

Enhancing Low-frequency Musical Articulation in a Room Using Electronic Bass Trap

A small room is used to evaluate how DEICON's patented, active acoustic damping technology, '**electronic bass trap**', enhances low-frequency musical articulation in that room. The rectangular room has a dominant coloration due to the 32 Hz standing wave that shapes up along its length. Electronic bass trap is used to add damping to the first low frequency acoustic standing wave, i.e., the 32 Hz mode, of the room. Figure 1 shows the frequency response functions of the room without and with the electronic bass trap.

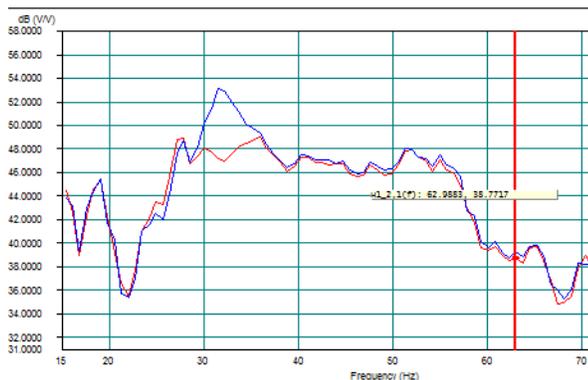


Figure 1 frequency response functions of the room without and with the electronic bass trap

Musical articulation test, is commonly used to evaluate the articulation of a listening room (or a recording studio). The test is done by recording the playback of a carefully selected set of tones designed to evaluate the way in which a loudspeaker or an acoustic treatment system performs in a listening or recording room.

In the musical articulation test performed in the small room equipped with DEICON's electronic bass trap, 11 bursts of sinusoids covering the frequency range of 29-40 Hz with the frequency increment of 1 Hz are used to excite the room. The reason for the choice of this limited frequency range is that the first standing wave of the room, the one targeted for damping, lies in this frequency range. The duration of each burst is 0.5 sec followed by 0.5 sec of silence with the total test duration of 11 sec. Provisions are made to be able to turn the electronic bass trap on or off and thus add damping to (by turning the system on) or not modify the acoustics of room (by turning the system off).



An alternative to the use of a low-frequency bass trap in a listening room or recording studio is active tuned damper/absorber. This actively controlled solution which can be viewed as a low-frequency '**active tuned acoustic damper**' or '**active tuned acoustic absorber**' adds damping to low-frequency standing waves and/or absorbs tonal persistent noise.

The application of this patented technology, as an electronic tunable bass trap, to recording studios, listening rooms, and home theaters is licensed to Modular Sound (the reputable manufacturer of Bag End professional grade loudspeakers) and is marketed under the trade name E-trap®.



Figure 1 E-trap®

Figure 2 shows the recording of the signal with the electronic bass trap 'off', the blue trace, and 'on', the red trace, indicating that the addition of active acoustic damping (bass trap on) makes the pressure at the frequencies in the vicinity of the first acoustic mode (the one targeted for damping), not to linger in the room; note that the ringing of the pressure with the bass trap on is by far less than that with the bass trap off.

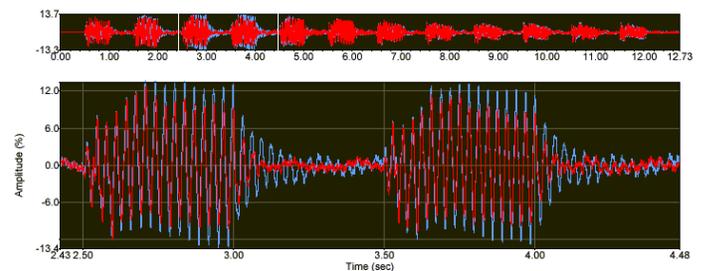


Figure 2 Pressure at the room corner with the controller off (blue) and on (red)

Clearly the active bass trap has smoothed out the uniformity of level, as well as improved the articulation in this 30 to 40 Hz range. The articulation is evidenced by the increased clarity of tone bursts, i.e., less ringing when each burst is turned off. The active tuned absorber has also been implemented in industrial applications, absorbing tonal noise in air/gas carrying ducts.