Genelec's 8351 explained

Genelec has introduced a revolutionary compact acoustically coaxial 3-way active monitor that looks like nothing else. AKI MÄKIVIRTA, ILPO MARTIKAINEN, and WILL EGGLESTON explain the thinking and the technology.

The 8351 is 80% of the size of the 8260.

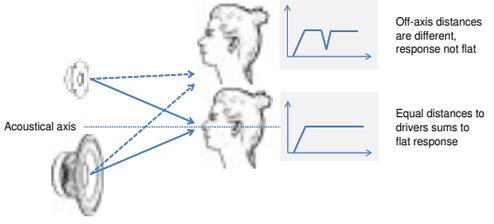
Audio engineers are increasingly facing the dilemma of working in smaller monitoring rooms, to tighter budgets, yet with increasing requirements for the highest quality of the end product. Shrinking room size means the walls come closer and the room becomes uneven in low frequency response and more colouration results in larger differences between rooms. The work being done in these smaller rooms is becoming varied and it spans simple dialog recording to multichannel recording and mixing. Rooms may be repurposed through booking schedules and this requires an audio reproduction system that is neutral for accurate editing work yet has high SPL capability when required.

Genelec has been solving difficult customer problems with innovative technology and in acoustically novel ways for 36 years. The Genelec 8351 continues on this path, taking a bold step in creating a 3-way acoustically coaxial monitoring system unlike any other. This product will evolve the proven 3-way monitor concept in a revolutionary way.

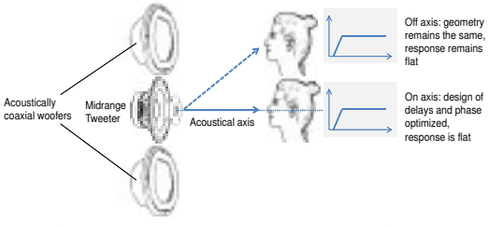
Although a 2-way active monitor is the reliable workhorse of the industry, a 3-way monitor design presents the performance optimum in many ways. It allows refined selection and optimisation of individual driver characteristics (sensitivity, linearity, output capacity, directivity) because of the more well-defined, narrower frequency range for each driver. Optimal crossover frequencies can be chosen based on the acoustical constraints given by the drivers and enclosure characteristics. Larger area waveguide control can further enhance directivity enabling the best performance in the presence of challenging room acoustics typical of small or acoustically compromised rooms.

A 3-way monitor is needed for applications where very high quality audio is required, where accurate sound stage imaging is wanted, where it is necessary to hear subtle acoustic details even at high SPL, and where accurate control of monitor directivity is necessary

Acoustically concealed woofer enables the whole front baffle to be used as a waveguide.



Traditional monitor sound is coloured for off-axis positions.



Acoustically coaxial monitors maintain constant geometry for off-axis positions, avoiding colouration.

A complete solution for acoustically challenging rooms should include electronic compensation tools for addressing the room influence on sound quality. Genelec builds these tools into its Smart Active Monitoring technology, enabling integration of the monitors into the acoustic environment, providing neutral sound and improved imaging accuracy by automatically compensating detrimental room influences.

It is challenging to build a compact 3-way monitor successfully that delivers all of the above benefits in the compact enclosure size needed for modern monitoring applications. The coaxial design, building multiple drivers on the same acoustical axis, offers the way forward to achieve this. Genelec introduced its first compact coaxial 3-way 8260 in 2010. Sound professionals loved its performance and sound and expressed the desire for something smaller without sacrificing the significant acoustic strengths of the design. Genelec has responded with the 8351 borrowing its size from the 2-way 8050 for enclosure dimensions that are 80% of those of the 8260. The external dimensions are 452mm x 287mm x 278mm, making the 8351 a very compact 3-way monitor indeed.

The 8351 uses the Minimum Diffraction Coaxial midrange/tweeter driver (MDC) familiar from the 8260, seated in a large area Directivity Control Waveguide (DCW). This driver has high accuracy and a flat diffraction-free response due to eliminating gaps in the coaxial arrangement of the drivers and in seating the MDC into the waveguide surface.

Good directivity control calls for a large area waveguide. The 8351 acoustically conceals the woofers in the front of the enclosure, creating a large continuous acoustic front surface for the mid and high frequencies. The waveguide geometry of the enclosure front has been optimised from the tweeter right to the outer edges of the front baffle, all the time avoiding sound colouring diffractions. As a result the 8351 has a surface area to control directivity equal to some physically much larger 3-way main studio monitors.

The 8351 has two woofers, spaced out on the two ends of the enclosure front. The woofers are housed in one bass reflex enclosure with the reflex port opening to the back of the enclosure. The woofer cone surface area and magnetic motor capacity has been maximised, enabling the woofers to cover the remaining front surface outside the MDC driver unit. The total woofer cone area is close to that of a 10-inch round woofer.

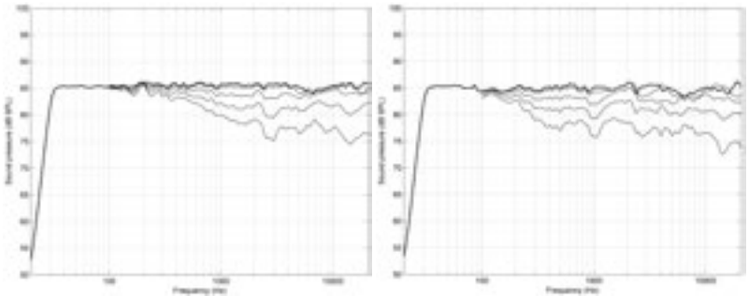
The two woofers are located under an acoustically optimised extension of the front baffle — this represents an acoustically continuous surface for the frequencies radiated by the MDC driver. Radiation of woofer frequencies happens through two openings and this acoustically concealed woofer (ACW) technology enables the 8351 to combine compact size with excellent directivity control and a flat response. Spaced woofers create acoustic directivity extending to woofer frequencies, making the 8351 unique in its physical size category.

The two drivers reproduce simultaneously the frequencies in the crossover range. A conventional multiway design has drivers distributed across the front baffle — when the two outputs are in phase, the combined output remains flat. For off-axis locations, the two drivers are not in phase because the distances to the drivers are changing. This can produce strong colouration and the frequency of this colouration changes when the listener moves further off-axis.

Drivers placed coaxially can eliminate colouration off-axis and matching driver directivities as in the 8351 improves the system performance even further. Coaxial placement allows the listening distance to be short — the minimum listening distance for the 8351 is less than 0.5m.

The acoustic axis of the combined woofer system created by the two spaced woofers coincides with the acoustic axis of the tweeter-midrange minimum diffraction coaxial driver. This makes the 8351 a unique coaxial 3-way and enables the woofer system to have controlled directivity. The 8351 is one of the first 3-way designs that retains favourable off-axis sound balance in vertical and horizontal orientations. The neutral acoustic character of the 8351 does not change as you move off-axis in either orientation and this similar sound character in horizontal and vertical orientations and the compact size makes installing the 8351 monitor easy.

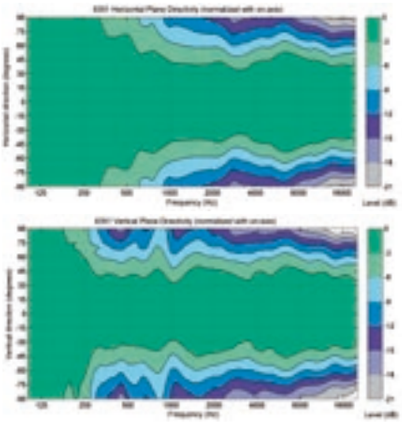
The 8351 is more directional along its long axis and this can provide benefits in the studio environment. For example, if console top reflection must be minimised, we place the 8351 vertically, and the increased vertical directivity



Frequency responses of 8351 on the horizontal (left) and vertical (right) planes on the acoustical axis, and at 15, 30, 45, and 60 degrees off-axis.

reduces the reflection level. If the side walls in the room are close, we mount the 8351 horizontally, reducing low frequency interaction with the side walls.

Analogue and digital audio sources can be directly connected to the 8351. An analogue input is capable +24dBu and the analogue input is converted for signal processing and reproduction. Monitoring of digital audio in AES-EBU supports sampling rates to 192kHz and digital audio is sample rate converted to ensure synchronisation with all sources. An AES-EBU thru output provides daisy-chaining to more monitors.



Directivity of 8351 in the horizontal (top) and vertical (bottom) planes.

The digital and analogue audio signals are internally processed at 96kHz and there is a true 48kHz wide audio path from the input to the acoustic output, with the tweeter system equalised up to about 40kHz. The 8351 uses an entirely new power amplifier design with two linear, low noise Class D amps powering the woofer and midrange with low thermal load. A Class AB amplifier powers the tweeter for maximum bandwidth and linearity. This discrete component tweeter amplifier design has been used by Genelec for 30 years in larger 3-way main monitors.

The 8351 is a member of the Genelec Smart Active Monitoring family of products. These monitors connect with Genelec's control network and enables setting of all aspects of monitor and system control at the main listening position, over the Genelec Loudspeaker Management (GLM) control network. It enables automated aligning of monitors and subwoofers with regard to level, timing, and equalisation of the room responses. Smart monitors can reduce room influence on the sound, and this can increase significantly the accuracy of monitoring.

Environmental values are high on Genelec's agenda and the components in the 8351 have been designed for long service life. All parts are serviceable with a change-of-module principle and a fast turn-around time whenever service is needed. Efficient use of raw materials is the key to modern designs so the 8351 uses recycled aluminium in the enclosure. All parts of the 8351 can be recycled or reused if that time should finally come. Saving energy is becoming ever more important. The 8351 supports Genelec's Intelligent Signal Sensing (ISS), which puts the 8351 to low-power sleep mode, waiting for any input signal. ISS removes electronic stress, stops heat generation, and can improve longevity of the product, apart from saving electricity. And for those applications that need the 8351 to be permanently on, ISS has full user control.

The 8351 is made possible by the Minimum Diffraction Coaxial and Acoustically Concealed Woofer driver technologies. These drivers and the electronics are all manufactured at the Genelec factory in Iisalmi, Finland. The MDC coaxial and ACW woofer are hand-assembled for maximum performance, precision, and reliability. During production, each 8351 is individually tested for all aspects of performance in a dedicated anechoic chamber. Computer based automatic response calibration ensures a tight match with the acoustic specification.

New SAMs

ZENON SCHOEPE visits the Genelec factory for a walk through the new 8320 and 8330 monitors, the 7350 sub and GLM 2.0 software.

Many who first heard Genelec monitors employing the early Smart Active Monitoring (SAM) were surprised by the elegance and completeness of a system that splashed tones through speakers, measured them with a test mic and then evened out the room response by tweaking the monitor DSP from a computer sitting on a network. It was significant because it was the Finnish firm being ahead of the game — and the competition — and providing a solution to a very real end-user problem that maybe all end-users didn't know they had at the time. That problem was that audio rooms were getting smaller, they were less likely to be acoustically treated in any meaningful way, and some audio environments — like OB trucks, for example — had become almost perversely audio unfriendly.

SAM monitors address the room 'fixing' problem via Genelec Loudspeaker Management (GLM) software that measures the room at the listening position and adjusts the monitors' DSP automatically. SAM monitors were never at the cheaper end of the Genelec range.

The original GLM package worked well but the new GLM 2.0 is even slicker and friendlier and coincides with the introduction of the smallest SAM monitors — the 8320 and 8330 — and the new compact 7350 subwoofer. Putting everything else aside this really does bring intelligent monitoring with room correction to a much bigger market and the models are also a much better physical (and economical) fit for today's smaller rooms. Previously the smallest SAM monitor was the 8240.

You can rest assured that Genelec DSP is not used to overcome inadequacy

or inconsistency in the monitor itself; Genelec always starts by creating the best active monitor it can for the intended footprint using traditional design principles. The Finns will tell you that the better the monitor is to begin with the more refined will be the power of the DSP when applied to corrective measures. It makes sense.

All three new models have a new processing platform inside the box — that's what the 3 in the model number denotes. The 8330 has AES-EBU and analogue input and predictably more maximum SPL over the smaller and analogue-input 8320. Over the original derivatives that people will ultimately compare them to, the new models have slightly improved neutrality in response. The 8320 also has more power and is capable of a higher SPL than the 8020 — so while the enclosures are the same and the drivers are the same everything else is new and much improved so you get better performance that is audible in a comparison. The 8330 has approximately the same sound output capability as the 8030 but the response characteristics are improved; they are better products. Apparently some 90% of the electronics inside the enclosures is new.

Switch mode PSUs means they work everywhere and the 7350 sub, which externally has similarity to the 7050, has digital input and much better control of how it integrates into a system. The new range all have new Class D amps. The new sub and the 8330 with their independence of I-O are very much the versatile modern go-anywhere SAM package.

Coming back to the number 3 and the new processing platform, Genelec has used these 'entry level' SAM monitors to introduce a significant step-up in DSP power. Genelec argues that a typical 8330 or 8320 installation is likely to need that extra corrective grunt although this power is largely hidden from the user behind the smooth and elegant tuning process; you don't have to be an acoustics expert to get the most out of these boxes as they are intelligent enough to do most of the hard work for you. The new processing has more than four times the tweakability than in the previous generation. Like the previous version of GLM the calibration process in GLM 2.0 can work with and draw from four mic 'listening' positions. The routine is simple.

After putting the speakers in the best acoustic positions for the space — Genelec is at pains to point out that this is a critical part of the setup and gives guidance on speaker positioning — you connect the new network adapter hub that interfaces to your computer via USB, which also powers it, and you daisy chain your monitors from this via network cables running a proprietary protocol to the sockets on the back of the monitors and subs in any order. Genelec offers a variety of kit options that include the hub and the essential measuring microphone which is positioned in the listening position. The software is downloaded from the website, which means that you always get the most recent software. As with everything else at Genelec, everything is made in Iisalmi including the mic.

The software launches and lists the monitors and subs it has identified — the mic is already active and measures SPL. In the software you drag and drop the relevant monitors and place them in a virtual room — one on the left, one on the right and the woofer off the middle line, for example. While you are dragging monitors the LED on the selected unit flashes and a sequence of tones is emitted from it to confirm its identity. They are named automatically and if you choose to connect digital signals then the system will automatically sort the subframe out for you too.

You confirm the creation of the setup and move on to the calibration process after selecting single point or multipoint measurement; a click on the microphone icon in the software starts the calibration process. The system automatically sweeps through the monitors and automatically starts calculating the calibration. You get displays for each monitor showing measured, corrected filter and the resulting curve. You can also see the curves of the other monitors in the system which can reveal positional discrepancies between the L and R, for example. Once you're happy, you confirm and the job is done — completed in a little over a minute. Spectacular.

You can then store the settings in the monitors — even unplug the network cables — and run the system without the computer software. It operates entirely standalone although you also have the curves stored on the computer. You can also have a Genelec soft volume control connected to the hub and control the system volume from that.

It's in the GLM 2.0 software that you can create different calibrated curves for different listening positions within a room, created by moving the mic to the client couch, for example, and you can switch between these on playback. Should you need it there's an editor that allows you to look in detail at the filters and to adjust them manually.

Now there are quite a few tools here and if your display is big enough you can see them all for all monitors in the system. There are 20 parametric notches per monitor which compares to the six in the excellent 8260, and that's already a very powerful toolset. However, Genelec points out that the object of the exercise is not to have as many as possible but to have more than enough to do the job. This was demonstrated by the fact that the correction made in the demo I saw — in a less than ideal listening environment — had achieved the result using only four filters. The software is intelligent enough to know what can be corrected to improve the room while maintaining headroom and ensuring that the audibility of the calibration process is kept to a minimum — when you switch between the Before and After you appreciate that the After is simply better; you aren't aware of anything 'funny' happening to the response. It's worth dwelling on this because the purpose of the calibration process is not to use all the DSP available to force as flat a curve at the listening position as possible; it's actually about arriving at the best compromise given the acoustic environment that will improve the monitoring experience as transparently as possible.

Those who haven't heard this process work should do so as a matter of priority.