

EASE Focus

Loudspeaker Array 2-D

Aiming Software

by Charles Hughes

Introduction

EASE Focus is a loudspeaker array aiming software from Software Design Ahnert GmbH (SDA) in Berlin, Germany. It is primarily targeted at end-users needing to design or set-up a line array system and quickly predict its performance in a particular venue. It runs under Microsoft Windows and is based on the .NET framework. EASE Focus consists of two separate pieces of software; EASE Focus Aiming and EASE Focus Compiler. The aiming software is free to all and is available for download at www.easefocus.com. It is currently available in English and German. There will soon be a Spanish, and possibly Italian, version released. The compiler is for manufacturers that have secured a license from SDA. This enables manufacturers to supply the data files that are used with aiming software. Interested manufacturers should contact SDA (www.sda.de) for more information.

Because the software is not proprietary to a single manufacturer it allows for comparison of the performance of different products. When new data files are posted by manufacturers they can be added to the program's database and are then available for the user to employ in a project. This can be done manually by downloading a data file from a manufacturer's web site or automatically by selecting Online-Update under the Help menu. The same automatic process is used when updates to the program itself are available. This greatly simplifies keeping everything up-to-date.

Operation

EASE Focus calculates the direct field SPL for a single array. A system data file contains all the necessary information for an array element (directivity data, allowed splay angles, maximum number of boxes allowed, etc.) to be configured into an array and its direct SPL to be plotted in a venue. EASE Focus is similar to EASE in that it operates on the principle of superposition. It owes its accuracy of prediction to the same research and new developments that are incorporated into the GLL file format. For additional information on this see AES Preprints #6631 and #6632 from the 119th AES Convention, October 2005.

Simply put, the GLL file format stores directivity data in the native resolution (with respect to frequency/time and measurement angle) of the measured frequency response (FR) or impulse response (IR) measurements of a source. Several sources may be present in a given loudspeaker system (i.e. two-or three-way model). When data is needed at points that lie in between measured data points of the sources, interpolation methods are defined that allow for this. It is for this reason, among others, that the use of complex data (magnitude and phase) is important to describe the directivity of each source within the loudspeaker system.

The current version of EASE Focus, v1.32, plots coverage in two dimensions. The data files are the EFO file format which is a 2-D predecessor of the GLL. The EFO files use 5°, one-third octave data. In the near future EASE Focus 2.0 will be released. It will use the newer GLL and plot coverage in 3-D.

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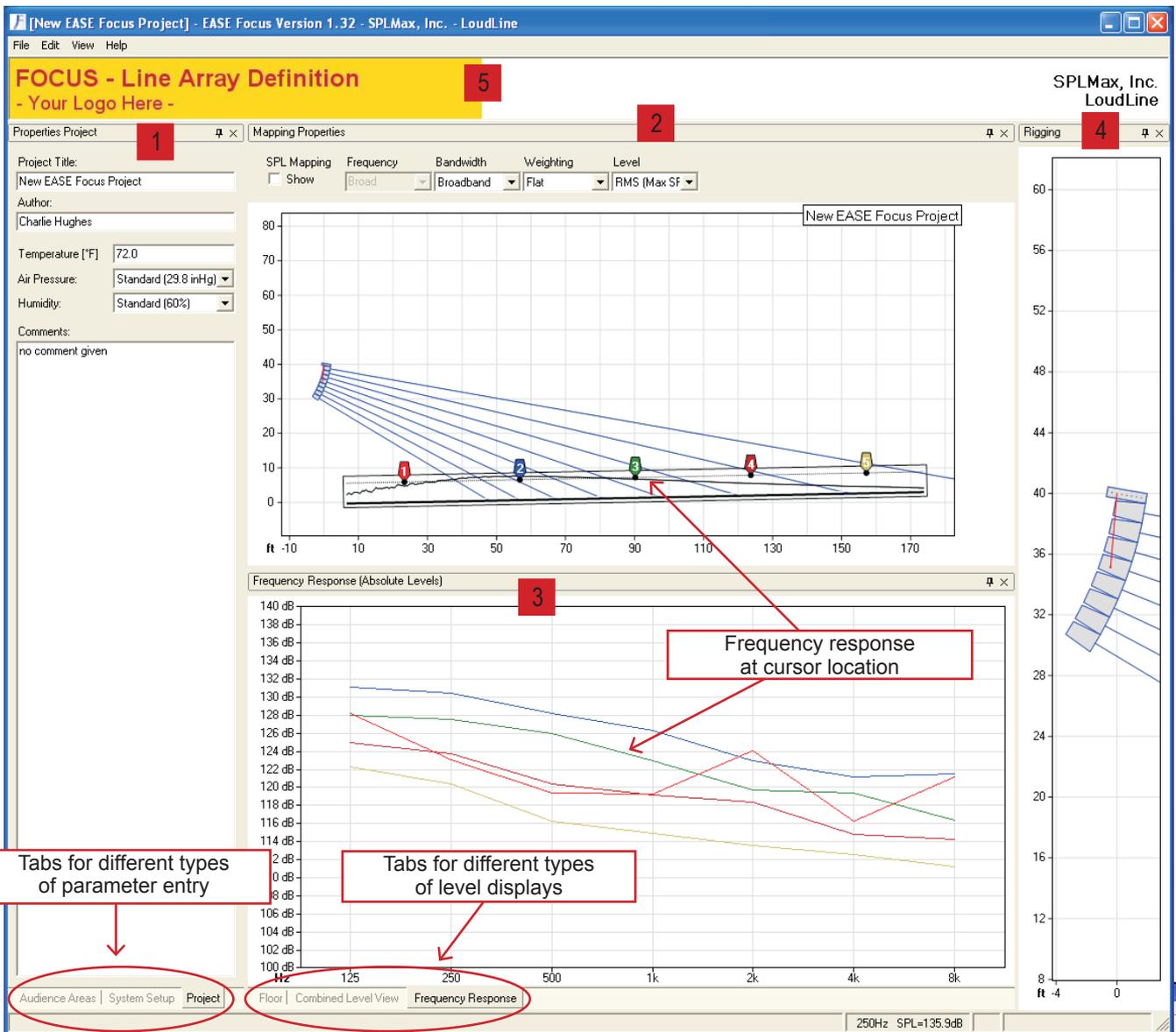


Figure 1 – EASE Focus showing the different sections of the GUI

GUI Layout

The user interface, shown in Figure 1 is very intuitive. It is divided into a parameter entry section (1) and a display section (2-4). The parameter entry section has three tabs to separate different functions; Project, Audience Areas and System Setup. The Project tab allows for a project name and comments to be entered. It is also where the values of the environmental variables of temperature, air pressure and humidity are set.

The Audience Areas tab (Figure 2) is where the elevation of a venue is entered. This will define the surface on which the array performance is calculated. The audience areas are typically 1.2 m (sitting) or 1.7 m (standing) above the venue floors but can be altered in the Options (F9) set-

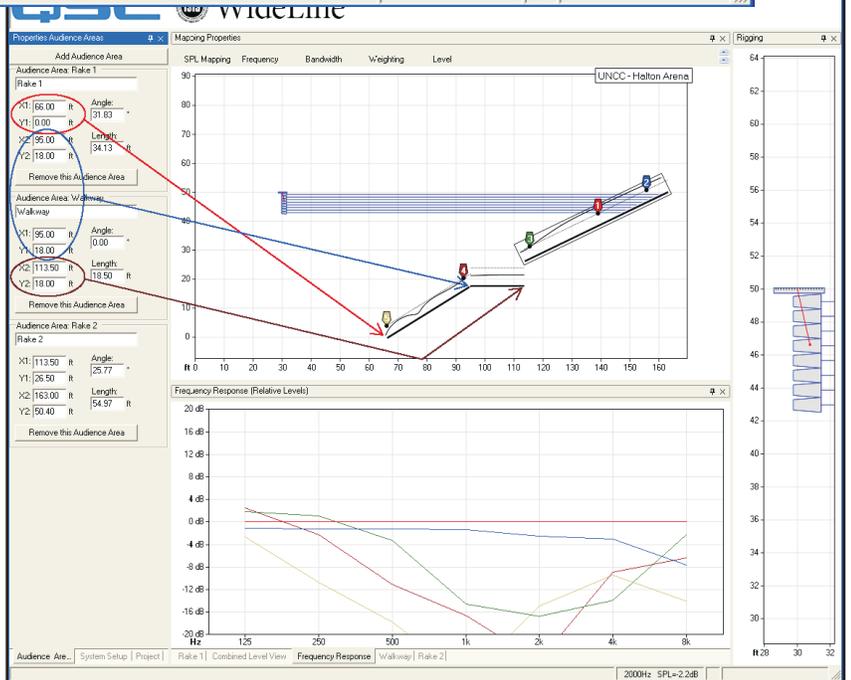


Figure 2 – Each set of coordinate pairs defines a straight line portion of the audience area.

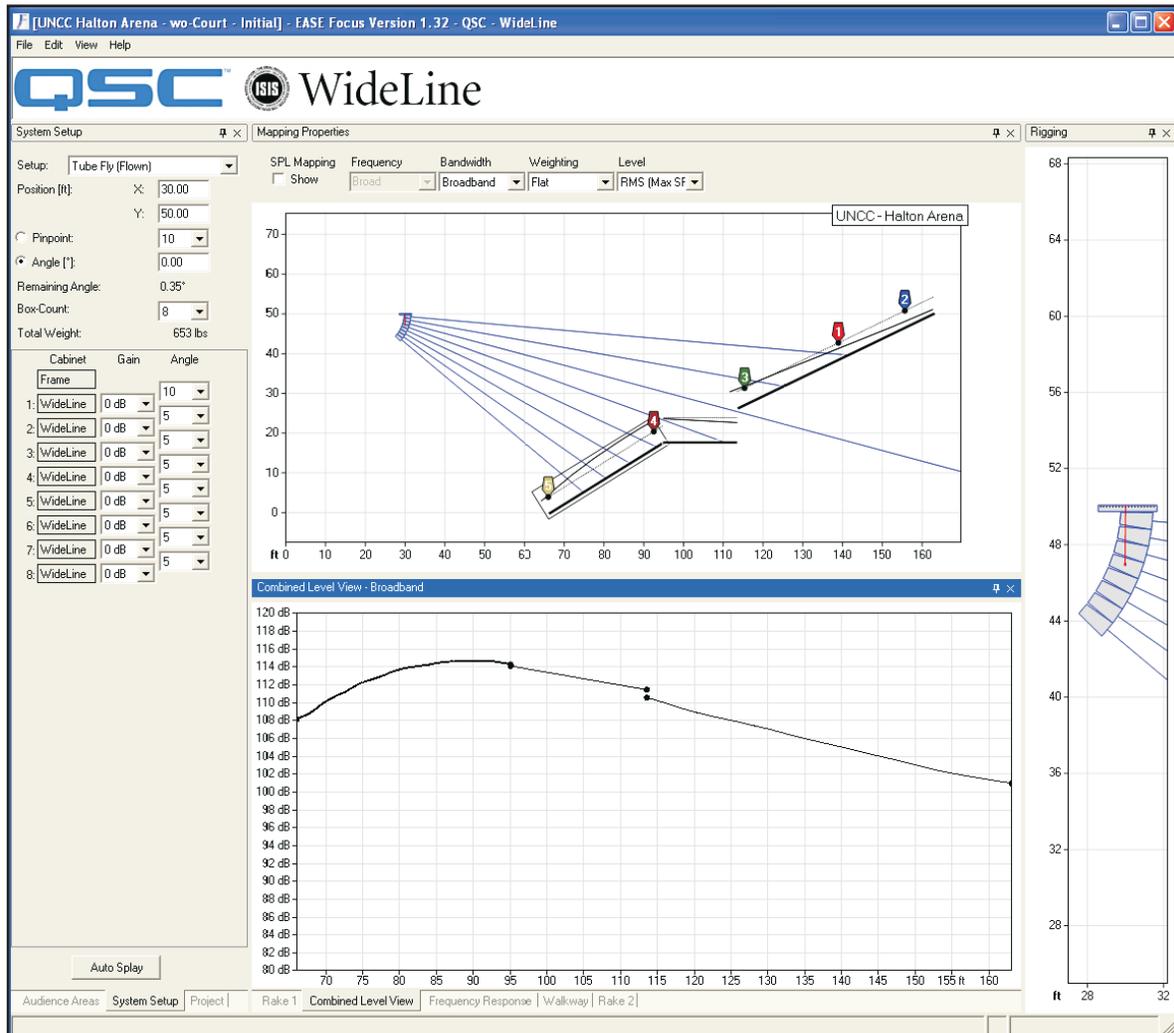


Figure 3 – Initial setup of curved 8 box array

tings. There are several Venue Presets available under the Edit menu. Using these can help to speed up the process of creating a venue. Audience areas may be added or removed as needed. Two pairs of coordinates which denote span and height (x and y, respectively) dimensions are entered. Alternatively, one pair of coordinates may be entered along with the angle and length of the section.

The System Setup tab (Figure 3) is where all of the loudspeaker array parameters are entered. The position of the array can be specified anywhere within the venue.

All of the other selections are based on the possible choices allowed by the particular loudspeaker system (EFO) being used. This is shown in the top portion of the EASE Focus window (Figure 1, #5). Changing to a different loudspeaker system is accomplished by selecting Change System under the Edit menu. Once a system and the number of boxes are chosen an Array Preset (J-Array, Line or Curved) under the Edit menu

may be chosen as a starting point. One of the really nice features is the Auto Splay function. This will alter the splay angles between the individual boxes to optimize the coverage over the audience areas. This is done with a given number of boxes and array position.

The EASE Focus display (Figure 1) can show multiple views. Typical displays are Mapping Properties (2), Levels (3) and Rigging (4). These may be turned on and off as desired. A system equalizer is also available for adjustments of the entire array. The Mapping section shows the array, cursors (up to nine cursors may be placed in the audience areas), the venue elevation and audience areas above the floor. Curves are shown over the audience areas. These denote the relative level at that position and at the chosen frequency. The frequency, bandwidth, weighting and level type (RMS, Program, Peak or Max Flat) are selected at the top of this section. Checking the Show SPL Mappings enables a color mapping of the SPL on this section (Figure 4).

The Levels view, just below Mapping, is tabbed.

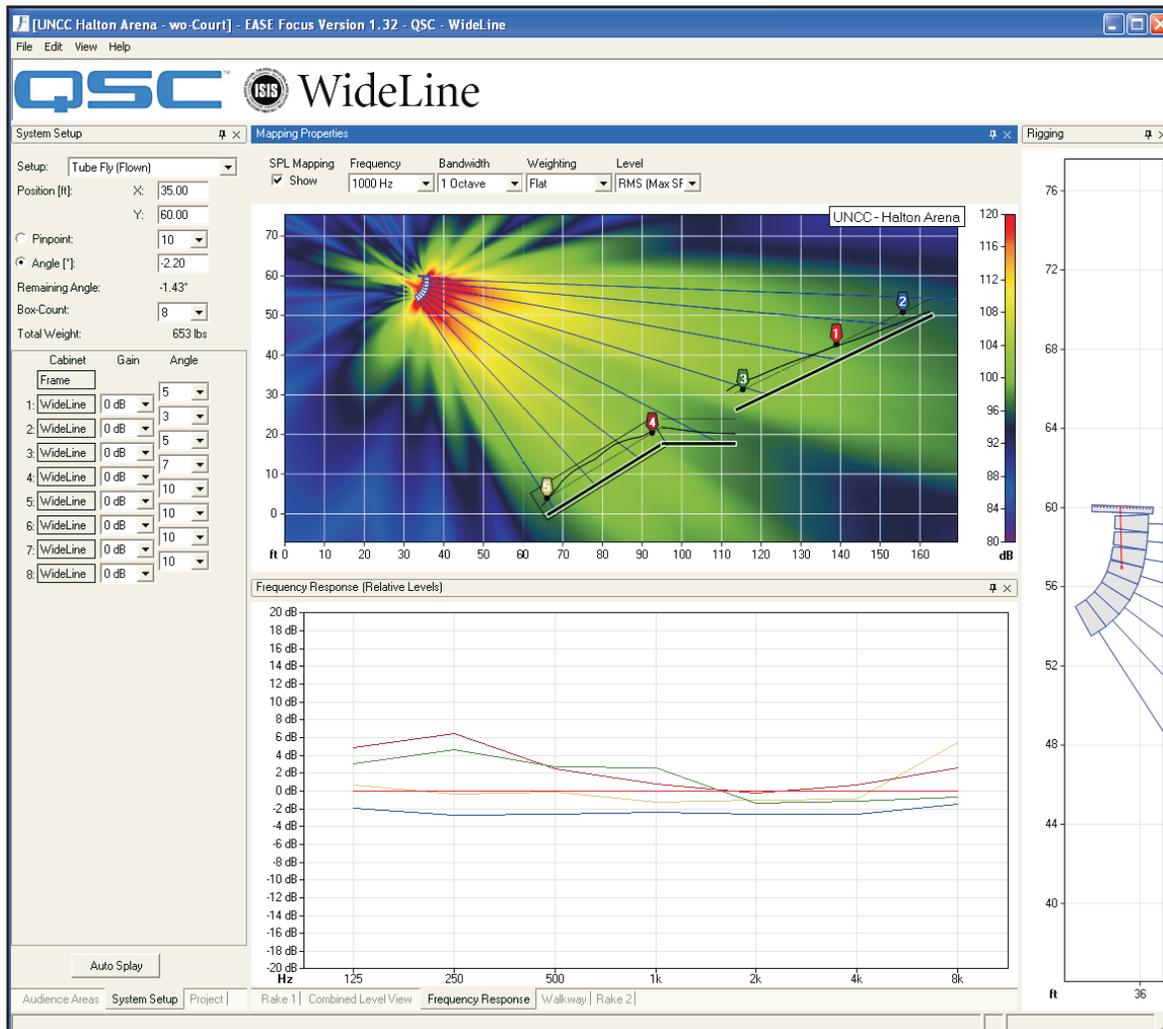


Figure 4 – Final array location and configuration showing SPL map and relative frequency response curves

The tabs allow the level on an individual area (floor or balcony), all of the areas combined, or the frequency response to be viewed. Frequency response curves are shown at the cursor locations. The cursors may be dragged anywhere on the audience area. The frequency response can be changed from absolute SPL to relative by double clicking on the graph. The reference for relative is the #1 cursor. The default frequency display resolution is one octave. If desired these can be changed to one-third octave in the Option (F9) settings.

The Rigging view, on the right of the window, shows a close-up of the array. It is displayed with a scale of the venue distance and height (x and y axes). This can be very helpful if positioning an array close to limits imposed by other considerations (roof, lighting truss, etc.)

It should be noted that in the illustrations presented here all of these views are anchored in place in the default location within the EASE Focus window. It is possible to place them anywhere on the screen, even outside of the EASE Focus application window. They can be

resized as well. There is a Reset Layout function available under the View menu which will place all of the views back in their default location.

There is an extremely nice feature that is a bit hidden but very useful. It is Create Print Version under the File menu. Selecting this will prompt the user for a location where a rich text format (RTF) file will be saved. This file will be a complete report on the current design. It shows the current SPL map and frequency response, if displayed. More importantly it shows a drawing of the array rigging, lists a table detailing all of the box splay angles and indicates rigging trim height and total array weight. Simply print this report and give it to your rigging crew.

Design Example

The design of an array was done for a local collegiate basketball arena. The first step was to input the elevation of the arena floor / audience areas. After getting the coordinates from drawings, this only took a couple

of minutes to enter (Figure 2).

An eight box array was thought to be able to yield sufficient SPL and was chosen as an initial trial run (Figure 3). The Curved Array preset was used to set a starting configuration for the array. By placing the mouse cursor over the array it can be moved anywhere within the mapping section. The individual boxes can be aimed similarly by grabbing a projection ray and dragging it to the desired aiming location. Note that this also affects lower boxes in the array just as it would for the actual rigging. A really nice feature is that when either of these is done the frequency response plots are updated in real time. Way cool!

When a reasonable location for the array had been selected the Auto Splay function was used to help set the array for good coverage of the audience areas. Several iterations of this process, while switching between views of the broadband level and the frequency response, were able to yield the right array location and configuration. The relative frequency response at the different cursor locations is shown in Figure 4. For all locations (except #4 at 250 Hz) the response of each is within ± 3 dB. With slight tuning modifications of individual boxes each of the locations should be able to be brought to within ± 2 dB.

An SPL mapping is also shown. This is very useful to check for high level rear lobes, especially at lower frequencies. If they exist, acoustical treatment may be in order.

The Rigging display was also useful in this exercise. It assures that the array is above the top of the scoreboard height (located at 52 feet) so that sightlines are not obstructed.

The maximum broadband level (RMS) in the audience areas is shown in Figure 5. The SPL ranges from 104 – 112 dB. All but the last 12 feet of the upper seating area are within an overall ± 3 dB range.

Conclusion

An overview of the operational principles and user interface of EASE Focus has been presented along with a design example. I hope from this that the value of the software can be appreciated. For the end user it allows multiple array configurations and locations within a venue to be evaluated very quickly. For the manufacturer it is a means to allow customers and potential customers to investigate the use of your product without the costly development (both in terms of time and capital) of a proprietary software application.

I also hope you're sufficiently curious about EASE Focus to download a copy to try it for yourself. *ch*

Figure 5 – Broadband level across audience areas

