DASaim™ – Digital Steering Technology

V1 EN – November 2018

Content

1 – What is DASaim™?

DASaim™ is the high-tech digital steering solution by DAS Audio, which provides new and powerful features for the AERO-40A, AERO-20A and AERO-20A-120 DAS AUDIO line-array systems.

- Controlled dBspl distribution over distance (level uniformity).
- Frequency response uniformity over the listening areas (tonal uniformity).
- Adaptation of the vertical dispersion pattern of the arrays to the audience zones.
- Improved intelligibility.
- A decrease in the dBSpl in no audience areas.
- Fast design, short set-up times, and efficient workflow.

DASaim™ is based on Firmaker® technology by AFMG®. It is already integrated within the V3.52 GLL library of the AERO-40A, AERO-20A and AERO-20A-120 systems used in EASE Focus V3 - the acoustic simulation and modelling tool used by DAS AUDIO.

In order to achieve the desired results, DASaim™ designs custom FIR filters for each cabinet in an array, which allows unprecedented control of the overall behavior of the array.

Visit this link for the introductory video.

2- How does it work?

DASaim™ adds a custom FIR filter per cabinet in order to control the interaction between the cabinets of the array over the listening areas.

Currently, FIR filters are becoming an essential tool in professional audio loudspeakers. For this reason, both AERO-40A and AERO-20A systems incorporate them in their internal DSP processing for linear-phase brick-wall crossovers, as well as for precise equalization of the transducers, resulting in a smooth frequency and phase responses.

Using FIR filters allows the user to control the magnitude and the phase response of each frequency individually, while providing a degree of freedom hard to achieve with conventional IIR filters where magnitude and phase responses are related. So, not only can the magnitude (equalization) be modified individually, but also its phase (its virtual position). The resulting effect is like physically varying the shape of the array along with the frequency.

Figure 1 shows an array of 8 cabinets aiming over two audience areas. DASaim™ evaluates the response at discrete listening points as well as the complex interaction of the contribution of each loudspeaker in the array over these audience areas (cabinets 5 and 8 are shown as an example). By applying advanced optimization algorithms, DASaim™ designs within seconds a custom FIR filter per cabinet, which specifies the magnitude and phase values of each frequency enabling the achievement of the targeted results over the listening areas like constant or controlled level over distance, frequency response uniformity, maximum gain, or a combination of all of these. These FIR filters modify the interaction of the cabinets and, hence the radiation pattern of the array over the frequency. This way, it is possible to re-direct the energy where it is needed.

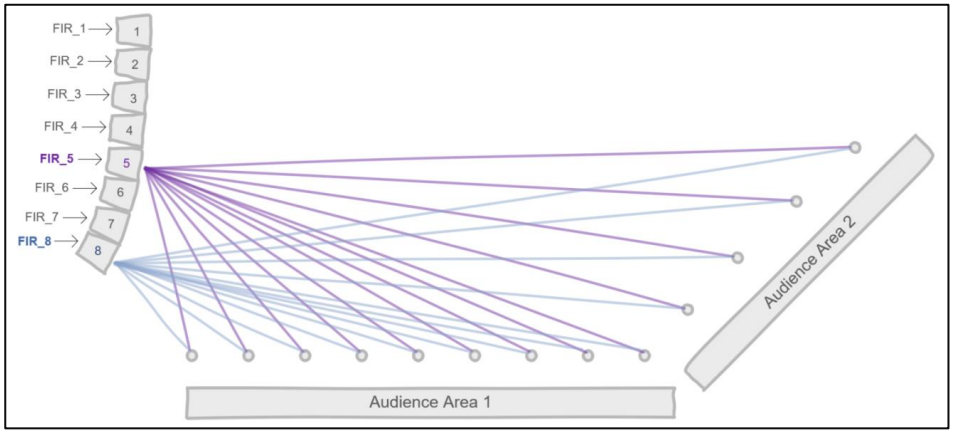


Figure 1 – Interaction of the sound source

To ensure satisfactory results, the GLLs library files of the loudspeakers must include all the detailed information about the loudspeaker response and how it radiates in all directions (the balloon) in a realistic way. For this reason, DAS AUDIO invests both time and internal resources to provide GLL files that mimic the real behavior of the systems.

Using one FIR filter per cabinet allows DASaim™ to deliver an optimum performance providing:

- Better magnitude and phase control for impressive results.
- Better spatial resolution and more uniform results over the audience areas.

- Precise control of the radiation pattern up to higher frequencies as it minimizes the distance between the sound sources with different filtering.

Other similar solutions on the market require the use of an individual processed amplifier channel per cabinet (in passive systems), which eventually increases the total cost, the number of cables and the connection error possibilities; and even then, they do not fully take advantage of the available power from the amplifier channels. For active systems with internal DSPs without sufficient processing power, one channel from an external processor per cabinet is needed, which also increases the system cost and cabling.

3 – What do I need?

All the information and software needed for using DASaim™ can be found in the link below at the DAS AUDIO web page: http://www.dasaudio.com/DASaim/

3.1 Firmware Update

Former systems, i.e. AERO-40A and AERO-20A, must update their internal firmware with the latest firmware version V3.52 or greater in order to incorporate the DASaim™ support. For that, you need the firmware update software DASLoader V1.7. Follow the instructions in the DASaim Firmware Update Manual document.

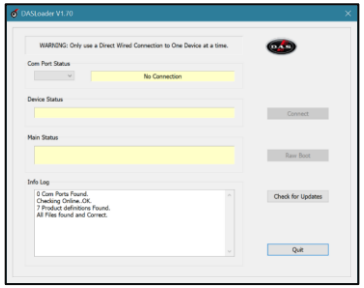


Figure 2 - DASLoader V1.7

Within seconds, thanks to the powerful DSPs employed, your AERO-40A and AERO-20A will be empowered to a new level.

Systems purchased as from March 2018 already include this firmware from factory, so you can skip the previous step. The new firmware V3.52 incorporates DASaim™ support and improvements on the system's frequency response and array size compensation. All in all, this new firmware version has taken into account the day-to-day experience and opinion of our valued customers.

"Thanks to the powerful DSP built into the amplifiers of every AERO system, there's no need for external multi-channel processors or processed amplifier channels in order to have one FIR filter per cabinet. This means greater simplicity and a significant reduction in investment and set-up time when compared to other solutions on the market"

Javier Navarro, Head of Engineering at DAS Audio

3.2 New GLL V3.52 and EASE Focus V3

Using DASaim™ with EASE Focus V3 or greater to design live events and installations requires the new GLL version V3.52 for the AERO-40A and AERO-20A. The GLL (Generic Loudspeaker Library) files contain all the mechanical, radiation pattern and signal processing information for loudspeakers and arrays, and have been created and used by AFMG® in EASE Focus and EASE. This GLL update incorporates the new system's frequency responses and DASaim™ support. The new AERO-20A-120 loudspeaker - a modified AER0-20A with wider horizontal dispersion (120º) - has also been included in this version.

Once the upgrade is complete, you will be ready to design your project with EASE Focus V3 - defining the audience areas, selecting the systems to work with their height and splay angles for proper coverage and SPL level - benefiting from the new opportunities and options that DASaim™ delivers to DAS AUDIO customers.

Ultimately, DASaim™ produces a custom FIR filter per cabinet that is saved in an independent csv text file that will be sent to the cabinets using DASnet V1.7.

3.3 DASnet™ V1.7

DASnet is the control and monitoring software for DAS AUDIO systems. It has been updated to version DASnet V1.7 incorporating DASaim™ capabilities and new models. For further information about DASnet, refer to the user manual and videos.

3.4 Firmaker® License

DASaim™ is based on AFGM's Firmaker® technology. For this reason, in order to export the custom FIR filters from EASE Focus, a Firmaker® License for DAS AUDIO products must be purchased and installed in the computer that executes EASE Focus. This license enables DASaim™ support in existing and future products from DAS AUDIO.

For purchasing and installation information contact us at DASaim@dasaudio.com.

4 – DASaim™ Design Options

The Compute FIR Preset (within the Object Properties tab in EASE Focus V3) gives access to the Firmaker® – FIR filler Optimization window:

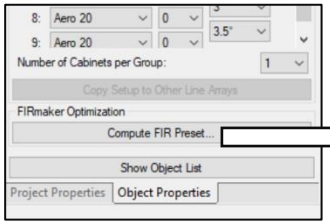


Figure 3.1

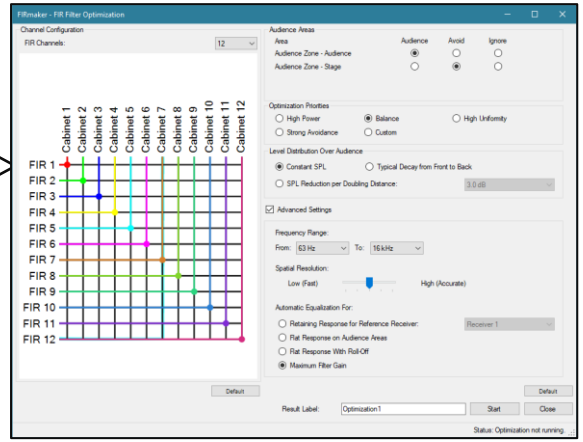


Figure 3.2 –FIR filters optimization

The matrix shown in Channel Configuration represents the assignment of the FIR filters (FIR Channels) to each cabinet of the array. Since the FIR filters are executed within the internal DSP of the cabinets, the default settings are always valid configuration to start with: one FIR filter per cabinet. In flown arrays, Cabinet 1 represents the cabinet on the top and it is assigned to the FIR 1 filter – this is exemplified by the dots on the matrix showing the filter-to-channel distribution.

DASaim™ Design Options appear on the right side of the window. A brief description is offered below. Additionally, further information can be found in the EASE Focus V3 User's Guide.

Audience Areas

In this option all the areas created in the EASE Focus V3 project will appear. They can be configured as follows:

- Audience: Areas where the high SPL and/or uniform SPL will be optimized.
- Avoid: Areas where the radiation will be minimized, like the stage or unoccupied balconies.
- Ignore: Areas that the optimization algorithm will ignore.

Optimization Priorities

This option allows the user to select how the optimization algorithm will affect the target frequency response of the array and its uniformity.

- High Power: aims to maximize the overall SPL of the system.
- High Uniformity: uniforms SPL level and frequency response over the targeted listening areas at the expense of some SPL loss.
- Balance: occupies the middle ground between High Power and High Uniformity.
- Strong Avoidance: focuses on decreasing the level in the areas configured as Avoid.
- Custom: allows the user to set their own parameters.

Generally, when selecting the Optimization Priorities, it is recommended to start by selecting the options of Balance or High Uniformity, and then compare the obtained results to a different set of design options. This will be seen in more depth in part 5 – Examples of use. Eventually, the final application will be determined by the main objective: maximum SPL, maximum frequency response and/or level uniformity, avoidance, or else.

Level Distribution over Audience

This option defines how the SPL over distance varies in relation to the array location.

- Constant SPL: equates to a homogeneous pressure distribution over the entire audience area, from front to back.
- Typical Decay from Front to Back: defines an average level reduction of 4.5 dB per doubling distance.
- SPL Reduction per Doubling Distance: lets the user select among the values 1.5dB, 3dB, or 6dB per doubling distance.

DASaim™ adapts the radiation pattern of the array to the audience areas. The excess energy at the front can be partly redirected to the far field (mainly in the mid and mid-high frequencies) without increasing the filter's gain and improving the interaction of the cabinet responses.

Bear in mind that there are physical limitations to this. If the user aims to obtain constant SPL over a long distance, DASaim™ may decrease the SPL at the front to balance the SPL at the rear.

Advanced Settings

When selecting the Advance Settings option, a new configuration menu appears:

- Frequency Range

It allows the user select the lowest and highest frequencies where DASaim™ will optimize the array behavior.

Note once again that there are physical limitations to this. Consequently, to achieve control over low frequencies, the length of the array and, hence the number of cabinets must be high. That is, larger arrays allow more control over low frequencies.

On the other hand, the effective high frequency limit will depend on the distance of the high frequency units between cabinets and their waveguide design. DASaim™ will optimize the interaction between the sources up to a frequency where radiation overlaps them and it will work as a magnitude equalizer above these frequencies.

The default values are a good starting point for configuring the system's frequency range and expect an effective low frequency control in line with the array size.

- *Spatial Resolution*

It configures the physical distance between the virtual microphones that DASaim™ automatically adds to the listening areas. The design objectives are evaluated at these receiver points and within seconds, the optimization algorithm interactively designs the best possible FIR filter per cabinet. Spatial Resolution can be configured from Low (Fast) with less virtual microphones to High (Accurate) with more virtual microphones. Basically, adding a large number of microphones can result in attaining a more uniform resolution. However, this increases filter design time and computer memory use. For this reason, an intermediate value will be enough in most cases.

- *Automatic Equalization For*

This option configures the equalization of the average filter response over the audience areas.

- Retaining Response for Reference Receiver selects the response of one of the reference receivers as the target response. With this approach, the user can select the response of the preferred receiver (like FOH) and DASaim™ will make this response global for the rest of the areas. The response over the selected receiver will not be modified.

- Flat Response on Audience Areas aims at a flat curve in all the listening areas, usually at the expense of decreasing the overall level. To maintain the system's headroom, a flat response can be achieved by making the levels over the listening areas as the ones at further positions. It is strongly recommended to limit the frequency range to 8kHz or less to avoid excessive level penalty. Otherwise, atmospheric attenuation comes into play and penalizes the overall level greatly.

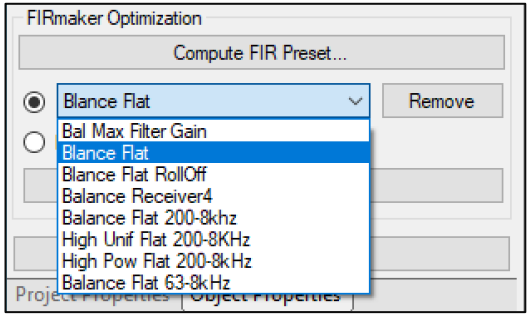
- Flat Response With Roll-Off is similar to the previous option but it limits by default the frequency range from 125Hz using a 4th order Butterworth filter to 8kHz with an 8th order Butterworth filter.

- Maximum Filter Gain is used to achieve the maximum filter gain at each frequency band. This is the least penalizing option for the overall SPL level and for any other option that does not allow a global SPL reduction greater than 2-3 dBs in your application.

RECOMMENDED STARTING POINT

- Optimization Priorities: Balance or High Uniformity
- Level Distribution Over Audience: Constant SPL
- Advanced Settings:
  - Frequency Range: 63Hz to 16kHz
  - Spatial Resolution: 50%
  - Automatic Equalization For: Maximum Filter Gain

Once the configuration settings are selected, the user can name the configuration in the Result Label edit box and design the FIR filters within seconds by clicking the Start button. It is possible to design different configurations within EASE Focus V3 project, and later switch between them in the Object Properties window in order to compare the results and select the most suitable configuration for the application. We also recommend giving a self-explanatory name to each configuration for clarity when performing later comparisons.



Example 1

Each installation or venue will require a different DASaim™ configuration according to the different types and number of cabinets, array heights and aiming, and different use (conference, theater, jazz, rock, techno...). As it only takes seconds to test a new set-up, the best way to create a design is to simulate different options and compare the resulting SPL and frequency responses over the listening areas. In fact, it is possible to design different FIR filters sets and after loading them into the AERO systems, check them for a final selection.

5 – Examples of use

5.1 Auditorium

Let's consider a given auditorium venue – shown in Figure 4 – which is 45 meters long including the stage, a steep seating area and a balcony. In this venue, 12 units of AERO-40A are used per side with an array height of 11 meters. The splay angles have been designed using Auto Splay with Spiral Strategy, with posterior manual modifications. This simulation also includes 8 receivers over the audience area to monitor the level distribution and frequency response from front (1) to back (8).

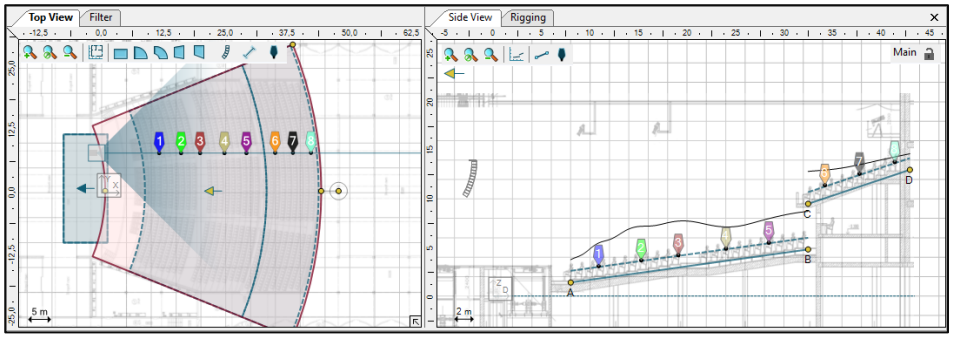


Figure 4 – Auditorium example

Figure 5 illustrates the performance of the array without DASaim™ support. The configuration for the Filter Settings of the cabinets is set to 12 Units (12U), the THROW to Long Throw (LT) for the 3 cabinets at the top (the cabinets pointing to the balcony) and to Mid Throw (MT) for the rest of the cabinets. For this particular setup, the predicted frequency response over the 8 receivers and broadband level over distance are as shown:

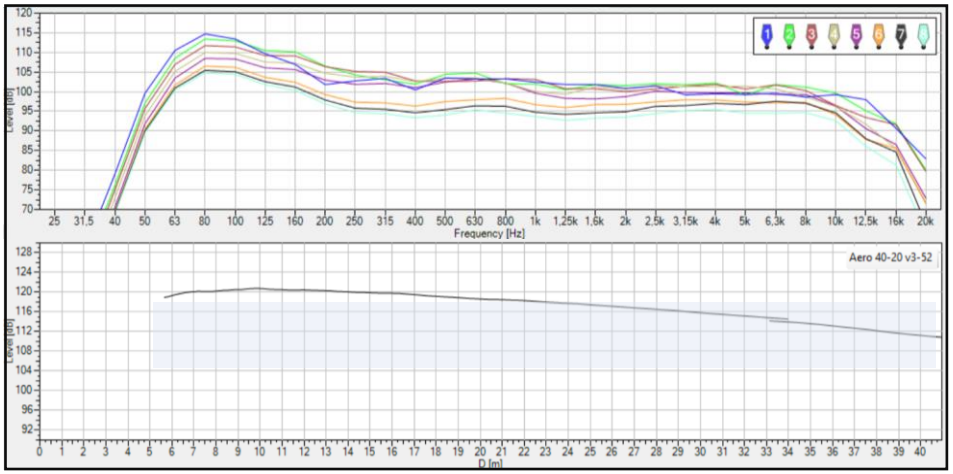


Figure 5 – Response without DASaim™

The resulting performance in level and frequency response is the expected for a line-array system. There is a front-to-rear level drop greater than 10 dB and a tonal variation

mainly in the mid frequencies displaying excessive level at the front and mid distances and a lack of it at long distances. Note that high frequencies at far distances - receivers 6 and above - are also attenuated due to atmospheric absorption. In this setup the mean SPL level over the audience areas is 114.2 dBspl with a variance of 3.5 dBs.

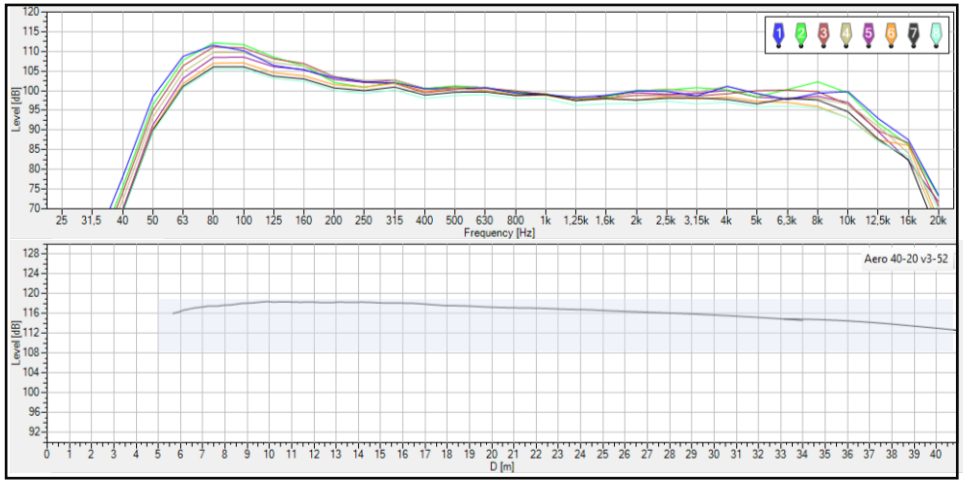


Figure 6 – Response with DASaim™: Balance, Constant SPL, Maximum Filter Gain

This graph shows how the frequency responses and level are almost identical - from 350 Hz to 6kHz - and the level variation from front-to-rear is reduced to less than 4 dB, keeping most of the audience area within ±1 dB. This is the result of an energy distribution from the front - where normally the level is excessive (and can be harmful for the audience) - to the mid and rear distances, where it is needed. This process is done without filter gains, just by improving the interaction between the sources. In addition to this, the level over the balcony is increased by more than 2dBs. Altogether, this is an extraordinary process since the global equalization of the system is homogeneous over all the listening areas, so there is no longer a need for near, mid and far field equalizations. At this point, the mean SPL over the listening areas is 113.2 dBspl with a lower variance of only 2dBs. In this case, the mean SPL loss for the overall audience is only 2 dB.

DASaim™ works by modifying the vertical radiation pattern of the array to properly cover the audience areas with a more efficient frequency range than other techniques. As it can be seen in Figure 7, the vertical mapping and the SPL over mid frequencies (630 Hz, 1/3 octave) are displayed. The picture on the left shows how the direction of the main lobe is perpendicular to the array, not covering the balcony effectively. As a result, the SPL over distance is uneven which results in a 10 dB difference from front to back. After turning on DASaim™, we can achieve the results shown on the right graph of Figure 7. In this case, the lobe is tilted-up adapting itself to the audience areas thanks to the digital steering capabilities of DASaim™. Consequently, the SPL is much more uniform within the overall audience areas with a deviation of only 1 dB from front to back.

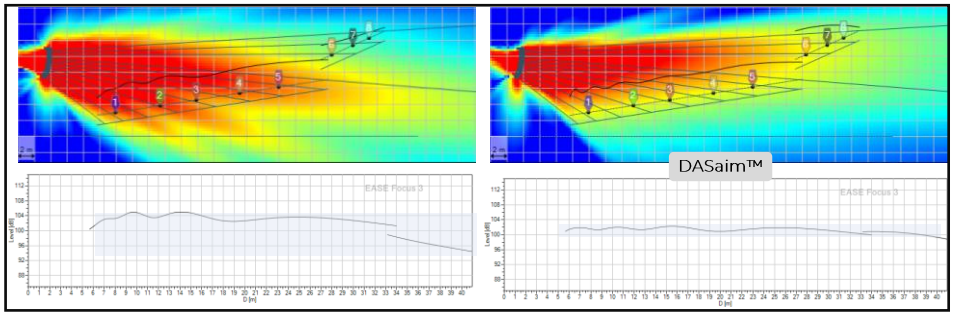


Figure 7 – Vertical radiation pattern at 630 Hz

Even though, there are complex and risky all-pass filtering techniques for tilting-up the lobe over low and mid frequencies, DASaim™ overcomes this by achieving a uniform SPL and frequency response for the complete audience in a fast and reliable way.

DASaim™ frees the user from a common problem that appears in line-array systems when attempting to achieve complete coverage over the listening areas. The array position, its inclination, and the splay angles of the cabinets are determined by the directivity of the high frequency units. However, the coverage at low and mid frequencies is determined by the mean array inclination, meaning that there is a lack of low-mid frequencies at mid and long distances, resulting in the loss of the tonal balance uniformity from front-to-back and SPL over distance. DASaim™ solves this issue delivering an unthinkable performance with pure equalization techniques.

Thanks to DASaim™, it is possible to achieve further uniformity by changing the design options. For example, setting the configuration for DASaim™ to High Uniformity, Constant SPL and Maximum Filter Gain (Figure 8) the frequency responses are almost identical over all the receivers - as happens with the SPL with less than 2 dBs from front-to back. In this case, the mean SPL is 111.2 dB, a decrease of 3 dBs from the system without DASaim™. In general, the price for achieving more uniformity is a slight SPL reduction.

High Uniformity
Constant SPL
Maximum Filter Gain
111.2 dBspl

Balance
1.5 dB double distance
Maximum Filter Gain
113.5 dBspl

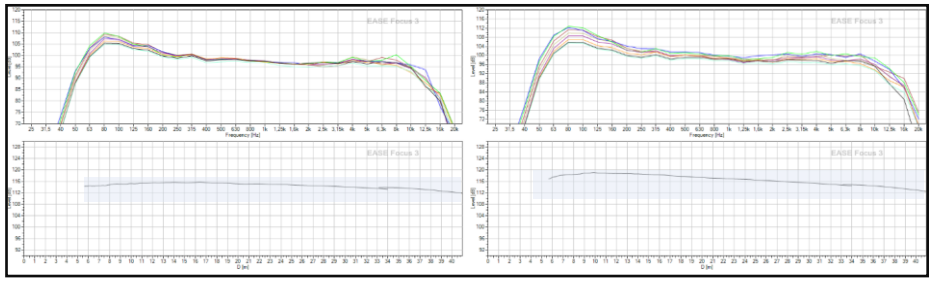


Figure 8 –DASaim™ configurations

DASaim™ is flexible enough to adapt its behavior to the specific requirements of each installation or venue whether it is maintaining the maximum SPL, requiring a level drop over distance, or any other design strategy – as illustrated on the right graph of Figure 8 where lower uniformity is required. The configuration is set to Balance, 1.5 dB attenuation with double distance, and Maximum Filter Gain. For this example, the mean SPL has decreased to 113.5 dBspl - only 0.7 dB below the response in Figure 5 – but it still maintains tonal uniformity. In this case, the power headroom of the AERO-40A will be enough to recover almost the original SPL.

In general, the best way to configure DASaim™ is by comparing the virtual receivers in order to monitor the evolution of the frequency response and level over distance. We recommend trying different design options or combinations to find the optimum tradeoff in any given situation. Each designed iteration takes only seconds to set up, so the user can find the best design option for each case within minutes.

5.2 Avoiding the balcony

Imagine now that in the venue, the balcony is empty. DASaim™ can be configured to avoid it by not sending the sound to it improving the voice intelligibility because the room is less excited. For this, let's set the following configuration - High Uniformity, Constant SPL and Maximum Filter Gain and Avoid the balcony. The frequency responses over the receivers will look as shown on the top graph of Figure 9. The level for the mid and high frequencies for the three receivers of the balcony (6-7-8) decreases considerably, about 15 dBs. Similar results are obtained when the balcony is configured to ignore instead of to Avoid. In fact, this attenuation value will be in reality lower because EASE Focus does not take into account the reverberation effect, even though EASE Focus is still reasonably accurate and useful in the measurements. Eventually, there is no need for moving the array or modifying its splay angles. The vertical coverage is adapted thanks to the digital steering using the designed FIR filters. To illustrate this, the bottom graph in Figure 9 shows the adapted vertical coverage at 4kHz. In addition to this, the user can change from one configuration to another within seconds in just a few clicks.

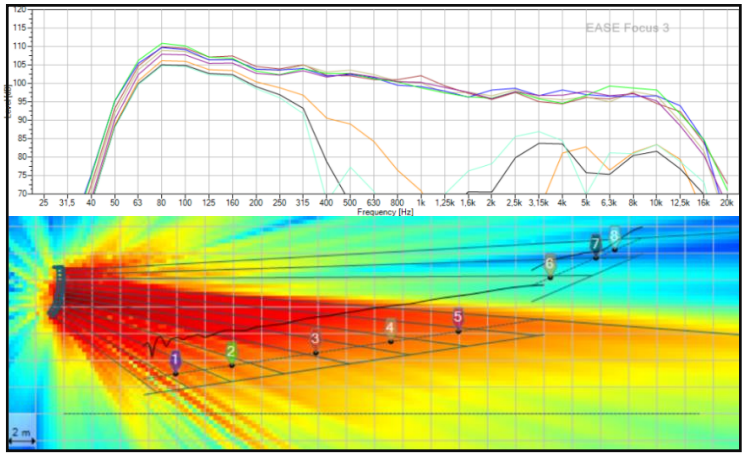


Figure 9 - Auditorium – Avoiding Balcony

5.3 Avoiding the stage

As with the previous configuration (avoiding the balcony), avoiding the stage can be done by selecting the Avoid function in the Design Options while applying another configuration to the other listening areas. To start with, let's combine again High Uniformity, Constant SPL and Maximum Filter Gain, and configure the stage to Avoid in the Design Options. As a result, a new receiver (see Figure 11, receiver 9) is added on the stage, 2 meters behind the array.

Firstly, Figure 10a displays the frequency responses and broadband SPL over distance without Avoiding the stage. As expected, there is contamination on the stage - about 7 dB below the level of the audience - and mainly at low frequencies.

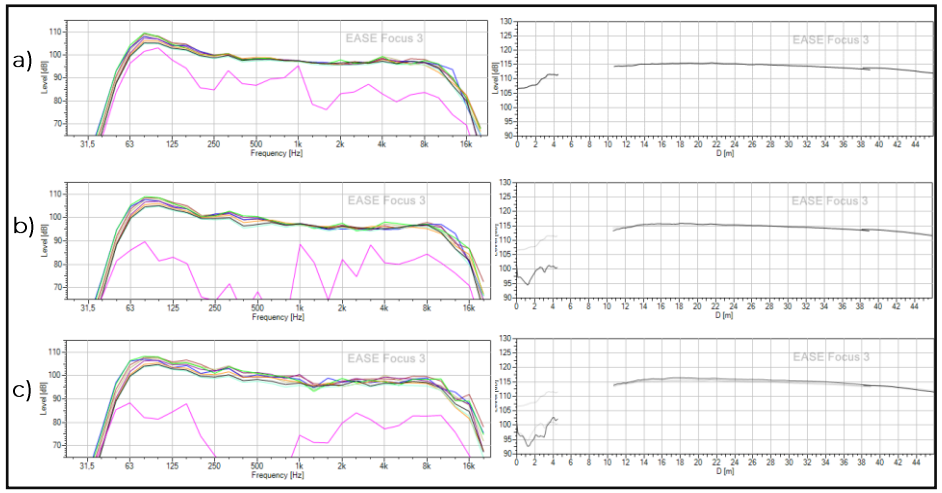


Figure 10 - a) Initial response on the stage; b) Avoiding the stage; c) Avoiding the stage with Strong Avoidance strategy

Figure 10b shows the configuration of the stage when selecting the Avoid function. The SPL and frequency response over the listening areas remain almost the same, but the SPL over the stage has been reduced more than 10 dBs. Please note the difference compared to the curve from the previous level. From 125Hz to 1kHz, the reduction is even greater, close to 20 dBs.

Changing the configuration to Strong Avoidance, Constant SPL and Maximum Filter Gain furthers the reduction as illustrated in Figure 10c. This new FIR filters design approach emphasizes the reduction at the expense of losing some uniformity over the frequency response and SPL.

Finally, Figure 11 illustrates how the radiation at 500Hz is modified according to the design approach – from not avoiding the stage (picture a) to avoiding it (picture b).

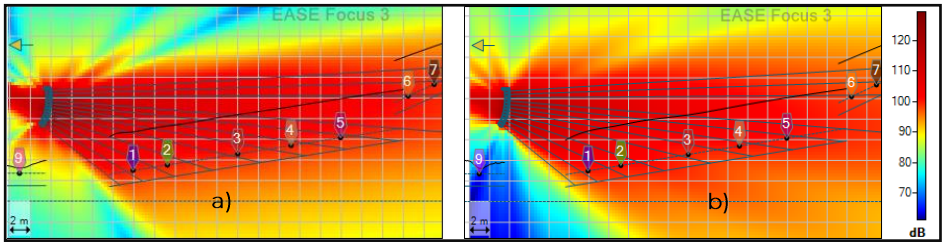


Figure 11 – Vertical coverage at 500 Hz without avoiding the stage a) vs avoiding it b)

5.4. Real Measurements

To demonstrate the performance of DASaim™ in real situations, let's consider a similar auditorium with two arrays of 9 AERO-20A and compare the EASE Focus 3 predicted results to real measurements in an indoor scenario.

For this purpose, three microphones (Earthworks M30) are placed at the near (8 meters –receiver 1 in blue), mid (18 meters - receiver 2 in green), and far field (32 meters, receiver 3 in red) and the configuration for DASaim™ is set to High Uniformity, Constant SPL and Maximum Filter Gain.

Figure 12 compares the measured results (using a Presonus AudioBox 44VSL interface and Smaart V7 analyzer) without DASaim™. Note the accuracy of the predictions and, hence the fidelity of the GLL data even in an indoor scenario with the room influence.

Likewise, Figure 13 shows what happens when DASaim™ is turned on, namely uniformity. DASaim™ ease of use lets the user effortlessly equalize and deliver their mix to the whole audience.

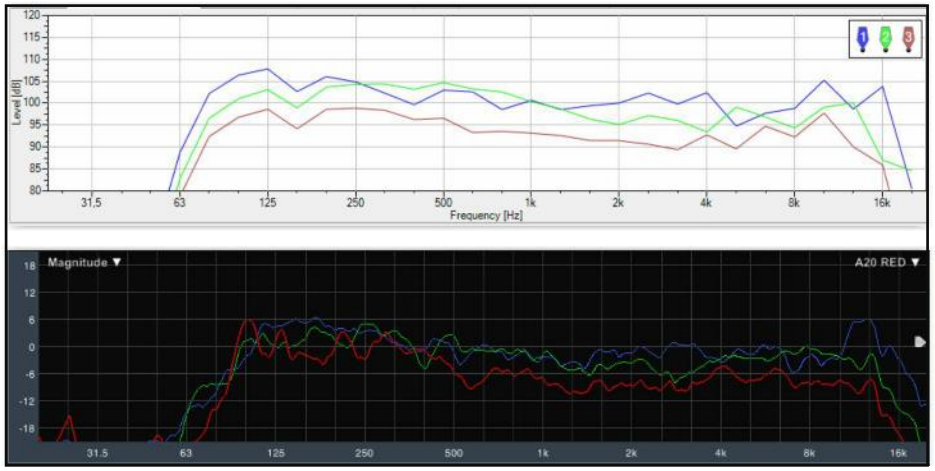


Figure 12 – Prediction and measured responses without DASaim DASaim™

Likewise, Figure 13 shows what happens when DASaim™ is turned on, namely uniformity. DASaim™ ease of use lets the user effortlessly equalize and deliver their mix to the whole audience.

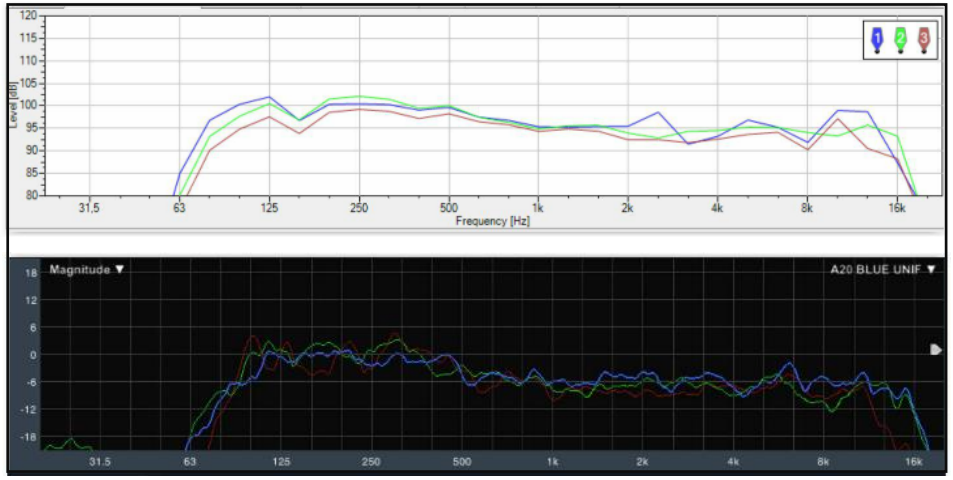


Figure 13 – Prediction and measured responses with DASaim™

6 – Workflow

After having explored the capabilities of DASaim™, let's take a look at the complete workflow in these three steps:

Step 1: Ease Focus 3

- To start with, use EASE Focus V3 or greater and the GLL V3.52 for the AERO-20A, AERO-40A and AERO-20A-120.
- Introduce the required information and configure the system: height, splay angles, and internal filter set-ups; then, evaluate its performance.
- As in Part 5 - Examples of use, try different DASaim™ configuration options to meet your specific requirements. Once the configuration is selected, you are ready to export the FIR filters.

Step 2: Export FIR filter / .CSV files

- With the selected configuration active, click the Export FIR Preset button. This button will be only enabled if a Firmaker® License has been acquired. Then we will apply the following configuration on the next window.

This must be the configuration:

Sample Rate: 48 kHz
Number of Taps: 384
DC Attenuation: None

- **48 KHz** is the sample rate of the internal DSPs of the AERO systems. **384** is the number of taps (coefficients) employed as this is a reasonable tradeoff between frequency resolution of the filters and the added latency (4ms). Finally, **DC Attenuation** configures how the low frequencies are attenuated

NOTE: DASaim™ adds 4 milliseconds of latency

By clicking OK:

- The user can identify the FIR filter set with a file name.
- Select the **CSV format file** (default). Be as explicit as possible to avoid later confusions.

- For an array with N number of cabinets, N csv files will be saved in the selected folder. These files add a "_x" to the file name identifying the specific FIR filter for each cabinet; "x" being x=1 for the cabinet at the top of the array.

Step 3: DASnet™ v1.7

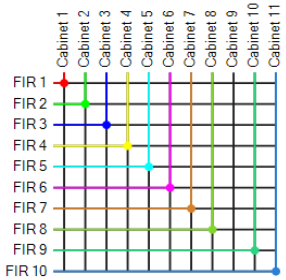
- Run Autoscan in DASnet V1.7 to display all cabinets. Additionally, a Zone must be created for each array.

  NOTE: Cabinets must be ordered from the top as they are physically in the array

- Use the IDs of the cabinets to identify them. This way, each cabinet will receive its custom FIR filter. A minimum of 6 cabinets are needed to work with DASaim™.
- Right-click on the Zone panel. A pop-up menu will appear. Now, select Load FIR and navigate to the folder with the csv files.
- Select any of the csv files with the "x" extension. DASnet will check that the number of csv files is the same as the number of cabinets in the array, and that the Number of Taps is 384.
- The names of the csv files will be shown in the Zone panel and each cabinet will be in red.
- Select Send FIR and, within seconds, all the FIR filters will be sent. Then, the text with the csv names will change to white.
- Finally, you are ready to activate and deactivate them by clicking Activate FIR and Bypass FIR for quick comparisons.
- Delete FIR allows you to delete the stored filters in the cabinets.

7 - Recommendations

- Configure the EASE Focus project as accurately as possible with the real set-up of the systems.
- Try different DASaim™ design options and compare them in order to select the one closer to your design objectives.
- Pay attention when defining the Audience Areas. Limit their dimensions to the real coverage areas, leaving the front, close to the arrays, out of them. Otherwise, DASaim™ will try to optimize the very near field - where there is no high frequency coverage - with the mid and far field, which results in a degradation of the overall results.
- Use self-explanatory names for DASaim™ configurations and csv files.
- Use Balance or High Uniformity as Optimization Priorities for uniform tonal balance with Maximum Filter Gain to minimize the mean SPL loss.
- For uniform SPL over distance configure the Level Distribution over Audience to Constant SPL at the expense of a mean SPL loss of 1 to 3 dBs. For lower dB losses, select a SPL Reduction per Doubling Distance such as 1.5 or 3 dBs. As usual, we suggest trying different design options and comparing them, evaluating the tonal balance and level distribution from front-to-rear at the receiver points.
- When using the Flat Response function in Advanced Settings, limit the frequency range to 8kHz or lower.
- Bear in mind that there is an energy balance from the near field - where there is usually enough level - to the far field -where there is a lack of energy.
- When selecting the Avoid function, always compare the results to selecting Ignore, in order to evaluate how the performance of the array varies when trying to cancel the radiation over the area to avoid. Check how the vertical dispersion pattern is modified to avoid undesirable lobes at other directions.
- Note that when using mixed arrays of AERO-40A with AERO-20A or AERO-20A-120, EASE Focus 3 needs the insertion of an AX-Combo, which will be considered as a "new" cabinet in the array. In this case, identify its position in the array and change the Channel Configuration to one less FIR Channel. Then, re-arrange the FIR Channel to Cabinets matrix to eliminate the FIR assigned to the AX-Combo. For example, for a mixed array of 8 AERO-20A, an AX-Combo and 2 AERO-20A-120, modify the matrix as shown in the picture. Cabinet 9 is the AX-Combo, so no FIR filter must be assigned to it.



- Verify that all the cabling and systems are working properly before using DASaim™.
- Compare the acoustic experience using similar SPL levels and your well-known music pieces

8– Conclusions

DASaim™ takes a significant step in sound system design providing a flexible and powerful tool for digital steering that adapts the performance of the AERO-40A, AERO-20A and AERO-20A-120 to your everyday acoustic needs.

Thanks to DASaim™, the desired results in any sound installation or venue - like uniform frequency response and controlled SPL over distance - can be easily achieved.

DASaim™ simplifies and quickens set-up times while solving complex acoustic situations when needed - like controlled radiations to audience areas or avoiding listening zones - enabling the modification of the vertical radiation pattern without modifying the height and angles of the arrays.

As the custom FIR filters are executed inside the cabinets, no external multi-channel processors or processed amplifier channels are needed in order to have one FIR filter per cabinet. This means greater simplicity and a significant reduction in investment and set up time when compared to other solutions on the market. Essentially, having one FIR filter per cabinet means better spatial resolution and efficient lobe control up to higher frequencies.

For more information or support contact us at DASaim@dasaudio.com