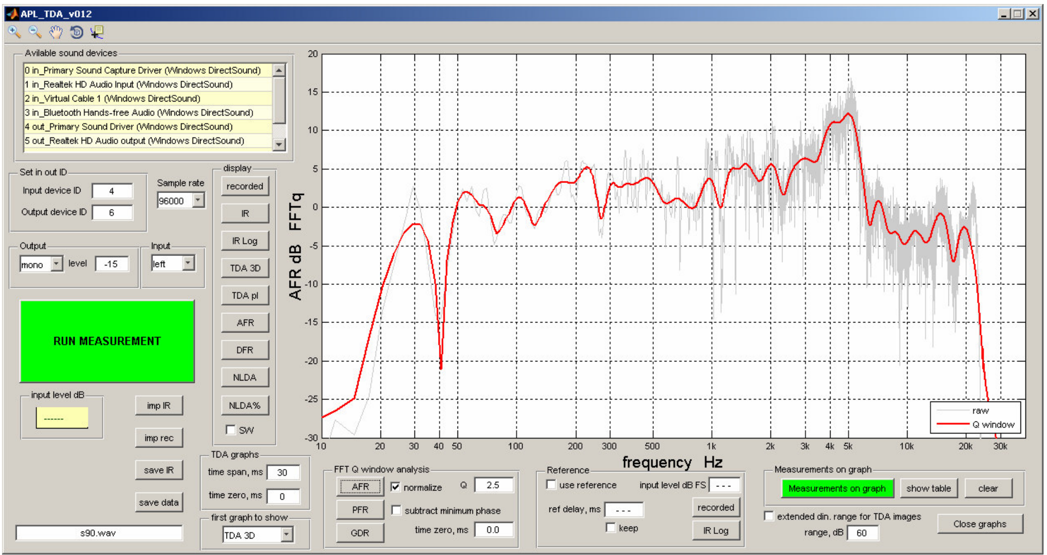
A short introduction of new functions and features of APL TDA software versions 011 and 012.



The most important addition is the analysis function called FFT Q. It is serving as with familiar curves available from classical FFT analysis but the windowing function called Q window is used. It limits ringings of particular impulse response to value of Q set in parameters and eliminates most of environment's reflections.
FFT Q is usable only when system already has been roughly tuned and timing is very close to correct tune. You can control the performance of Q window by observing "raw" and "Q window" AFR curves. If "Q window" curve is pretty much following "raw" curve, it means you are close to correct tune and "Q window" curve (the same way PFR and GDR curves of FFT Q analysis) is trustable.

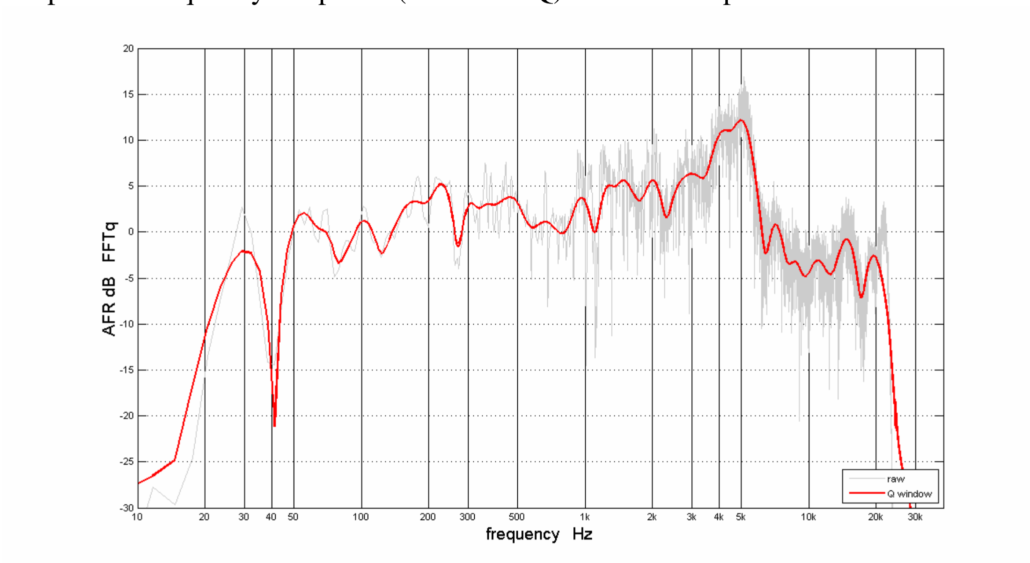
The use of reference signal will help in measuring absolute time instead of relative time (as it is on all previous versions) when time zero is set to arrival time of high frequencies. Now the reference delay is calculated as difference between the arrival of high frequencies and the reference channel signal arrival. You can use that reference delay for next measurements by checking the checkbox "keep".

New "view" for TDA images is added. It extends dynamic range of the image and allows to see the sound decay process in a room or hall.

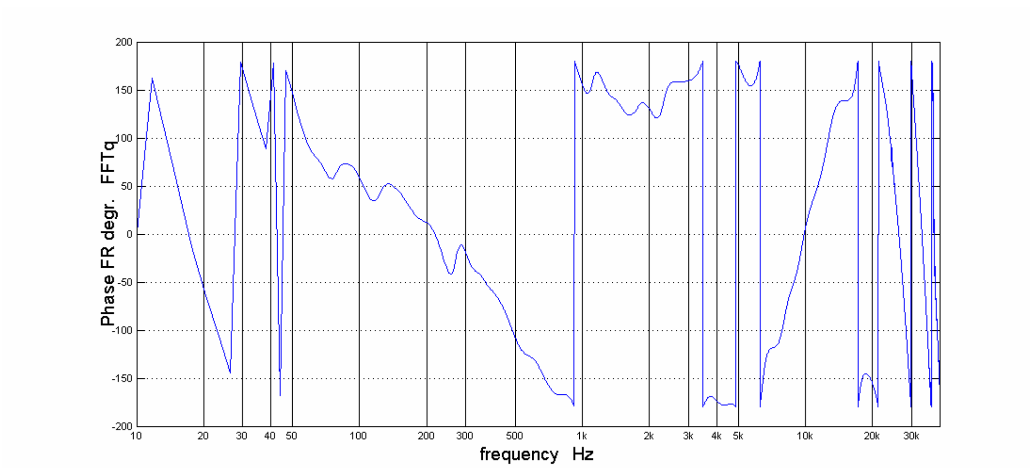
Some examples.

Let's try to create and tune two-way loudspeaker system containing Yamaha NS10 for HF and ancient Hi-Fi loudspeaker S90 for LF with crossover frequency at 100 Hz.

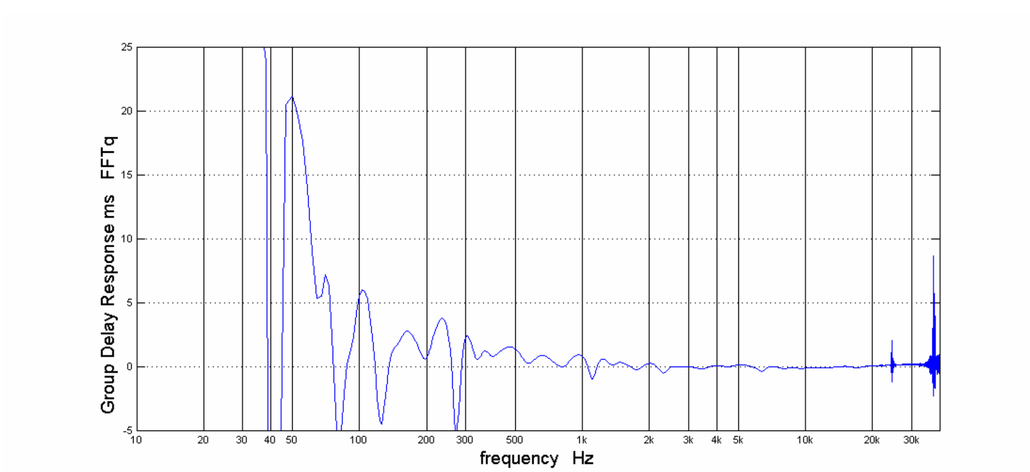
Amplitude Frequency Response (AFR FFT Q) of S90 loudspeaker:



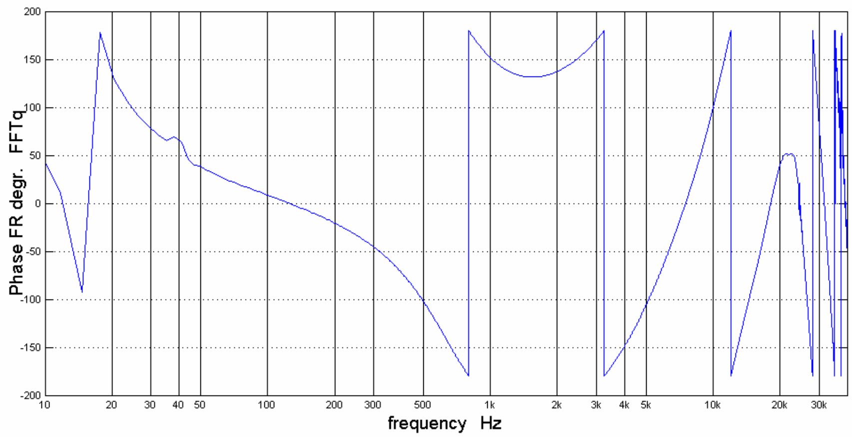
Phase Frequency Response:

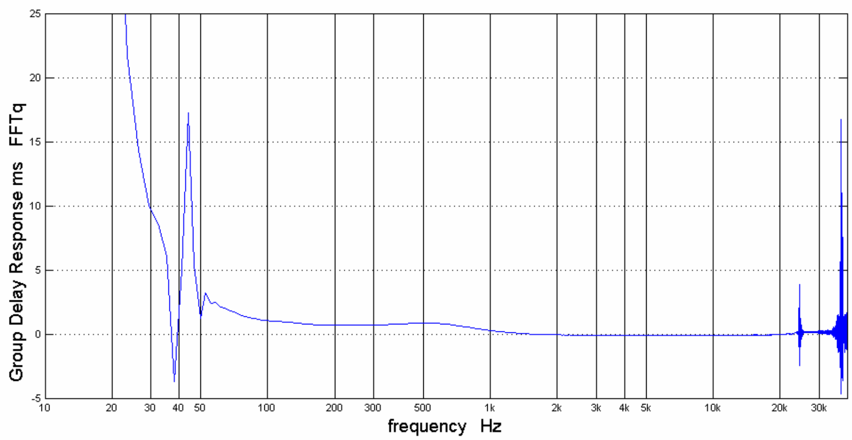


Respective Group Delay Response:



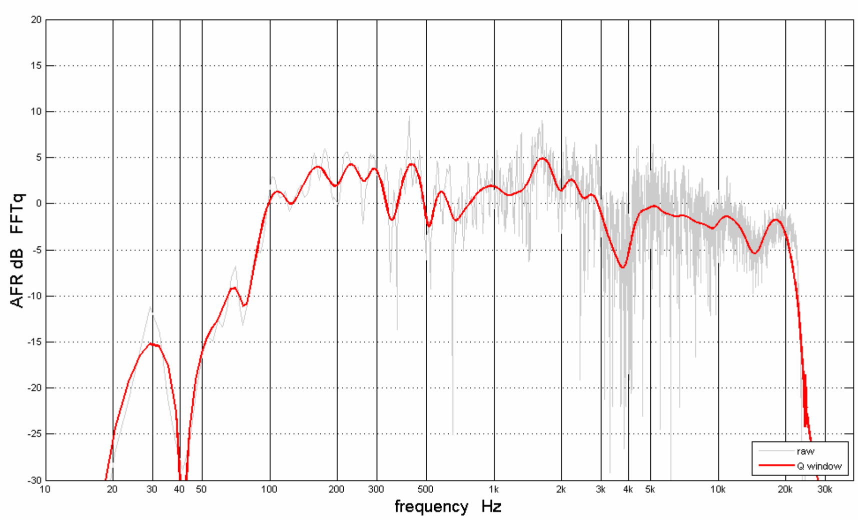
The very high quality of Q windowing makes possible to use such valuable function – to subtract minimum phase behavior of loudspeakers performance. It is virtual use of a minimum phase equalizer. It removes all resonances of loudspeaker and also it lets us to see a performance just of crossover.
Let’s check “subtract minimum phase” check box and see new PFR and GDR curves.



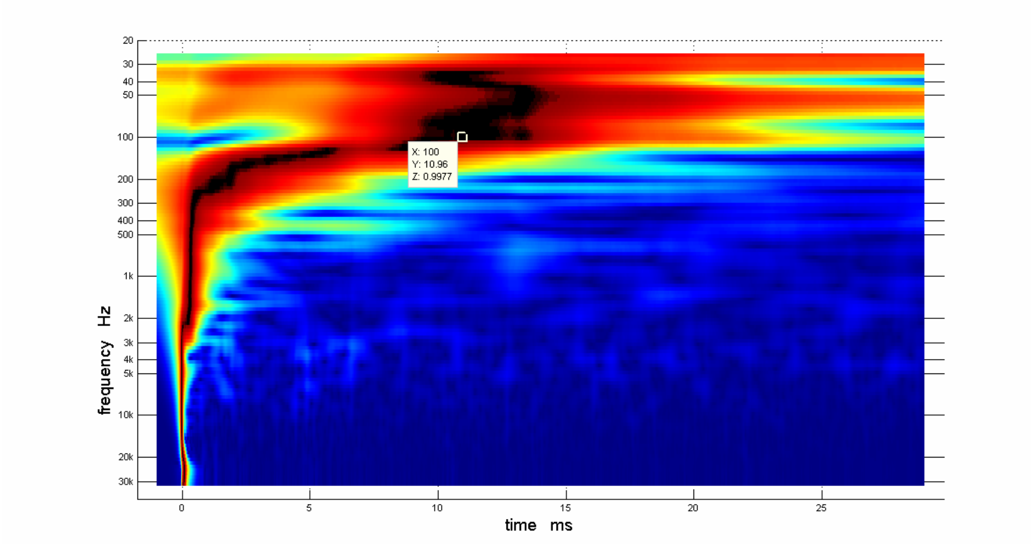


It allows us to observe and tune crossover unit much easier.

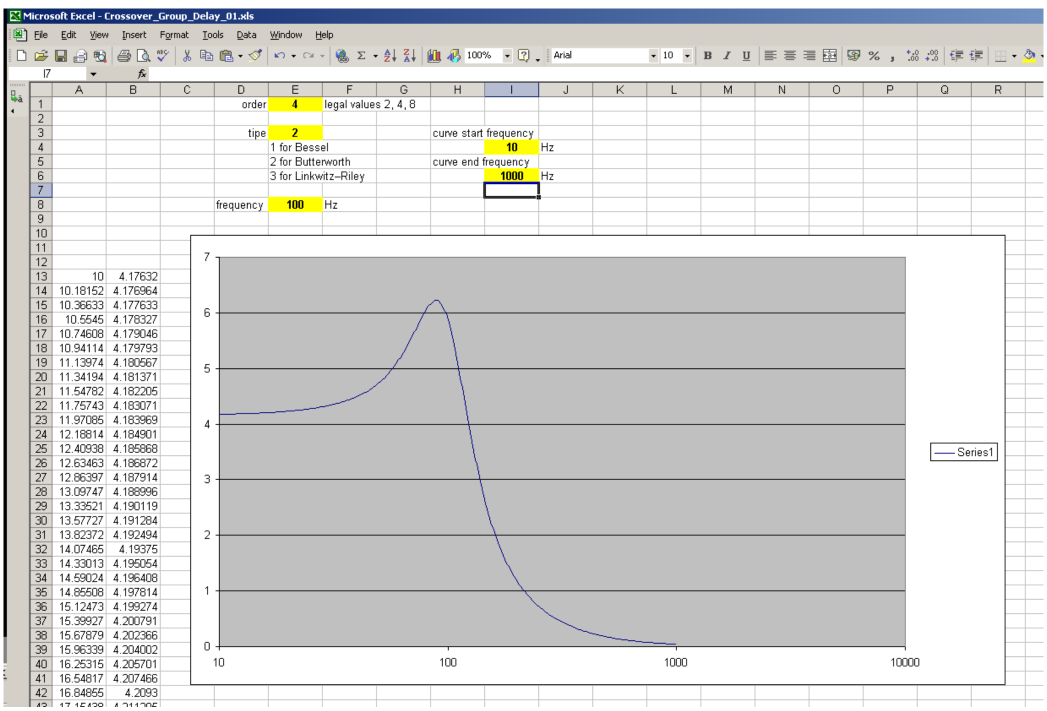
The AFR of Yamaha NS10:



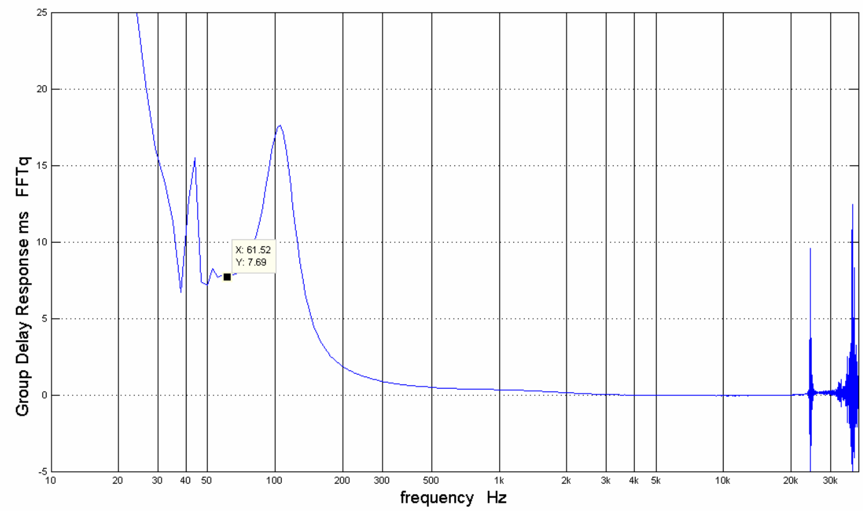
The initial TDA pl picture of two way system. Butterworth 4th order crossover on 100 Hz.



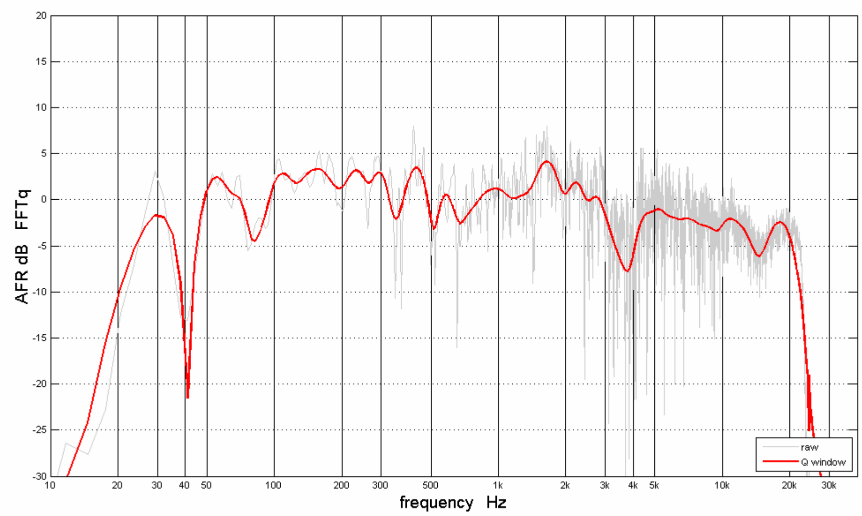
The Group Delay introduced by Butterworth 4th order crossover on 100 Hz should be:



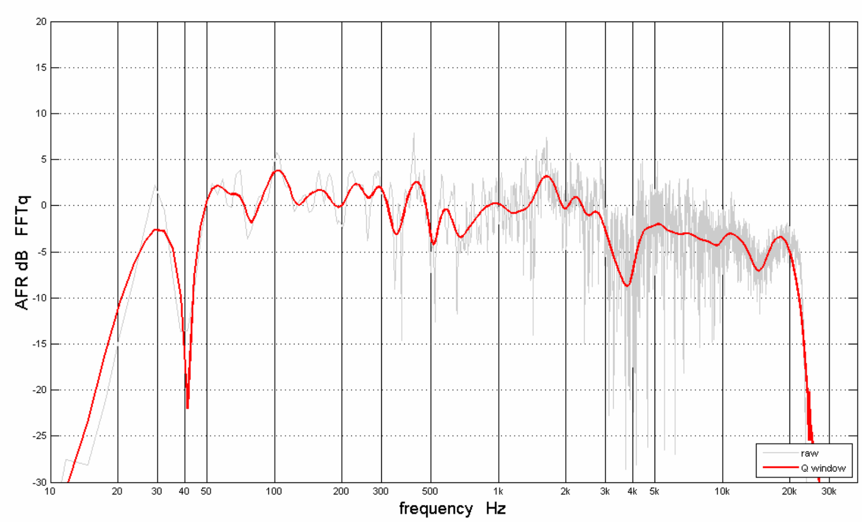
The Group Delay curve with “subtract minimum phase” active:

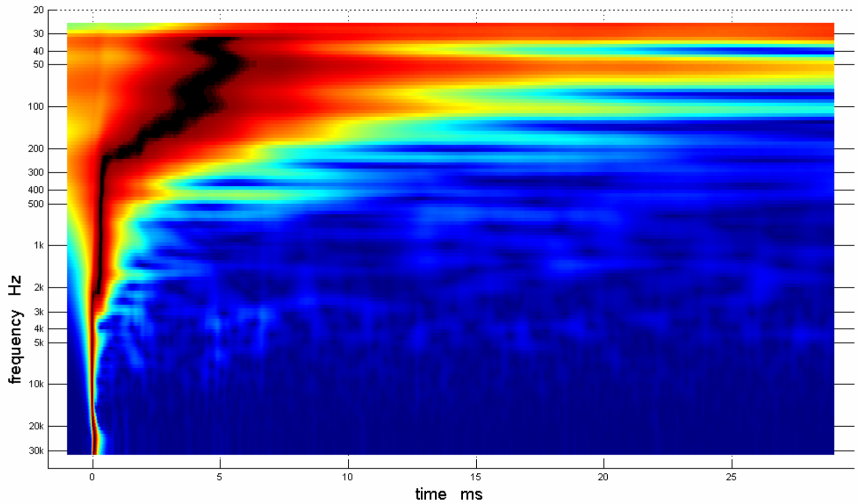


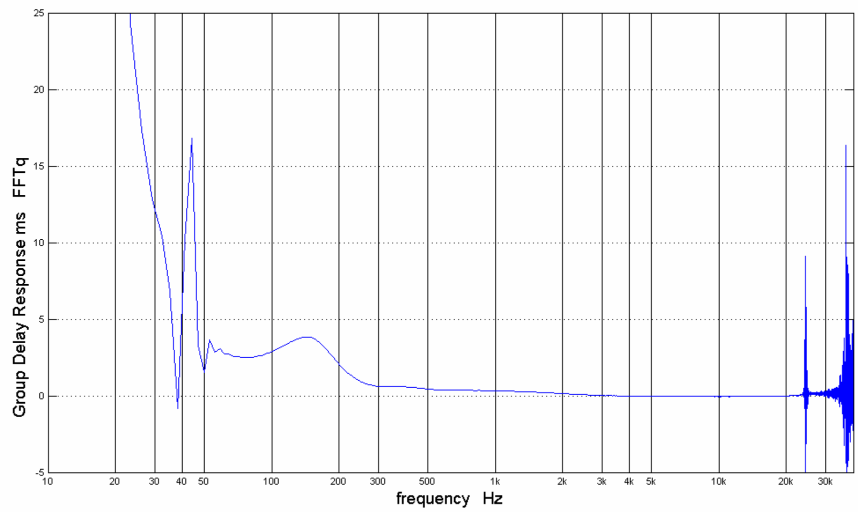
Let’s introduce 5 ms delay in HF.



Let’s tune HPF from 100 Hz to 60 Hz.

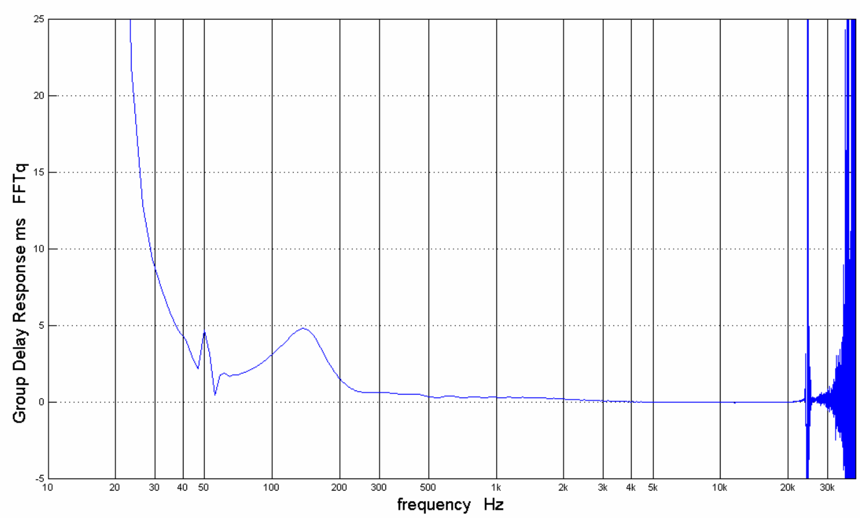




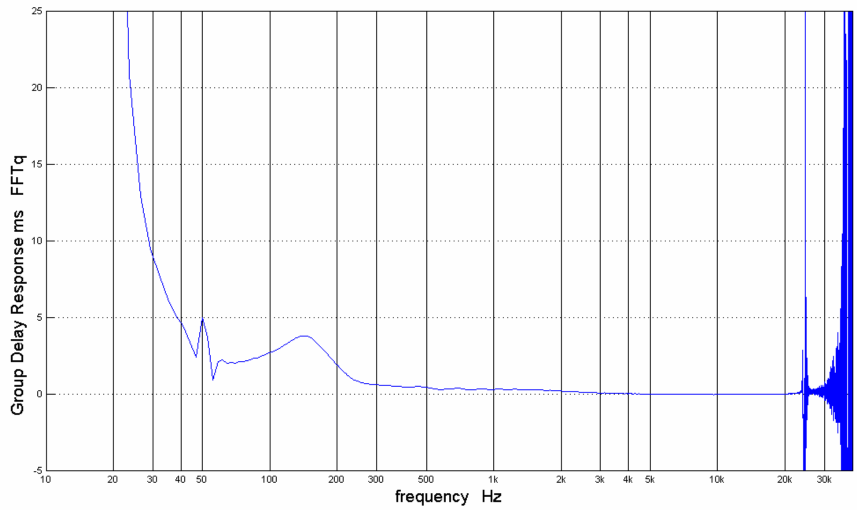


Let’s play with delay and change it from 5.5 ms to 0 ms.
Actual values will be 5.5 5.0 4.5 3.5 2 1 0 ms.

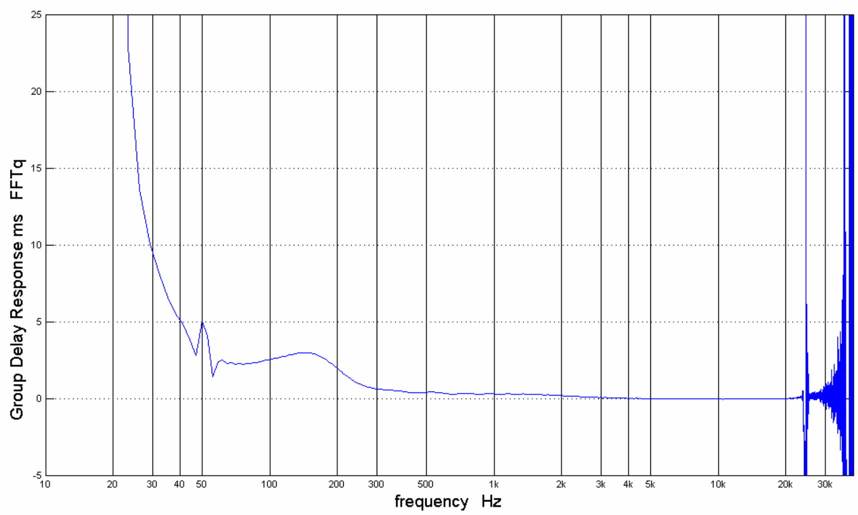
5.5 ms



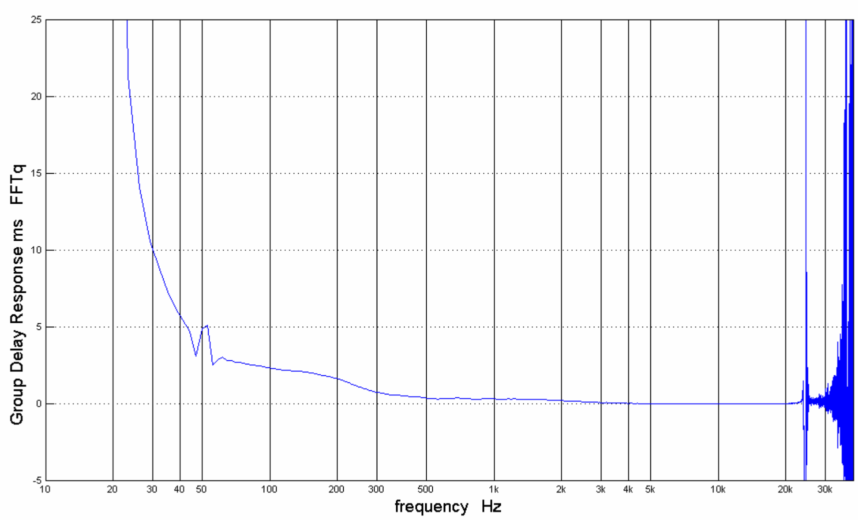
5.0 ms



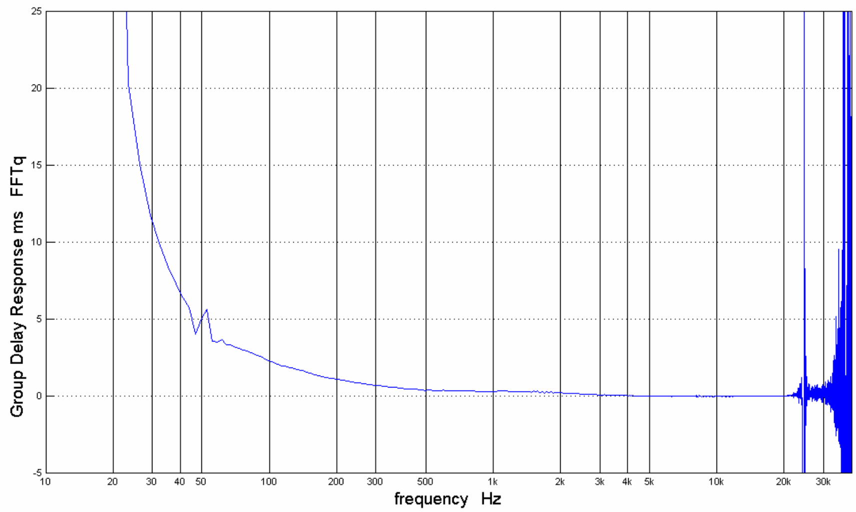
4.5 ms



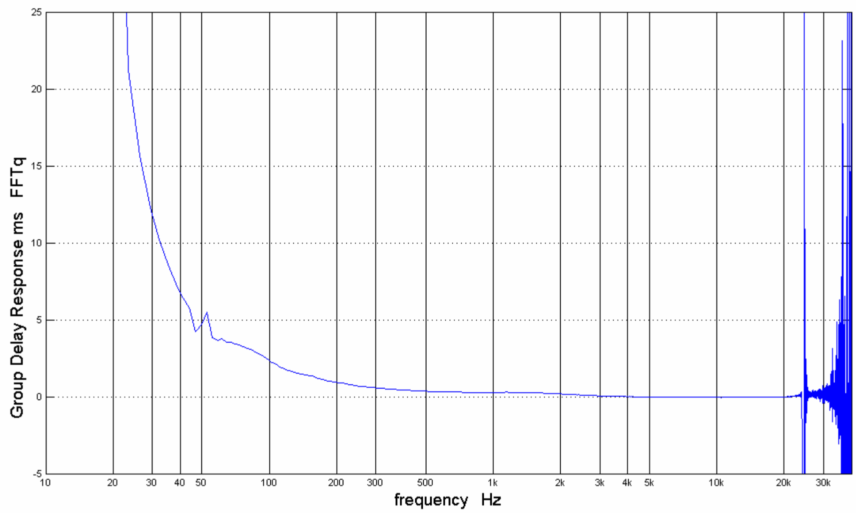
3.5 ms



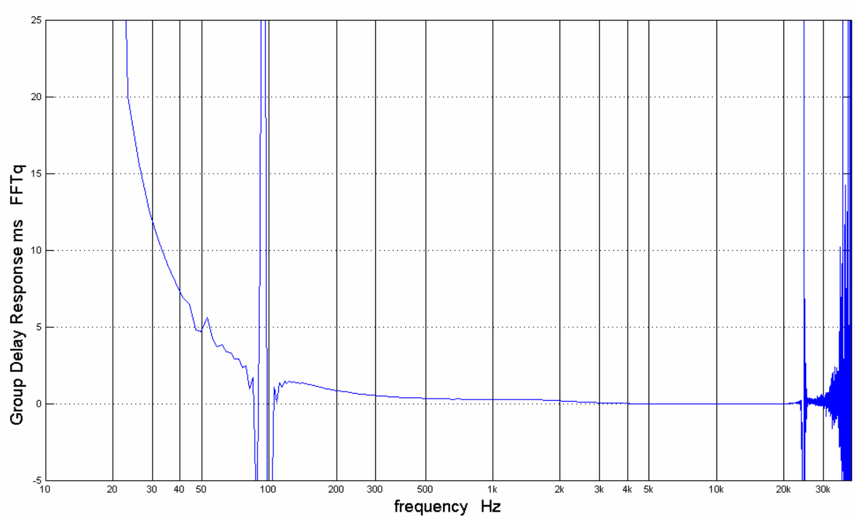
2.0 ms



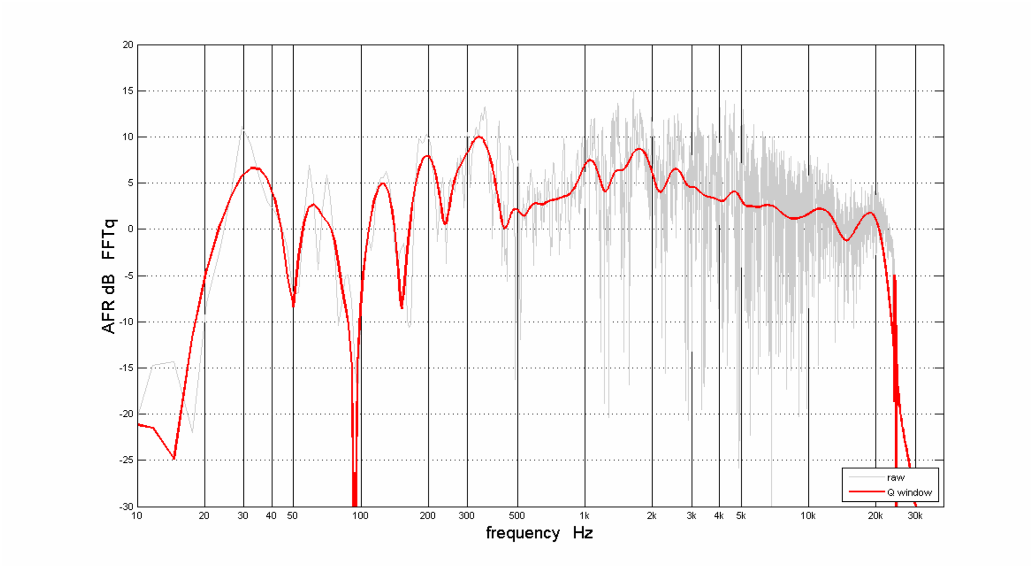
1.0 ms



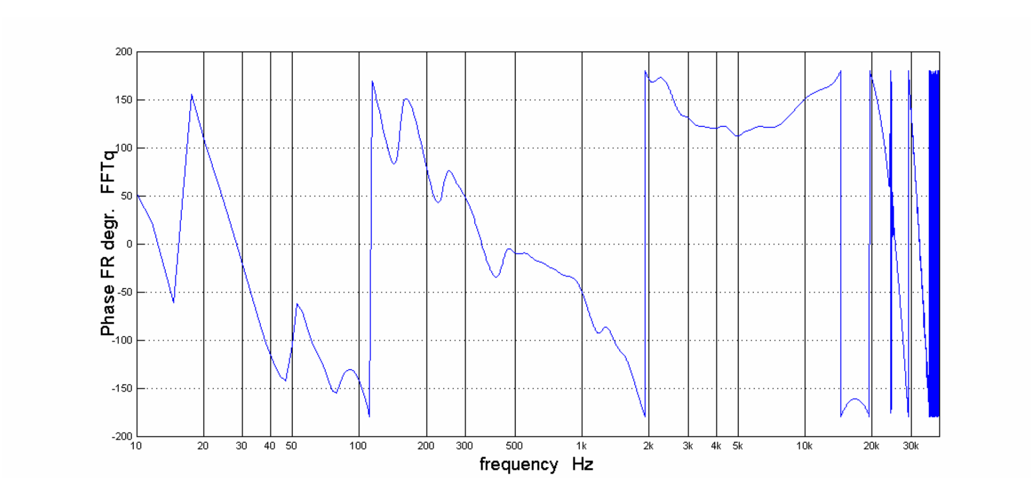
0 ms

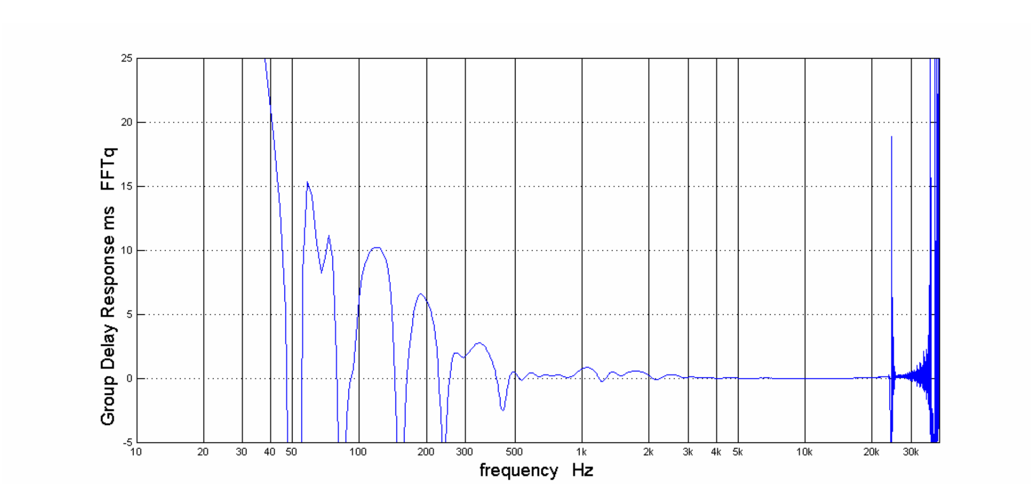


AFR for 0 ms



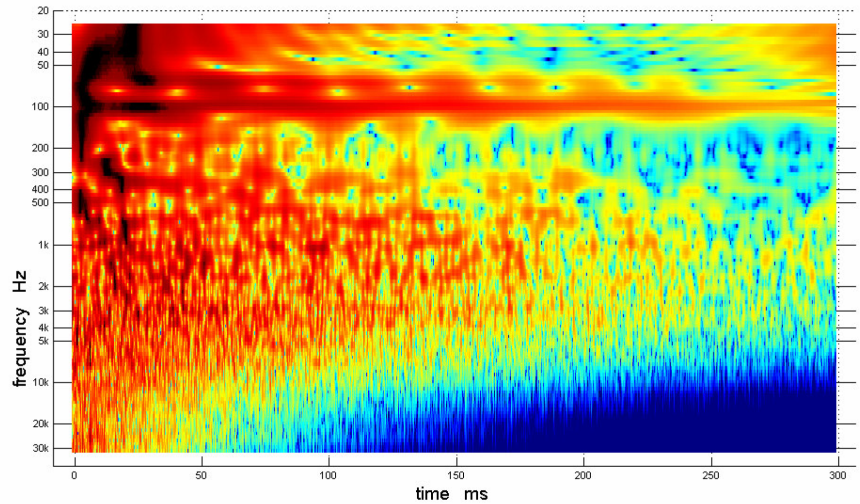
Looks like 4.5 ms delay is the best one. Let's switch off "subtract minimum phase" and see overall Phase and Group Delay responses for 4.5 ms delay.



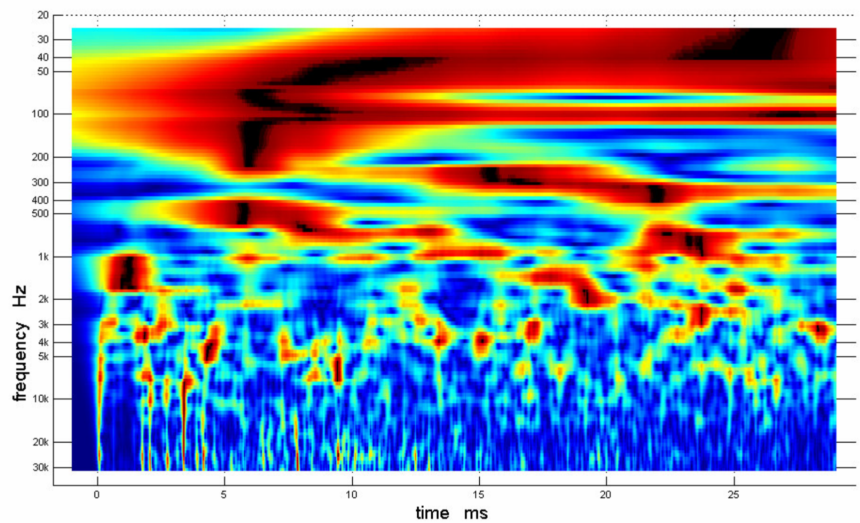


Here are some example images that show how to use extended dynamic range for TDA images.

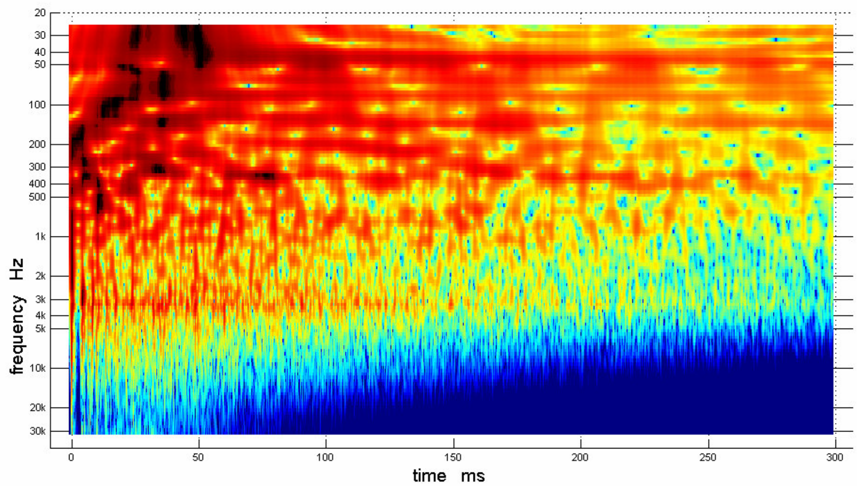
A bathroom, dimensions 2.2 x 1.5 x 1.73 meters. There is no reverberation below 50 Hz frequency. We can see strong room modes on 70 and 100 Hz.



And 30 ms time span:



An empty reverberant room (concrete walls) with dimensions 2.52 x 2.61 x 4.12 meters:



Theater hall: