



# AOS Installation & User Guide

This user guide is intended for the purpose of explaining the functions and use of the Array Optimization Software (AOS) and assumes a working knowledge of line array loudspeaker applications and installations.

NOTE: Ambisonic Systems will periodically update or add new data files to AOS. Be sure to check the website for newer versions.

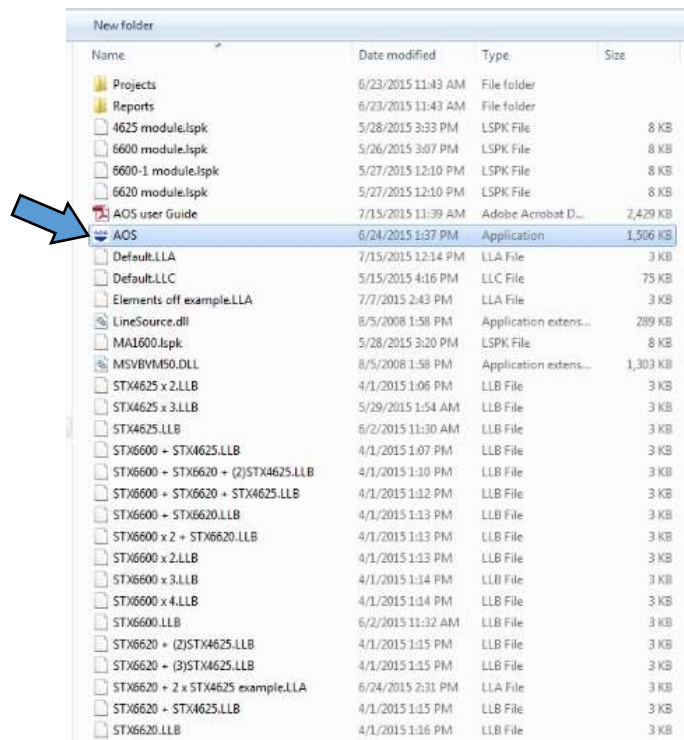
NOTE: It is recommended to have only one version of AOS on your computer at a time. See Upgrading AOS next page.

## Getting Started

### Section 1:

#### AOS Installation

1. Download “AOS.zip” from our website, to a location on your computer.
2. Unzip the “AOS.zip” file. (*Extract All*)
3. Browse the AOS folder for the AOS application icon, create a shortcut for your desktop if desired.



4. Double click the icon to launch the program.

## **Section 2:**

### **Updating an existing version of AOS**

To upgrade an existing version of AOS. Unzip the new version "AOS.zip" file. (Extract All). Open and select all files, copy or cut and paste into your existing AOS folder overwriting (replacing) the files and merging the folders when prompted. Rename your existing folder to the new version and delete the new folder. Example AOS v2.1 to AOS v2.2. Create a new shortcut of the AOS.exe application file for your desktop if desired.

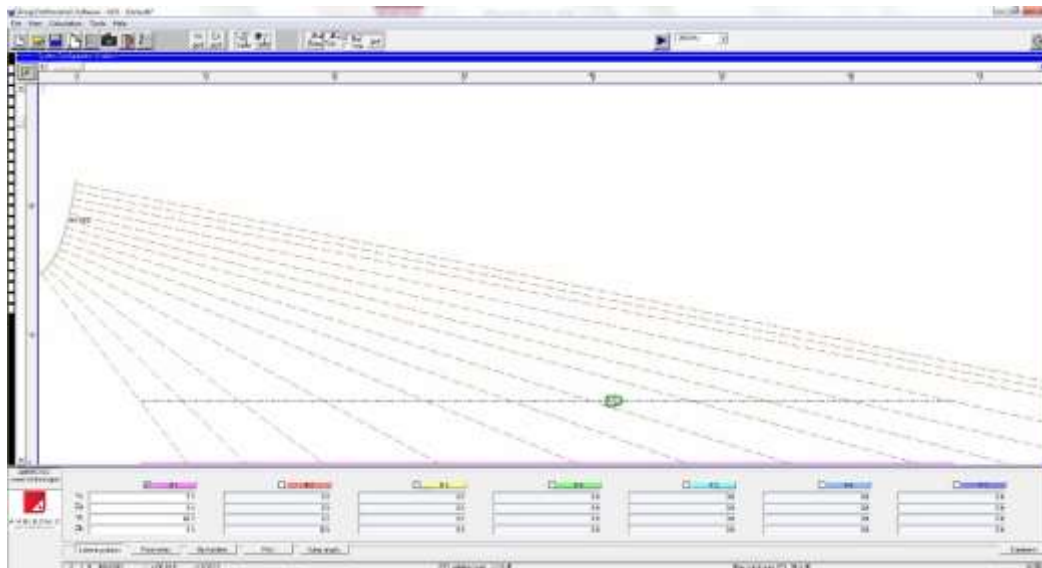
## Section 3:

### Using AOS

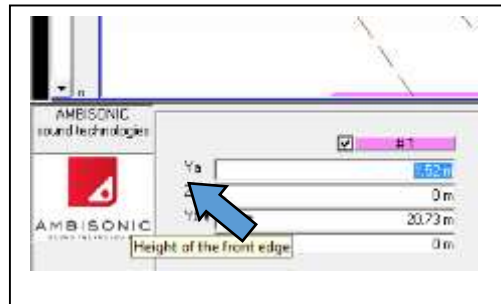
1. The AOS landing page is the first screen you will see, you can either click on continue in the upper left hand corner or anywhere on the page and the default design will load.



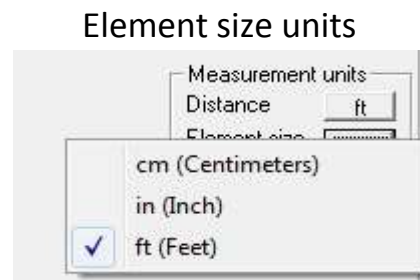
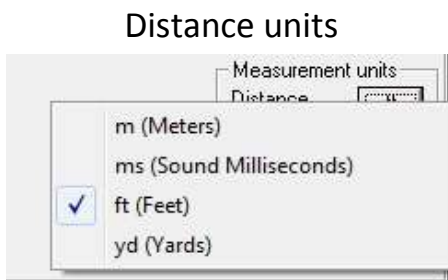
2. If nothing is done at the landing page the default design will load in about 20 seconds automatically



- At this point placing your mouse pointer over or on an icon, or font anywhere on the page will give a drop down explanation of that function.



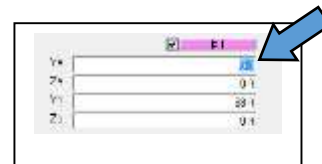
- Select tools from the top toolbar and choose the Distance units (*units of measure*) for floor plane dimensions (*Distance*) and Element size units (*array geometry*) that you would like to use in your design. These can be changed anytime at the far right of the parameters window.



- Select the **listening planes** tab at the bottom left.



In column #1 enter the seating “floor” plane dimensions by highlighting the appropriate box and overwriting the default dimensions.



All “Y axis” dimensions should be measured from a reference point in the room. IE; presidium wall, back wall (*up stage*) or front of stage (*down stage*). All “Z axis” dimensions should be measured from the front of the forward most listening plane. This becomes the zero elevation reference point.

Each listening floor plane is entered as follows.

**Ya** = distance from reference point to the front of the listing plane

**Za** = elevation (*height*) of the front of the plane

**Yb** = distance to the rear of the plane

**Zb** = elevation (*height*) of the rear of the plane.

Up to seven planes can be entered, modeled and turned on or off as needed by checking or unchecking the box next to the number of the plane.

## Section 4:

### Designing with Ambisonic Immersive HDLA series of line array Elements (boxes).

- 1) After all listening planes have been entered (see section 2.5 above) select the **parameters** window tab at the bottom toolbar.



- 2) **Model Select**- Click the arrow for the drop down list, select the model of interest. Model numbers with the suffix “EB” are for use with extension “Rigging Bar Kit” (part # BKT-ERB)



- 3) Enter your values into the appropriate box



**Y**- Horizontal axis, front to back position of the top front edge of the top box in the array.

**Z**- Vertical axis, height position of the top front edge of the top box

**Elements**- enter the number of cabinets to be used in the array, this can be adjusted later in the optimization window. A minimum of four cabinets is recommended.

**Elements off- Expert users only:** You can turn off cabinets in an array by entering their corresponding number from top to bottom followed by a period. Since AOS can only model one array at a time this is useful if for instance, you want to model one array for a balcony and one for the main

floor at different heights. Build one large array and turn off the boxes that are virtual (not there) in the array. For an example of this click file/open choose the Elements off .LLA example from the root folder. Note: there must be sufficient space between arrays to prevent interference and lobbing. Start with 25 elements (*boxes*) the maximum number allowed.

**Inclination-** up or down angle of the entire array. Adjust to at least one degree higher than the highest ear level is recommended. This can be further adjusted in the **Optimization Window** later.

**Ear level-** height above the listening plane, typically 45 inches for a seated audience and 69 inches for standing. This is the plane used for SPL plotting and mapping.

**Y ref-** Horizontal axis, front to back position of the **Green Cloud** reference point. This is the zero db reference point for both spl deviation and frequency response.

**Z ref-** Vertical axis, height position of the reference point **Green Cloud**.

**Grid-** Use Auto recommended.

**Accuracy-** The lower the number the higher the accuracy. A setting of 12 gives good results and a faster calculation.

**Db step-** Dynamic range of the color variation in the SPL mapping field. A setting of 1 is recommended.

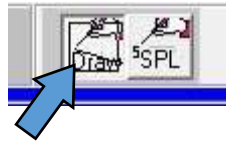
**Tail Elements-** enter the number of down fill elements (boxes).

**Note:** the down fill angle is fixed between “Models” (*main array*) and “Tail Elements” (*down fill elements*).

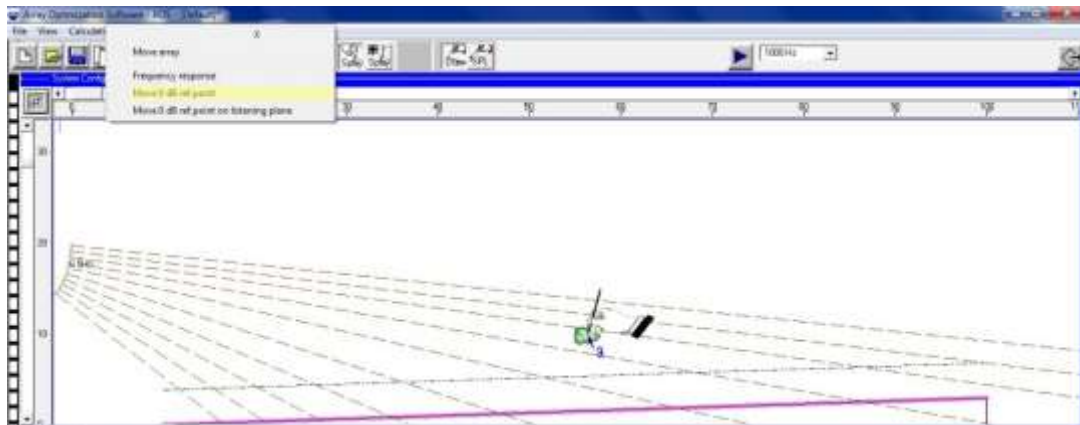
**Tail gain-** Adjust the gain of the down fill elements (boxes). They must be on a separate amp channel.

- 4) After all parameters have been entered, set the reference point (**green cloud**). This is the 0db reference point for both SPL deviation and frequency response and is typically set at mix position, but can be placed anywhere within the **System Configuration Window**.

- A. Make sure the **draw** mouse function button is selected in the top toolbar.

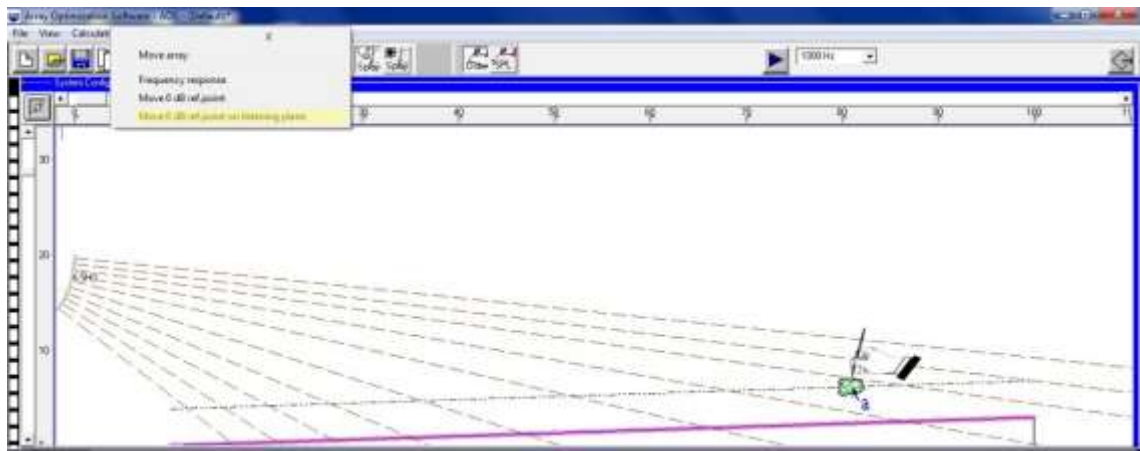


- B. Using your mouse, place the pointer (**wand in hand**) at the precise location where you want the reference point and left click. When the popup window appears choose “move 0db reference point”.



- C. If you are placing the reference point at ear level on a listening plane choose “move 0db reference point on listening plane”. The lowest number listening plane always takes precedence if there is one plane above another such as in the case of a balcony.



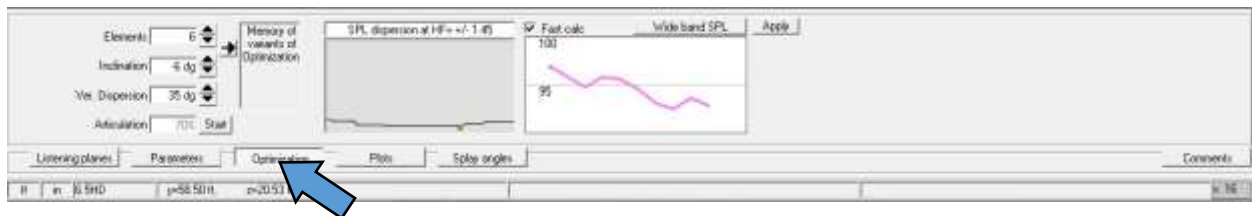


## 5) Automatic Optimization

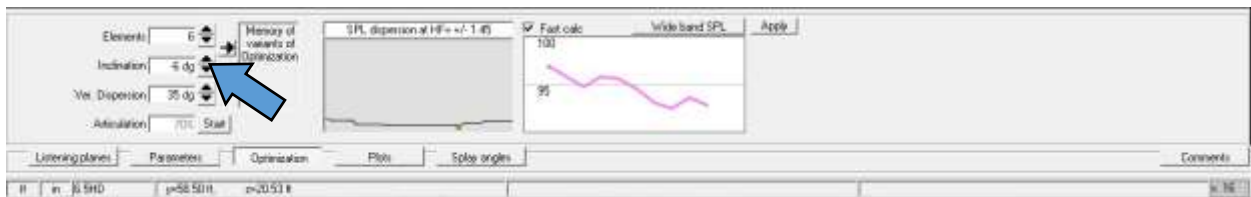
Select the **Auto Splay** button



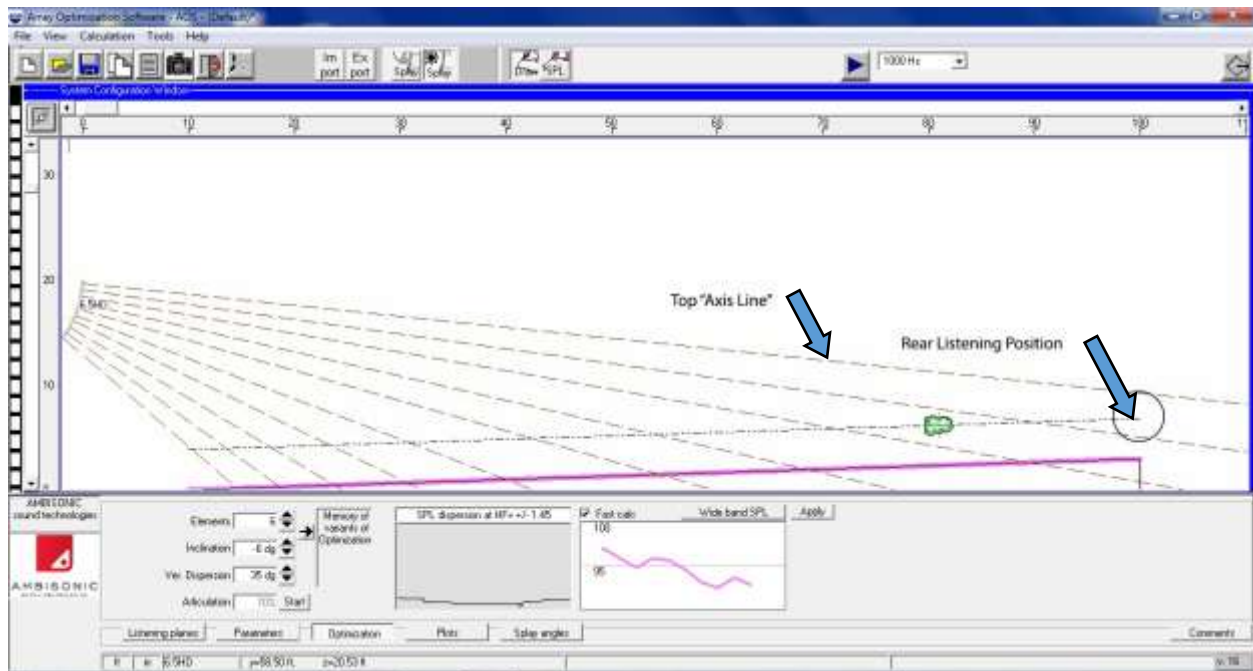
A. Select **Optimization** from the bottom toolbar.



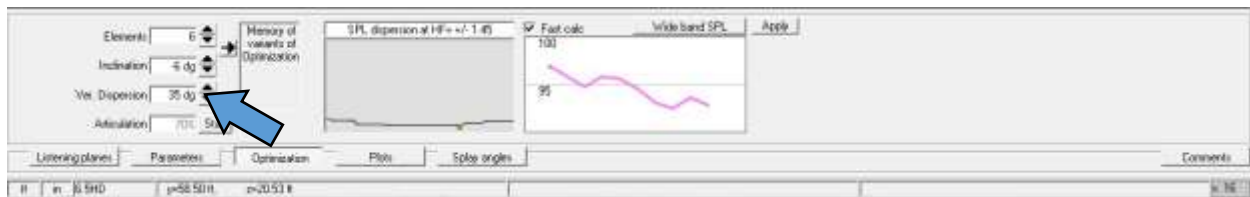
B. **Set Inclination-** Adjust the inclination angle using the up and down arrows.



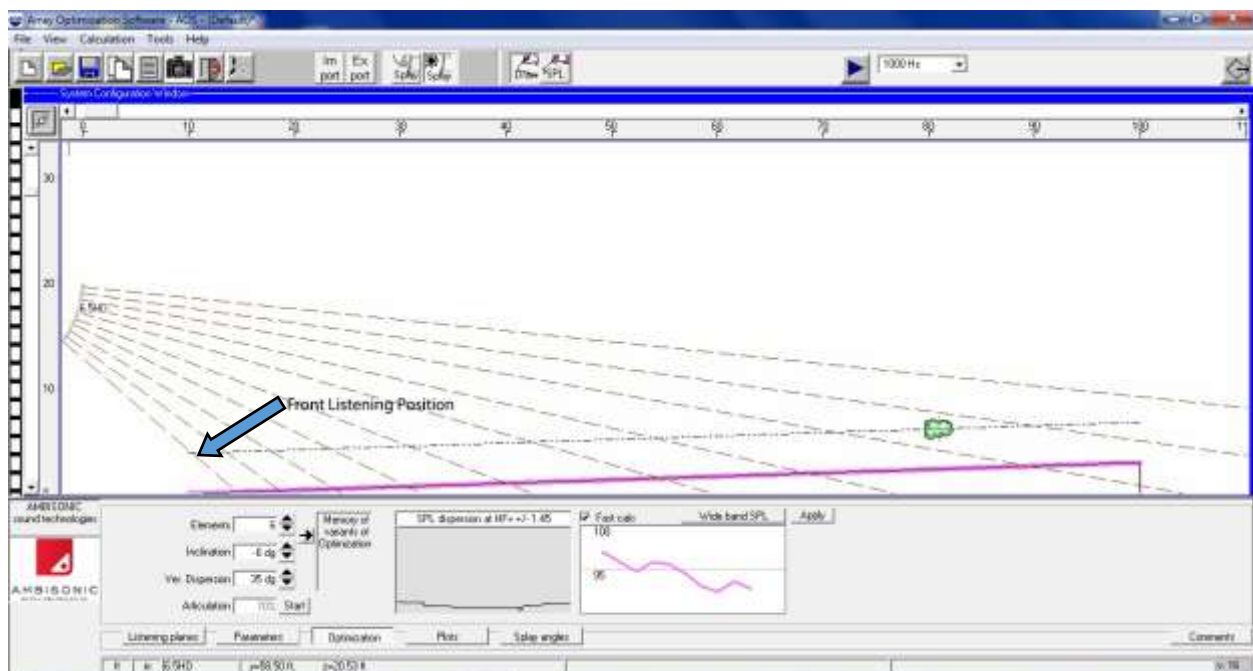
Adjust the top "Axis Line" at least one degree above the Rear Listening Position.



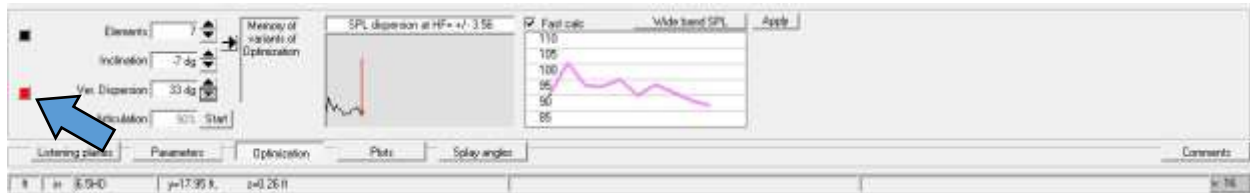
C. **Set Ver. Dispersion-** Use the up and down arrows to adjust the degree of Vertical Dispersion.



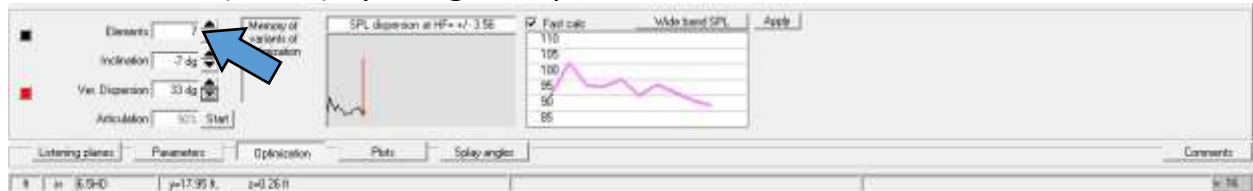
Adjust the bottom "Axis Line" in the array by pointing at the Front Listening Position.



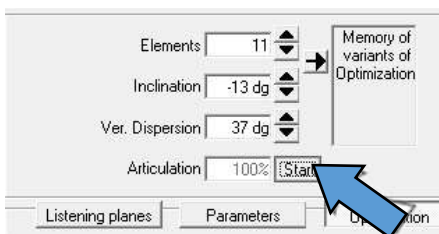
If Vertical Dispersion cannot be achieved with the number of Elements (boxes) selected, a red indicator will be shown which indicates that more Elements (boxes) are needed.



Add elements (boxes) by using the up arrow.



#### D. Run Articulation- Click start



AOS will calculate the optimum splay angles of all elements (boxes) automatically maintaining the vertical dispersion you entered.

E. Do a quick evaluation of the design (see Section 4.1 & 4.2)

F. If it is determined that amplitude shading of the bottom elements (boxes) is required, you can convert Elements (boxes) into “Tail Elements” as needed.

#### 6) Converting “Elements” into “Tail Elements”

##### A. Select Parameters



##### B. Subtract the number of required “Tail Elements” from “Elements”

Model: 6.5HD, Inclination: 6 dg, Accuracy: 12, dB step: 1, Tail Elements: 4, Tail Gain: -3. Elements: 6. Measurement units: Distance: ft, Element size: in.

C. Enter the number of “Tail Elements”

Model: 6.5HD, Inclination: 6 dg, Accuracy: 12, dB step: 1, Tail Elements: 4, Tail Gain: -3. Elements: 6. Measurement units: Distance: ft, Element size: in.

D. Enter the amplitude shading (Tail Gain), as a negative number.

Model: 6.5HD, Inclination: 6 dg, Accuracy: 12, dB step: 1, Tail Elements: 4, Tail Gain: -3. Elements: 6. Measurement units: Distance: ft, Element size: in.

## 7) Setting “Tail Element” Splay Angles

You must enter the splay angles manually for the “Tail Elements”.

A. Select **Splay Angles** from the bottom toolbar.

Check: Hinge 1: 0.0 dg, Hinge 2: 0.0 dg, Hinge 3: 1.0 dg, Hinge 4: 1.0 dg, Hinge 5: 1.0 dg, Hinge 6: 1.0 dg, Hinge 7: 2.0 dg, Hinge 8: 2.0 dg, Hinge 9: 3.0 dg, Hinge 10: 5.0 dg, Hinge 11: 8.0 dg, Hinge 12: 8.0 dg, Hinge 13: 8.0 dg. Test Box: Hinge 1: 1.0 dg, Hinge 2: 1.0 dg, Hinge 3: 2.0 dg, Hinge 4: 3.0 dg, Hinge 5: 5.0 dg. Listening planes: Parameters, Optimization, Plots, Splay angles.

B. Select the **Manual Splay** button



C. Find the **BOLD Hinge Angle**

(This is the first “Tail Element” angle which is fixed)

Check: Hinge 1: 1.0 dg, Hinge 2: 1.0 dg, Hinge 3: 2.0 dg, Hinge 4: 3.0 dg, Hinge 5: 5.0 dg, Hinge 6: 1.0 dg, Hinge 7: 5.0 dg, Hinge 8: 5.0 dg, Hinge 9: 5.0 dg, Hinge 10: 5.0 dg, Hinge 11: 8.0 dg, Hinge 12: 8.0 dg, Hinge 13: 8.0 dg. Test Box: Hinge 1: 1.0 dg, Hinge 2: 1.0 dg, Hinge 3: 2.0 dg, Hinge 4: 3.0 dg, Hinge 5: 5.0 dg. Listening planes: Parameters, Optimization, Plots, Splay angles.

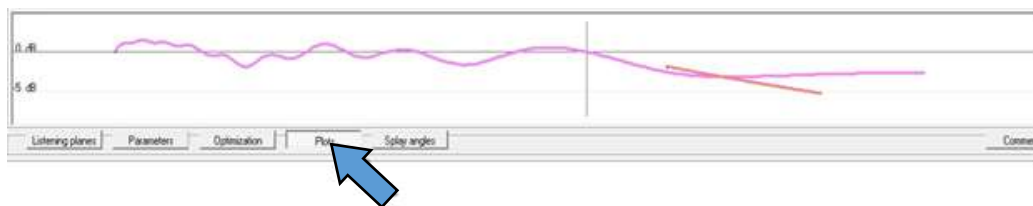
- D. In the following boxes, enter the “Tail Element” Splay angles (*Hinge Angles*) which should typically be equal to or greater than the **BOLD Hinge Angle**.
- E. Re-run Optimization (see Section 3.5)  
NOTE: AOS Optimization algorithms use high frequency information for calculating “Splay Angles”
- F. Adjust main “Element” angles manually if desired.

## Section 5:

### Evaluating the Design

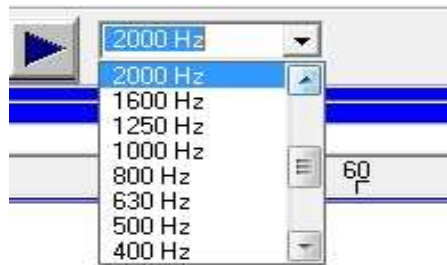
AOS provides multiple ways to evaluate your design. It is recommended that the front to back deviation in SPL be approximately 6dB or less for excellent in room results.

- 1) Choose the **Plots** window tab at the bottom toolbar. This plot shows SPL at each third octave frequency along the listening plane(s).

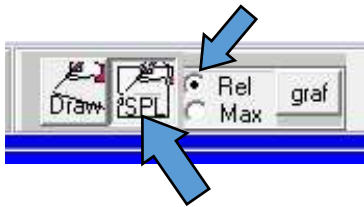


- 2) Select the frequency from the drop down menu by pressing the arrow next to the **frequency window** located on the top toolbar. The plots will refresh as each frequency is selected.





- 3) Select the **SPL** mouse function **button** in the top toolbar, select **Rel** in the adjacent box and click anywhere in the System Configuration Window to see the SPL value relative to the reference point 0db.



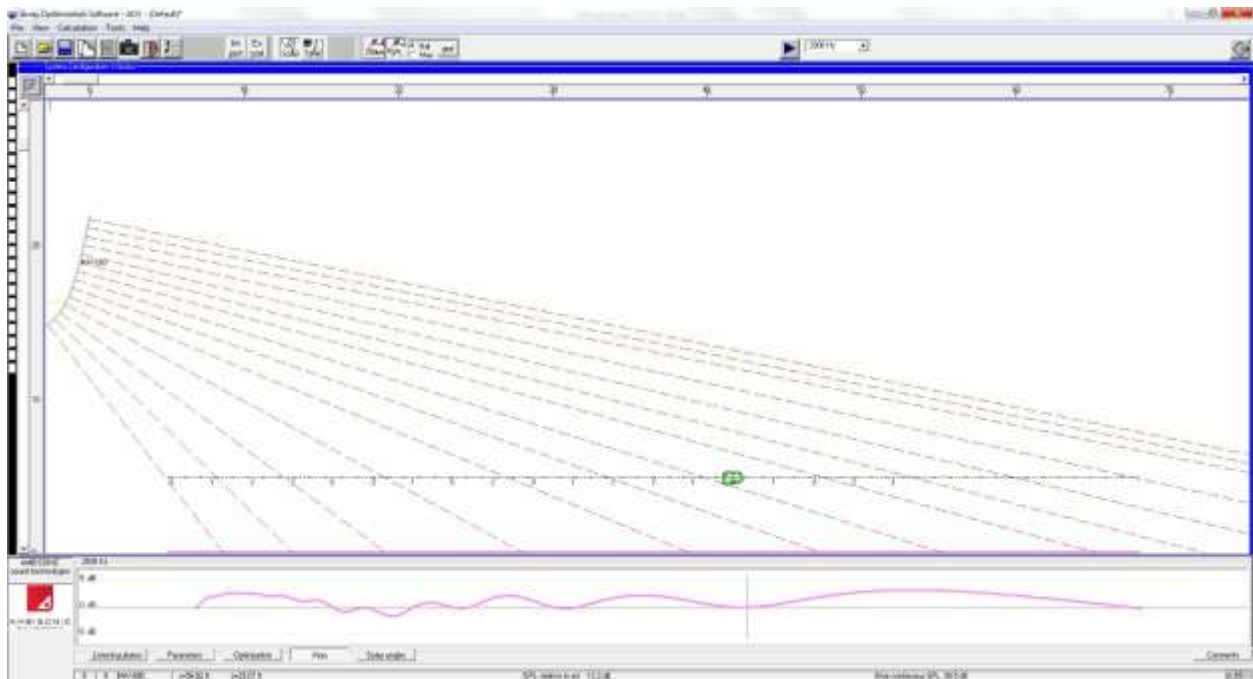
Or click **Max** to see maximum continuous SPL.



- 4) To map the SPL values along the listening line (ear level) of the listening plane of interest place the pointer at the front of the listening line, left click and hold down, draw a line to the rear or anyplace in between and let go.

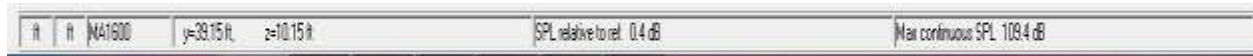


The relative numerical values will be shown.



The numbers are refreshed each time a new line is drawn.  
*(You can also click anyplace in the System Configuration window,  
 Relative or Maximum SPL numerical values will be shown.)*

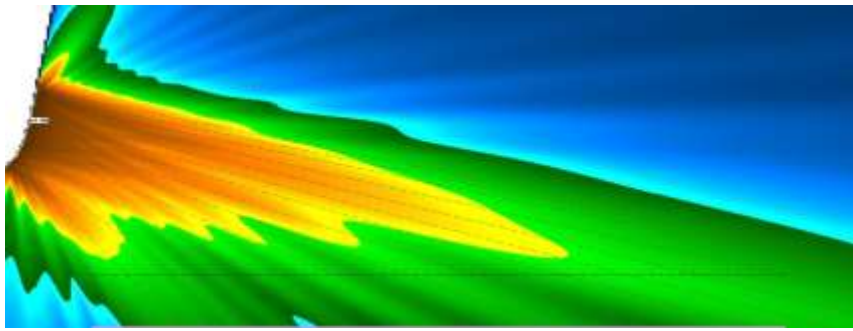
Relative and Maximum SPL is continuously updated in the bottom **Status bar** as the mouse pointer is moved in the System Configuration window.



- 5) AOS can plot a color map of the arrays vertical directivity and SPL relative to the reference point at each 3<sup>rd</sup> octave frequency. Select the frequency as above in (Section 4.3) and press the **blue arrow** next to the frequency window to run the calculation.





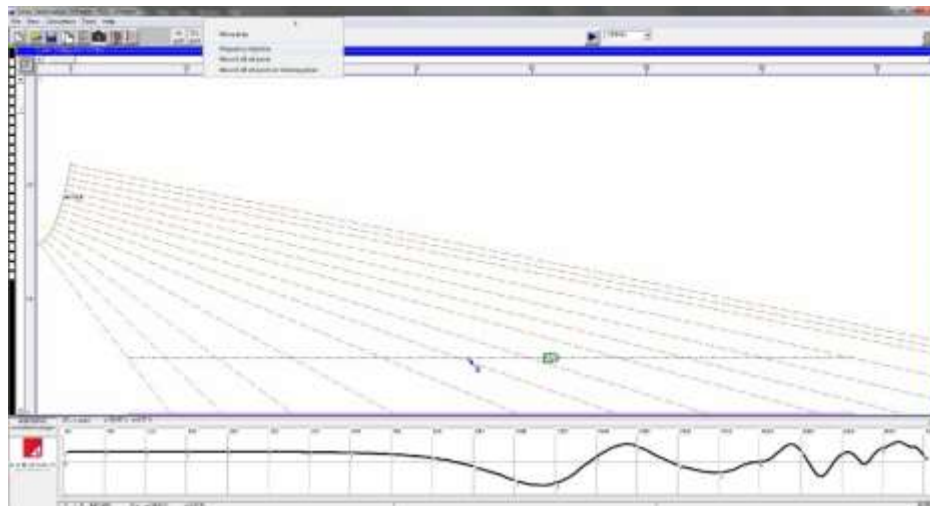


6) Frequency response relative to the reference point can be plotted in two ways.

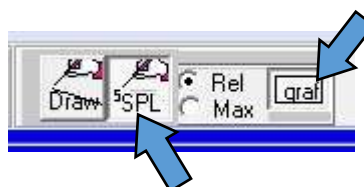
A) Select the **draw** mouse function button.



B) Point the mouse **wand** on any point in the screen, or at ear level on a Listening plane, left click and choose frequency response in the pop up menu.

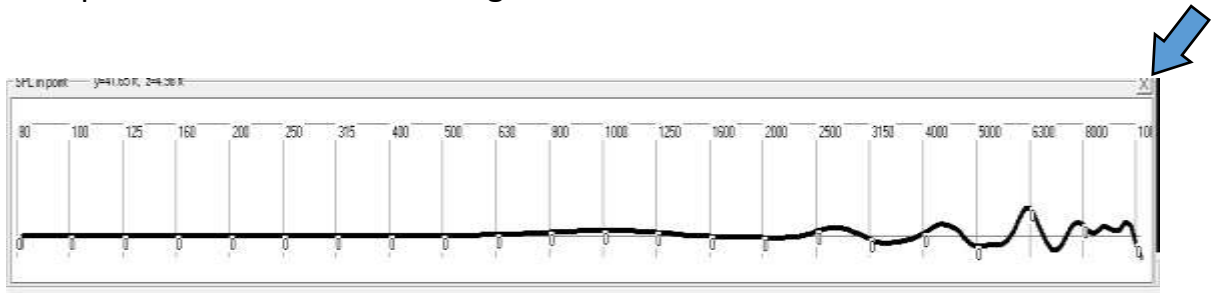


c) Select the SPL mouse function button in the top toolbar and select **graf** and click any point.



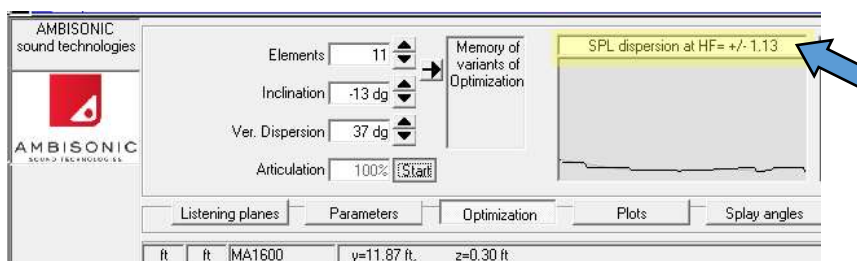


To exit the frequency response window click the **X** on the top right of the response window or unselect graf.



## 7) Additional ways to evaluate your design.

- A) While in the **optimization** window, view **SPL dispersion at HF**. A maximum deviation of  $\pm 3$  dB is recommended. Adjust the number of boxes, inclination angle, vertical dispersion and/or array position in the room (*Y/Z coordinates*) as needed, running the articulation algorithm each time a change is made.



- B) Click on **Wide band SPL** to view more information about the design.

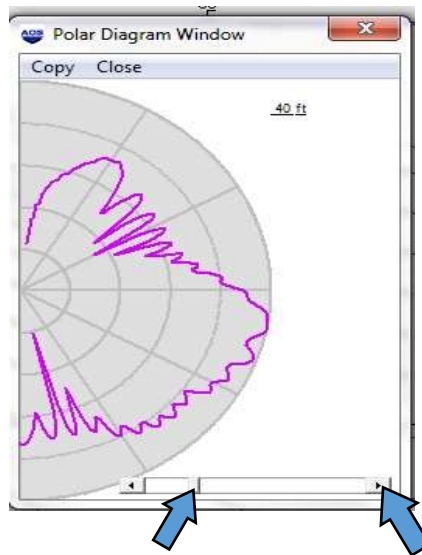


## 8) AOS can also plot a vertical polar of the array.

- Choose a frequency. (see section 4.2)
- Click on the **Vertical polar diagram** button on the top toolbar,



- C. Choose a distance by clicking the arrows or moving the slider at the bottom of the **polar diagram window**



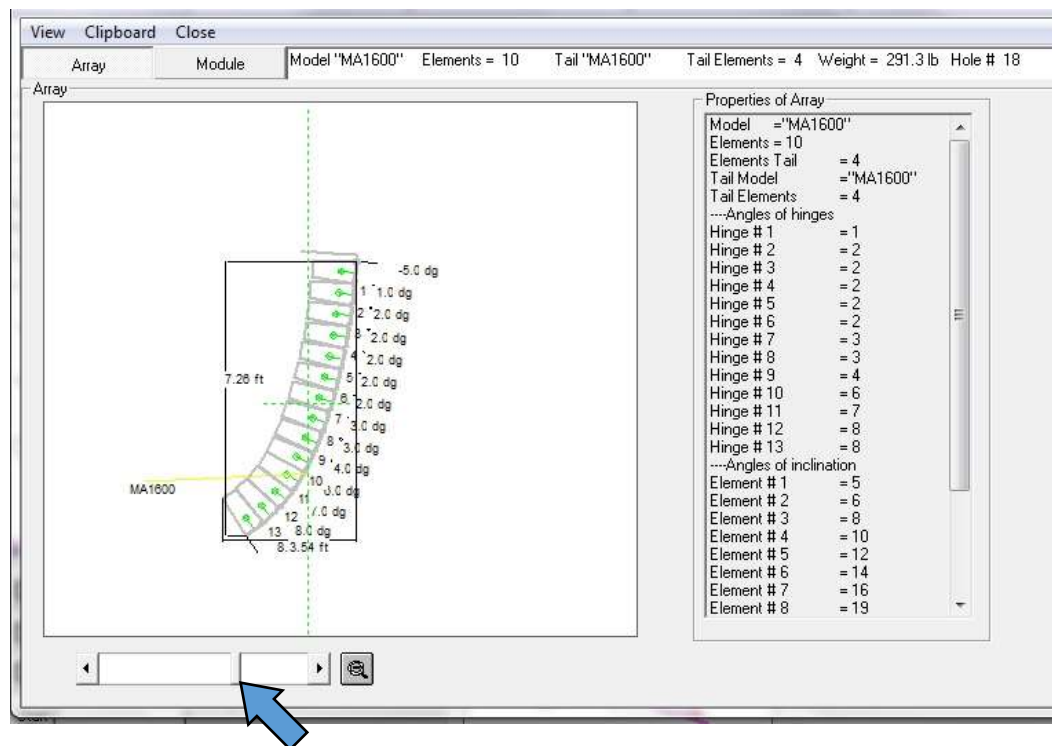
*(Line Arrays have a different polar pattern for every different distance)*

**Note:** After evaluating your design, if needed adjust the **Y/Z** coordinates and **inclination** of the array and re-evaluate your design, repeat until you have achieved the smoothest SPL deviation for the listening planes.

- 9) Important physical information about the array can be viewed by clicking the **view array geometry** icon on the top toolbar.

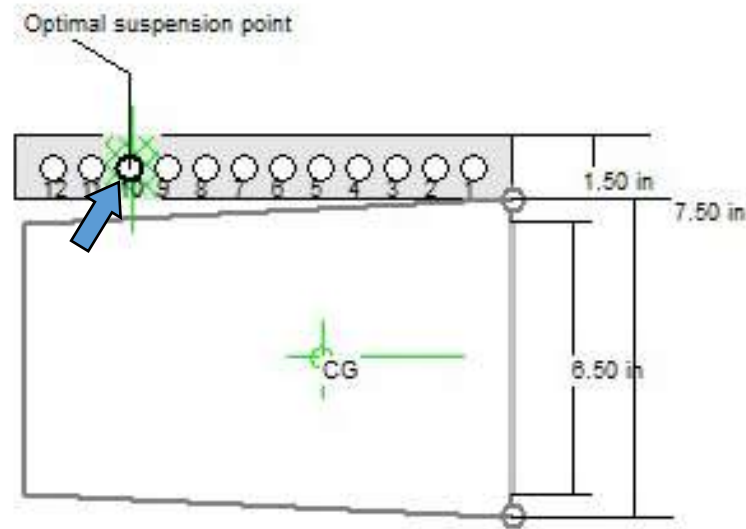


This window gives information about the array, such as size, weight, center of gravity, inclination, hinge angles (*articulation*), and accumulated angles of inclination. The size of the view of the array in the window can be adjusted by using the arrows or sliding the bar with your mouse. The array can also be moved in the window by grabbing the array with the **hand** and moving to the desired location.

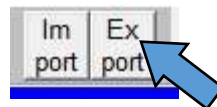


While in the **View array geometry** window, click **Module**. This window gives important information about rigging height above the top box and optimum rigging point (*closes available hole*) for the chosen inclination. If the rigging

point is beyond the last available hole in the rigging frame a pullback will be need to install the array correctly.



Once you are satisfied you have achieved the smoothest overall coverage and are finished with your design it is recommended you save the file in the **Projects** folder. At this time you can also Export this array for use in the future by selecting the **Export button** in the top toolbar, naming the array and clicking export.



The file will be saved with the extension .LLB and the default location is in the root directory.

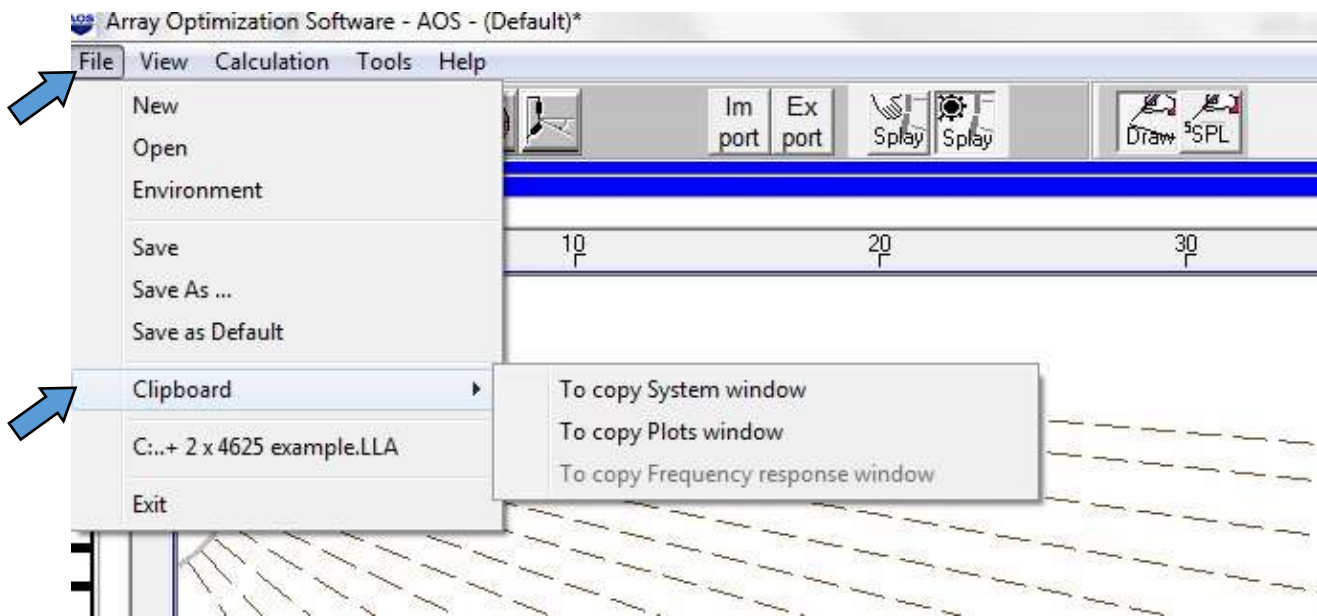
To import a saved array, click the **Import button** and chose the .LLB file of interest.



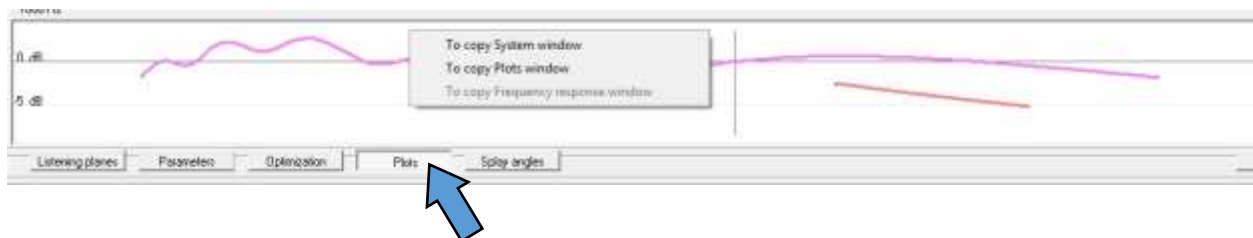
## Section 6:

Using the graphics from AOS for presentations.

- 1) To copy the **System Configuration Window** or the **Plots window**, select file, go down to **clipboard** and choose which window to copy.



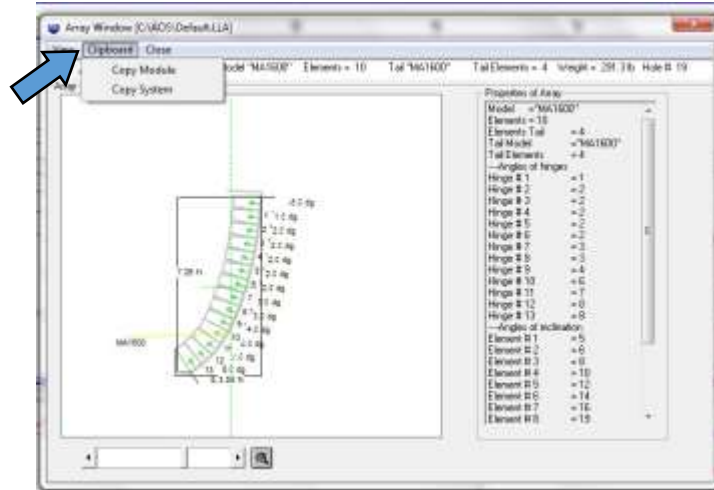
- 2) Or select the **Plots** tab on the bottom toolbar and right click in the plots window, choose the window to copy.



- 3) To copy the **Module (box)** or **System (array)** select the **View array geometry** button on the top toolbar.

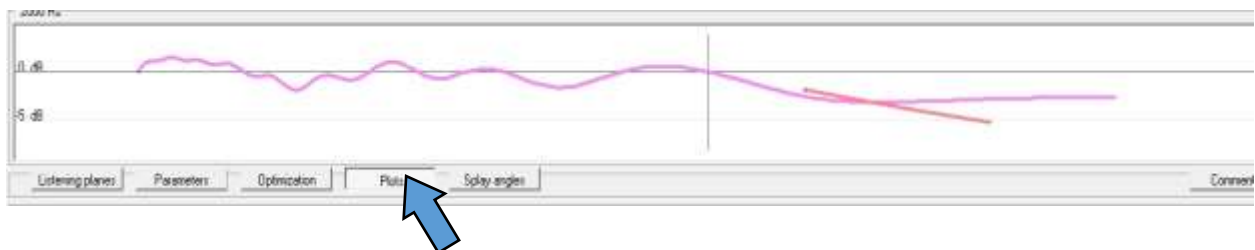


Select clipboard and choose “Copy Module” or “Copy System”

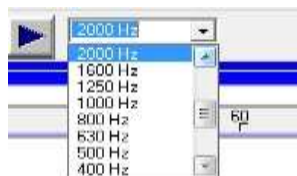


4) Snap Shot:

A. Select the **Plots** window



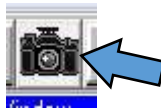
B. Select the **frequency** to plot



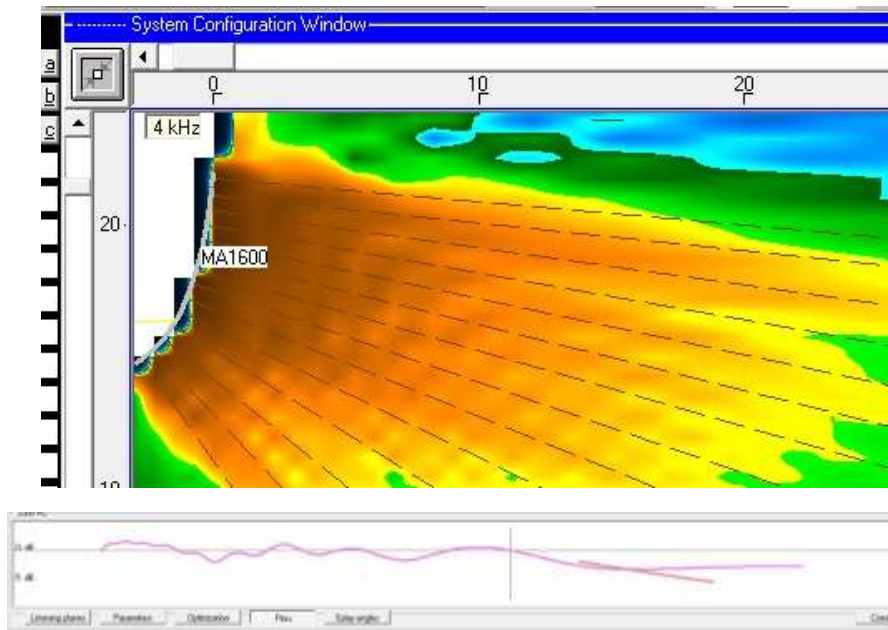
C. Run SPL mapping by clicking the **Blue arrow**.



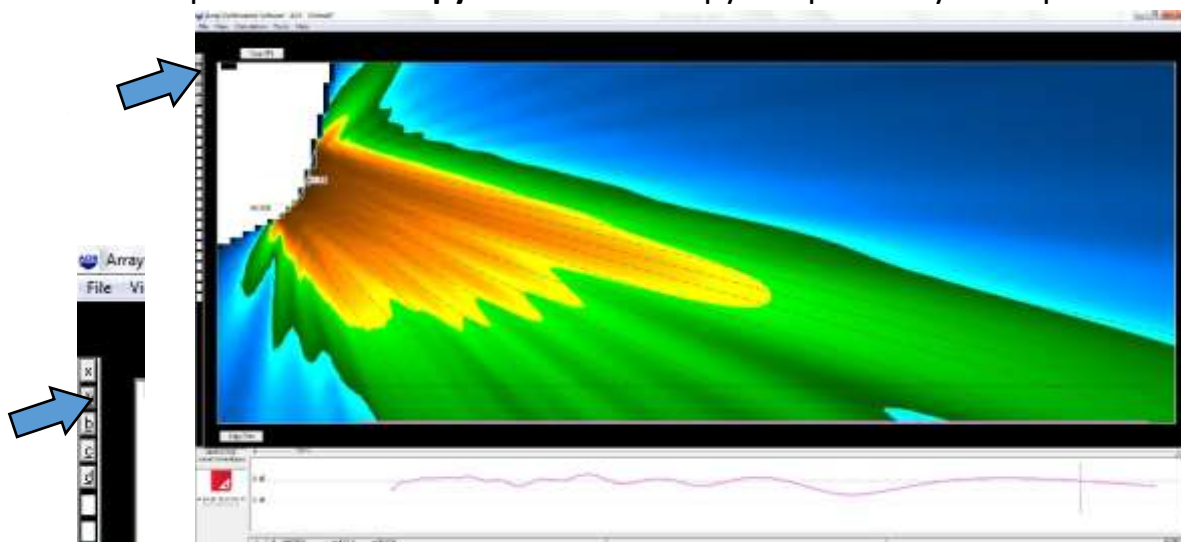
D. Take a **snap shot** by clicking on the camera icon located on the top toolbar.



The color map in the System Configuration Window and the Plots window will be copied and stored in memory and placed in the small rectangle boxes on the far left of the screen in alphabetical order. Repeat for each frequency of interest.



- 5) To recall a **snapshot**, click on the letter in the rectangle boxes at the far left of the screen. From this screen you can click the **Copy SPL** box to copy the SPL Map or click the **Copy Plots** box to copy the plots to your clipboard.

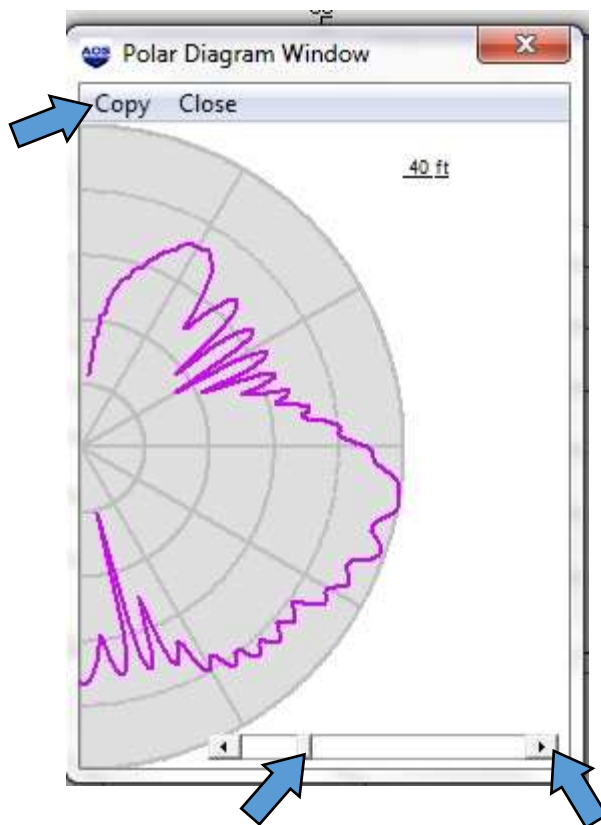


- 6) Polar Diagram:

AOS can also plot a vertical polar of the array. Click on the **Vertical polar diagram** button on the top toolbar.



Choose a distance by clicking the arrows at the bottom of the **polar diagram window** (*line arrays have a different polar pattern for every different distance*). Click copy at the top of the window to copy to clipboard.





## Section 7:

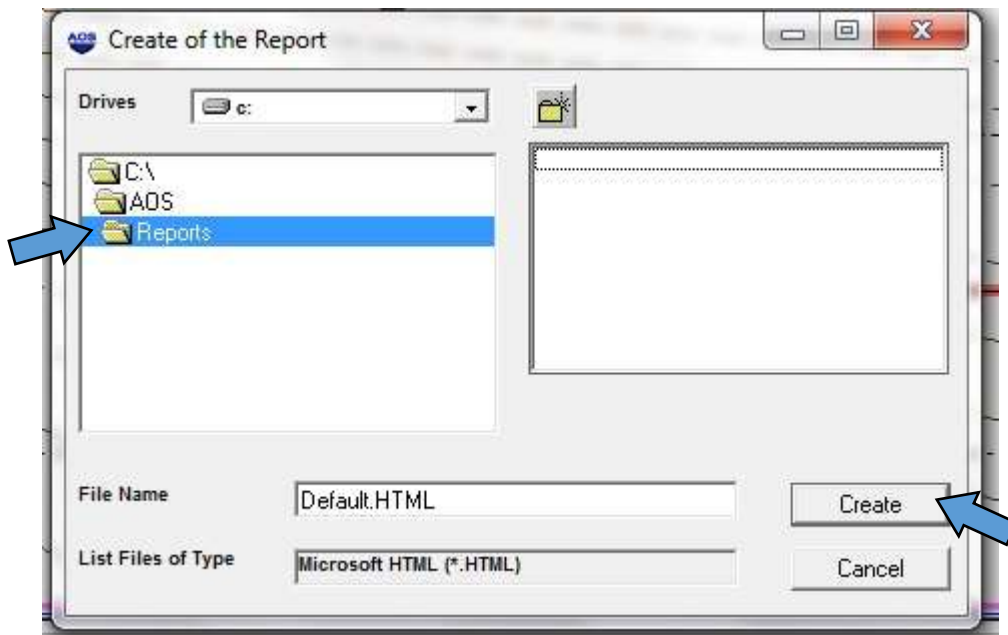
### Create A Report.

AOS can create a complete report in HTML format consisting of: System parameters, Table of splay angles, Table of listening planes, Continuous SPL, System configuration and venue cross section, Array geometry, Side view of rigging frame (*bumper bar*) and top module, SPL distribution along all listening planes at all third octave frequencies.

- 1) click the **Create Report** button on the top toolbar,



- 2) When the window opens select Reports for the location, name the file adding the .HTML file extension and click the **Create** tab. The HTML document and all related graphic files will be placed in the Reports folder.



- 3) To retrieve the Report, open your AOS folder, open reports, and double click the HTML file. The graphic files and the HTML document must be in the same folder location so if you want to use or send the report to another location be sure to send all related graphic files as individual files along with the HTML document. Recipients must save all files to the same folder.