone excursion or distortion. The filter consists of a cap, an inductor and a pot. The pot allows adjustment at F_b of +/- 3dB. This is similar to being able to change the Q_{tc} of a sealed box from .5~1.0. If you think about it we have the choice between a D2, SC4, and a C6 in the same box by plugging the port and/or bypassing the eq. If you have a SET amp or simply want to get the most out of the LaScala you will want to upgrade the woofer to something with a lower Q_{ts} . The Klipsch K43E does the trick, as do the EV DL15W and the JBL 2205. The EV and JBL drivers require some minor network changes. The lower Q_{ts} drivers allow for an SBB4 alignment which has the best transient response of the vented alignments. With no eq they have 3dB more output at 30hz than the stock woofer. With eq we have a maximally flat B6 and the F_3 of the system is 27~28hz. If using a solid state amp with the low Q_{ts} woofers a small resistor must be added in series with the driver to have the same R_g as the SET does. This mod can be backed out of a stock LaScala with no externally visible changes if you don't like it. No one has ever gone back to stock after hearing this mod. Paul Klipsch was violently opposed to the venting of horn speakers based on his experience with venting the K-horn. In retrospect it is easy to see why. The 12" Jensen field coil woofer he was using had an F_s of 60hz and a quick calculation of the vent area vs the V_b based on the photographs of this experiment looks like an F_b of ~80hz. I am sure this sounded horrible. Paul Wilbur Klipsch is a giant in audio. If I appear to see farther than PWK it is only because I am standing on his shoulders.

None of the stock Eminence Delta, Kappa ,etc series drivers will work. The K43Es that I have measured has $F_s=31\text{hz}$ and $Q_{ts}=.25$, the TS parameters that Klipsch hands out are bogus. The EV DL15W has an $F_s=30$ and $Q_{ts}=.23$ and the JBL 2205 has an $F_s=30$ and $Q_{ts}=.21$. After taking into consideration the dc resistance of the woofer inductor and the output impedance of the amplifier the optimum Q_{ts} for the vented LaScala would be .312 with a V_{as} of 10.5 cu ft and an F_s of 30hz.

I'm looking for a total net volume of about 4.8 cu ft. I figure the stock back volume is about 2.25 cu ft. Call it an internal height of about 9" ($22.5 \times 22.5 \times 8.70 = 4404 \text{ cu in} = 2.55 \text{ cu ft}$). Two 4" ID by 10" long ports displace about .15 cu ft so 10" outside is close enough.