Tact-V1.0 Short Guide to Room Correction

Room correction systems (RCS) are designed to provide control over combined room-loudspeaker response. These systems incorporate state of the art digital signal processing technology and room acoustics theory. As such, RCS systems can be quite intimidating for many users that would like to include them in their sound systems. The purpose of this guide is to help users understand some important aspects of the room correction process that includes target curve, room response, correction filter response and correction verification process.

In the recent years room correction technology has evolved to a level that made it possible to offer all RCS benefits to users not that familiar with signal processing and room acoustics theory. Tact-2.2 XP technology offers full control over your room response throughout entire audio band. With **Tact-V1.0** software version you can manipulate room measurements, correction filters, target curves, crossover filters and all other correction parameters until you are completely satisfied with the performance of your system. What makes **Tact-V1.0** unique is that all these parameters can be easily changed and all made changes are instantly engaged without any interruption to played music.

Room Response and Target Curve

What is room response? Room response represents sound pressure level at the listening position measured at all frequencies over entire audio band (20Hz-20,000Hz). To obtain room response, RCS such as 2.2 XP performs room measurement at the listening position for all used channels. Usually you would place the microphone at the listening position, enter 2.2 XP measurement screen and perform room response measurement. A sample of 2.2 XP measurement is shown in Fig. 1.

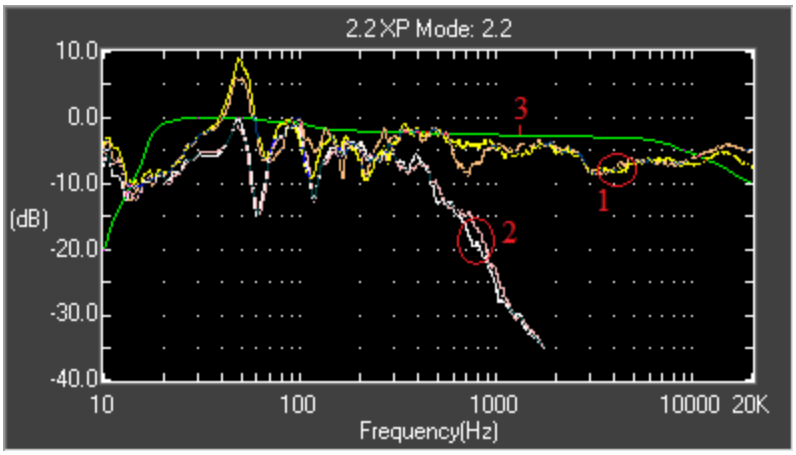

Figure 1. 2.2 XP measurements of all four channels as displayed by Tact-V1.0

1. Left and Right channel room response
2. Left and Right Subwoofer channel room response
3. Target curve

What is target curve? In Fig. 1 graph (1) represents left and right channel room response and graph (2) represents left and right subwoofer channel room response. These are typical room measurements with some obvious room abnormalities such as huge peaks and deeps at low frequencies and channel mismatch at higher frequencies. Obviously this is something that nobody likes to listen to. Target curve represents desired room response, room response without peaks and deeps at low frequencies and

without channel mismatch at higher frequencies. Target curve is represented in Fig.1 with curve number (3). In simple terms you would like your room to measure like the target curve (3) and not like (1) and (2).

Can room response be changed? In most cases room response is fixed and cannot be changed, at least not significantly. Room response change would involve some major structural change in the room, such as adding or removing heavy drapes, adding or removing carpets or significant furniture rearrangement. If you have made any such change in your room you would need to take a new set of room response measurements.

Can target curve be changed? Yes target curve can be change. Target curve represents your desired room response and as such it is a very personal choice. For a given room it would be very hard to find two persons that would accept the same target curve as a target curve of their choice. Therefore it is very important to have the ability to change the shape of the target curve. With RCS units that do not allow for target curve change you are basically told what you should listen to regardless of whether you like it or not. With 2.2 XP and Tact-V1.0 target curve manipulation is extremely simple and fast. In addition to this simplicity any target curve change can be instantly engaged for a listening test. This feature is crucial for finding a target curve that matches your particular listening preferences.

Room Correction Filter Response

What is room correction filter response? After you complete room response measurement and after you select desired target curve 2.2 XP will compute room correction filters. A sample of the room correction filter response is shown in Fig. 2 and Fig.3. These room correction filters incorporates 300 Hz crossover filter between the main channel and subwoofer channel. For any target curve change 2.2 XP recalculates a completely new set of correction filters. Correction filters are ultimately responsible for correction your combined room-loudspeaker response. Correction filters will force your room-loudspeaker response to follow selected target curve.

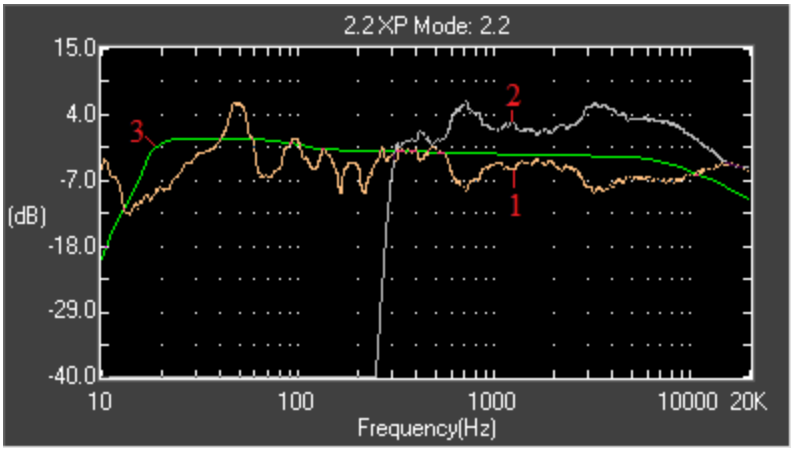

Figure 2. Main channel room and correction filter response.

Main channel room correction filter is supposed to force main channels to follow the response of your selected target curve combined with the crossover filter. Main channel crossover filter is a *high-pass* filter with crossover frequency and filter slope selectable from the 2.2 XP crossover screen.

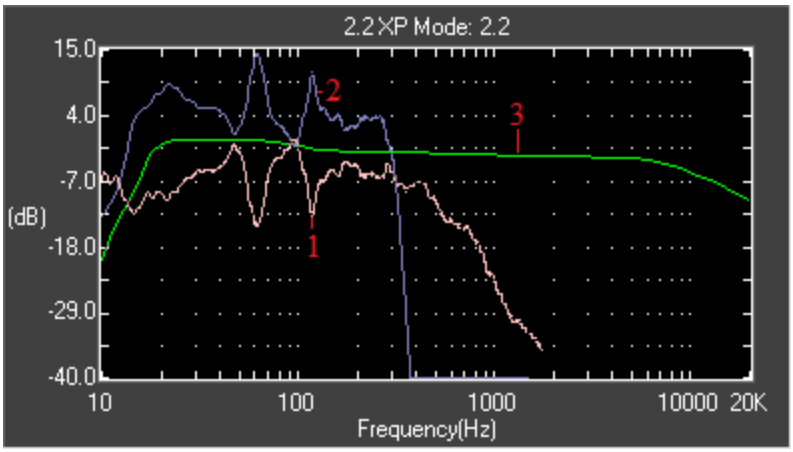

Figure 3. Subwoofer channel room and correction filter response.

Subwoofer channel room correction filter is supposed to force subwoofer channels to follow the response of your selected target curve combined with the crossover filter. Subwoofer channel crossover filter is a *low-pass* filter with crossover frequency and filter slope selectable from the 2.2 XP crossover screen.

In both cases (Fig.2 and Fig.3) correction filters are almost a mirror image of the measured room response. It is very important that correction filters with high accuracy follow the inverse of the measured room response. The accuracy of the correction filters depends on the RCS processing resolution. High resolution processors such as 2.2 XP, 2.2 MINI, 2150 XDM and TCS MKIII require substantial processing power that can only be achieved by employing multiple of high speed digital signal processors.

Correction Verification

Any system of such a sophistication and complexity such as room correction systems must have a way of performing the end result verification. After you perform room measurement, select your target curve and crossover filter you want to make sure that your sound system does follow your desired room response - target curve.

Tact-V1.0 software offers complete system verification that is extremely easy to use. Just enter **Tact-V1.0** calculator screen and in few seconds you can view combined room and correction filter response. If target curve normalization is enabled and your selected target curve has its maximum point set at 0 dB, the combined room and correction filter response has to follow target curve response.

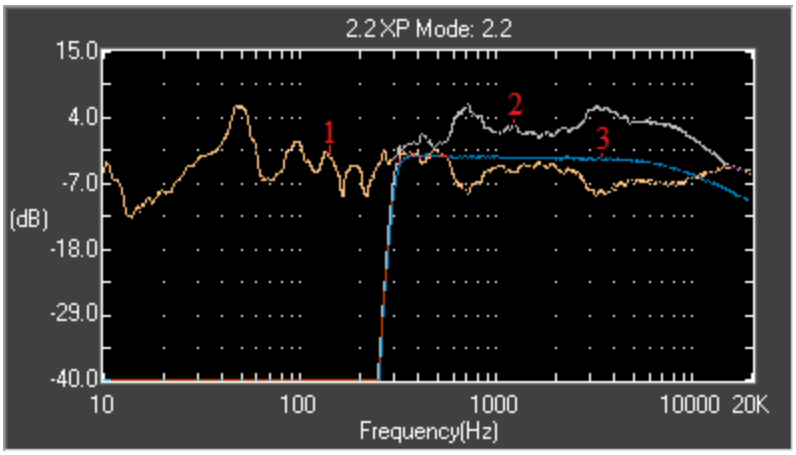

Figure 4. Main channel verification result.

1. Left channel room response.
2. Left channel correction filter response. Note that this filter implements main channel room correction as well as high-pass crossover filter.
3. Verification curve. The verification curve represents combined room and correction filter response.

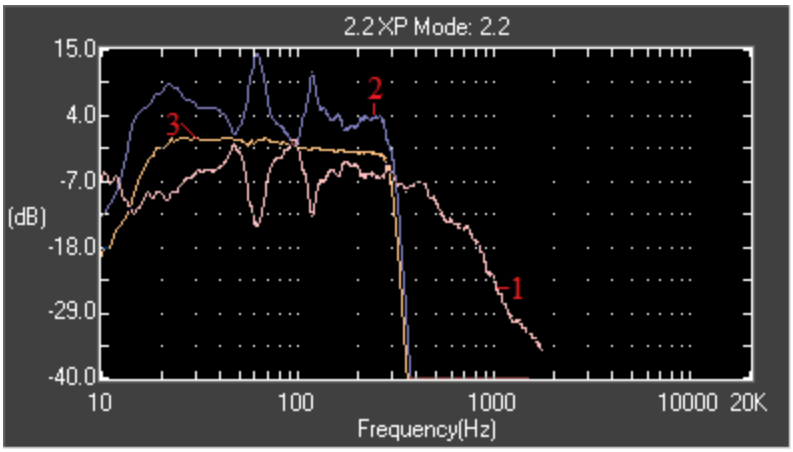

Figure 5. Subwoofer channel verification result.

1. Left subwoofer channel room response.
2. Left subwoofer channel correction filter response. Note that this filter implements subwoofer room correction as well as low-pass crossover filter.
3. Verification curve. The verification curve represents combined room and correction filter response.

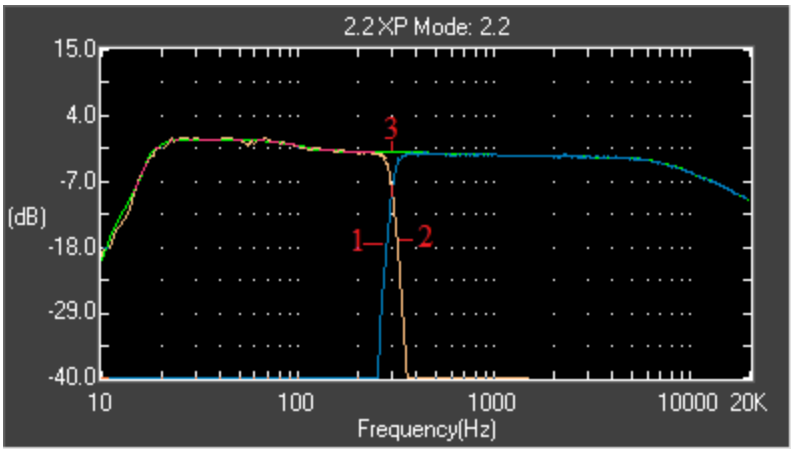

Figure 6. Main and subwoofer channel verification.

1. Left channel verification curve
2. Left subwoofer channel verification curve
3. Target curve

Fig. 6 represent what ultimately you would like your system to produce. Please note how your verification curves follow target curve response. This example illustrates verification process for the left and the left subwoofer channel. The same would apply to the remaining channels.

Summary

This article covers basic room correction concepts such as target curve, room response, correction filter response and correction verification process. All measurement responses, correction filter responses and target curve are actual representation of 2.2 XP performance in a typical listening room. All displayed results are obtained using Tact-V1.0 in combination with 2.2 XP. The same results can be applied to 2.2 MINI, 2150 XDM and TCS MKII.