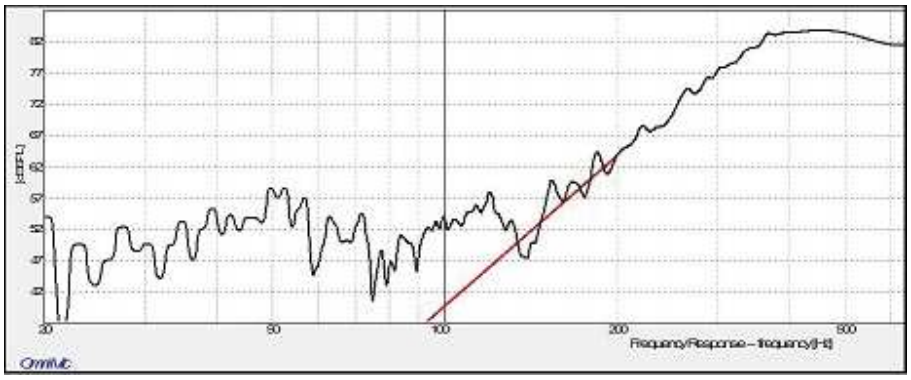
Cleaning up Frequency Response Curves (or calculating Minimum Phase responses)

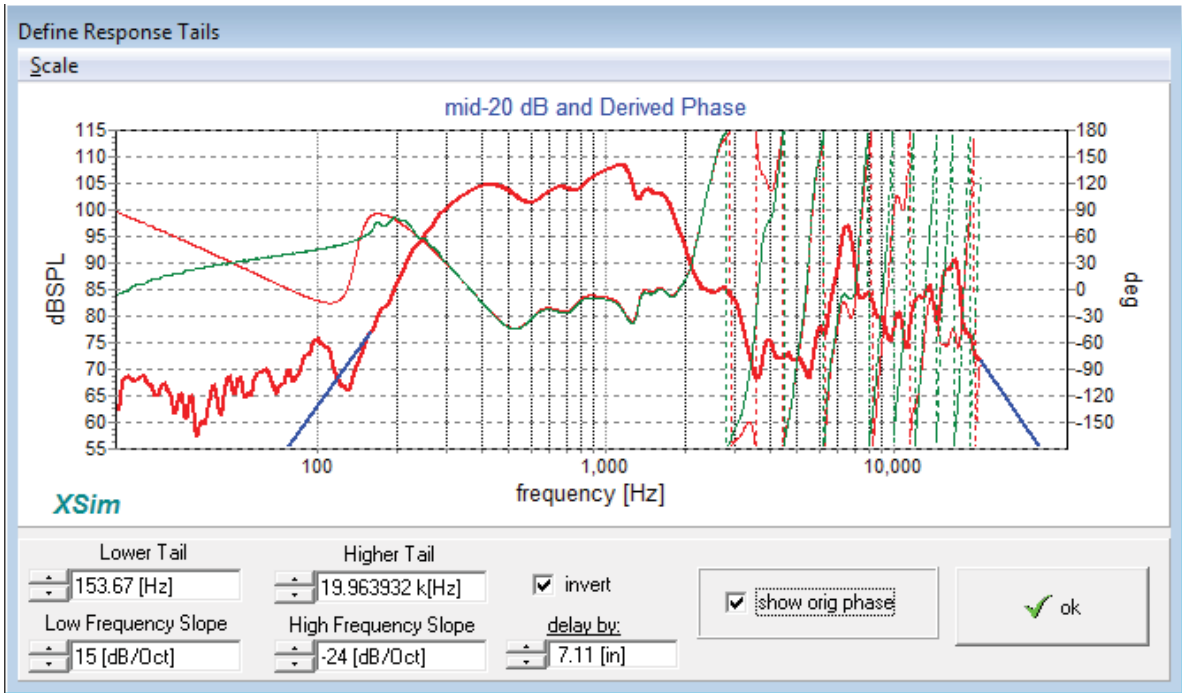
A reality of any physical measurement is the finite degree of dynamic range that can be practically obtained. Environmental noise, hardware limitations or mathematica processing can all limit the dynamic range of any collected data, and can result in portions of a measured curve in which data is corrupted, incorrect, or meaningless. A typical case would be at lower frequencies, where the frequency response in lower-level regions may show mostly the noise present at the time of the measurement.



This could cause errors in later interpretation, processing, or simulation using the data. Usually, the lower levels involved minimize the error caused in, for example, a crossover network simulation done in an application such as XSim, as the poor data will be swamped by energy from other signals in the same band. Phase data in that frequency range, however, will usually be completely incorrect, possibly even seeming random. And it certainly makes the data curve look poor.

Often the actual response shape in the lower level regions is known. For instance, at low frequency extremes, the response of a sealed box loudspeaker is known to roll-off at a 12dB/octave rate; a ported box rolls off at 24dB/octave. OmniMic provides a feature to allow you to fix these portions of a response curve, and to calculate the correct phase response shapes in these regions. NOTE THAT THIS PHASE CORRECTION WILL ONLY WORK ON SINGLE DRIVER (i.e., MINIMUM PHASE DEVICE) CURVES. For the calculated phase response to be accurate, the magnitude (dB) levels must be known even at frequencies below and also to much higher frequencies than the measured data.

In the Frequency Response section of OmniMic, use the "**File -> Phase Restore an FRD File**" **menu** to bring up an editing form in which you can select the points where to attach the estimated rolloff curves and the slopes at which they roll up (or down). You can also adjust the polarity and effective delay (relative to minimum phase) so that phase response will match over the strong parts of the curve. This operations can be performed on **saved** frequency response (FRD) files, and the result is saved onto another (or the same) FRD file, as you choose.



To use the feature, use the menu item to load from the presented browser the FRD file you want to fix. Click on the box labeled "show orig phase", set the Lower Tail and Upper Tail frequencies, and if necessary, the Low Frequency Slope and High Frequency Slope. As you make these settings, the calculated "**minimum phase** response" curve (the thin green line) will update. For cleaning up data without affecting the phase response in the strong signal area, adjust the applied delay ("delay by") and polarity along with the rolloff slopes, if necessary, to match the phase of the measured curve in the area where the magnitude is strong. (If you are only looking for a minimum phase curve for the data, set the delay to zero (0) and the rolloffs to the best estimate of the device rolloff in the noisy or out of band area).

Then click 'Ok' and OmniMic will prompt you for the file name to save the new results under.