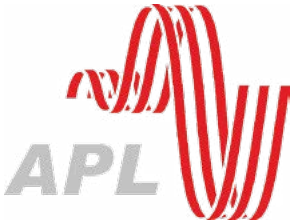
Introduction to TDA

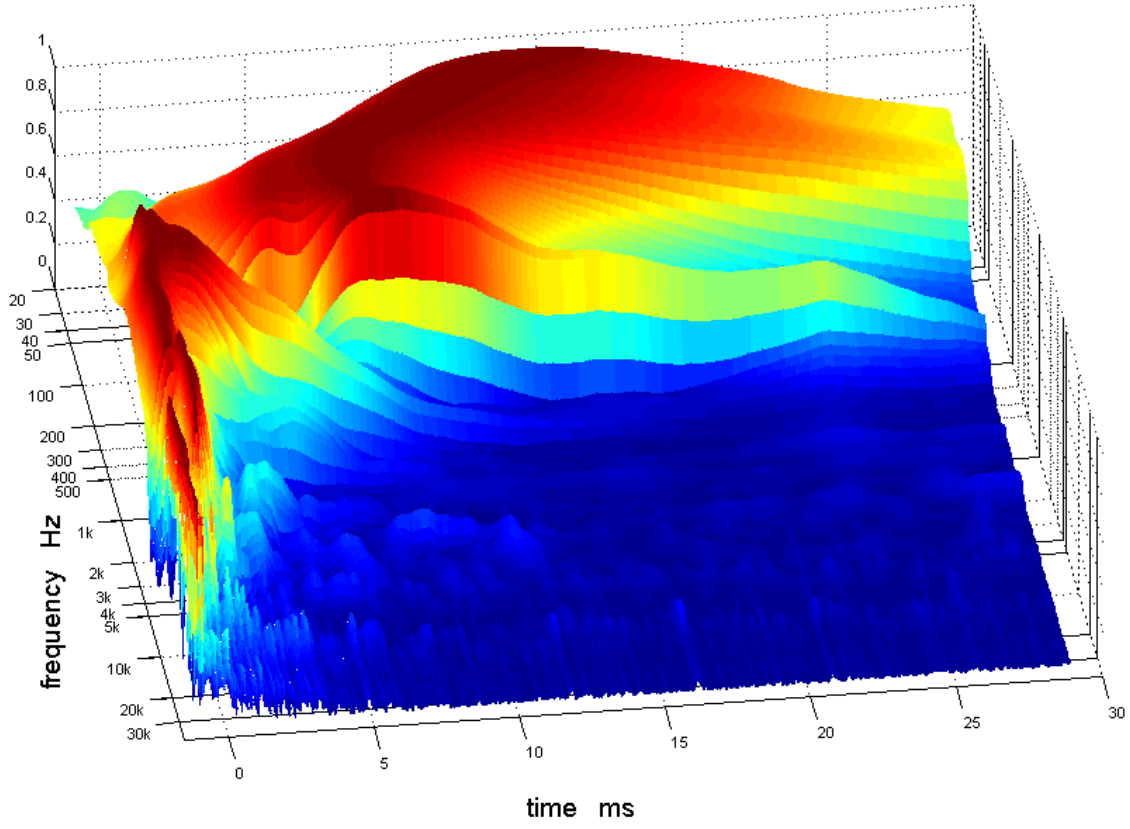
Time Domain Analysis Software

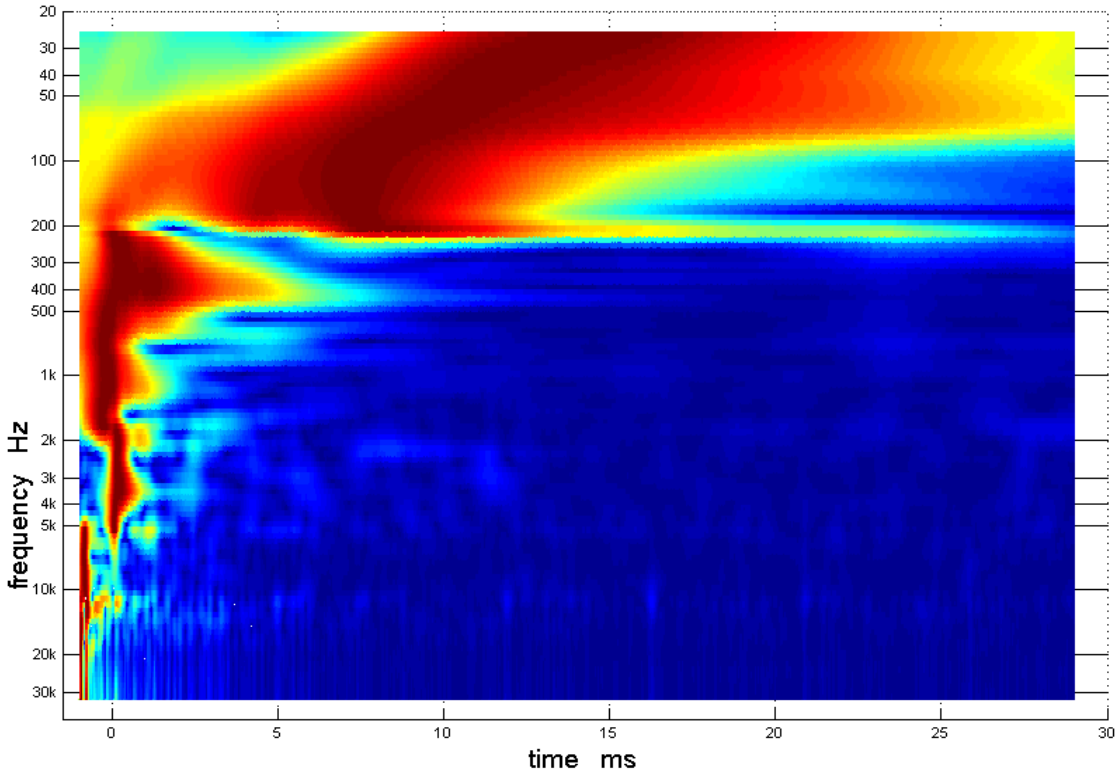


By Raimonds Skuruls 2014

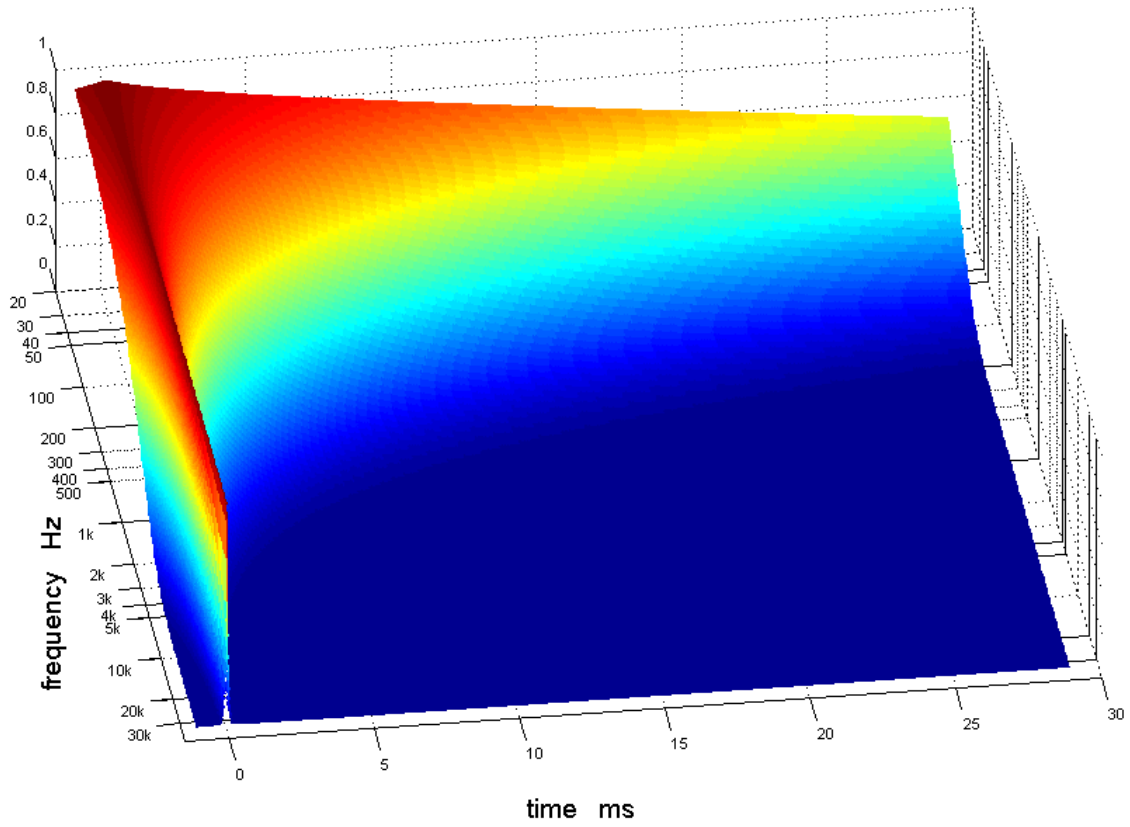
The TDA System

Well come to TDA – Time Domain Analysis. The measurement system that allows to see frequency dependant delays of loudspeaker systems like graphs, that allows us to evaluate „delays” of loudspeaker system in just a few seconds.

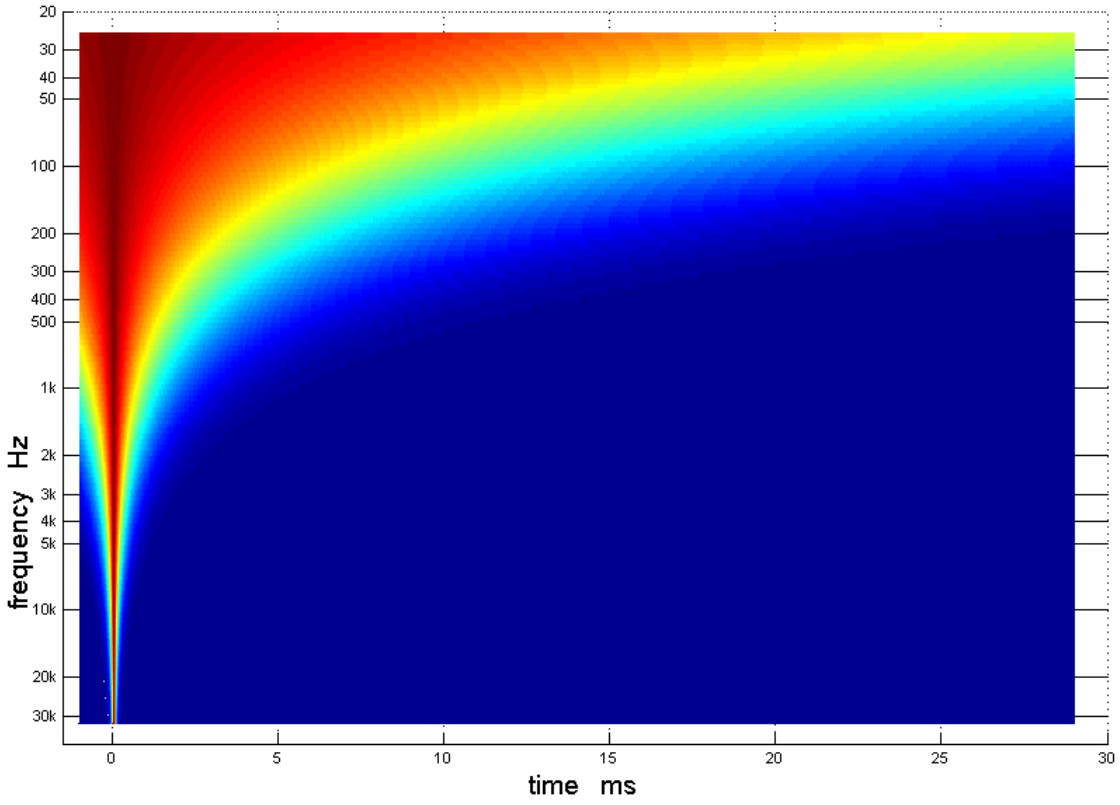




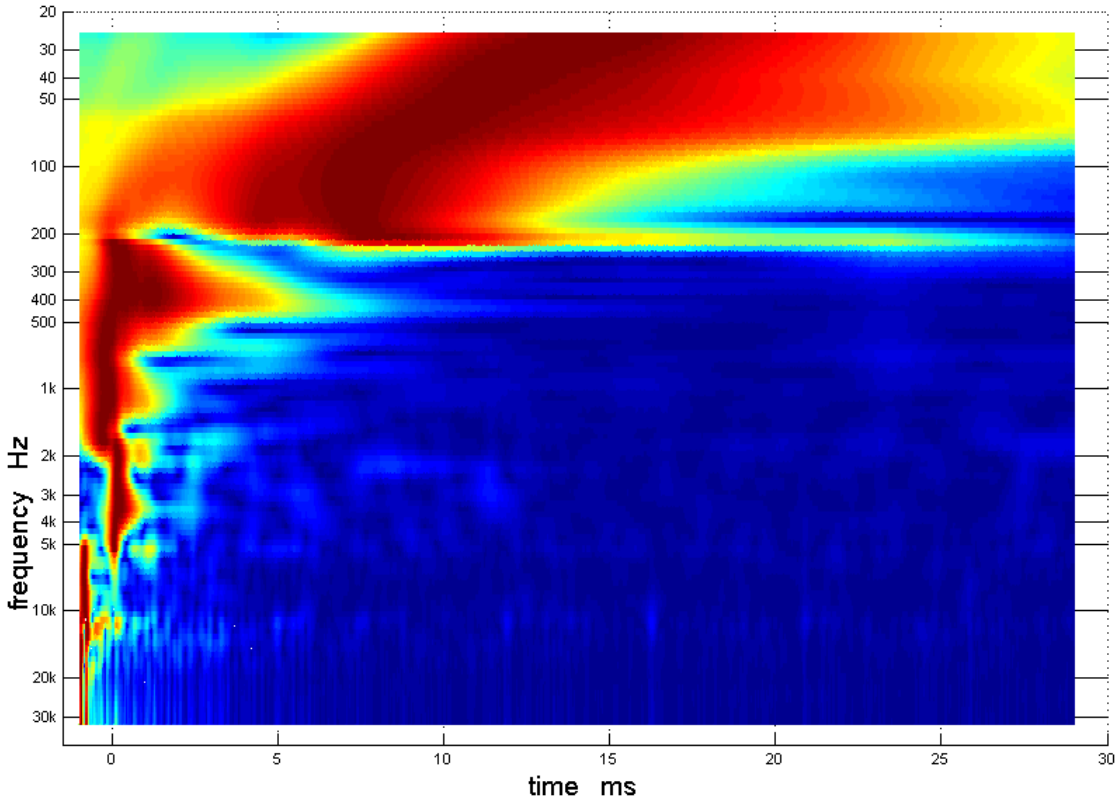
For introduction. If system translates signals of all frequencies without changing time relationship of them, we assume that signal of all frequencies leaves system in same time. Such example is shown in this 3D picture, where the maximum of 3D surface (deep brown color) represents time of arrival of respective frequencies.



We can also view this graph straight from above, to read time values more easily.

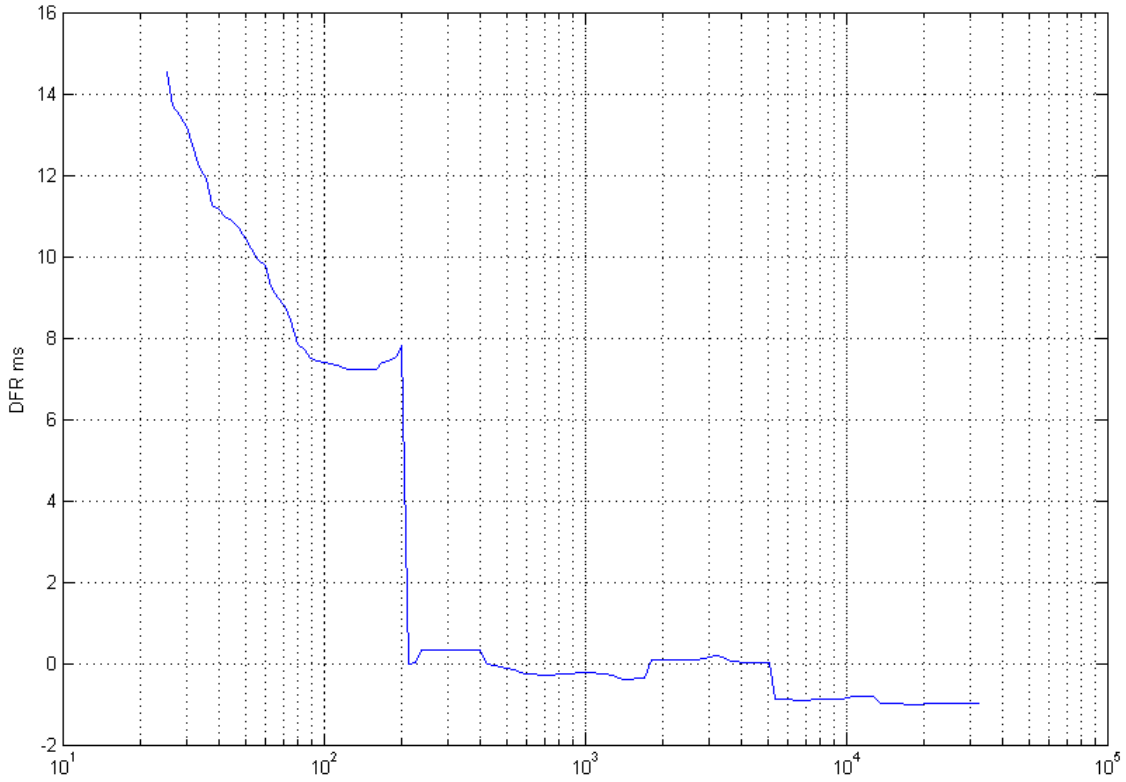


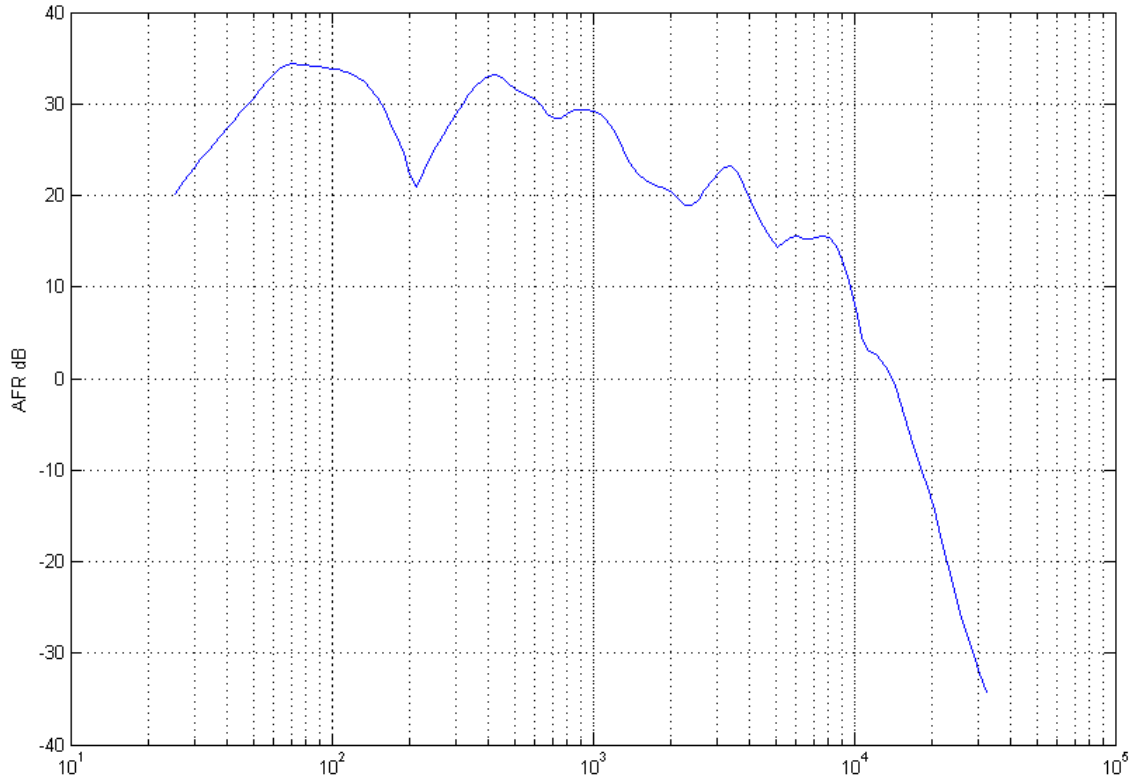
Let’s learn how to read time values of TDA graphs from the first pictures, now in view from above. The zero of time scale can be set to any point but in most cases it is set to time of HF arrival. Times zero-point in this example is set to arrival of MHF of the driver unit. We can read from this graph that the sound of tweeters (5...16) arrives at 1 ms, sound of mids (200 Hz...1.8 kHz) at 0.7 ms and sound of LF (25...200 Hz) follows about 7 to 14 ms but it is frequency dependant because of resonances in LF speaker.



DFR and AFR Graphs

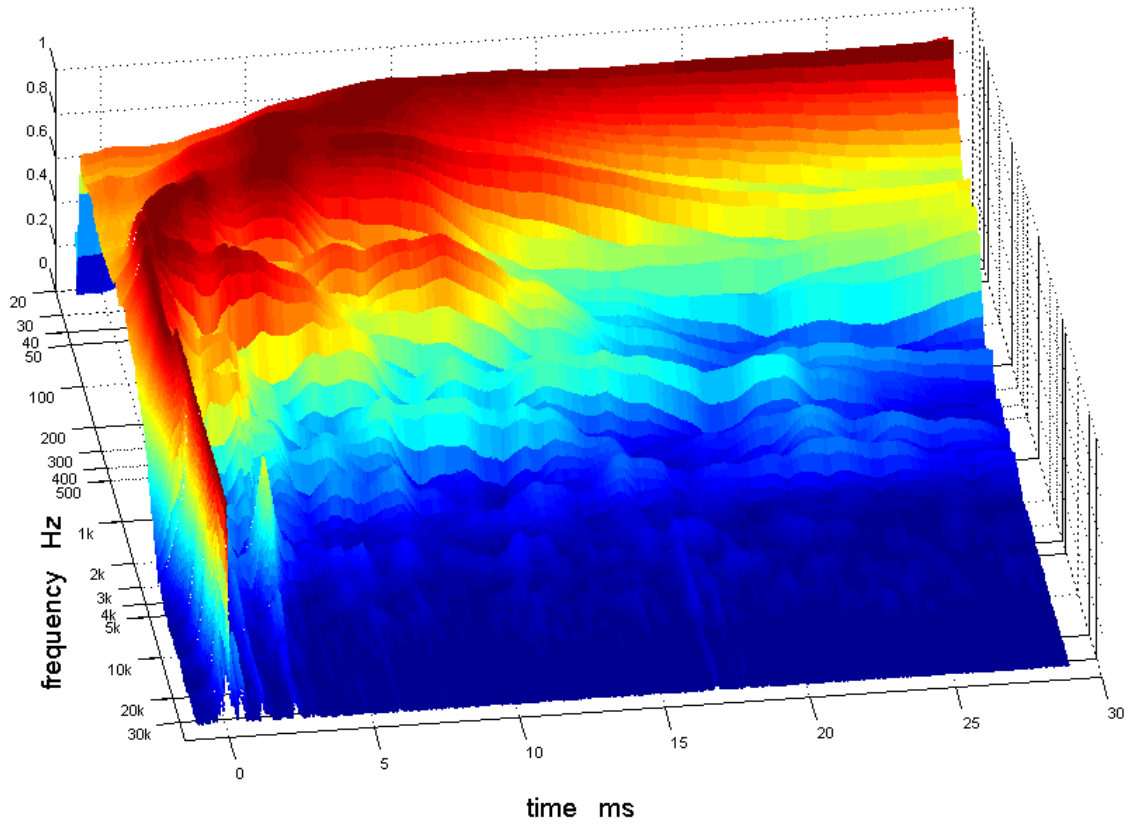
TDA software creates Delay Frequency Response (DFR) and Amplitude Frequency Response (AFR) graphs.

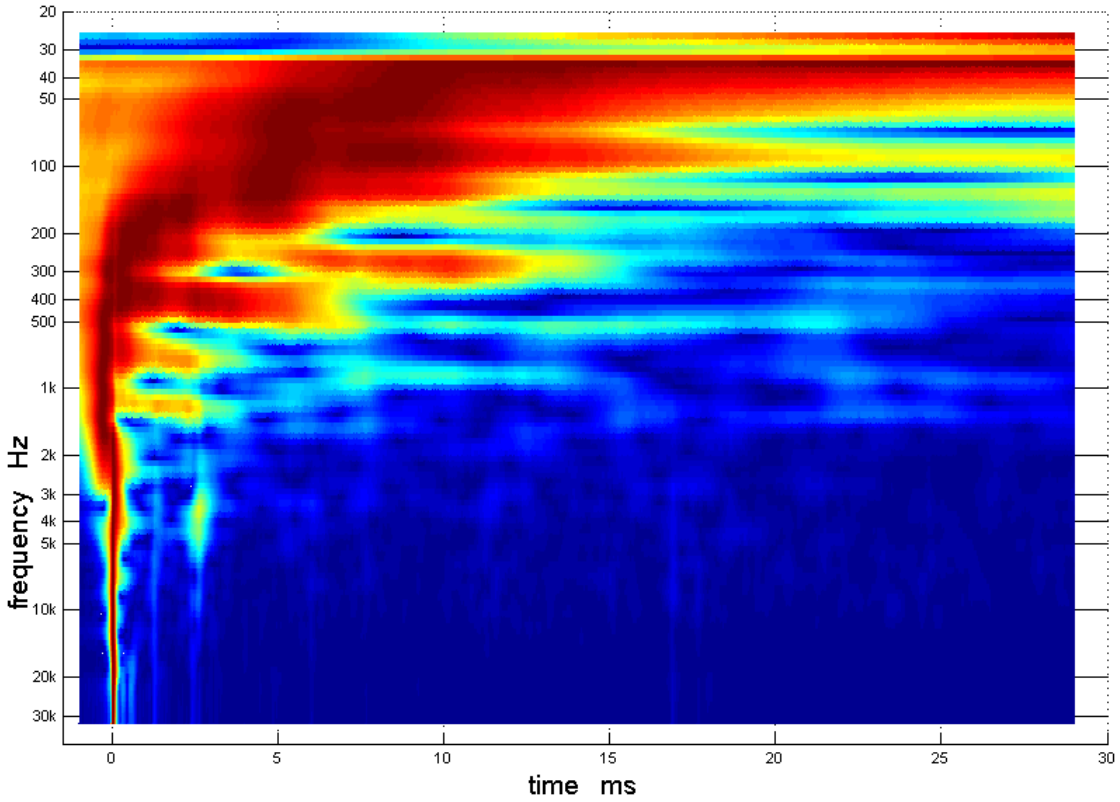




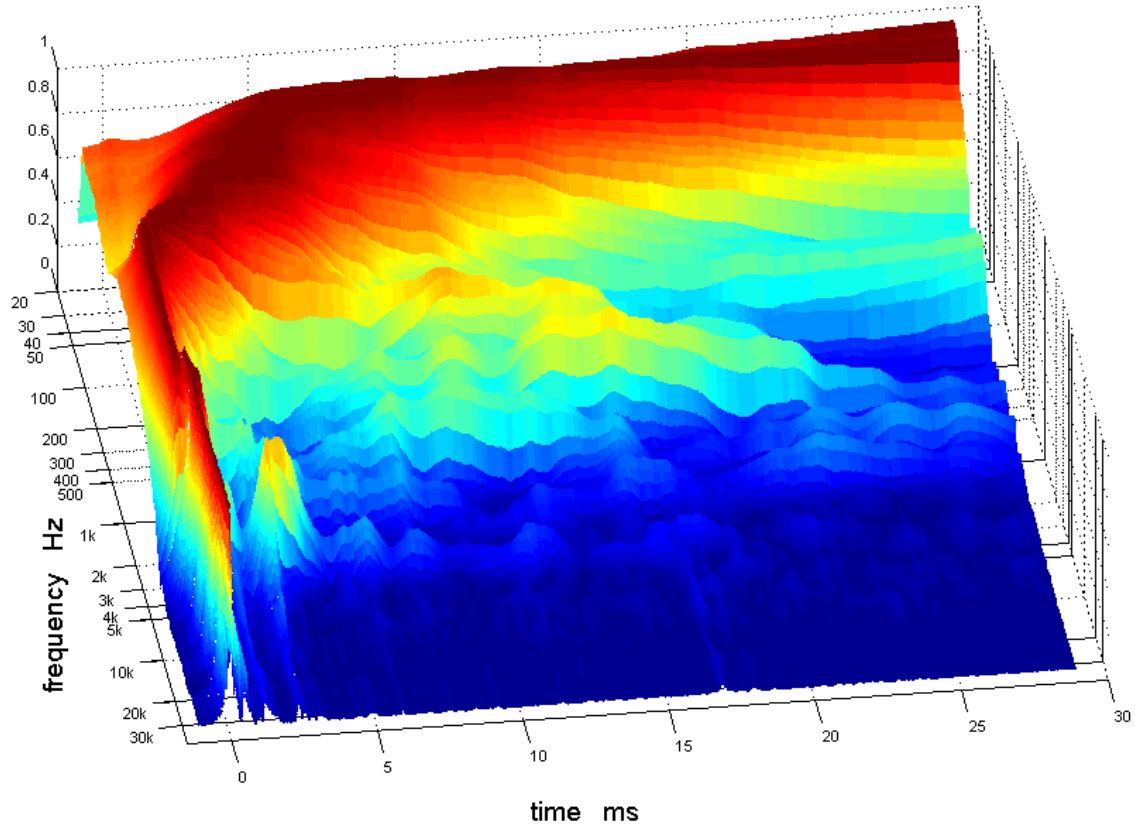
Correction possibilities

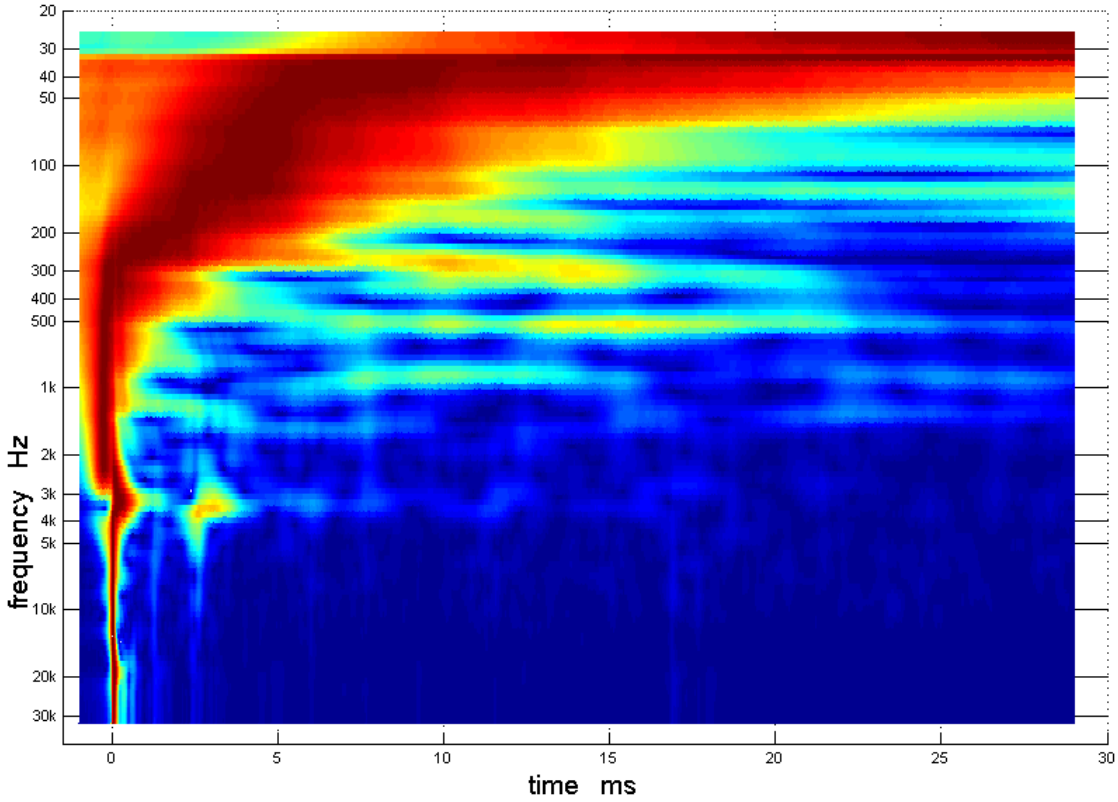
Initially



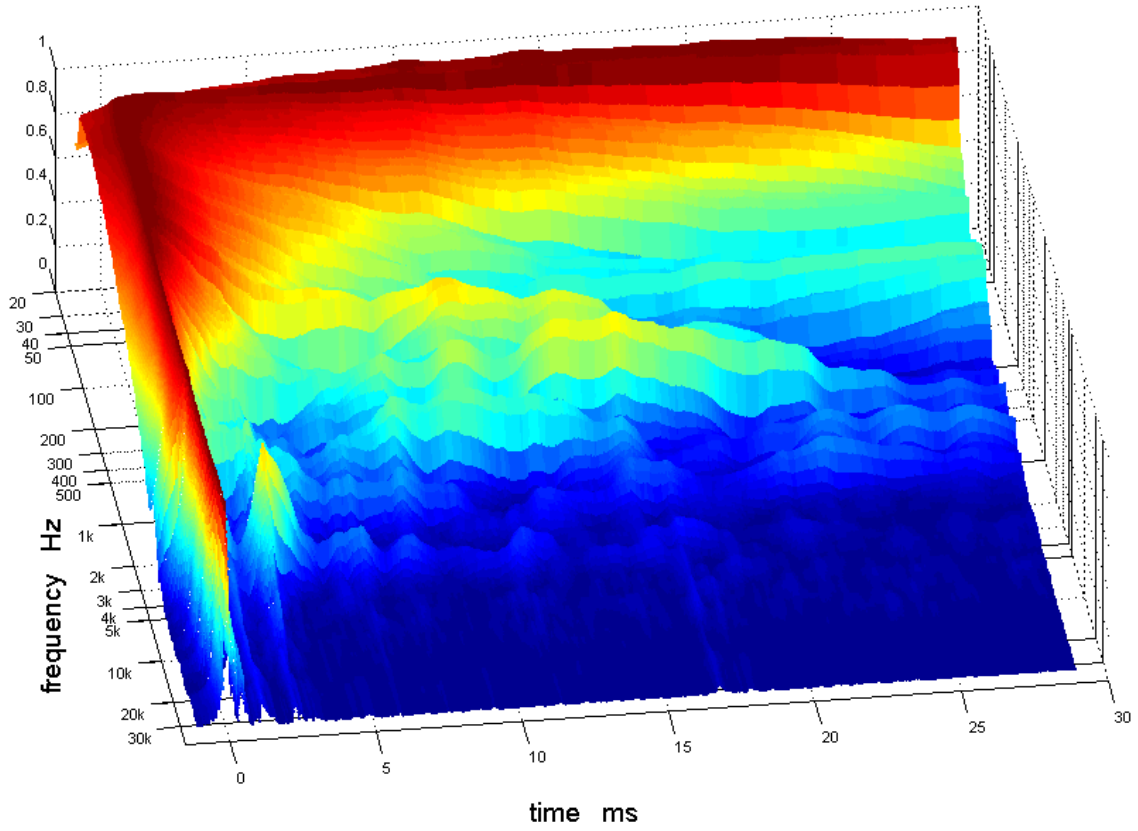


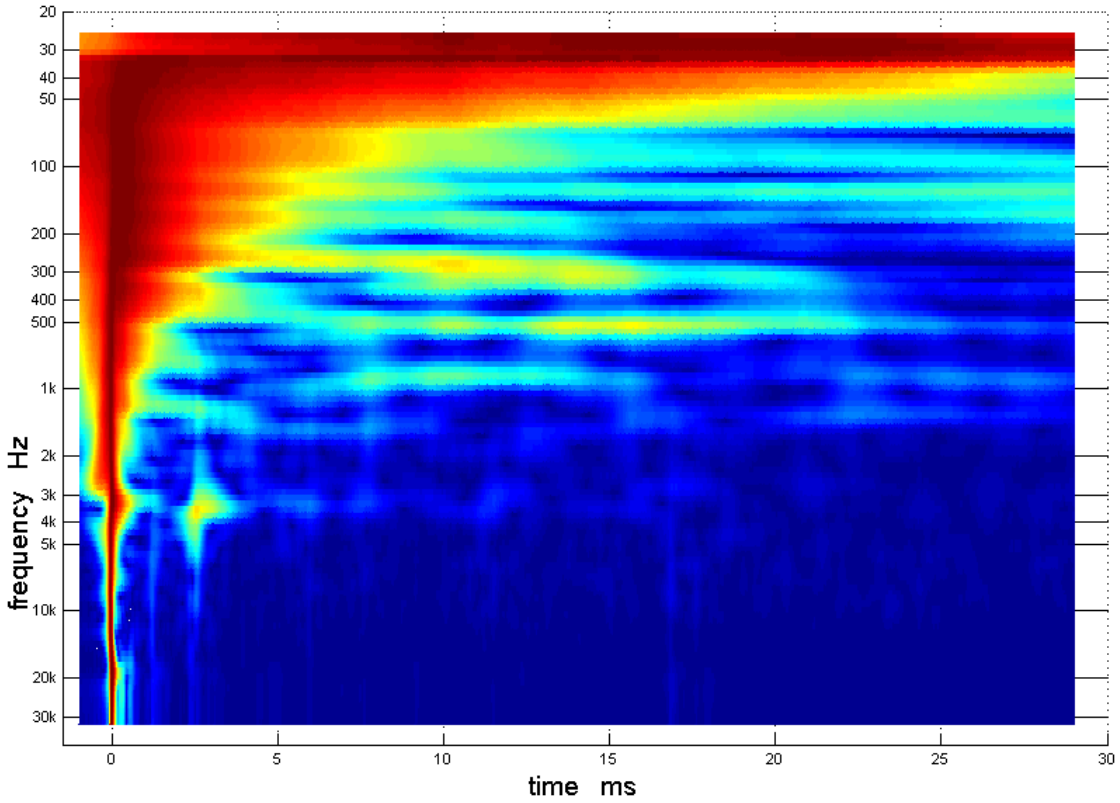
After APL MPF correction





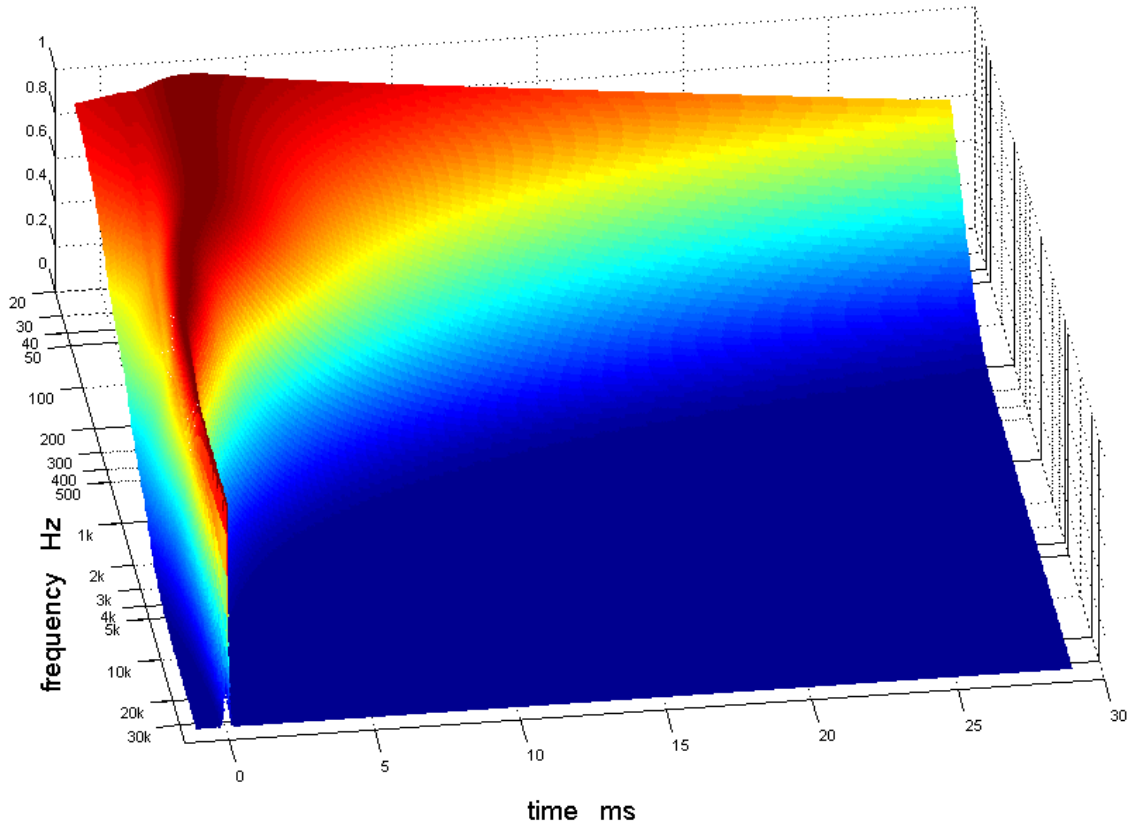
After TDA time correction

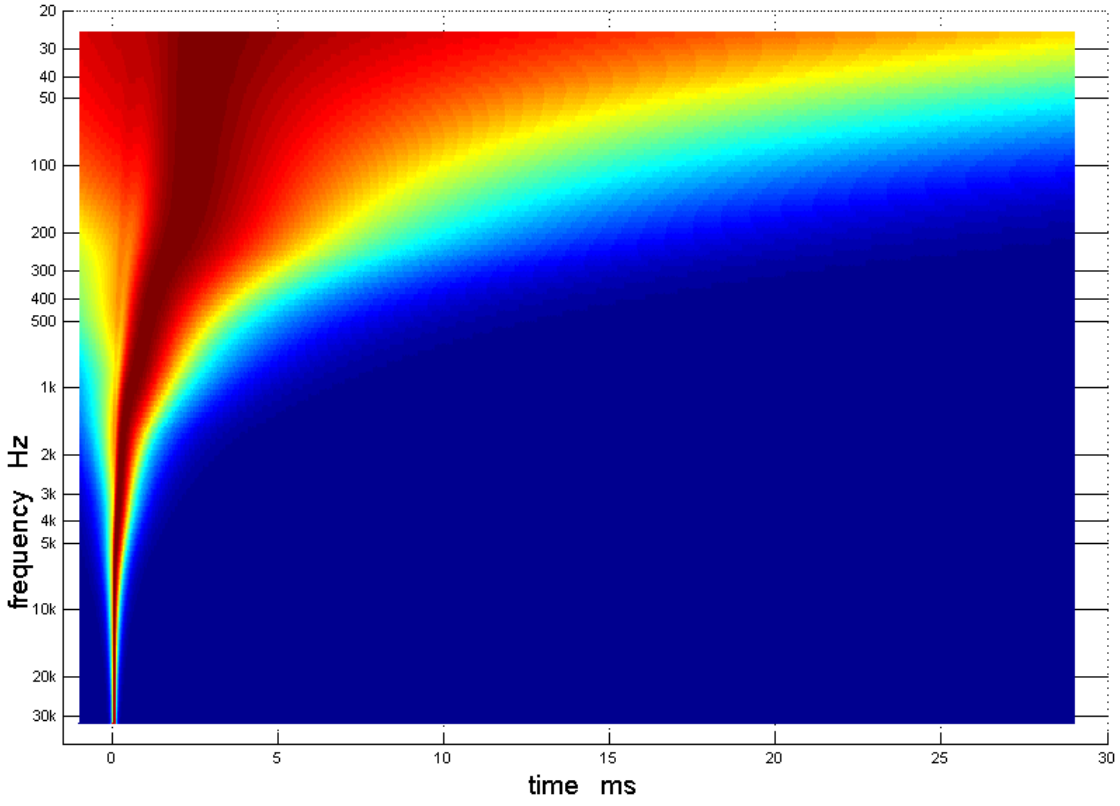




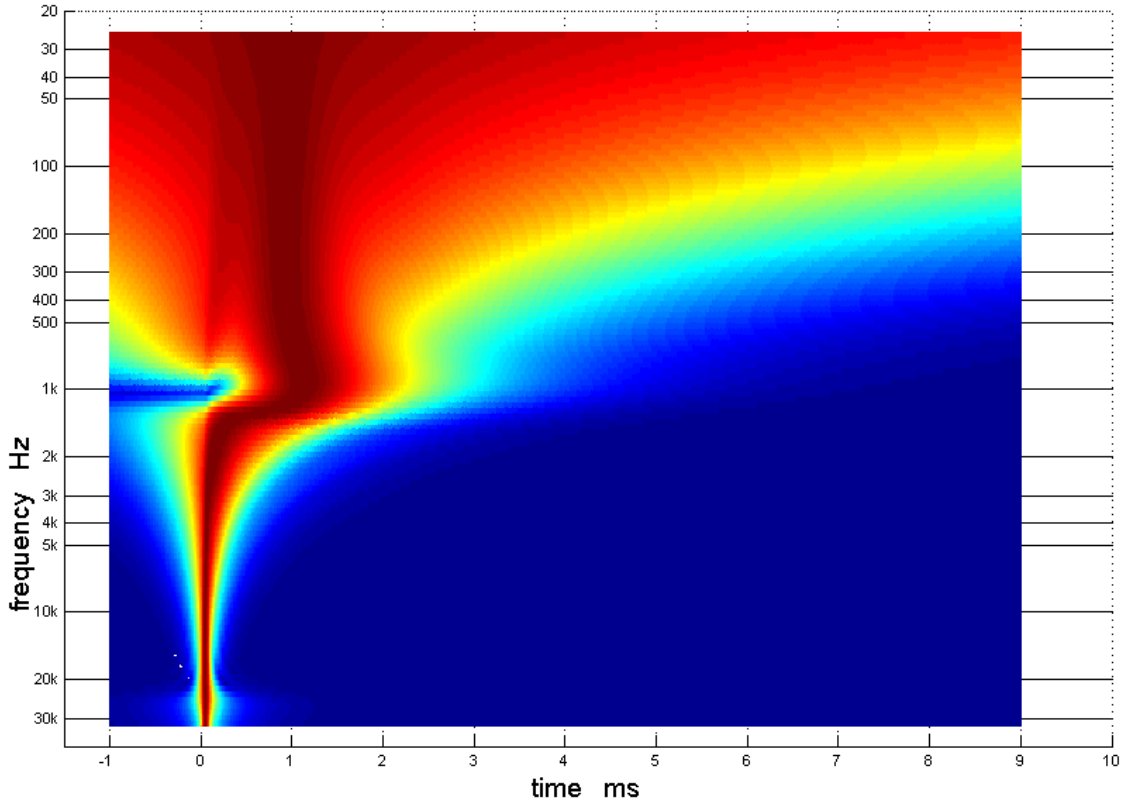
To show how it works, let's see some collection of measurements.

Just a 4 way 4 order crossover unit. All four outputs summed.



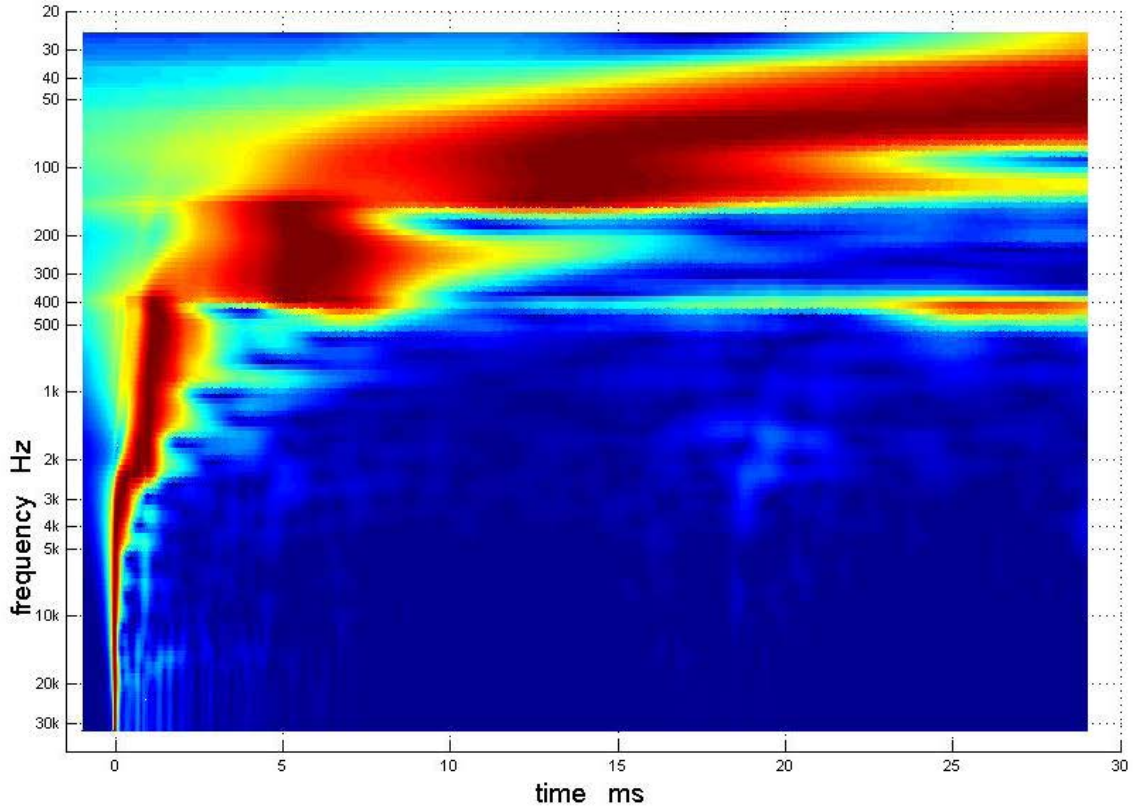


Just a 2 way 8 order crossover unit tuned on 1kHz.

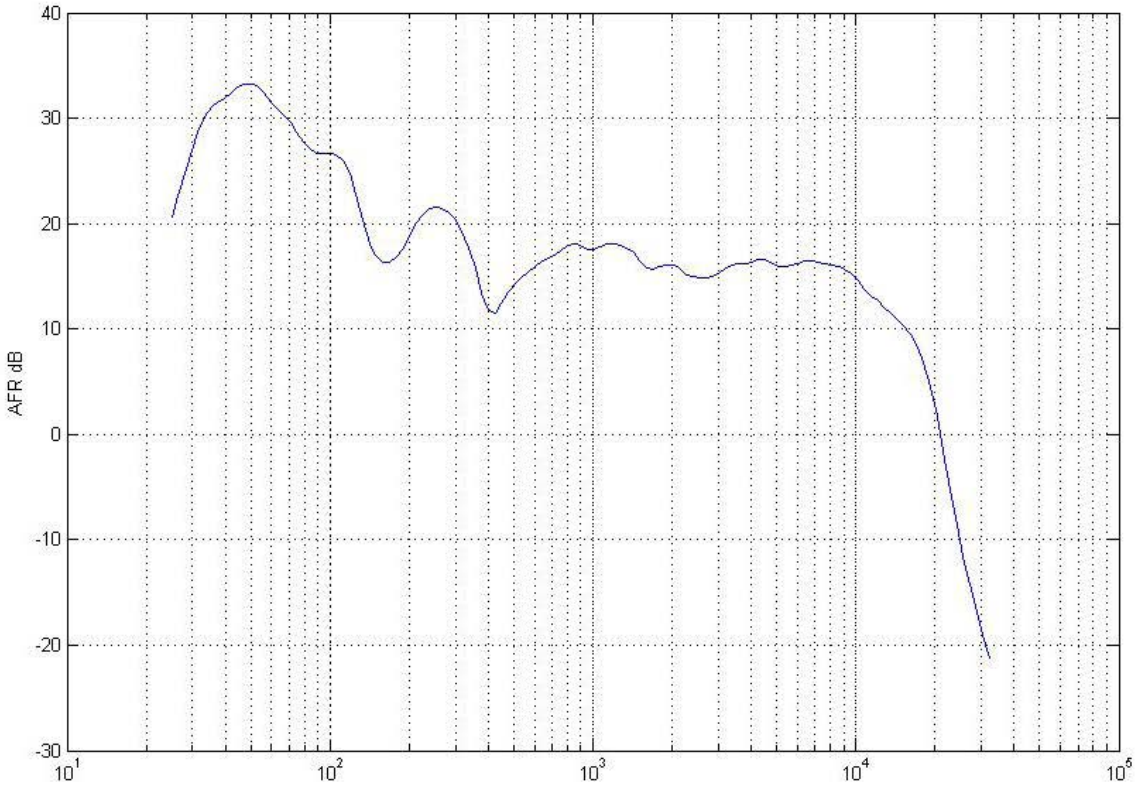


Concert halls

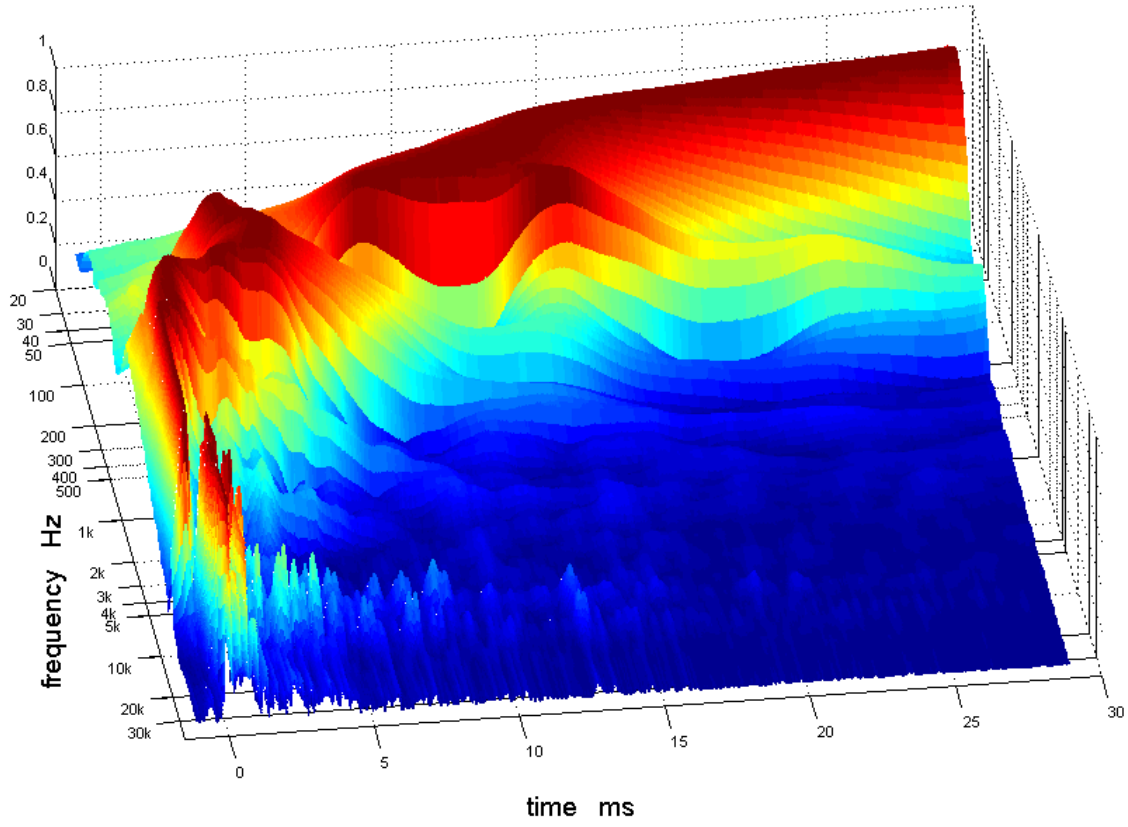
System N, out of phase 400 Hz



System N, out of phase 400 Hz, AFR



We see out of phase around 400 Hz on AFR graph, for mic position it is true out of phase but it is not true out of phase for other directions and mic receives a narrow band reflection after about 27 ms.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frequency Hz
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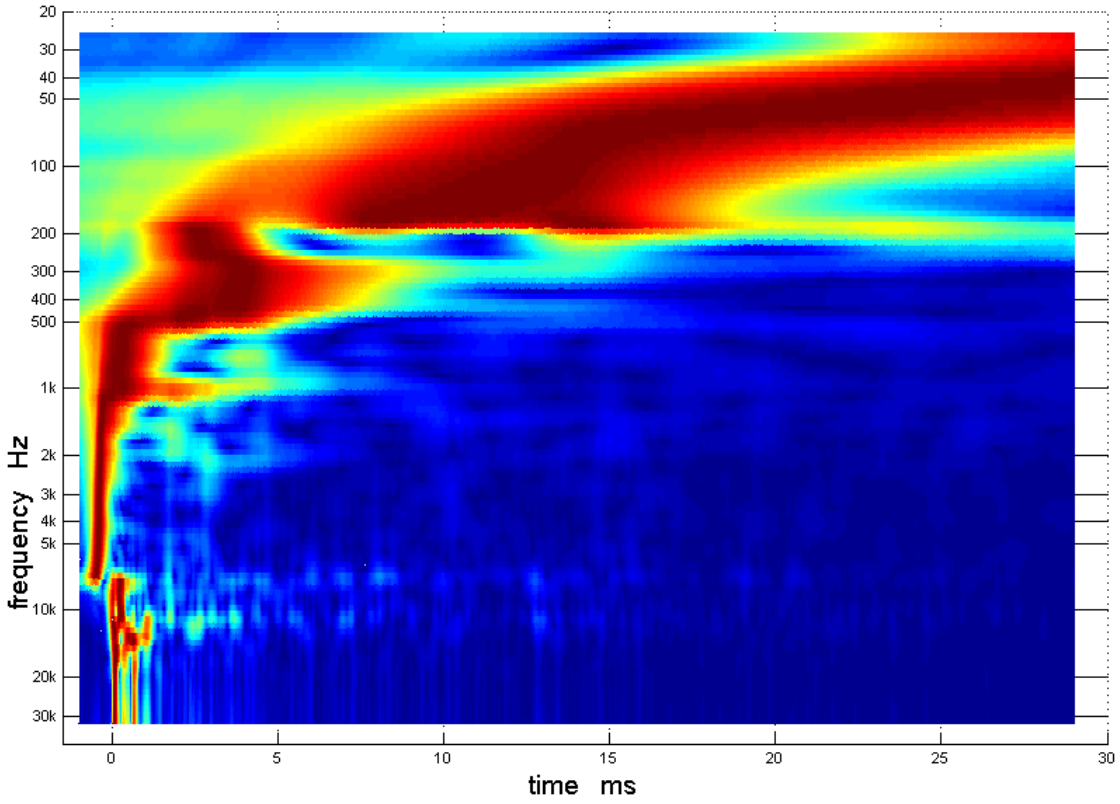
time ms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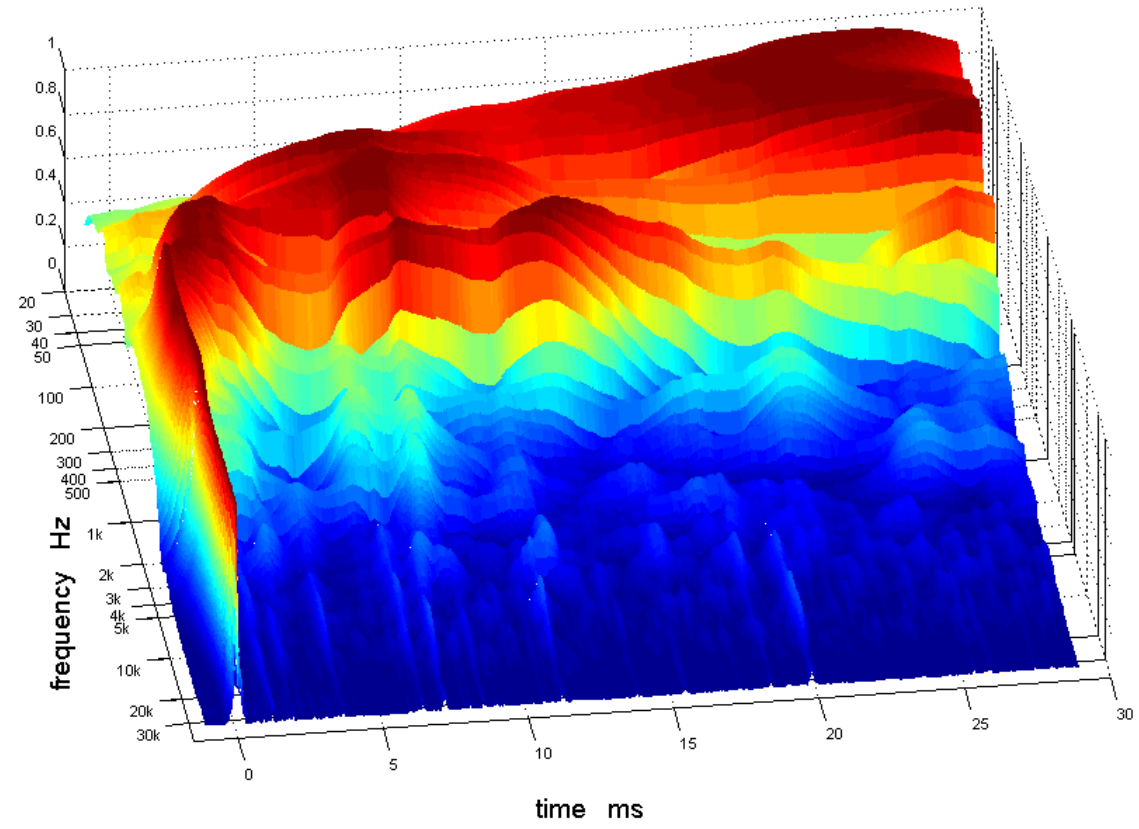
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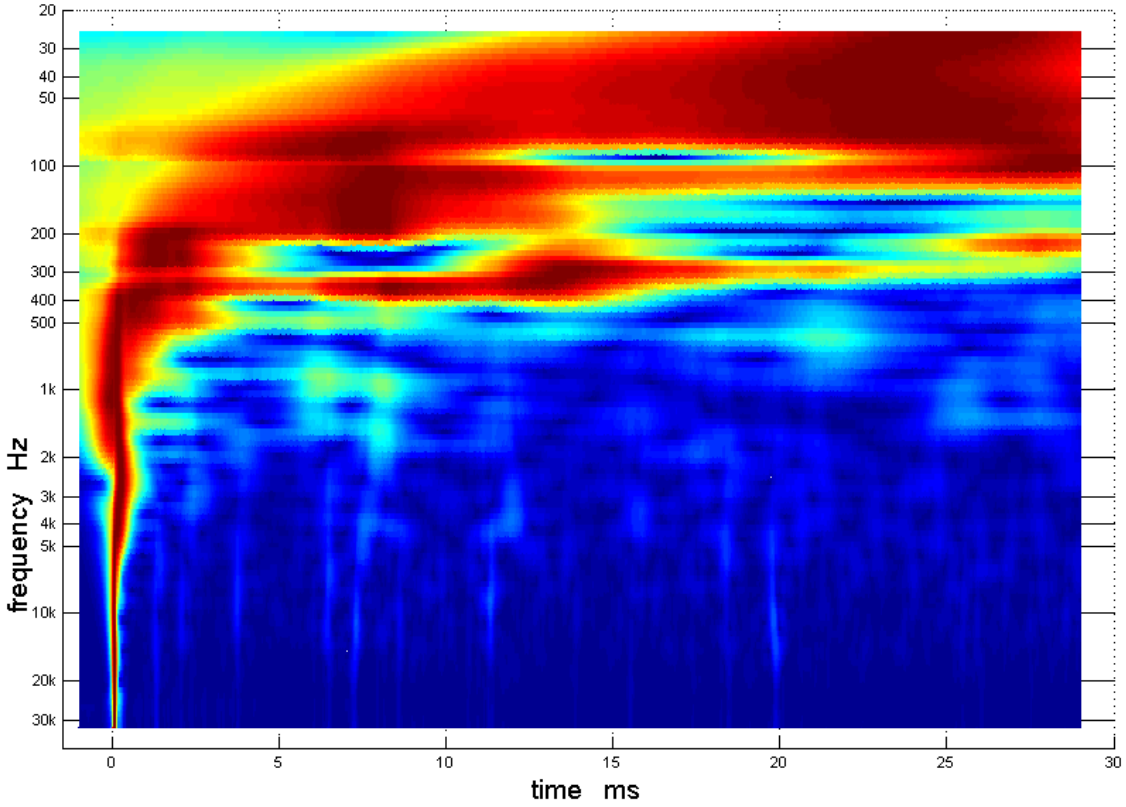
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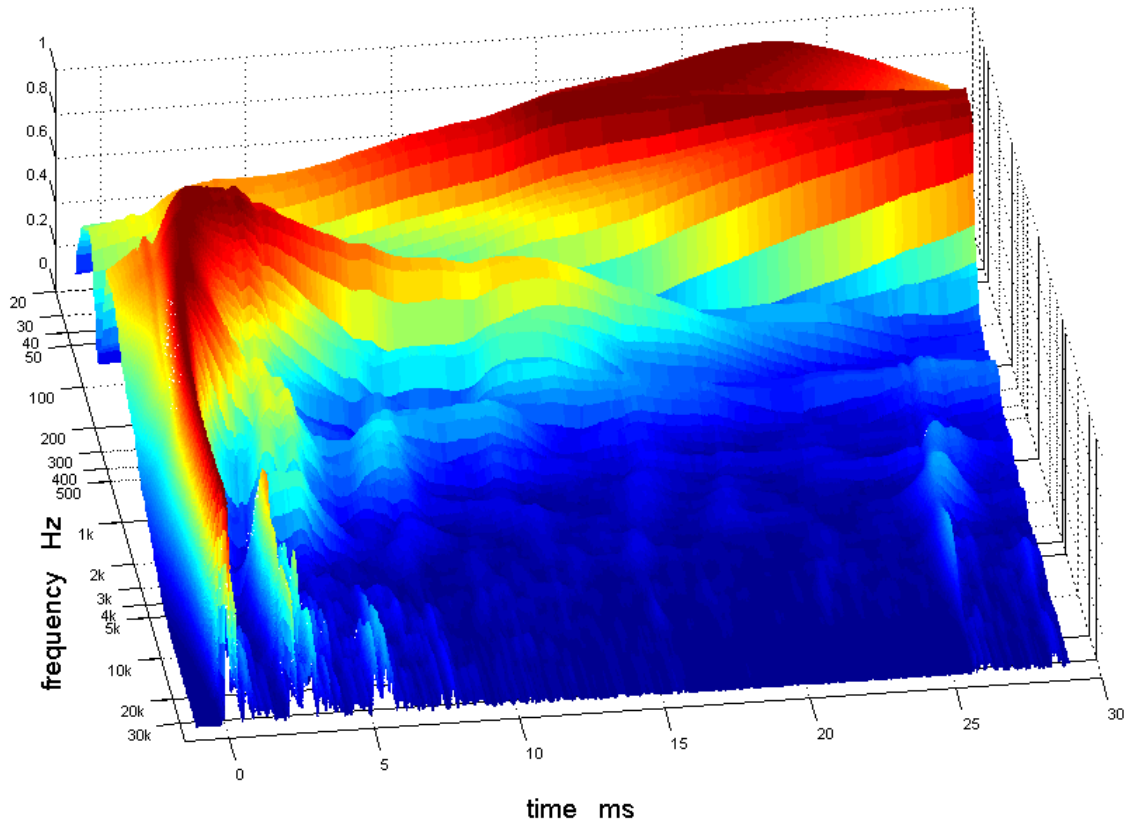
Helsinki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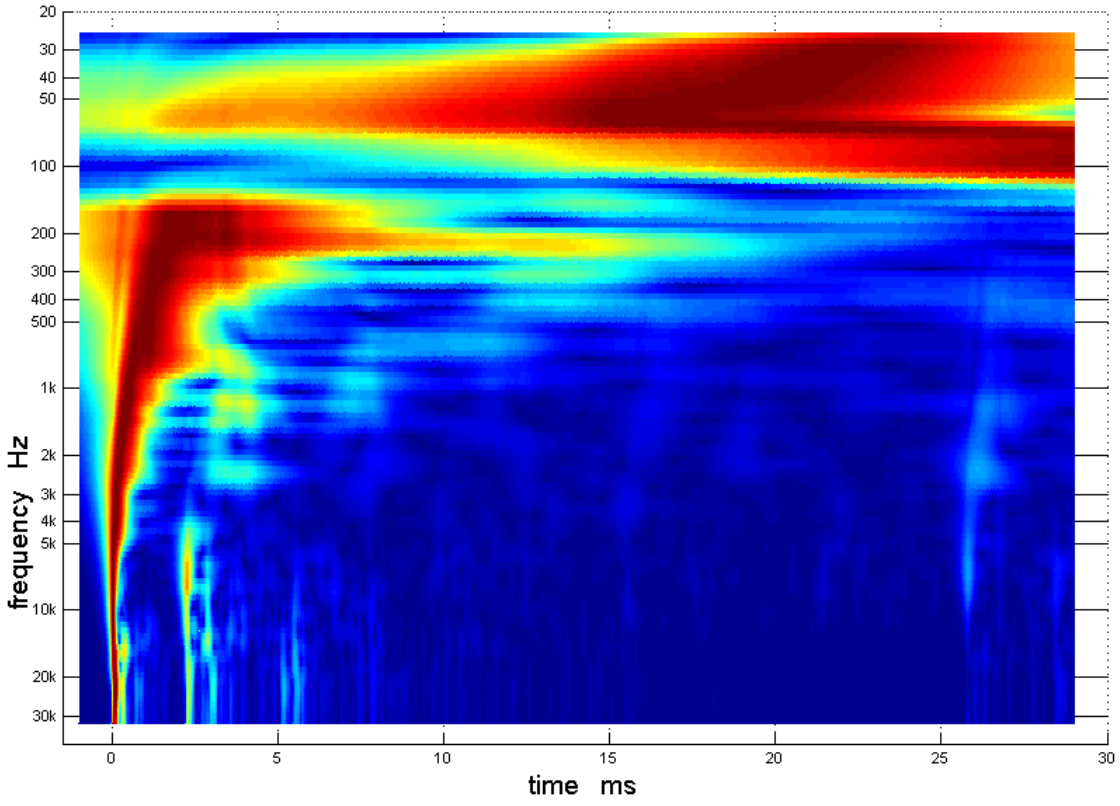
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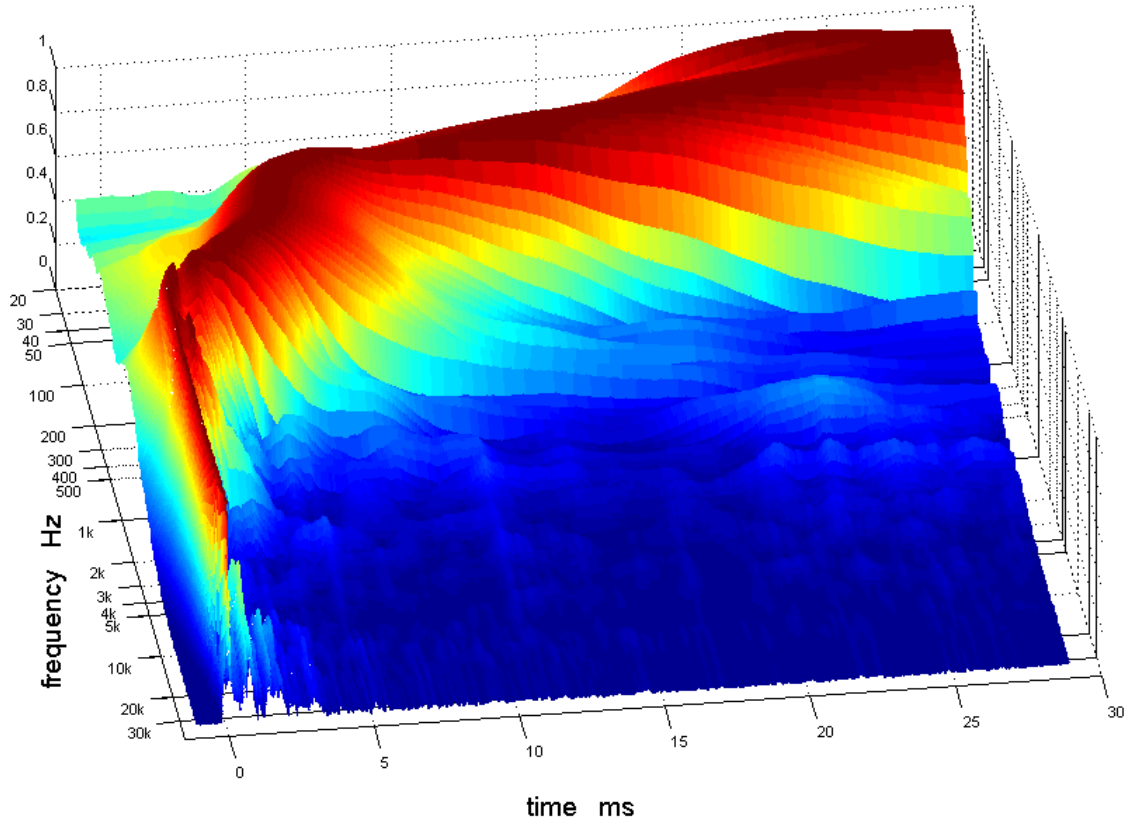
Rezekne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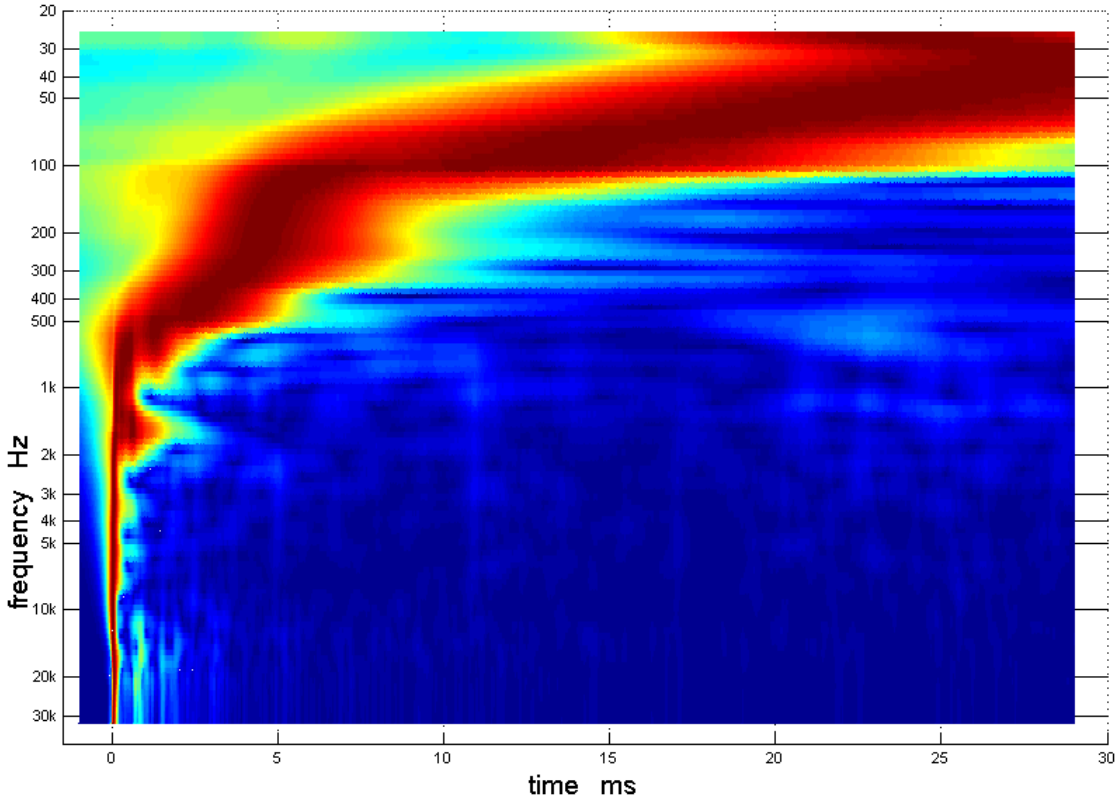
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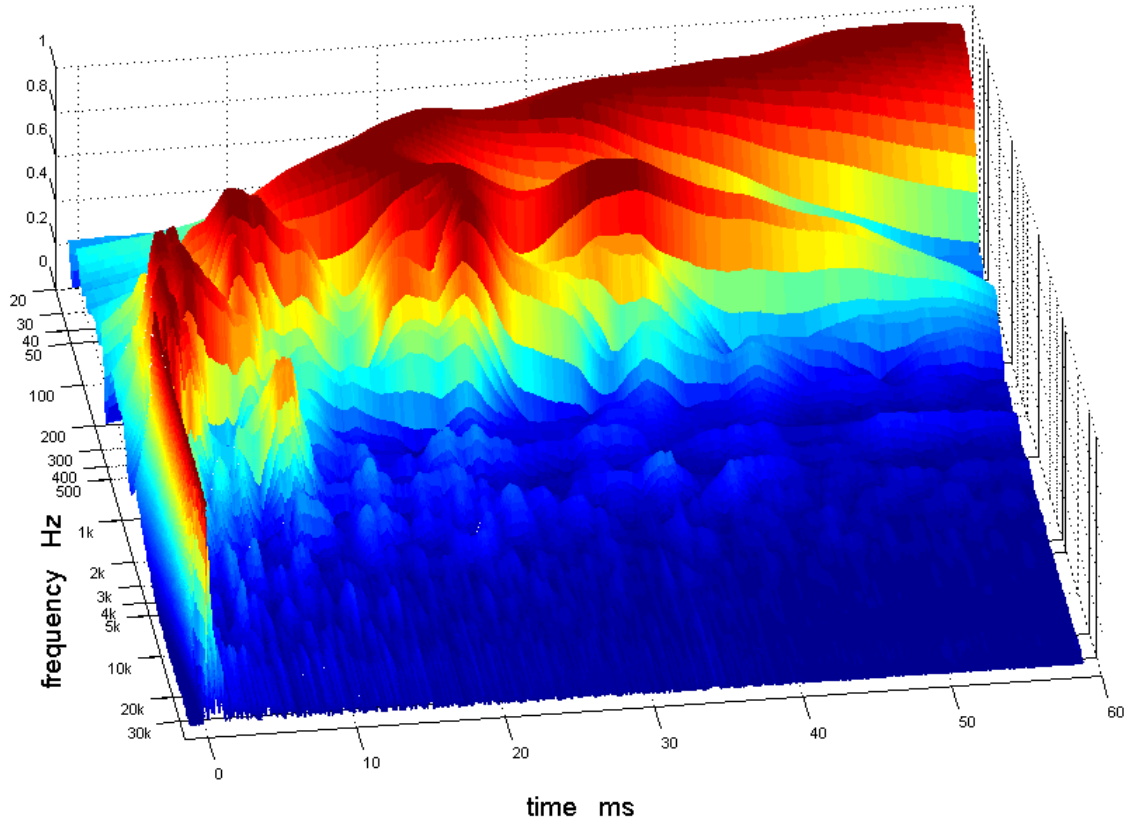
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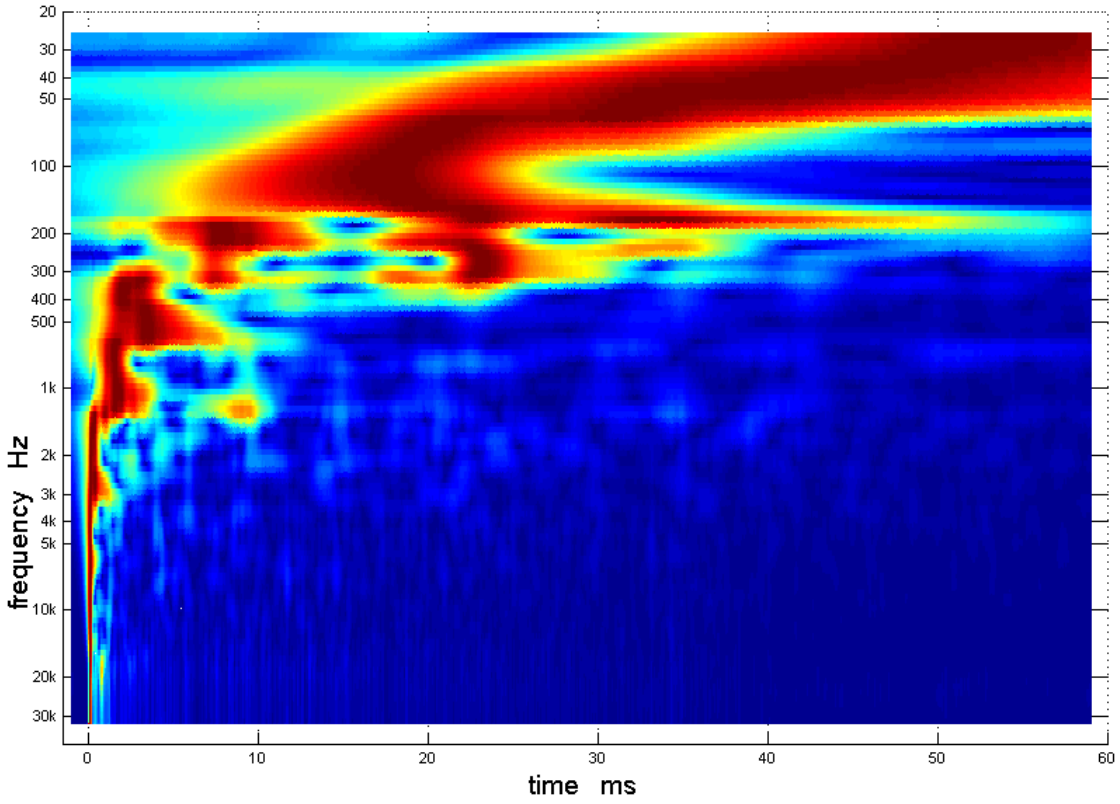
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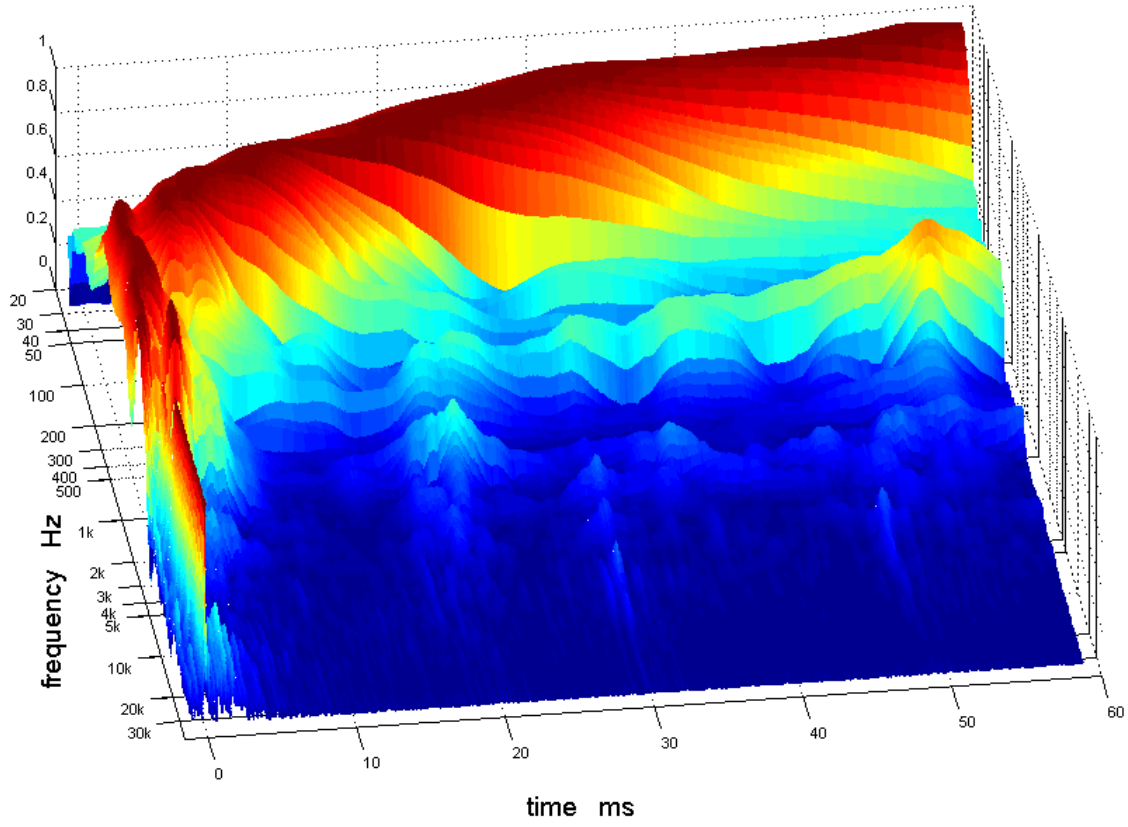
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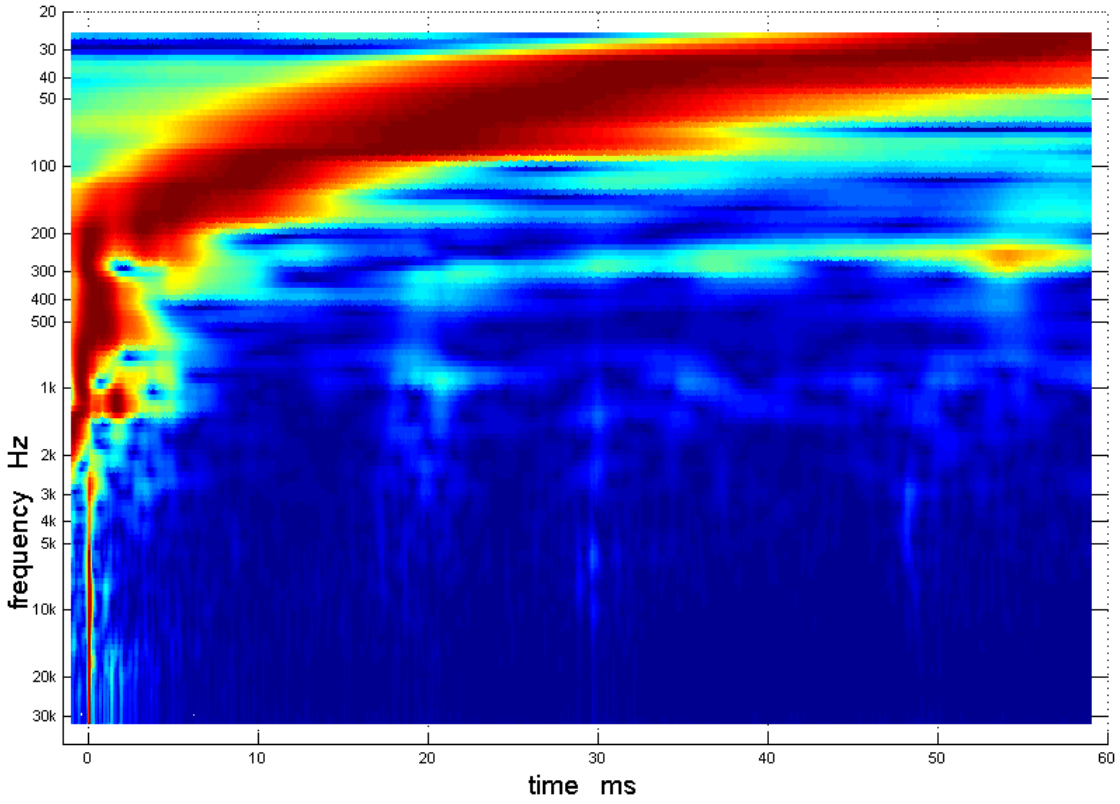
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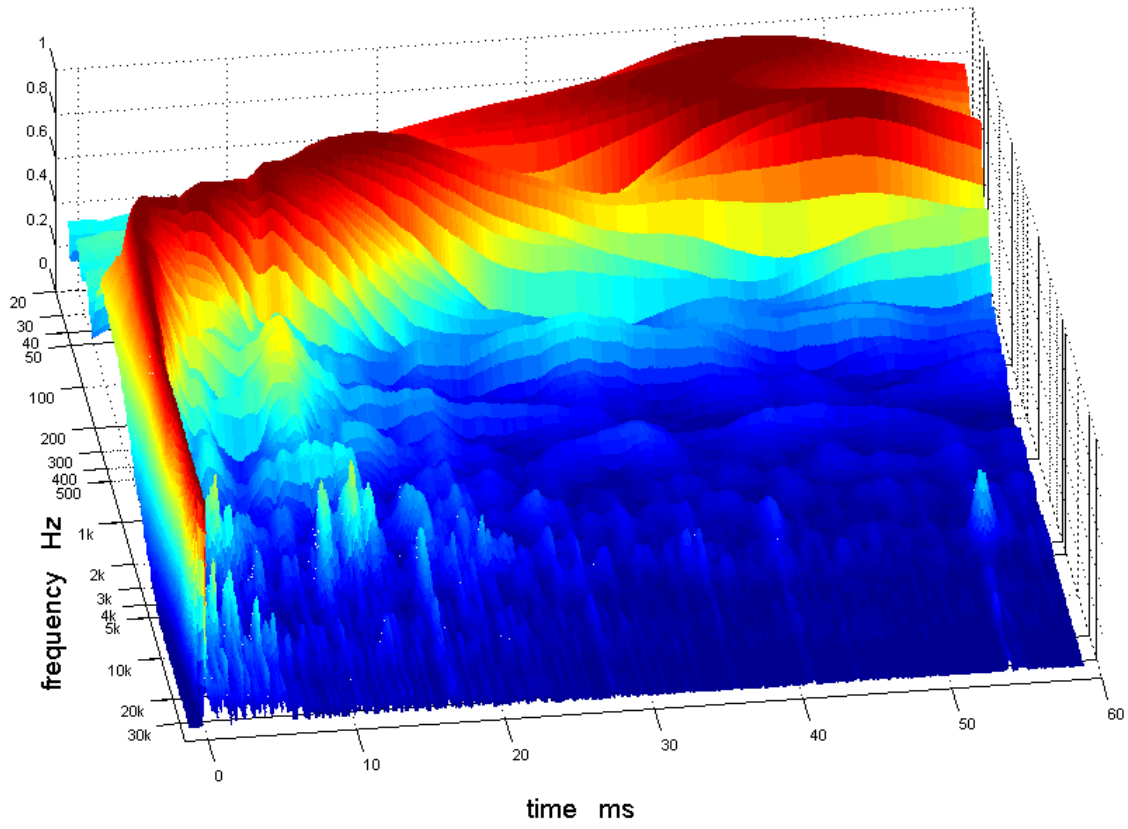
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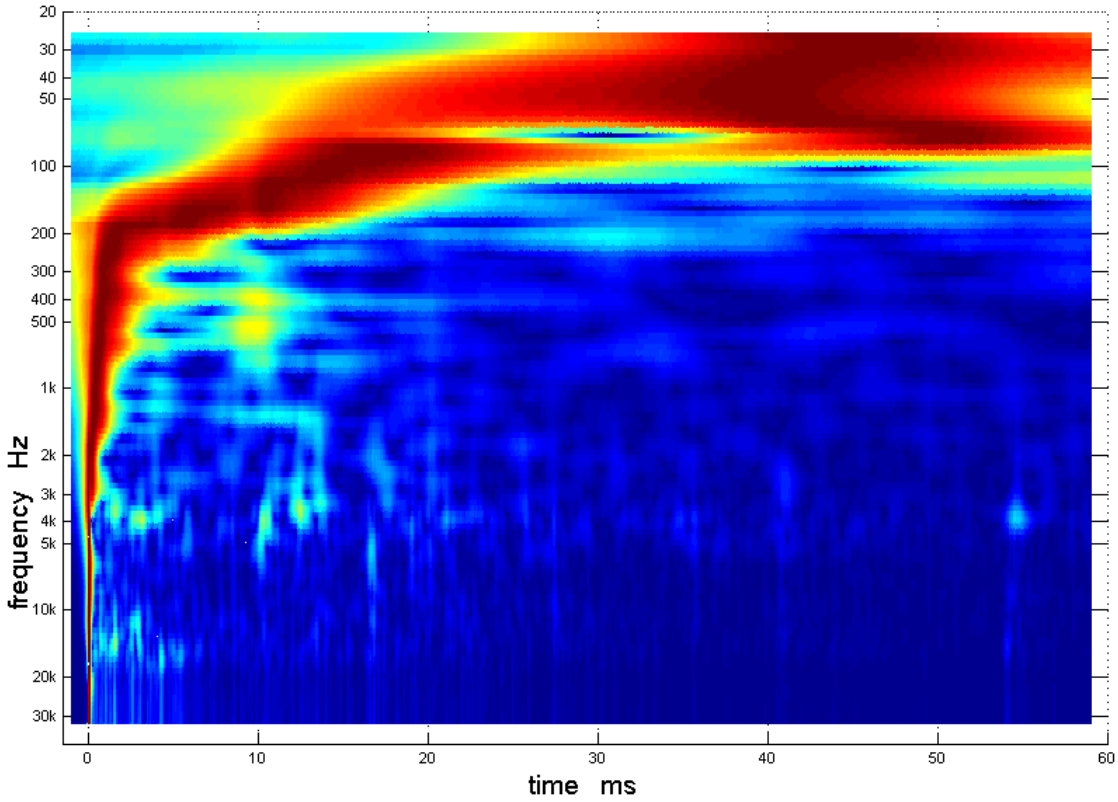
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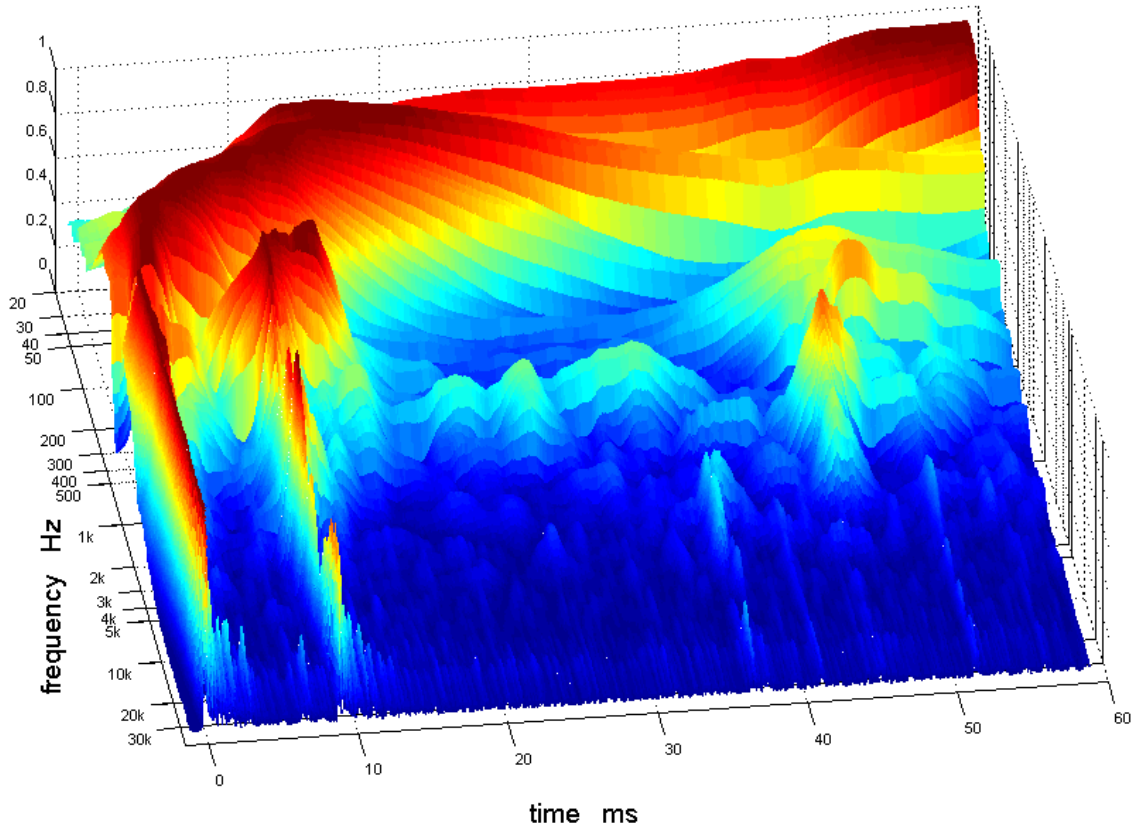
NY Club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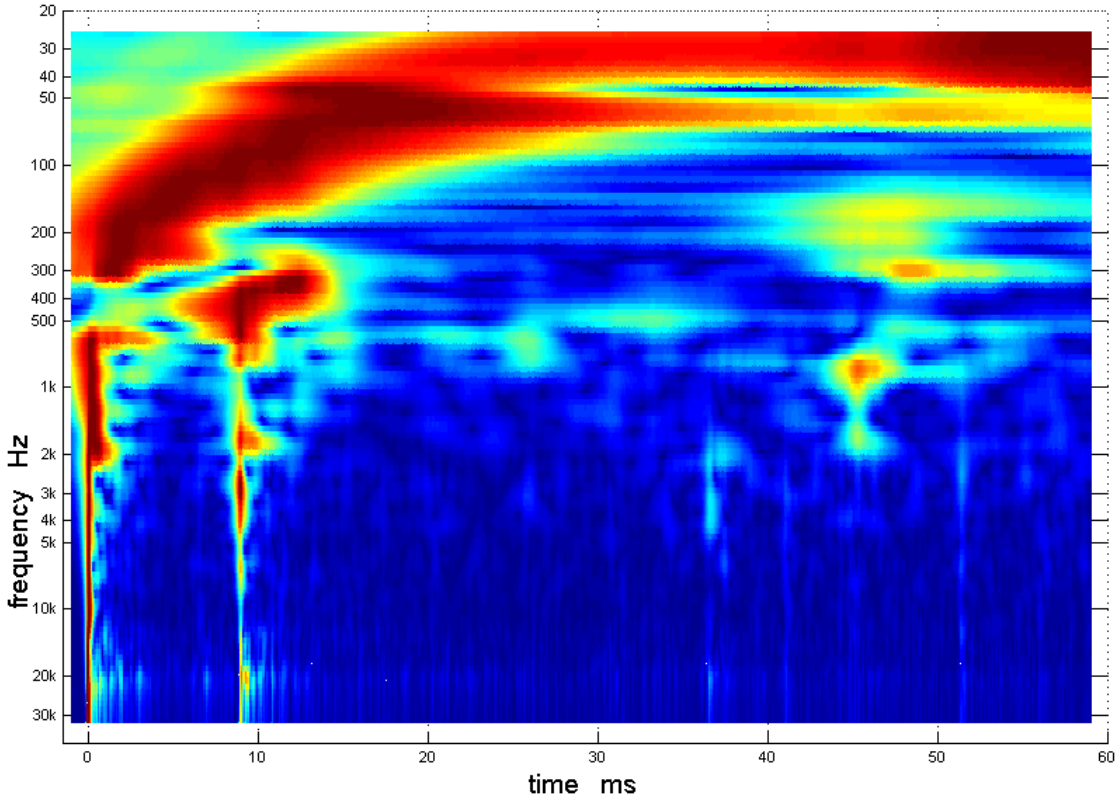
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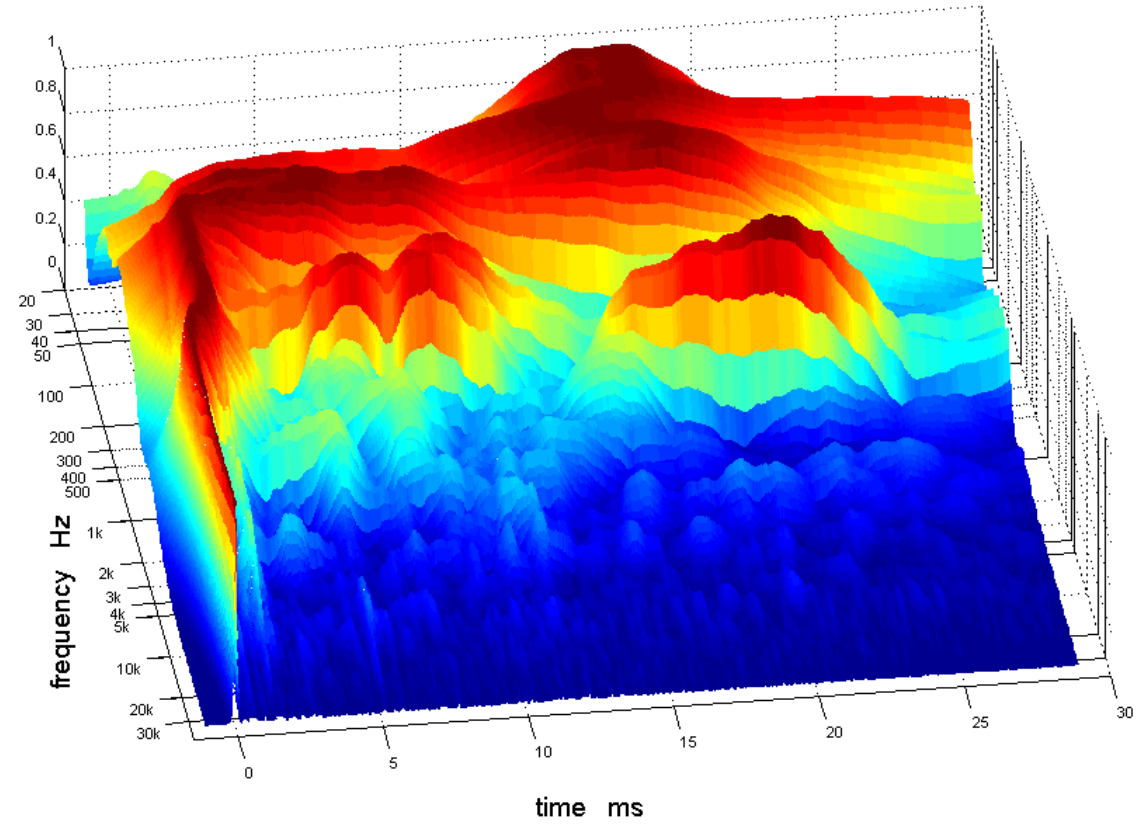
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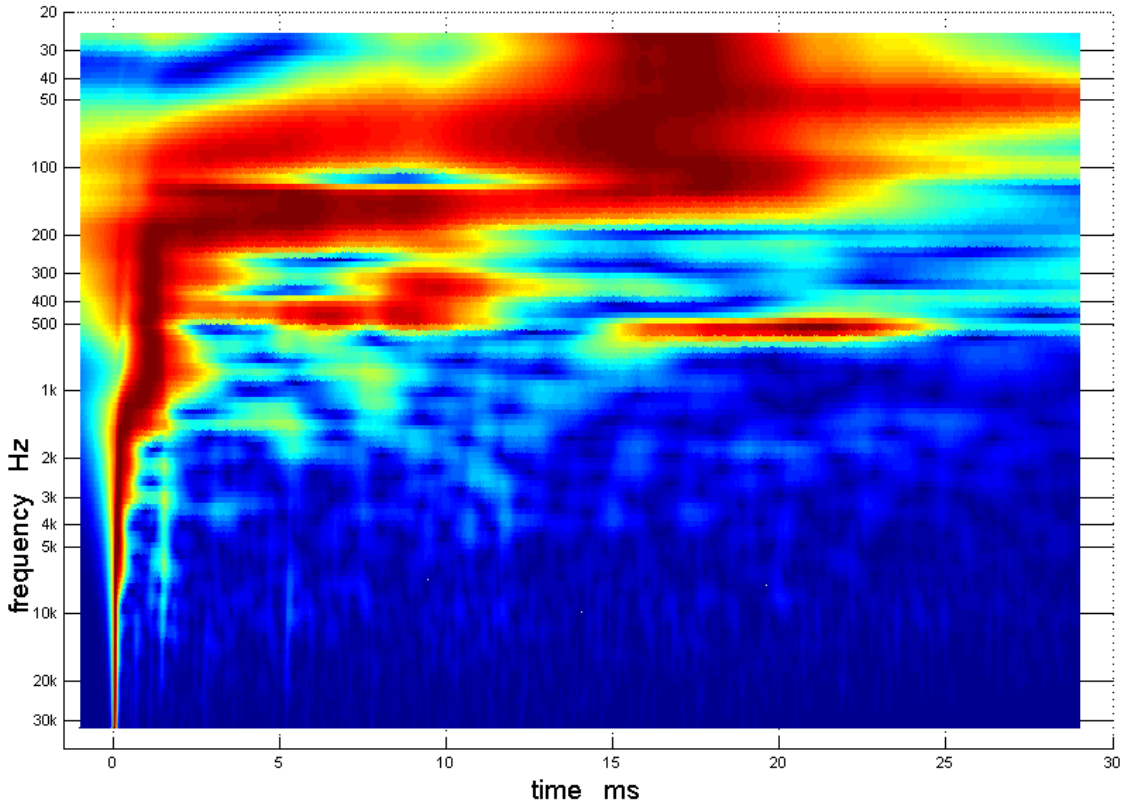
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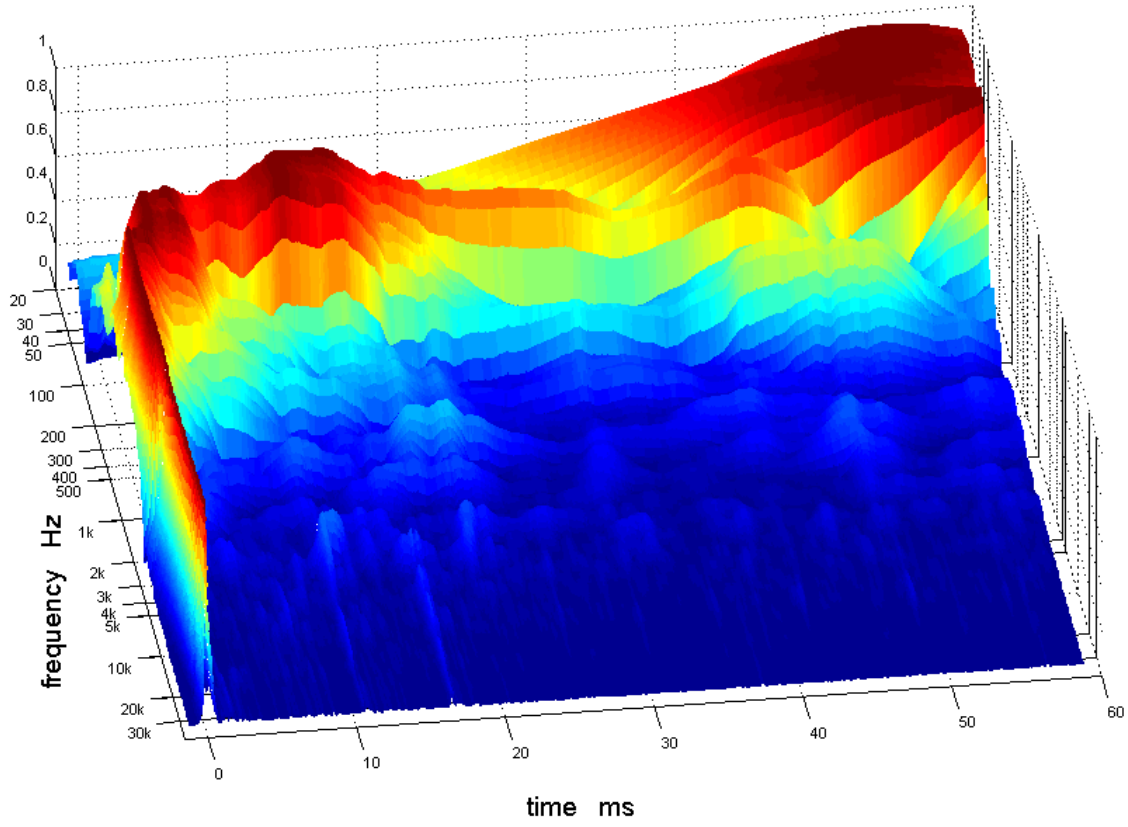
VJV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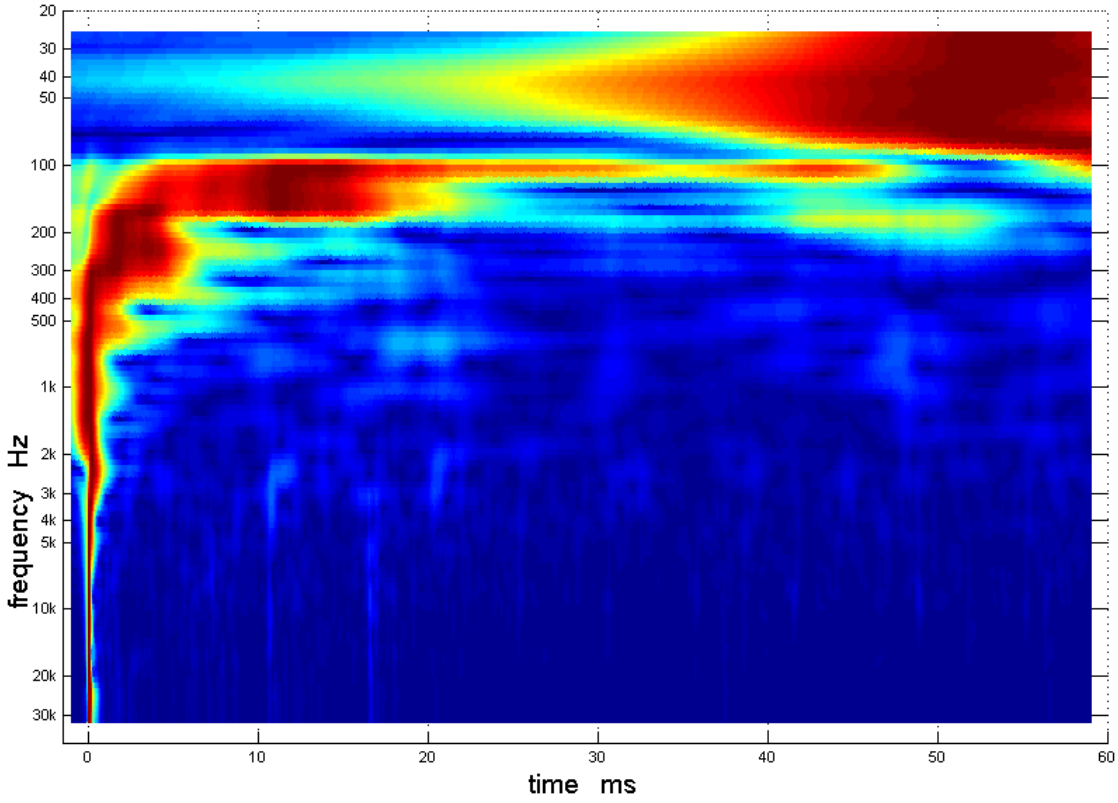
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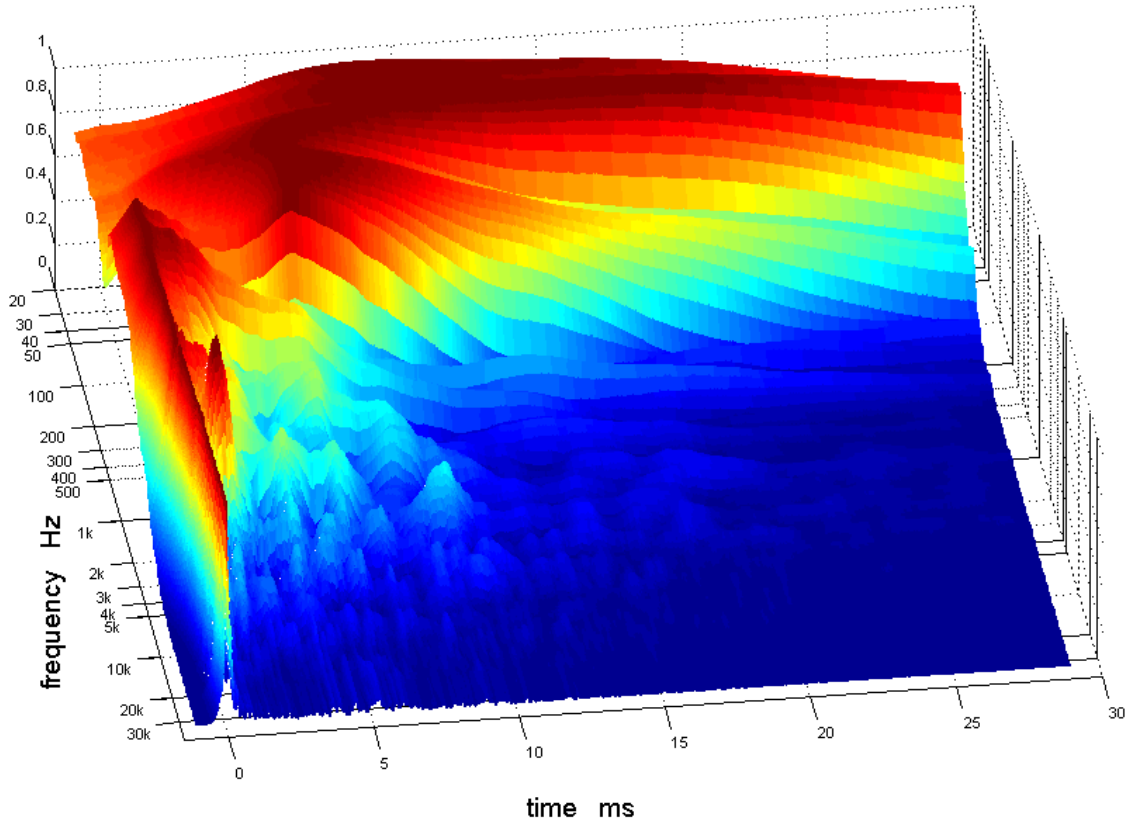
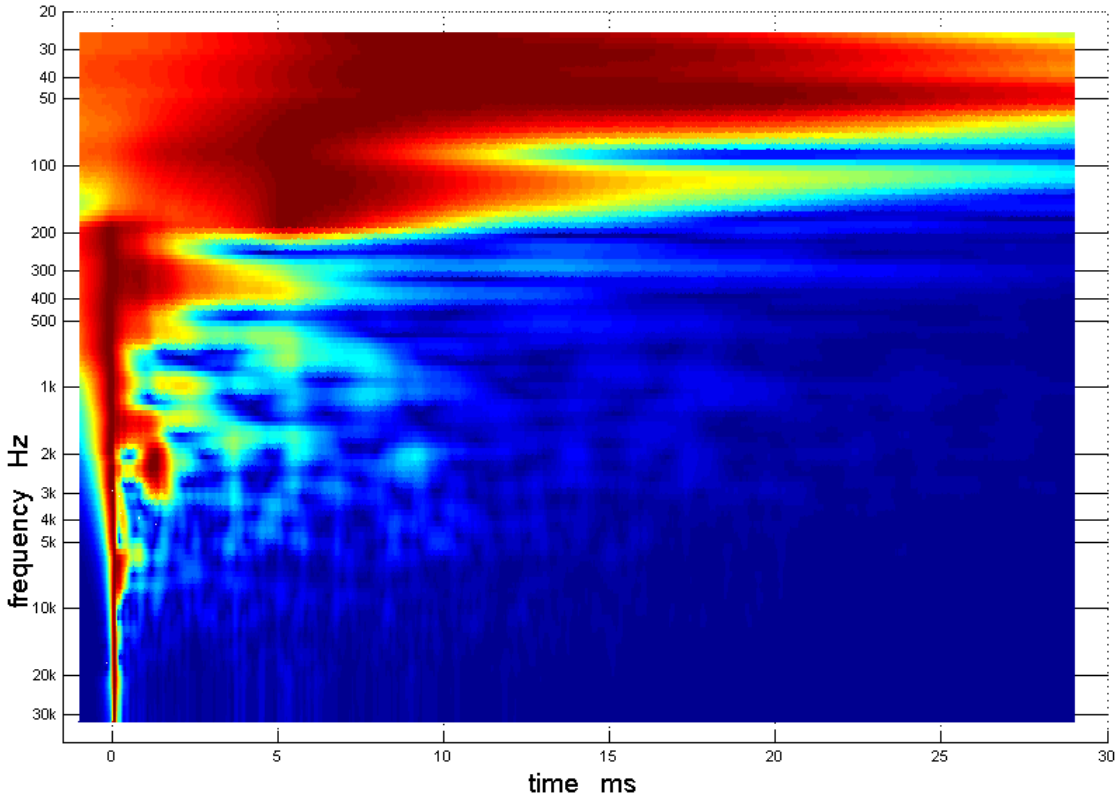
time ms

Some cars measured with TDA

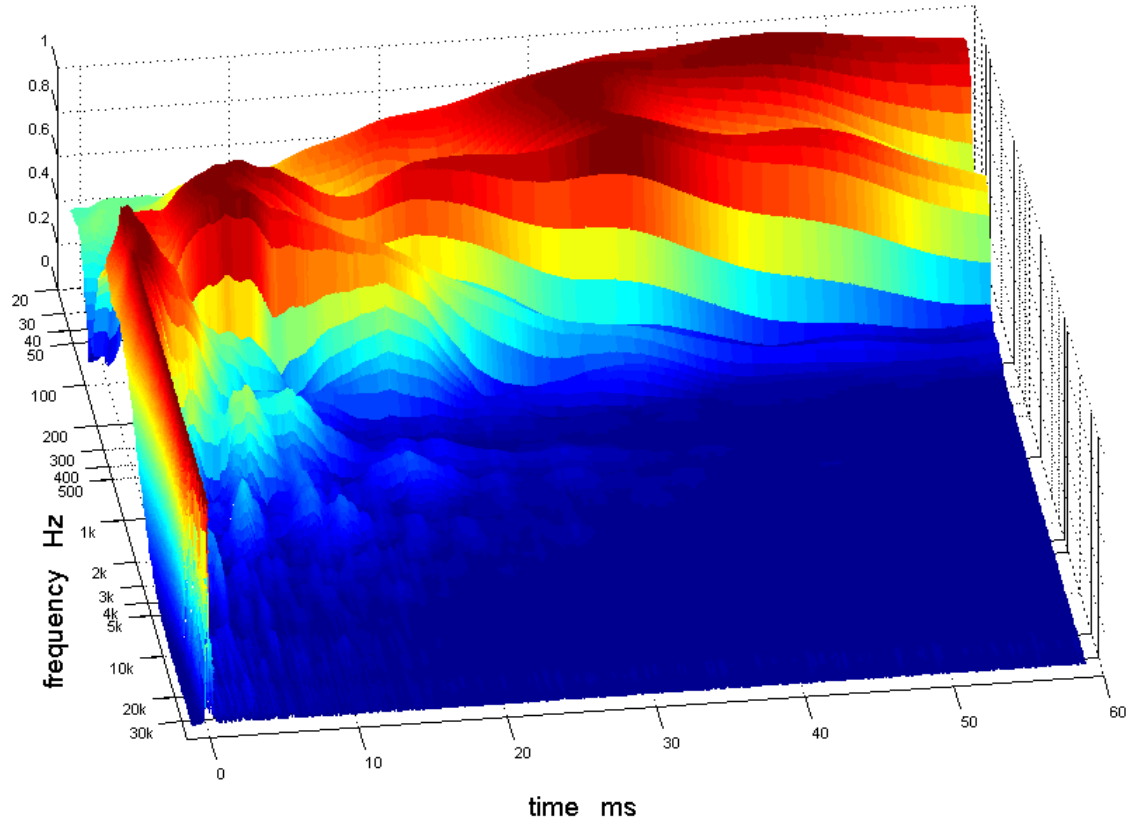
Dmitrijs

One very good but with a serious mistake in LF – delay for 5 ms (1 period)





Anna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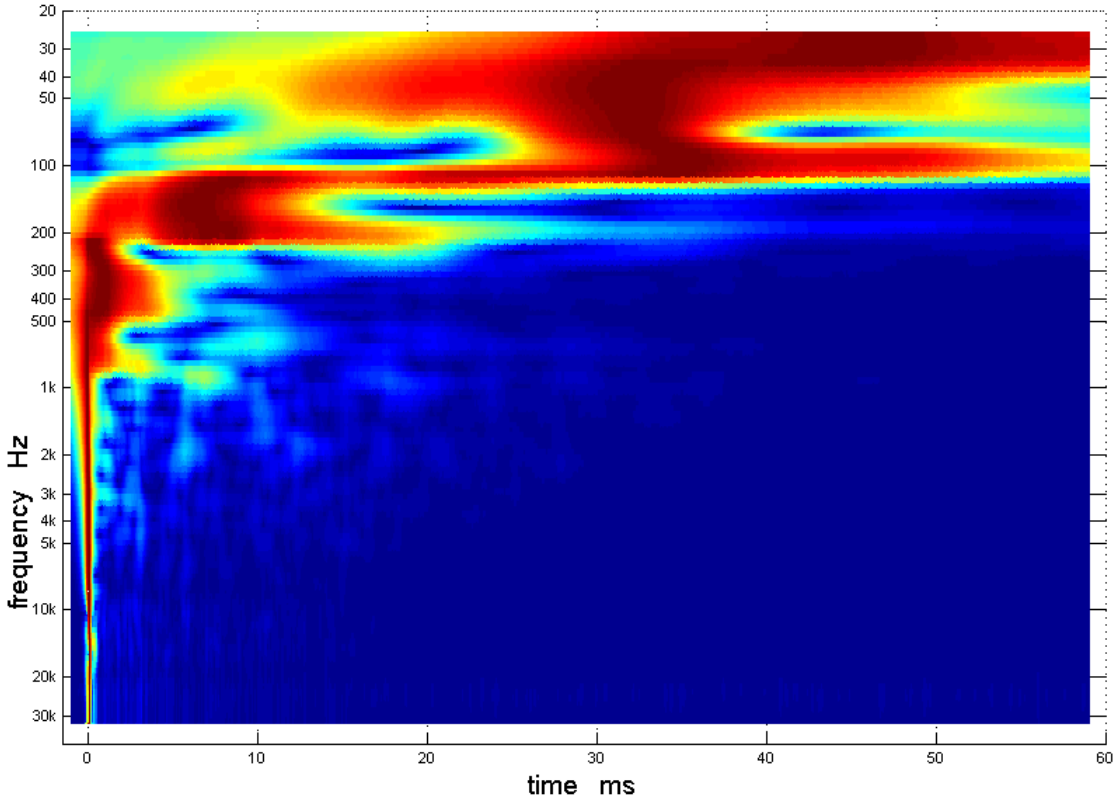
time ms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frequency Hz
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30
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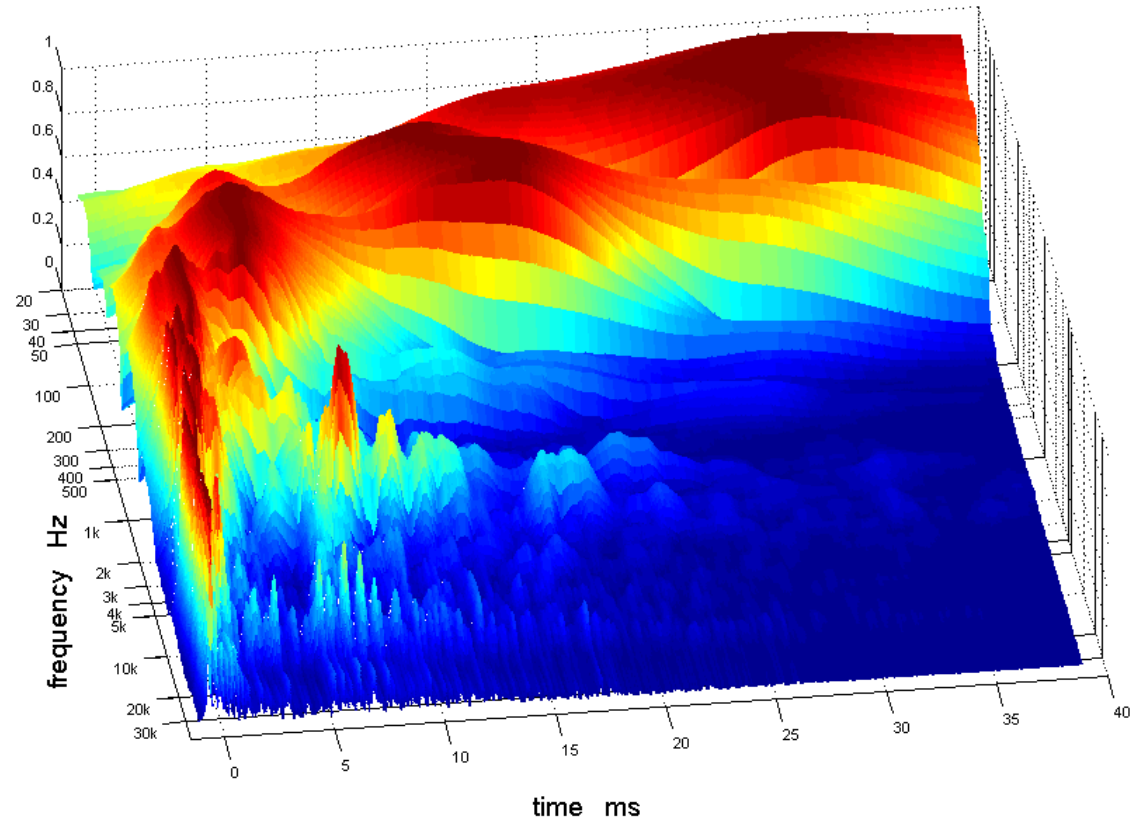
60
time ms

Honda 001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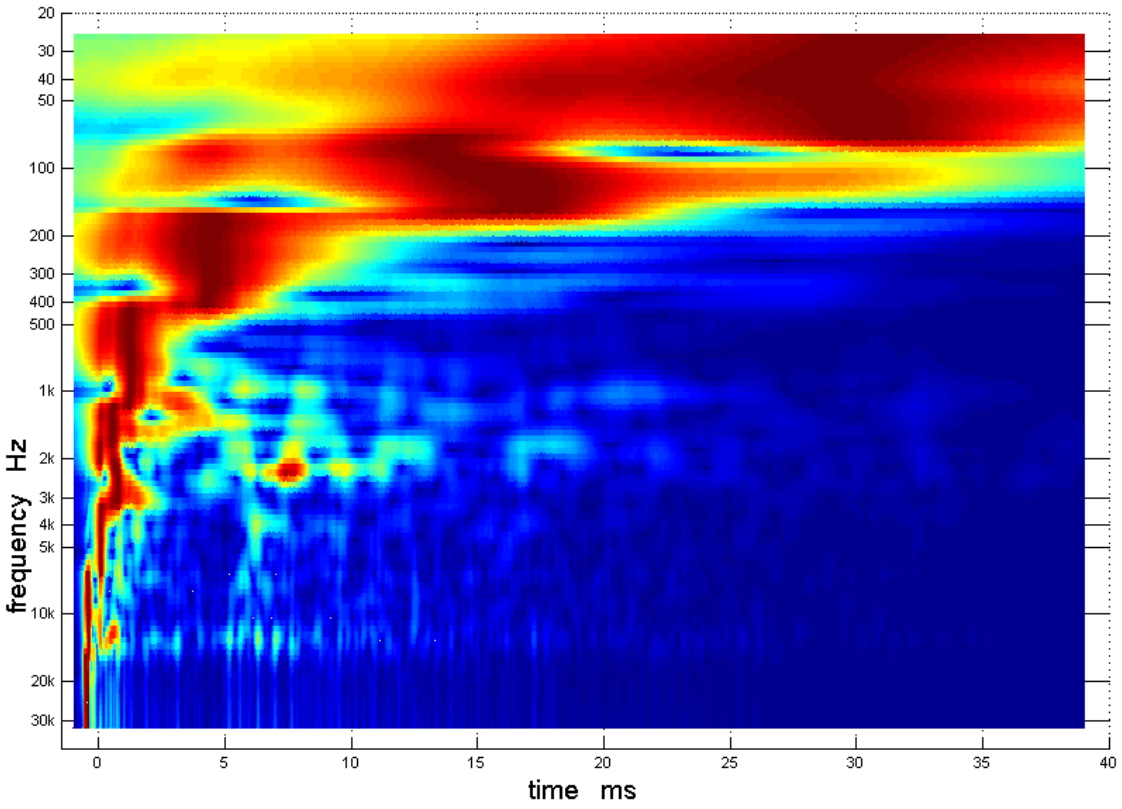
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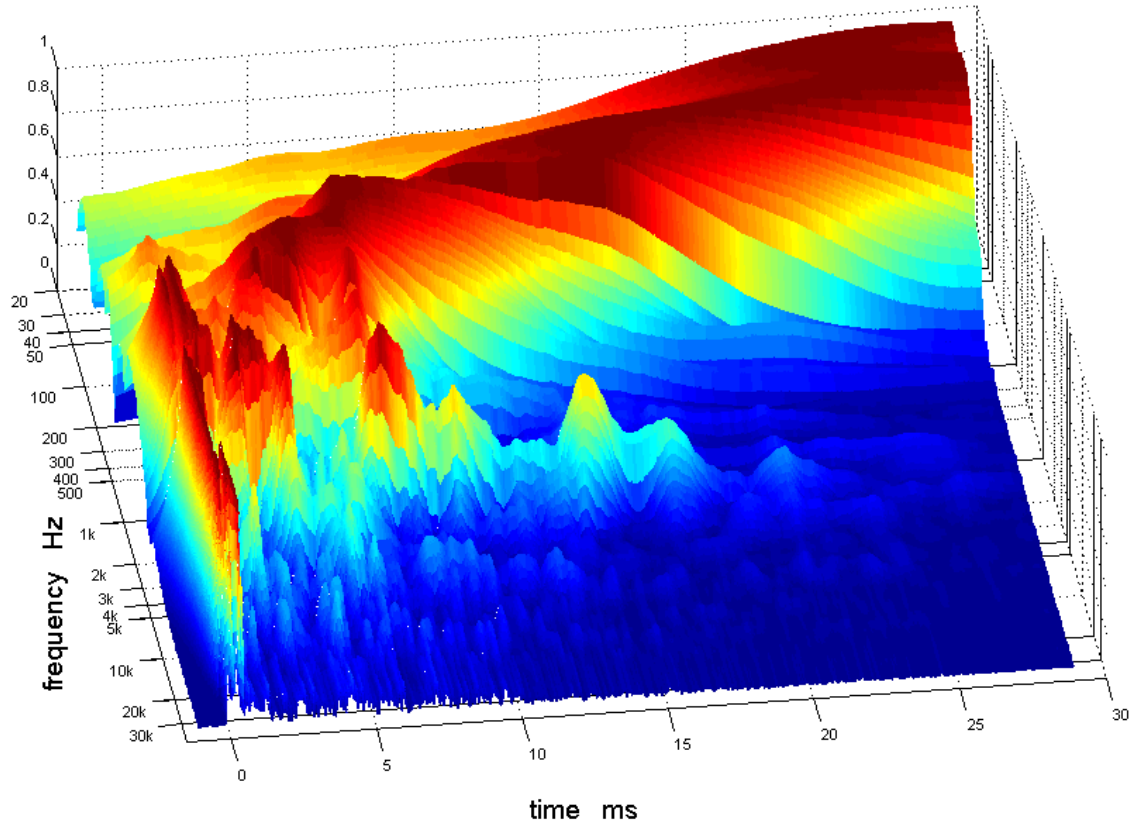
time ms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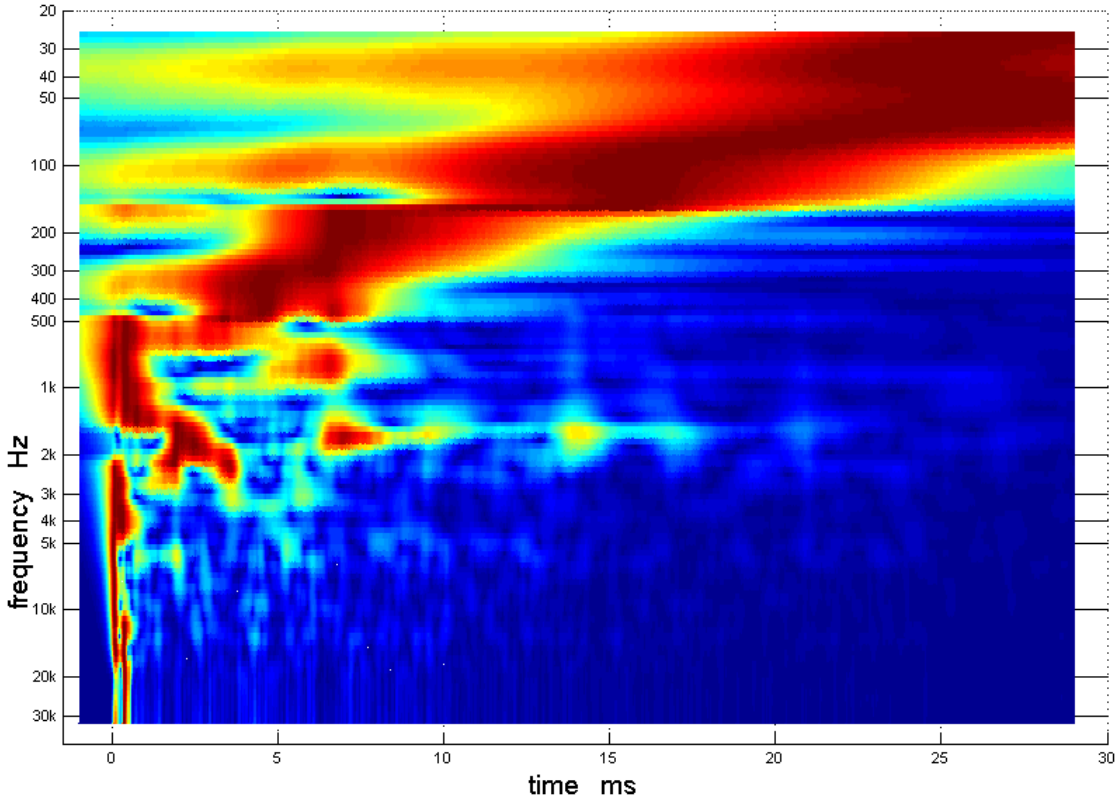
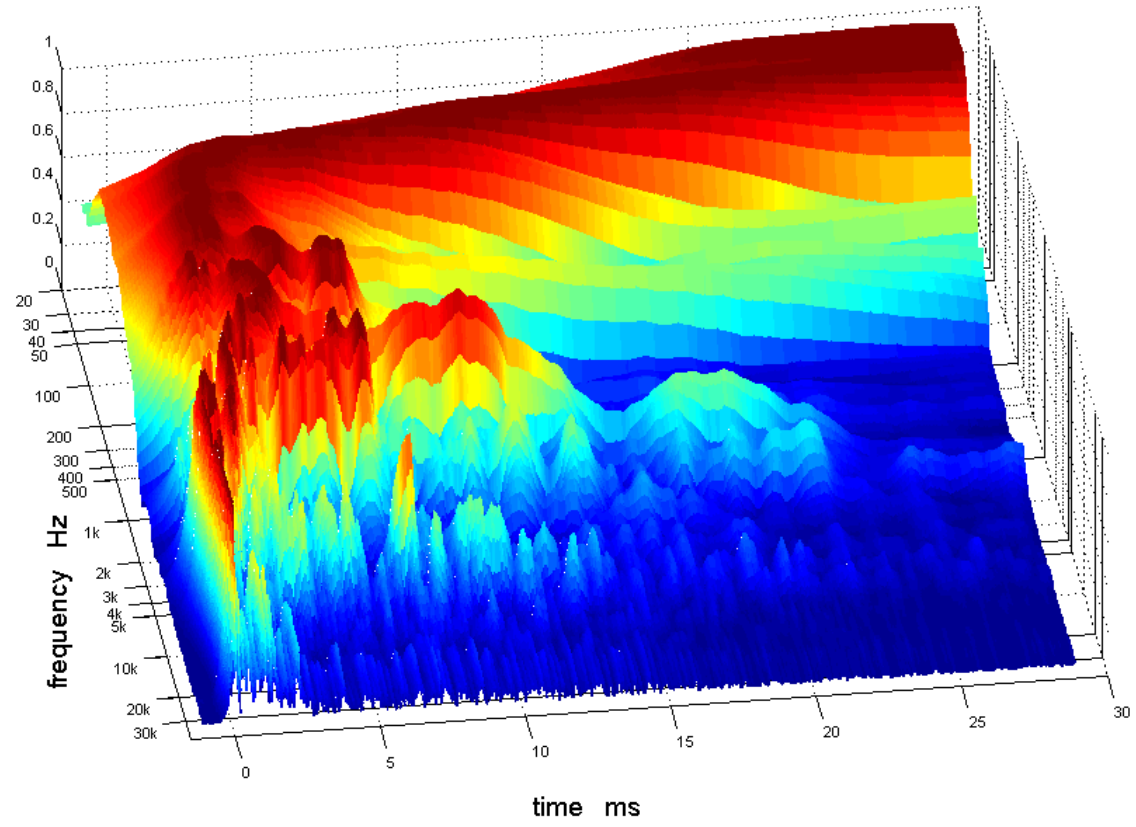
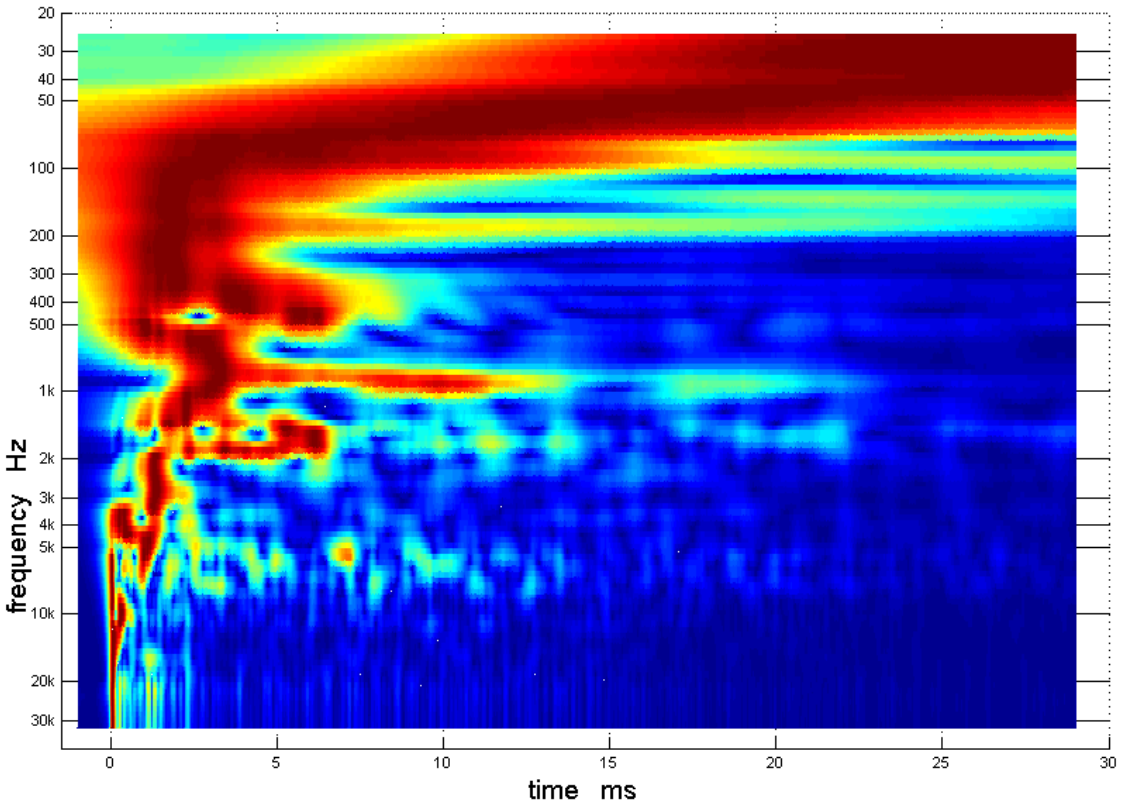

frequency Hz
time ms

A car from street





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