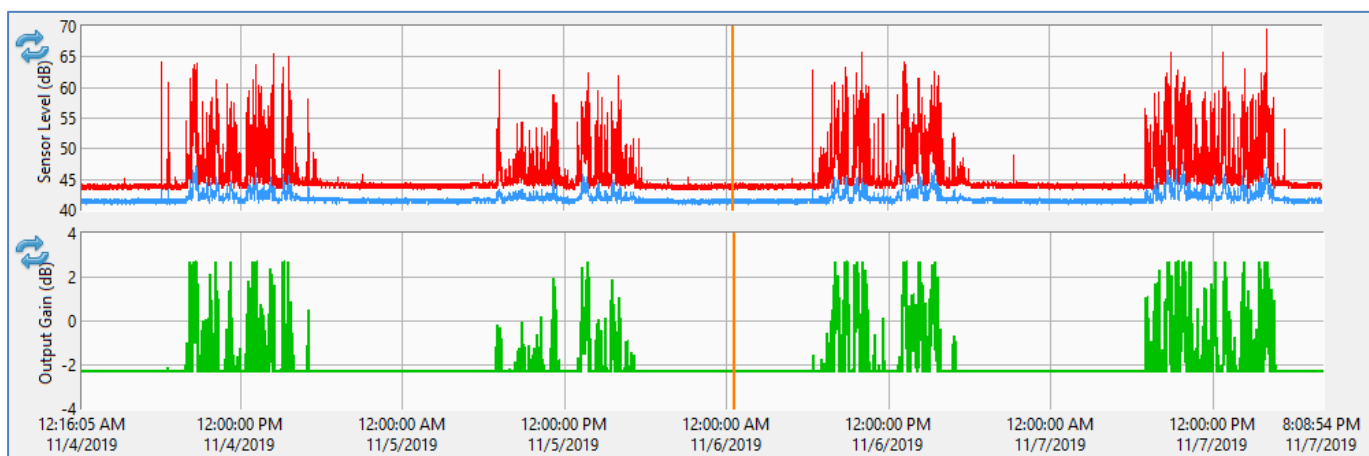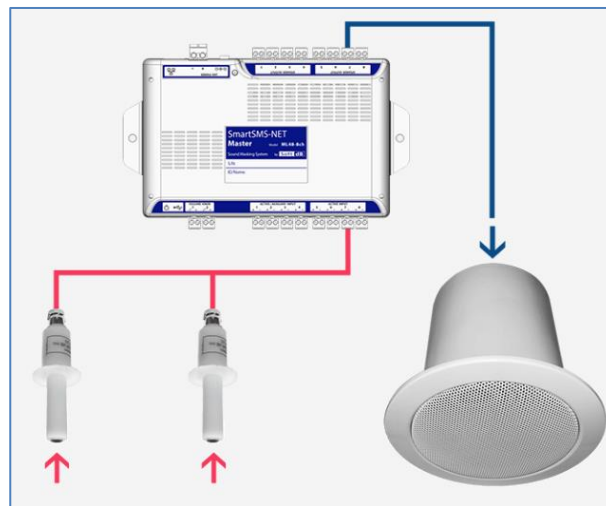# Adaptive Sound Masking technology Algorithm explained

Adaptive Sound Masking technology is a major feature of our SmartSMS-NET system. The Adaptive Sound Masking technology makes use of ceiling-mounted noise sensors and the advanced signal-processing technology embedded in our controllers to automatically adjust the sound masking volume up or down based on how loud or quiet the office gets throughout the day. Auto volume adjustments are virtually unnoticeable and only occur for sustained variations in office noise levels—never for sudden noise or short activity spikes.
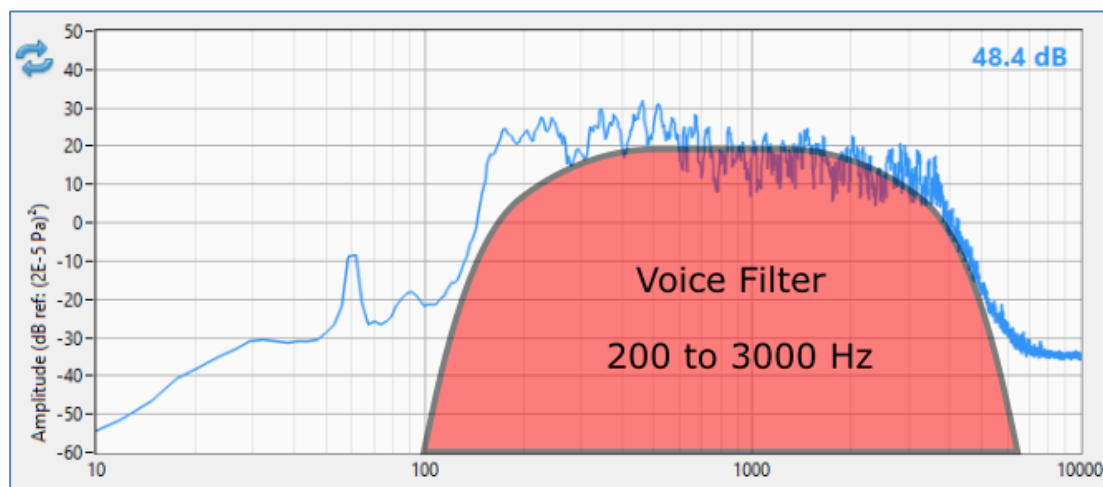
Behind the scene, the Adaptive Sound Masking System algorithm is sophisticated. It provides a lot of flexibility and will avoid the many potential pitfalls of "dynamic" sound masking systems.

No Feedback, Self-balancing system:

The Adaptive Sound Masking technology will do an adjustement every 15 seconds. The algorithm will measure the peak noise level during that period (L10%) and will compare that to the background noise level (L95%). When the gap between those two values is small, it means that the space is quiet and the algorithm will reduce the gain slightly, by default, using 0.5 dB steps. When the gap between the peaks and background increases, it means more activity in the space and thus the system will increase the sound masking gain slightly. After a few minutes, this will tend to increase the overall background noise level, composed of natural background (activities+ventilation) and sound masking. This increase of background noise level (L95%), will thus reduce the gap between the peaks and background, and the the masking noise increase will stop. **The result is a system that doesn't feed back into itself and will balance itself in any conditions.**

Proper reaction to background level changes:

A proper sound masking system should react to speech noise but should not increase when the natural background noise level increases in the building (increased ventilation, increase traffic noises). To achieve that goal, the Adaptive Sound Masking system has a "Voice Filter", a bandpass filter between 200 to 3000Hz to focus on the human voice.

Also, the Adaptive Sound Masking system will actively reduce the sound masking level output if the ventilation noise or other steady-state noises increase.

Here is an example of the behavior that we created using a 5 minutes speech loop. The peak levels are coming from the recording and are constant during the 5 minute periods (orange curve). When the background noise increases (blue curve), the sound masking system will reduce the level of the output gain slightly (green curve). **This will result in an environment that is more comfortable in all conditions.**
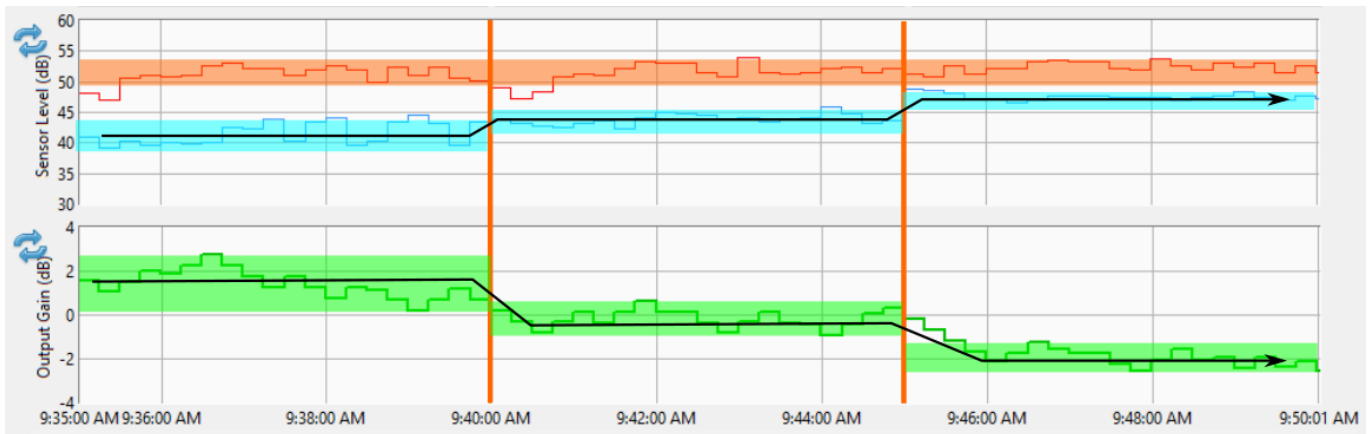

Zones independence and flexibility

One of the great advantage of the Adaptive Sound Masking technology is that each active zone will adjust on its own, independent from the surrounding zones. So if one zone has a lot of activity, the sound masking will increase in that zone only. It's much better than a timer function that will set the masking level depending on the time of day. This makes the active control **the perfect tool in for Activity-Based Workplaces (ABW)** or **Flexible Workplaces**.

Limits on the Gain

The system also has limits on the maximum and minimum Gain to make sure the sound masking never goes below or above certain limits. These limits can be adjusted differently in each zones if needed.
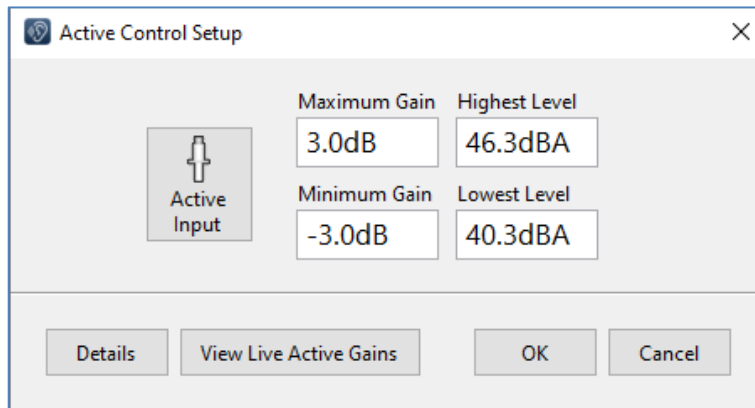
Adjustable response time.

By default, the response time of the Adaptive Sound Masking technology is limited to 0.5 dB change every 15 seconds to make the changes undetectable. This setting can be changed to get a faster response time, up to 2 dB every 15 seconds.

Schedule Adjustment option

Finally, the system has the option of setting a time-based adjustment. This operates on a 7-day schedule so you can have the system operate at a lower level at night or on the weekends for example. This schedule adjustment can be combined with the active control.