HAYDEN J. NEBUS Audio Engineering ◆ Production Services

532 Brighton Drive. ◆ Richmond, Virginia 23235 ◆ (732) 742-7829 ◆ hjnebus@gmail.com

Impulse Response Analysis: Soulshaker Studio

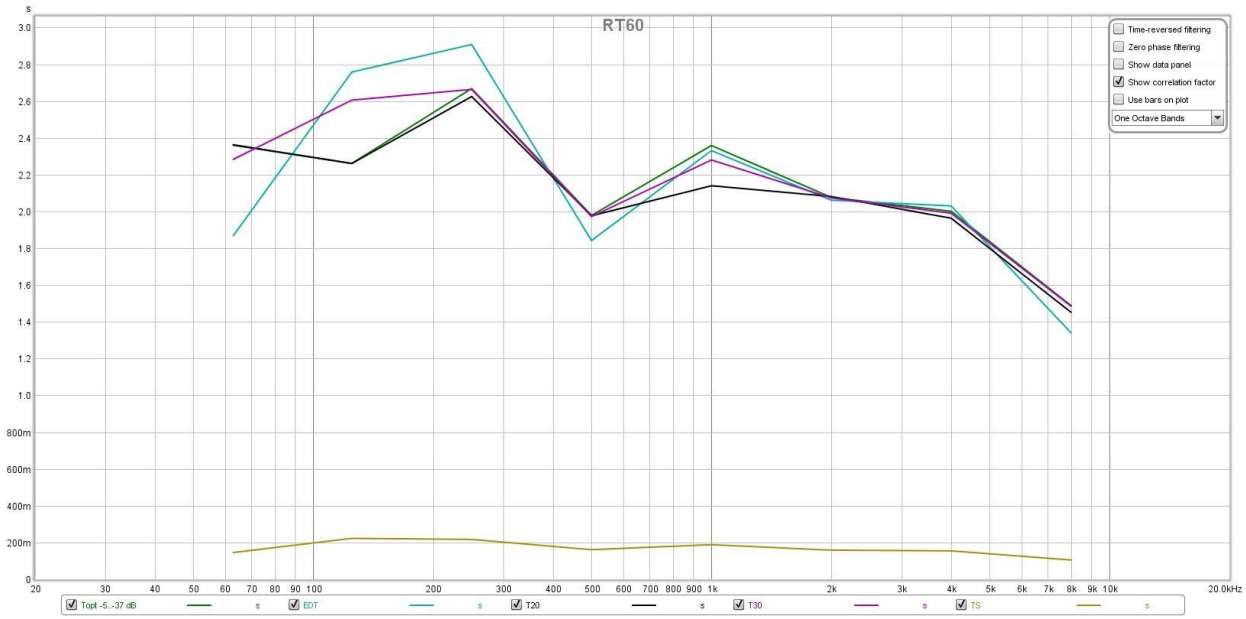
Soulshaker studio is a purpose-built isolated music tracking room, measuring an irregular 19x 27, with 9 foot ceilings sloping to 12 foot at the center of the room. The space represents approximately 140 cubic meters.

A series of 16 room impulse response measurements were taken on site 7/22/2022 using acoustic impulse sources (balloon pops) measured with an omnidirectional Earthworks M23 microphone, incident to room surfaces and distant from the source in accordance with ISO3382. The room response was measured in 3 conditions: untreated and empty, with the addition of a large monolithic loose fill fiberglass bass trap, and finally with the bass trap and 6 703 rigid fiberglass gobo panels of approx. 4ftx8ftx6in at arbitrary locations. 3 representative measurements of these conditions are studied here.

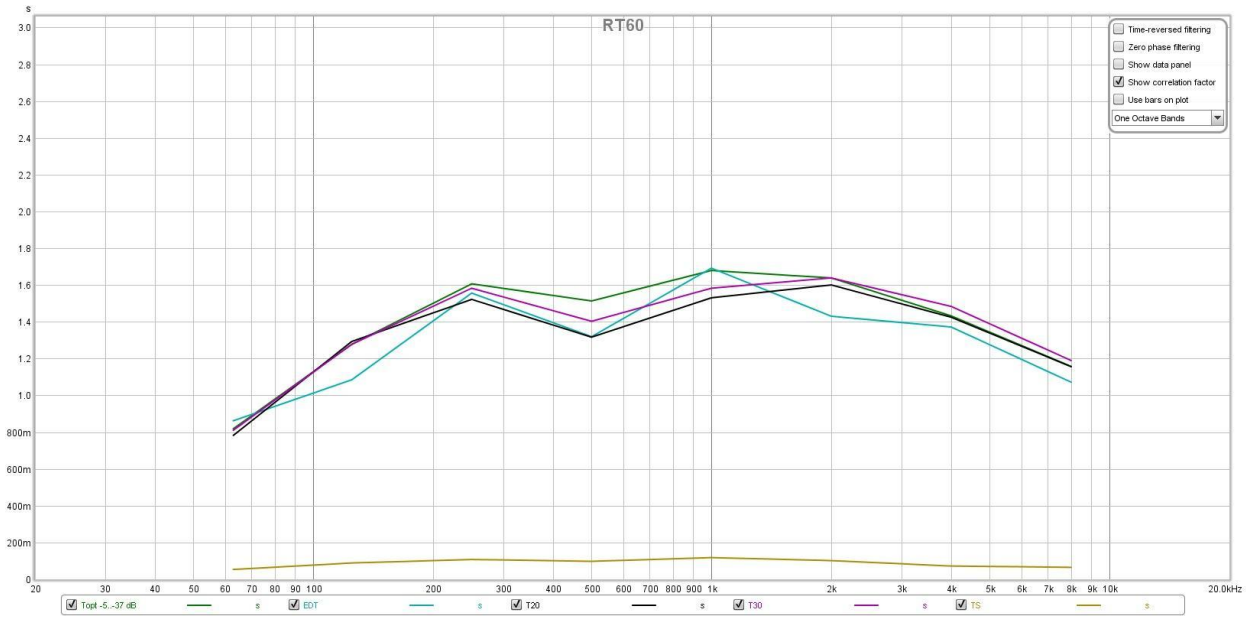
Source files are 48kHz 24 bit:
untreated kit postn 1 ctr.wav
bass trap kit postn 1 cntr take 2.wav
pnels and trap kit postn 1 mic postn cntr.wav

Results:

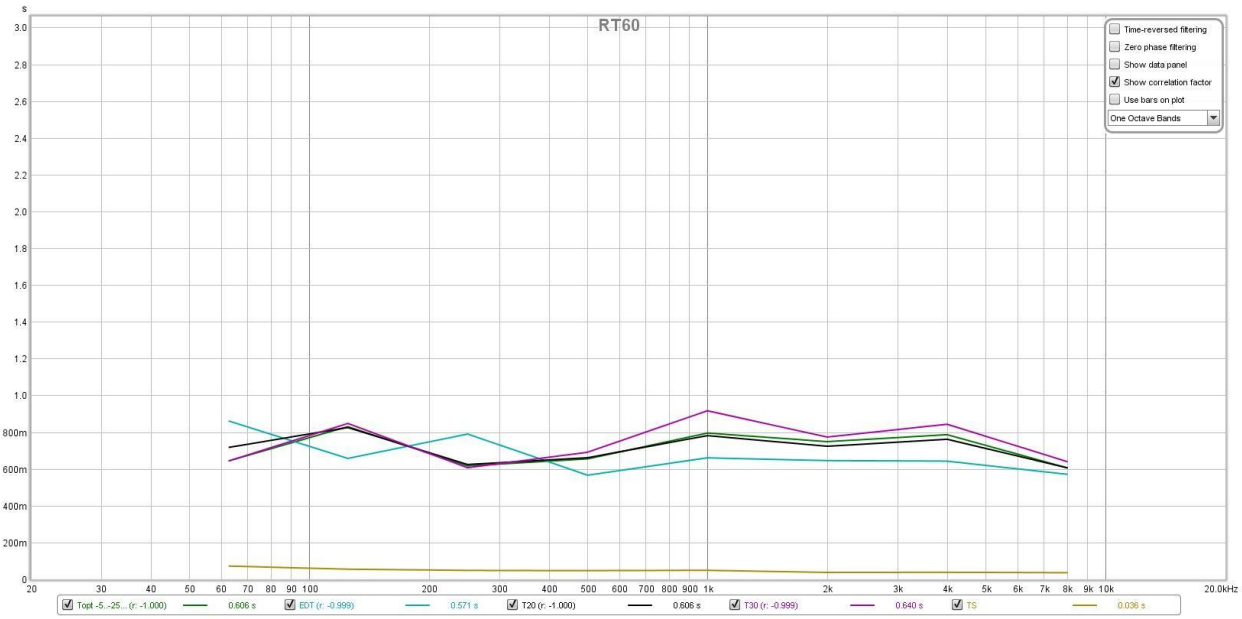
Reverberation Time/ Early Decay- The addition of a large bass trap effectively reduced low-mid band decay, from in excess of 2 seconds to 1.6sec, with a notable knee at 200Hz, indicating the large surface area and significant distributed mass of the absorber is highly effective at absorbing low frequencies. The addition of large gobo panels at approximately 25% wall coverage further reduced the room reverberation time to a broadband average of 0.8ms.



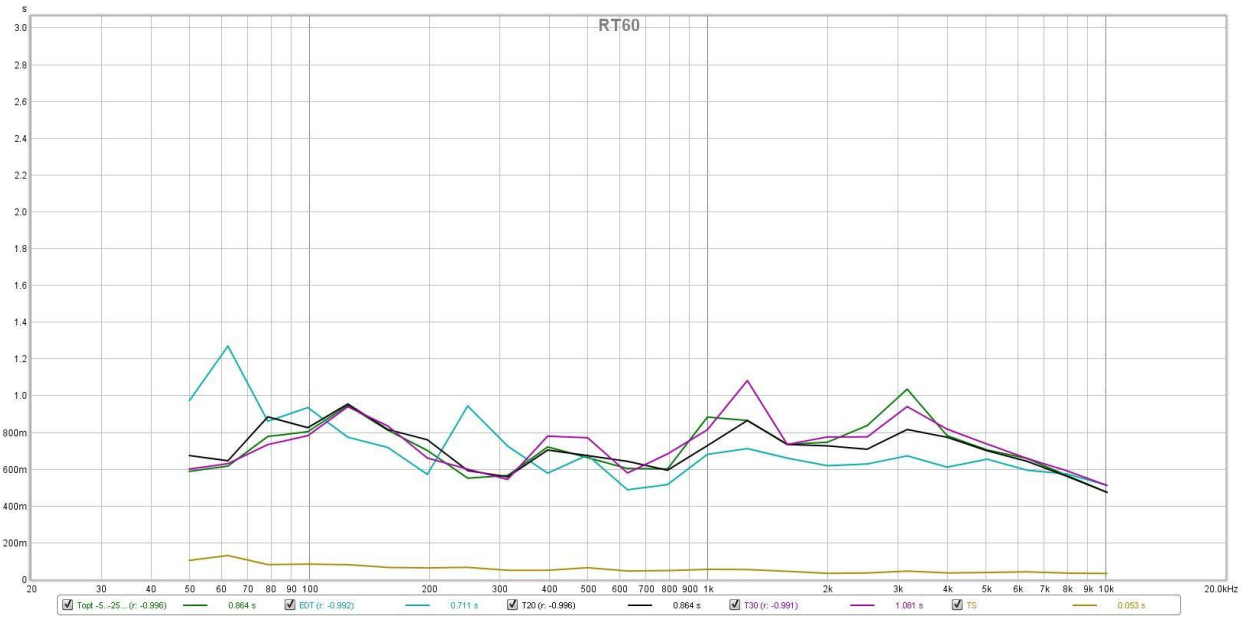
Untreated room, Reverberation Time, octave banding



Room with Bass Trap, Reverberation Time, octave banding



Room with Panels and Bass Trap, Reverberation Time, octave banding

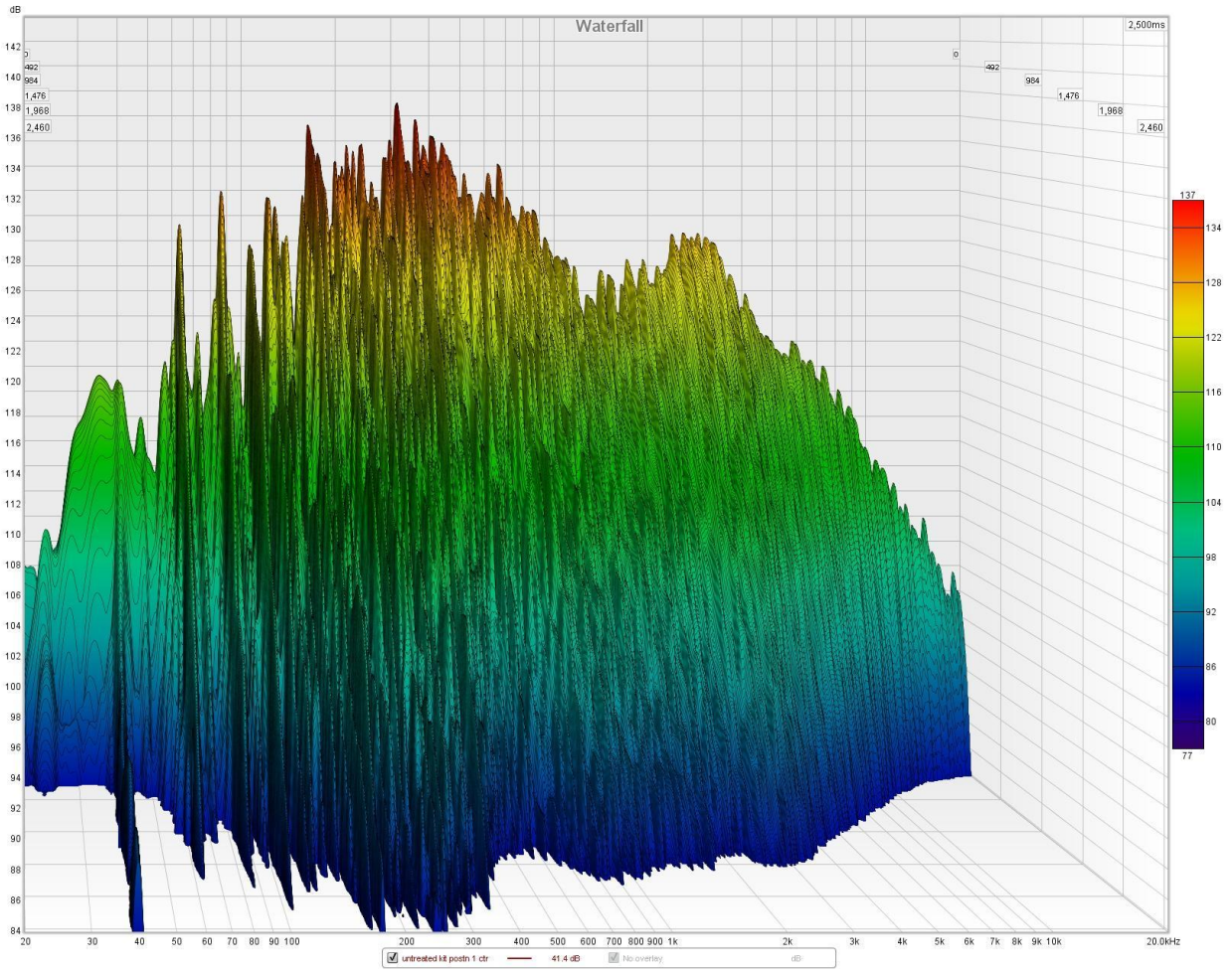


Room with Panels and Bass Trap, Reverberation Time, 1/3octave ban

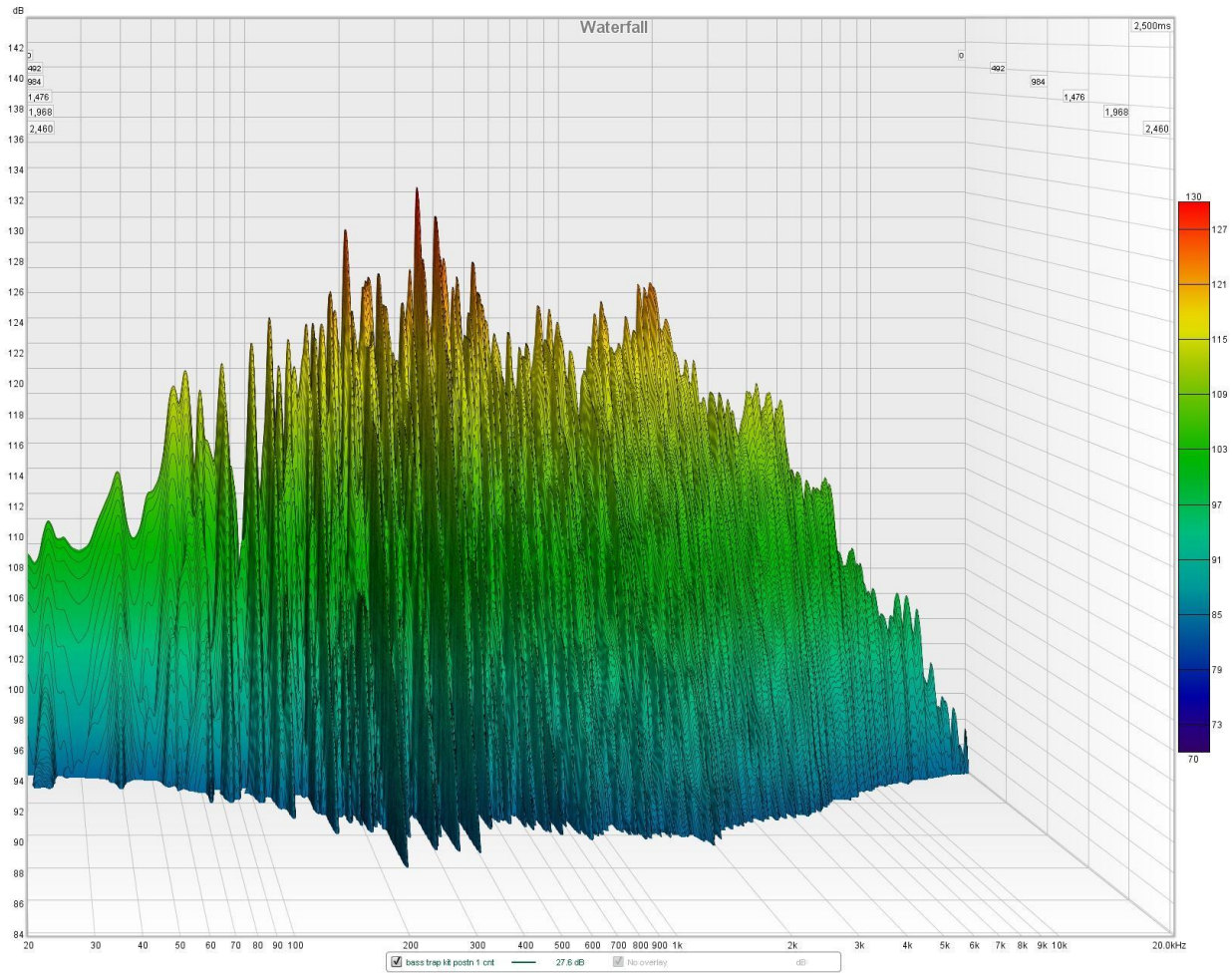
Time Domain Analysis-

Waterfall and spectrograms show a 40 Hz Low frequency room mode evident in the untreated room measurements was effectively absorbed by the bass trap. Low-mid frequency buildup in the room centered around 250Hz was roughly halved by the trap, and brought to match the broadband average with the addition of panels. Remaining modes at 120Hz 180Hz

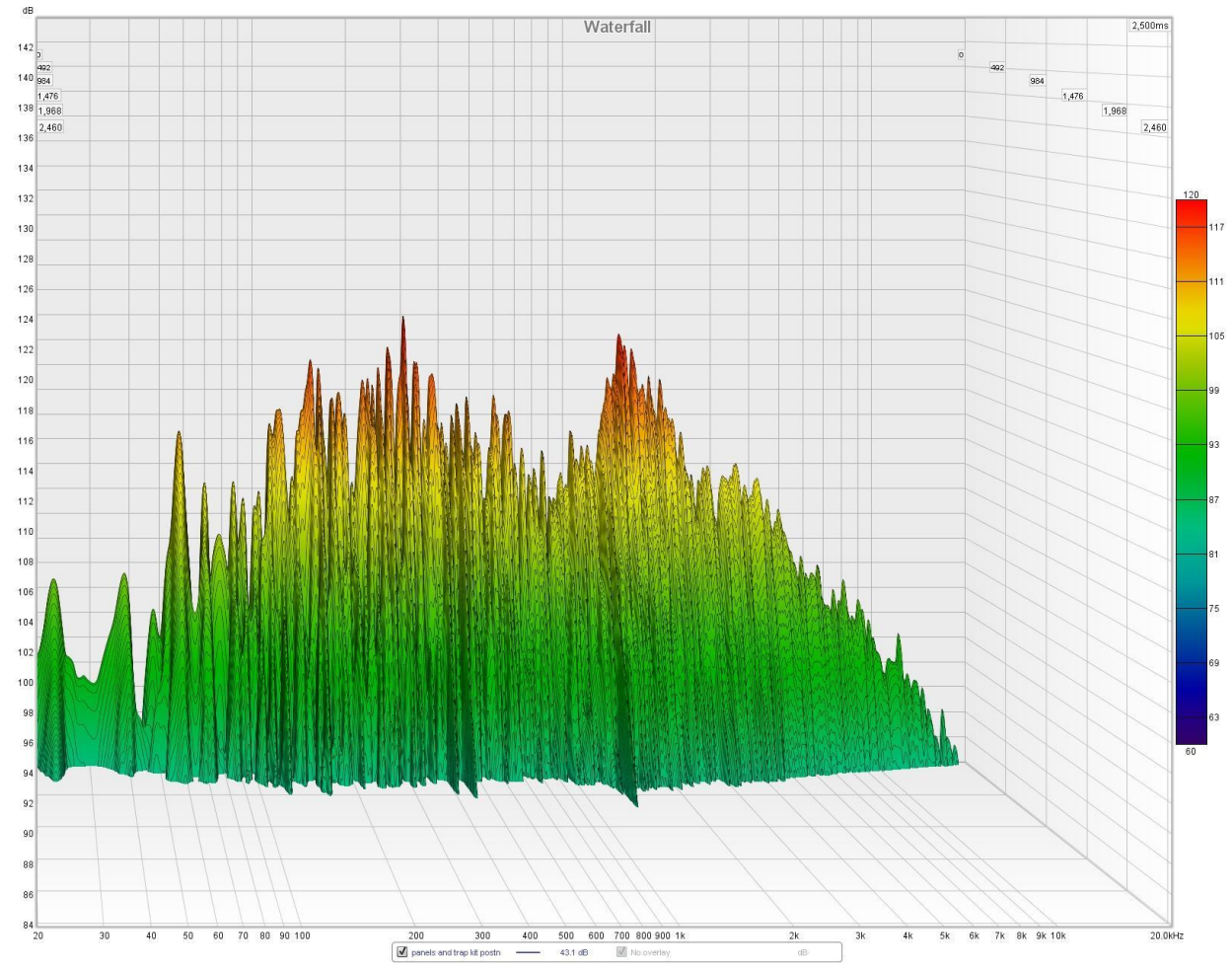
A complex ring in the 1k octave subjectively perceived in the room during excitation is identifiable in the treated room waterfall, spectrogram, and windowed frequency response of the IR. It is hypothesized this is a flutter artifact of the sloped ceilings, as ceiling treatment is yet to be addressed.



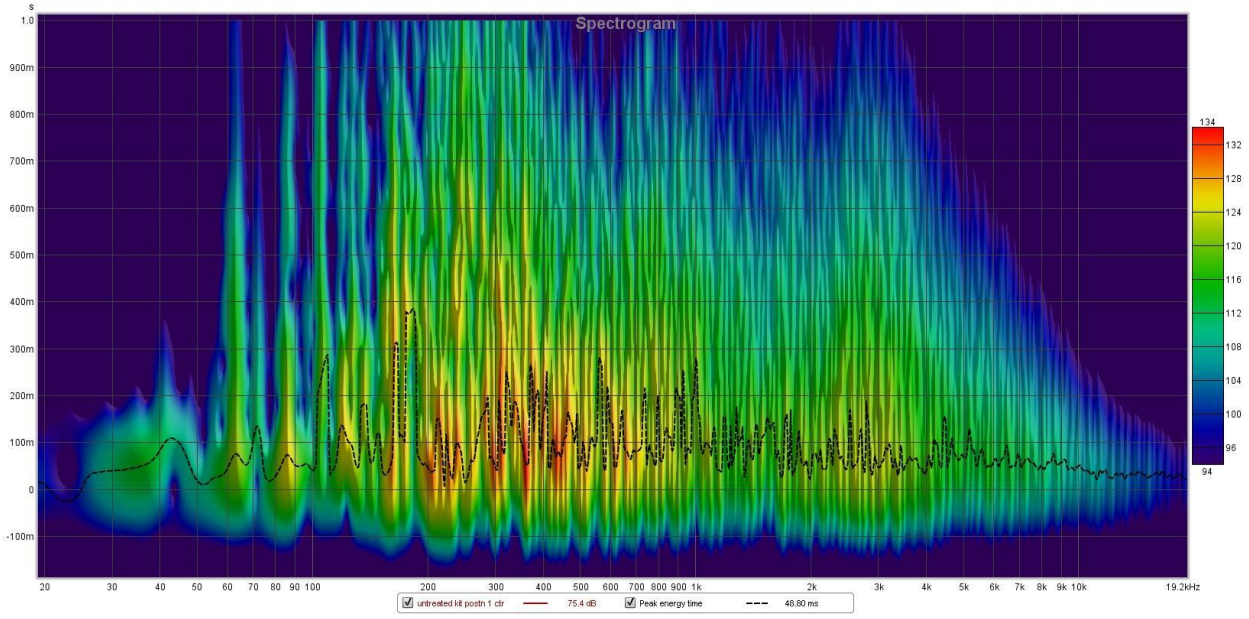
Untreated room, Waterfall plot 2500ms



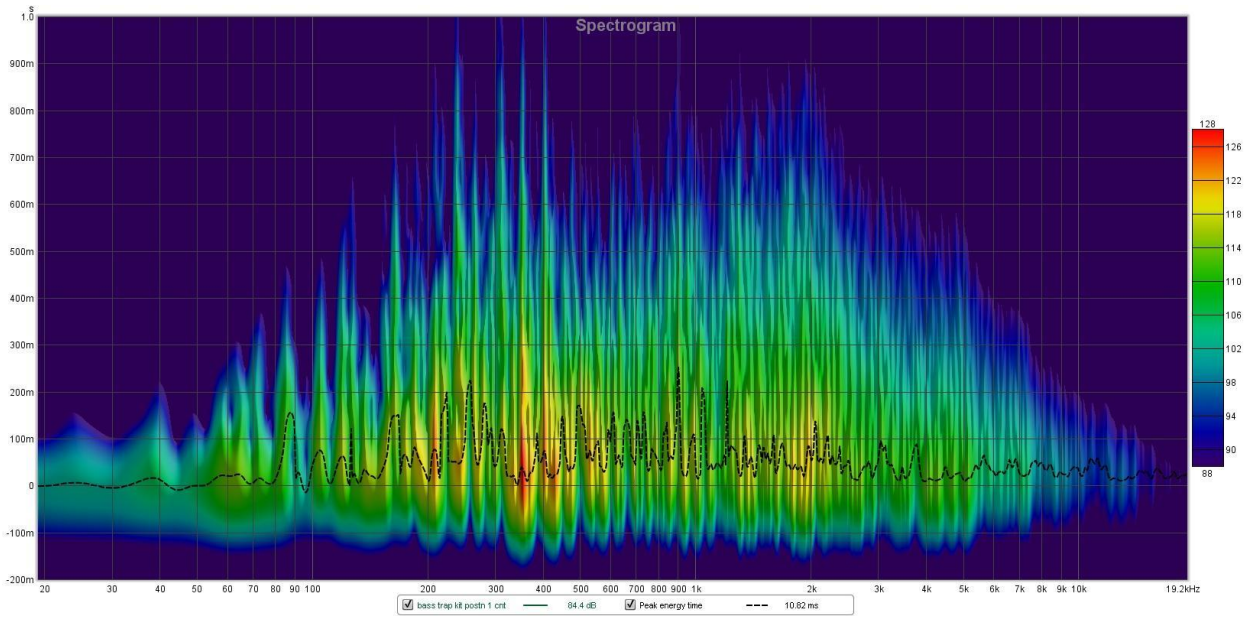
Room with Bass Trap, Waterfall plot 2500ms



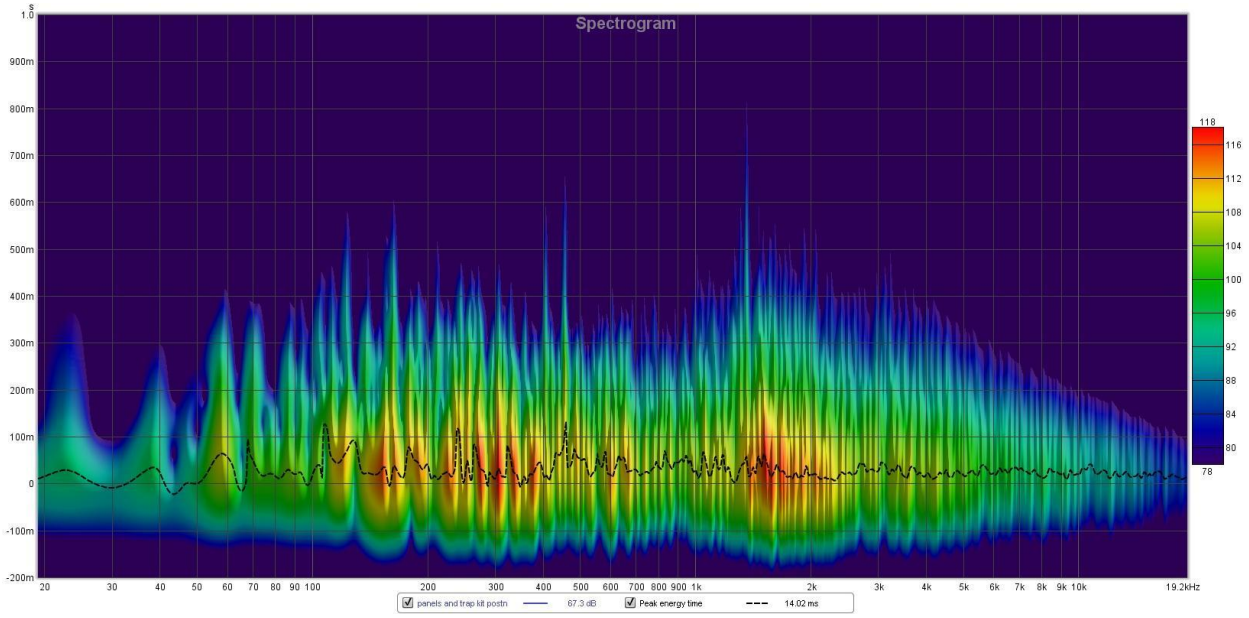
Room with Panels and Bass trap, Waterfall plot 2500ms



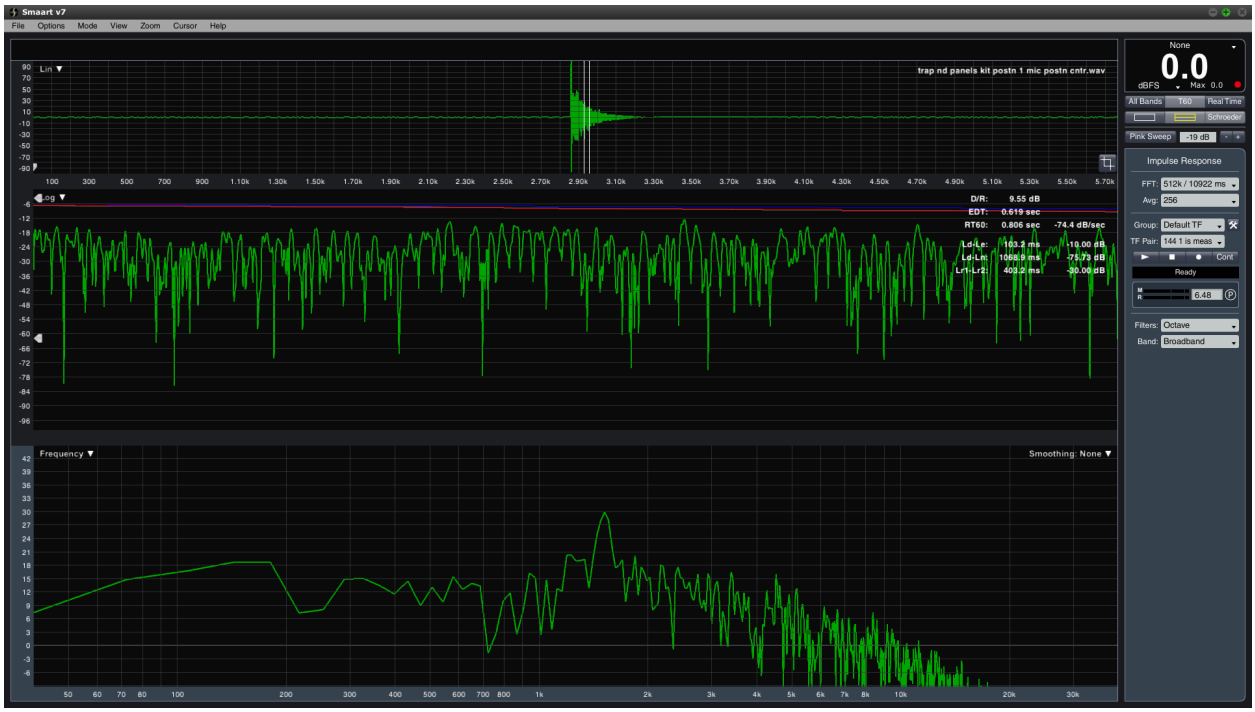
Untreated room, Spectrogram



Room with Bass Trap, Sprecrogram



Room with Panels and Bass Trap, Spectrogram



Room, with panels and bass trap, Windowed Frequency Response 73ms after direct sound arrival

Conclusions-

Ceiling treatment is reccomended, with 25% cloud coverage bridging the center peak of the room expected to be a reasonable accommodation to break up flutter between floors and ceiling, which via room geometry is effectively horn loaded into the center of the room. 120Hz and 180Hz modes remaining in the treated room can be reduced with further corner-loaded bass traps and air-gapped absorbers.