Room EQ Wizzard

REW will be used to do the following:

1. Measure the room frequency response;
2. Generate create the initial parametric EQ filter settings to achieve a flat frequency response.

See the following topics:

- Umik-1 Setup
- Make Measurements
- Smoothing
- Averaging

Multiple Averaged Measurements

Measuring

In REW it is possible to average a number of measurements. The idea behind this is to eliminate over-corrections which validity is limited to the exact place where the microphone has been setup in case of a single measurement. Use an imaginary cube of 25 cm around your hear position and perform +/- 5 measurements all at ear height with the mic always pointing to the front wall (or to the ceiling if your mic is designed that way and it has 90 degrees calibration file). Resulting in a total of 10 measurements for two speakers - to the left, right, front and rear of the LP each around 25 cm away from LP. If you consider bass upper frequency limit to be 200 Hz which converts to a wavelength of 43 cm, a 50 cm wide (25 x 2) measurement area seems to cover enough of the bass waves.

For the center head position, take two measurements for Left and Right speakers as this is the most important location. Using two measurements at the LP will give a slight bias to the central position during averaging. Keep both measurements if they are identical (they should be identical at least past the speaker’s lowest bass frequency capacity). If they are not identical it is probably caused by some unwanted environmental noise during measurement, you should delete the irrelevant looking one.

Time Alignment

Before averaging make sure that all measurements are time aligned prior to making any kind of algebra on these measurements. Select the corresponding measurements inside the ‘All SPL’ tag of REW and use the ‘Time Align’ function in the Control window. Do not align IR starts!

Averaging

Select the measurements you want to average in the ‘All SPL’ tag of REW and use an Average function inside the Control window.There are several algorithms for averaging. Vector Average differs from other methods (like RMS Average) because it sums magnitudes and phases coherently, meaning

phase differences cause cancellation and dips, especially in high frequencies or different positions, which is great for multiple measurements at the same spot but less so for different locations. The RMS Average, however, treats measurements as incoherent (ignores phase) by averaging power, resulting in a smoother curve without deep nulls from phase cancellation, making it better for multi-position averaging (like across a listening area). The difference often appears as dips in the vector average that aren't in the RMS average, due to reflections or timing variations between measurements. When to Use Which Average

- Vector Average: Use for multiple measurements from the exact same spot (or time/level aligned) to see the coherent sum, good for detailed analysis and filter generation for that specific point.
- RMS + Phase Average / dB + Phase Average: Good for multiple measurements from different spots, averaging power while keeping phase info, resulting in a smoother, less cancelled curve.
- RMS Average: Best for averaging many measurements from different locations (spatial averaging) to get a general, smooth representation of the overall room response, effectively removing reflections.

Why They Differ (The “Problem”)

- Phase Cancellation: With vector averaging, if measurements have slight timing shifts (due to reflections, mic placement differences, or clock drift), the phase relationship changes, causing destructive interference (dips) at certain frequencies.
- Coherent vs. Incoherent: Vector averaging is coherent (like summing sound waves in phase), while RMS averaging is incoherent (like summing sound power), which doesn't cancel out.
- Spatial Averaging: For multiple listening positions, RMS averaging is better because it averages the power (what you hear) rather than the complex wave, which is less affected by reflections and phase.

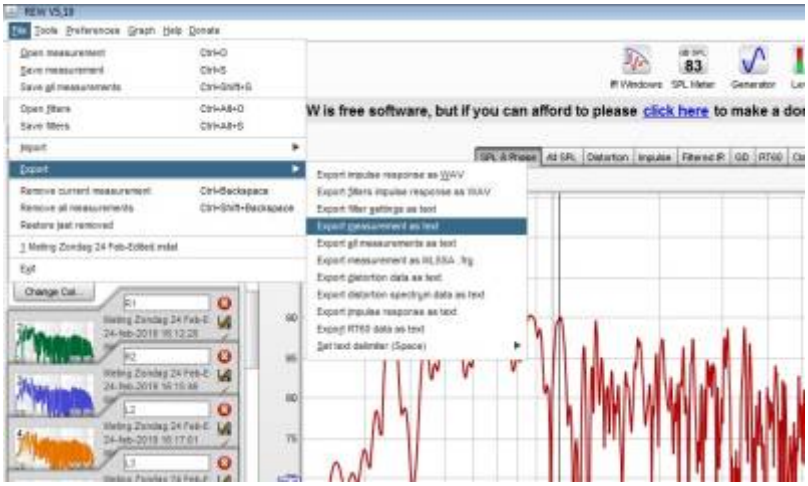
Solution if They Differ Unexpectedly

- Time-Align: If using Vector Average for nearby spots, time-align the impulse responses first using REW's tools.

In case of Vector Averaging check the averaged curve. In case of anomalies, there is probably a phase problem in the measurements (reflections or timing). For simple EQ (room nodes)use then RMS/DB averaging. Dips in the curve are occurring at frequencies where measurements are out of phase with each other due to room effects. You can use the RMS or dB average to ignore phase, giving a magnitude-only result. If you need phase in the result you could use the RMS+phase or dB+phase average options.

Save Measurements

Now save the measurement so that it can be used in Rephase as a baseline measurement. Select “File → Export Measurement → Export Measurement as text”.



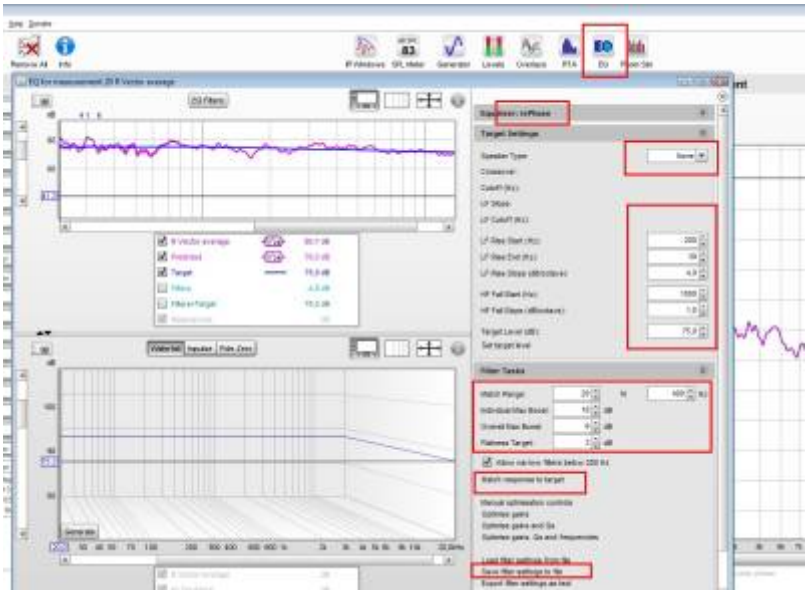
Generate EQ filter

Now we will create equalization filters for each channel using REW's own EQ filters tool.

Select the "Left Speaker Average" measurement and click the EQ button. In the popped-up EQ window, change smoothing to VAR (it should be at 1/48 smoothing by default due to FDW and you can even select "no smoothing" as vector average of various measurements is already smooth enough in most cases). VAR smoothing is good if you will EQ in the whole frequency spectrum and RePhase it later. If you will just EQ the bass frequencies just leave it as is.

In the top menu press the EQ button and apply the following settings:

- On the right side of EQ window under Equaliser choose rePhase.
- Under Target settings configure a target type as close to your speakers' true frequency response as possible. In my case "Full Range Speaker".
- House Curve: preferred settings for your room. Set target level to have REW set the target level or configure it manually.
- Target Level (dB SPL). Should be around the lowest dips of the frequency response to avoid the EQ from boosting too much. You can use the button "Calculate level from Response" which will suggest an appropriate level.
- The "Allow narrow filters below 200 Hz" option lets REW use very narrow filters (high Q) to correct peaks from room modes (standing waves) in the low bass region to tame bass peaks, while unchecking it (for device EQ) limits filters to a maximum Q of 5, preventing over-correction and distortion in the bass. It's generally selected for room correction (bass) and deselected for headphone/device EQ.
- Option "Vary max Q above 200 Hz" allows to use progressively narrower (higher Q) filters for bass issues below 200 Hz but allows for broader (lower Q) filters at higher frequencies, preventing overly sharp, unnatural-sounding corrections above the bass region, aiming for a smoother, more musical result as it moves toward treble. It's often used with "Allow narrow filters below 200 Hz" for comprehensive correction.



Generate

Under Filter tasks hit “Match response to target”. Hit EQ filters button to get dialog for additional manual filter adjustment.

Check the deep dips for their wavelength with the simple formula: distance (in metres) = 85.75 / frequency (in Hz). You will usually find an early reflection point at that distance from the woofer to your ears. You cannot and should not equalize for these.

Save project

Hit Save filter settings to file to save REW EQ filter (use XML format to imported into rePhase). Save your work under File/Save All Measurement