Your Church Name Here

Sanctuary Audio System Retrofit

Engineering Great Results

Engineered by Scott Oliver-Director of Contracting and Engineering

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An engineered system vs. a non-engineered system design.

- If you are going to buy a sound system and not have engaged or are not willing to engage someone who is qualified in audio system design engineering to PROPERLY engineer, design, install, and calibrate your system in your room, then spend as little money as possible on the system. It is **WAY** better to spend as little as possible on a system that ***will not work*** than it is to spend a lot on a system that ***will not work***. Proper engineering is the only possible way to ensure you are being a good steward of God's resources.

- We do not provide "L.A.R." systems….."Looks About Right". We do NOT recommend that you buy an L.A.R. system. We do NOT recommend that you use a local retail musical instrument store that has no engineering department; it's a retail store! Their motivation is to sell you what is on the shelf first, and if they do not have it in stock, they will order it for you as soon as you pay for it. We do not sell you anything until the engineering package is complete, and you have seen the proven results yourself. Lastly, we do not recommend that you buy your equipment online and piece-mill your system yourself; unless of course you enjoy wasting money.

- Engineering provides no basis for opinion, it only provides facts. It has been our experience that proper engineering always provides results that are 100% accurate, 100% of the time. Engineering audio is based on the laws of physics…..laws written by God himself.

- It is our job to lead you in the right direction, and make sure you are not being led astray. The "Looks About Right" approach may be used with really good intentions, but it has been proven over and over, (and you may be a victim of the L.A.R. approach right now) that avoiding the engineering process is costly, and disappointing 100% of the time.

And if the blind lead the blind, both shall fall into the ditch. Matthew 15:14

We Use EASE software in predicting room and system behavior.

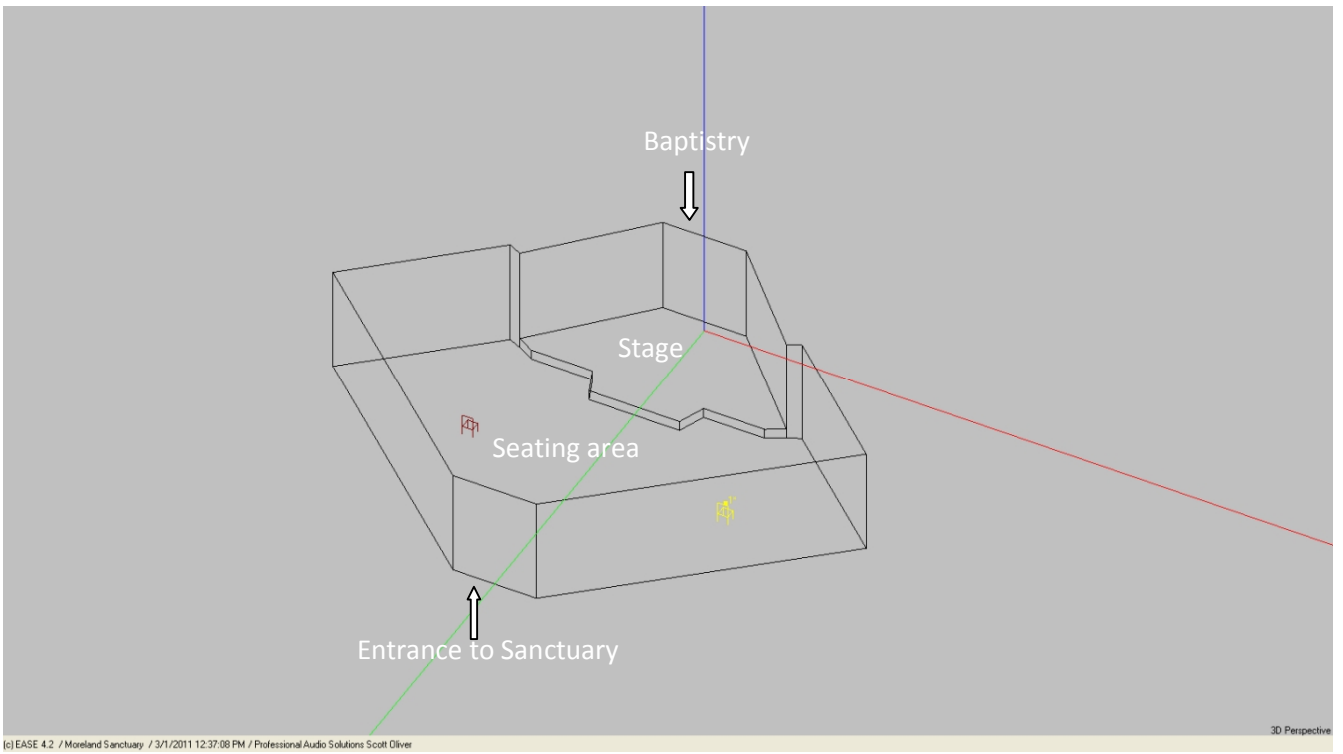
Since its introduction over 15 years ago, EASE has grown from a single MS-DOS program into a powerful and versatile suite of Windows® software. AFMG (Acoustic Design Ahnert & Software Design Ahnert) continues to expand and evolve the mathematical and acoustical algorithms, graphical user interfaces, and the tools for presenting and analyzing both measured and predicted acoustical data.

Today, the EASE software suite provides system designers and consultants with an invaluable set of tools for all aspects of professional practice, from detailed, realistic modeling and simulation of venue acoustics and sound system performance to informative and engaging client presentations, to comprehensive measurement and verification.

EASE & EASE JR take the guesswork out of system design, help eliminate costly mistakes and reduce installation time. They help designers learn and grow by graphically displaying accurate predictions of real-world acoustics. EASE models are an ideal way to explore options and to learn what works and what doesn't work – before the virtual venue becomes a job site and changes are time consuming and expensive. AURA's advanced calculation engine is like an "acoustician's microscope."

EASE Modeling & Prediction Results

Wire Frame Model of the Sanctuary

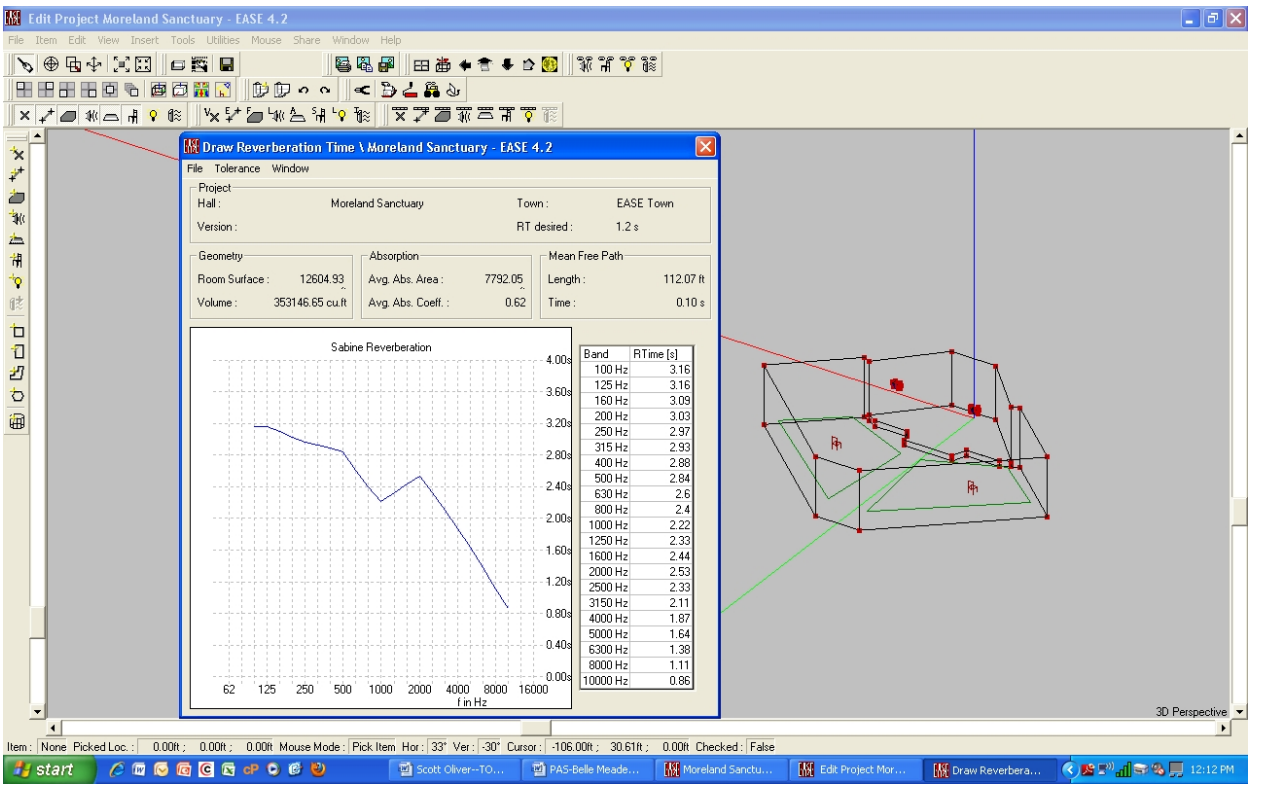


RT60 Graph

Not only do we rely on computer modeling for speaker choice and placement, we also rely on EASE for any and all the unseen acoustical information in the room. We start with the RT60 value.

RT_{60} is the time required for reflections of a direct sound to decay by 60 dB below the level of the direct sound. Reverberation time is frequently stated as a single value however it can be measured as a wide band signal (20 Hz to 20kHz) or more precisely in narrow bands (one octave, 1/3 octave, 1/6 octave, etc.). Typically, the reverb time measured in narrow bands will differ depending on the frequency band being measured. It is usually helpful to know what range of frequencies are being described by a reverberation time measurement.

Knowing the reverb time of the room helps us engineer the acoustical environment so that the speaker system performs perfectly in the environment. Not only do we look at the overall average reverb time, we look at frequency-specific reverb times as well. Targeting specific problematic frequencies ensures that we install the wrong treatments in the wrong place.



Prediction Sets

Once we have determined the behavior of the acoustical environment and have settled upon the correct solution(s) for the acoustic treatments, we begin speaker model and placement predictions.

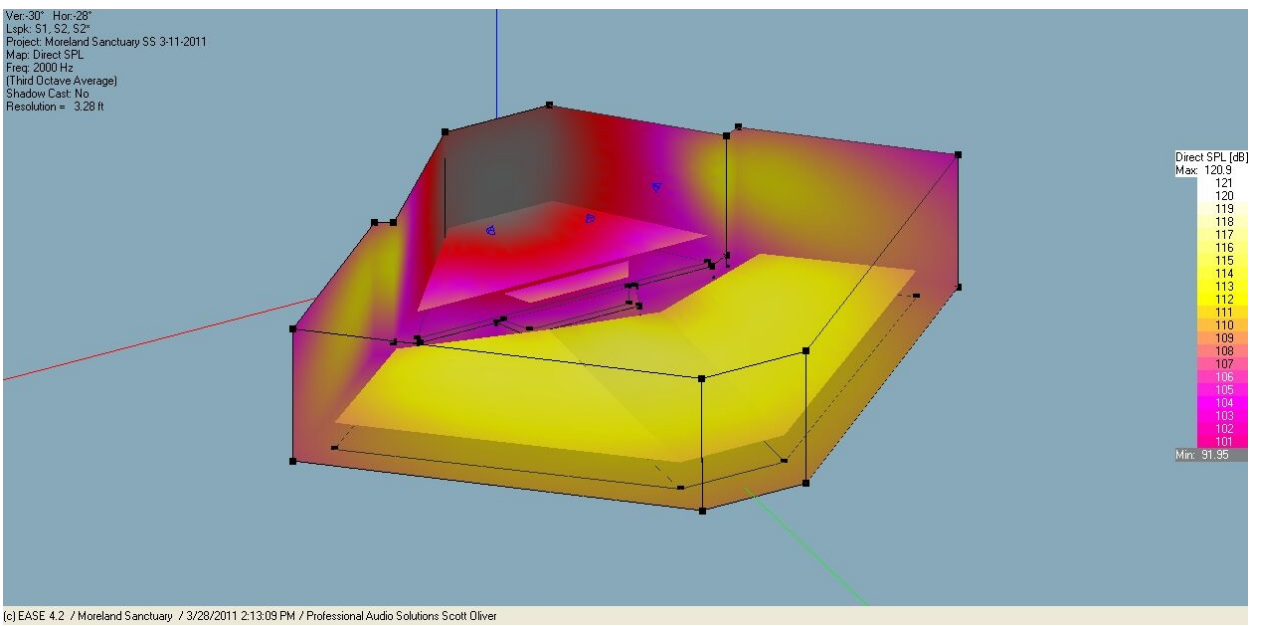
In order to show the successful predictions and why they are successful, we will show you some failed predictions starting on this page (and why they are failures), followed by some successful predictions starting on page 9 (and why they are successful). Each color represents a 1db difference in sound pressure level.

Electro-Voice XI-2123

Prediction Set #6: 3 EV Xi2123- 2K

Prediction Failed

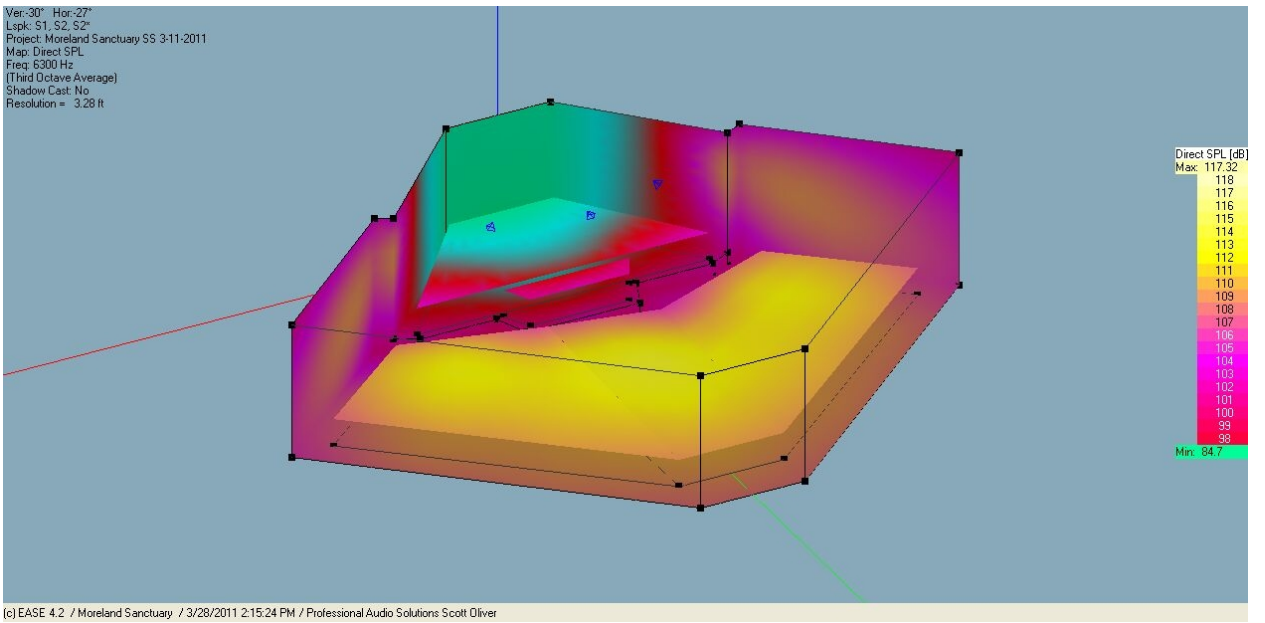
Consistent colors show a consistent coverage of sound. However, notice the color yellow on the seating area is also on the side walls. This prediction shows that this speaker is covering too much area, also including the side walls. The energy on the side walls translates into reflections off of those surfaces. It is possible to use these speakers, but there would need to be absorber panels applied to these surfaces to tame these reflections. Workable, but not ideal.



Prediction Set #6: 3 EV Xi2123- 6.3K

Prediction Failed

The same room with the same speakers only this time at a higher frequency. Notice that at this higher frequency there is in fact less energy on the side walls, but absorbers are still in order if these speakers are to be used.

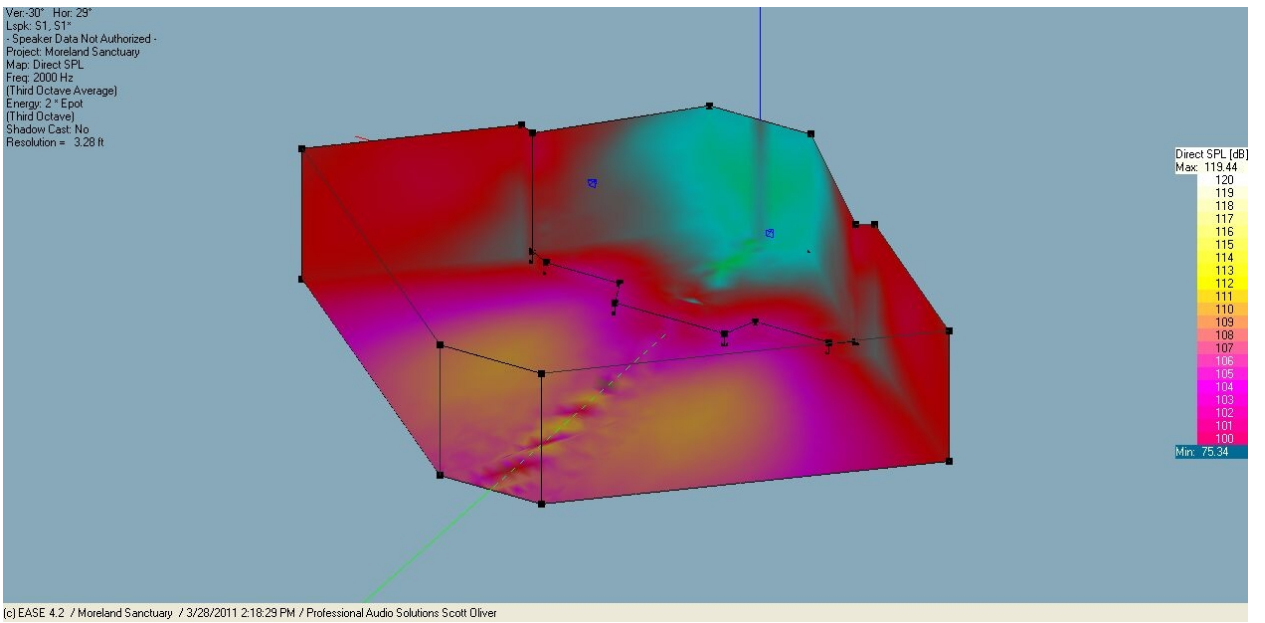


Fulcrum Acoustics DX1595

Prediction Set #7: 2 FA DX1595- 2K

Prediction Failed

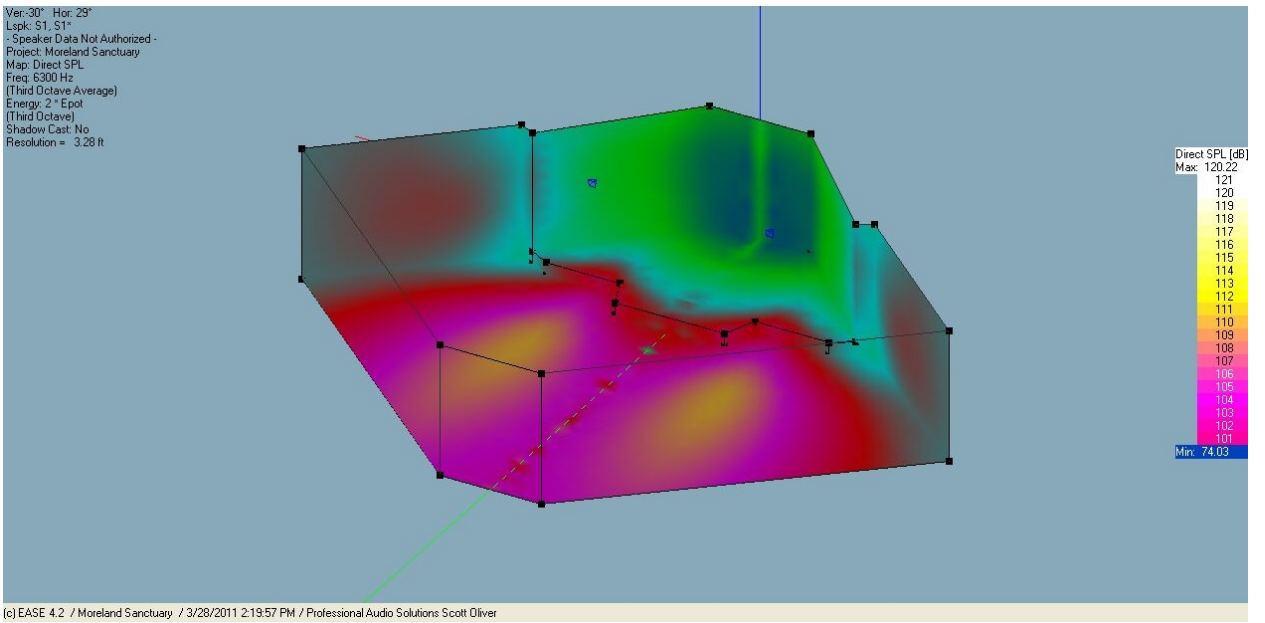
This prediction is using a different speaker entirely with similar specs to the EV speaker used above. While we love the sound of Fulcrum Acoustics speakers, it is clearly evident why this speaker will not work in this environment. Fulcrum Acoustics enclosures sound fabulous, but we could not find a model that is effective in this room. Notice the inconsistency of colors on the seating area at 2K. Very inconsistent. The yellow sections represent a high SPL level and is creating a hot spot in at least 50% of the seating space.



Prediction Set #7: 2 FA DX1595- 6K

Prediction Failed

This prediction is using the same Fulcrum Acoustics enclosure only this time at 6.3K. The inconsistencies are even greater.



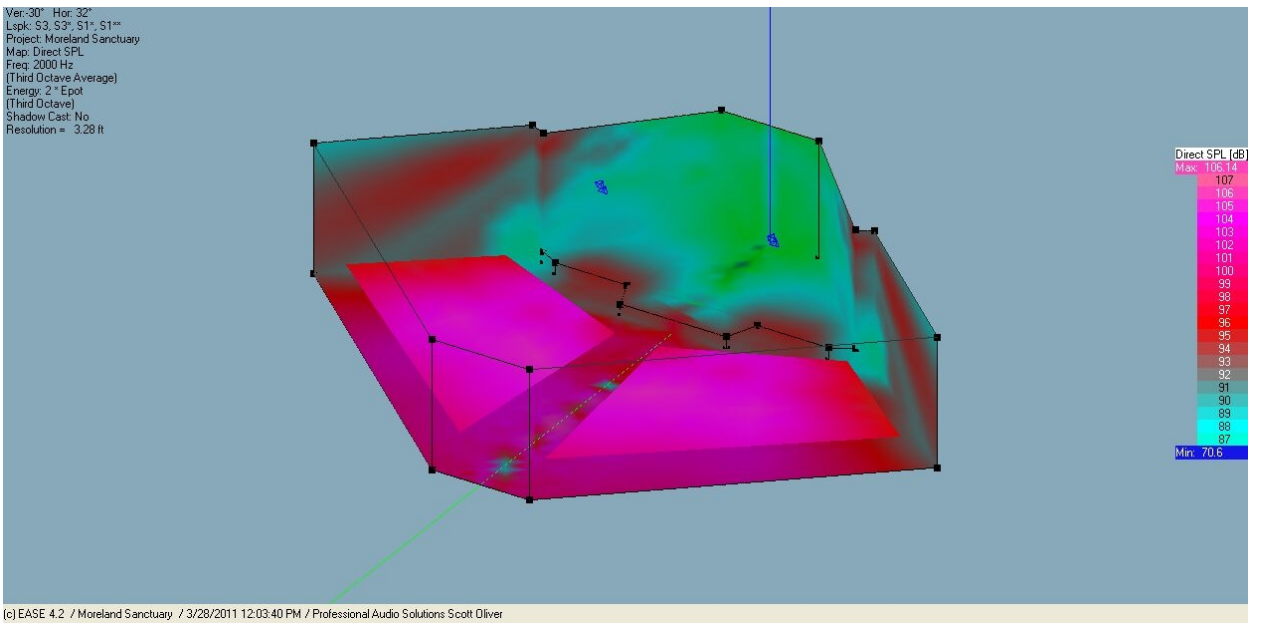
Successful Predictions

Danley Sound Labs SH95

Prediction Set #5: 4 Danley-SH95-2K

Prediction Successful

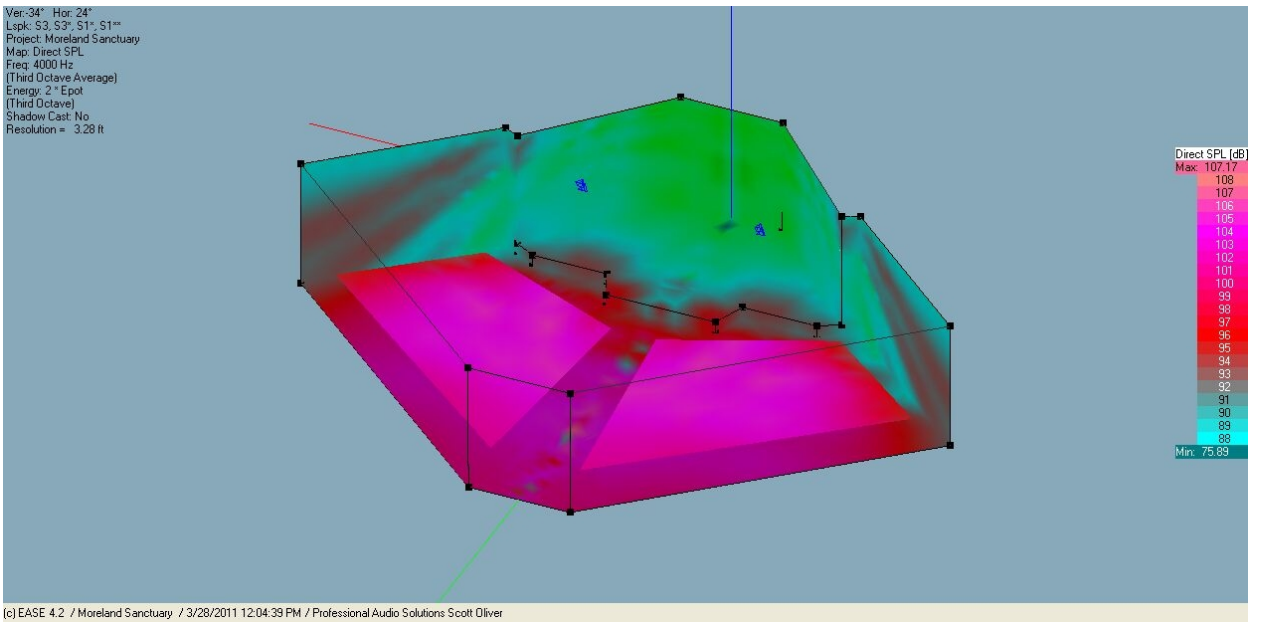
This prediction is using Danley Sound Labs SH95 speakers. While there is some energy being splashed on the side walls, it is easy to see that that energy is 10db lower that the seating area. Not a big problem at this frequency or height/angle.



Prediction Set #5: 4 Danley-SH95-4K

Prediction Successful

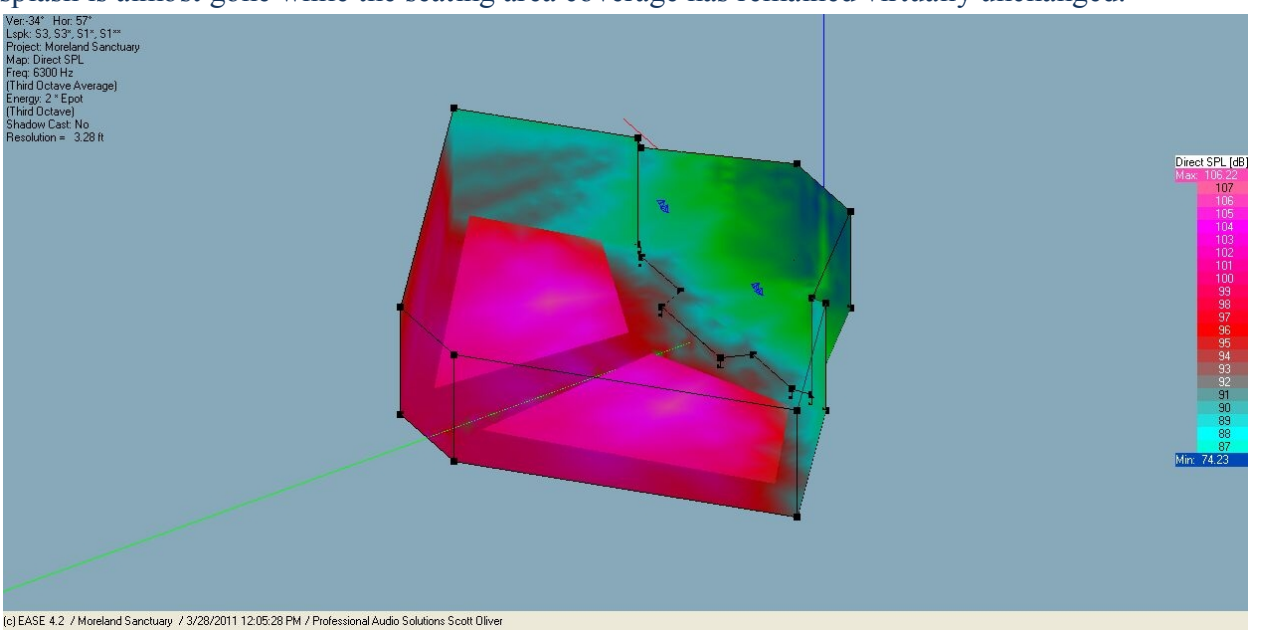
This prediction is using the same Danley Sound Labs SH95 speakers but at a little higher frequency. While there is still some energy being splashed on the side walls, it is clear that it is much less.



Prediction Set #5: 4 Danley-SH95-6.3K

Prediction Successful

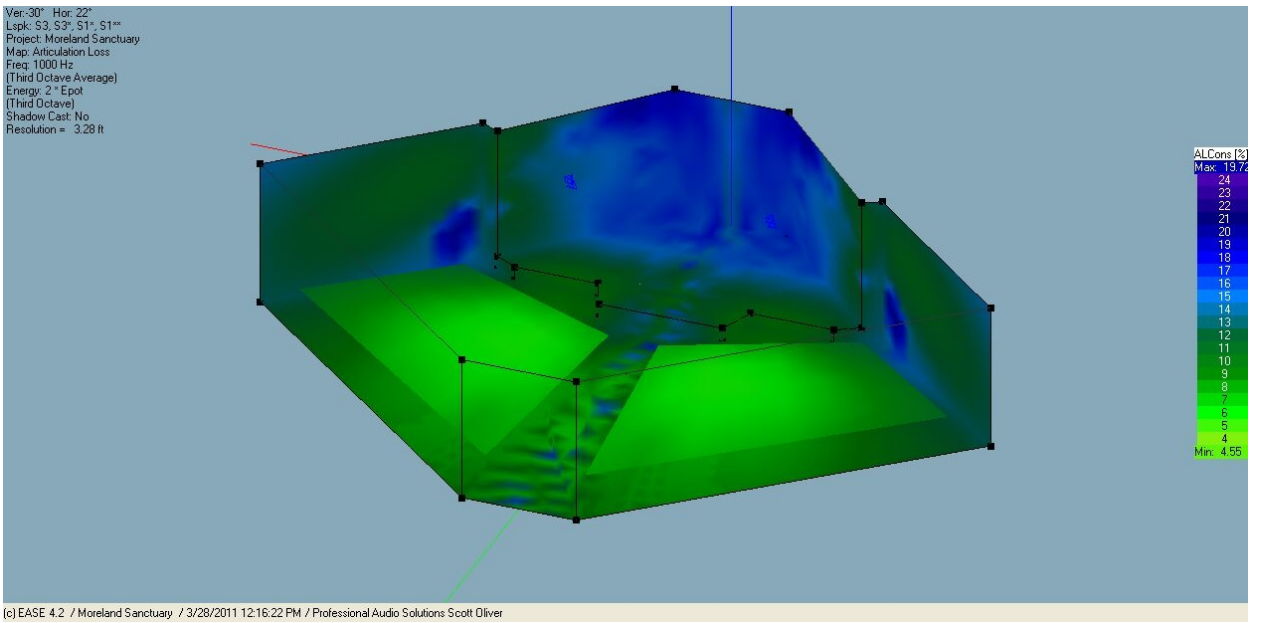
Again, same Danley SH95 speakers, but at an even higher frequency of 6.3k. The side wall splash is almost gone while the seating area coverage has remained virtually unchanged.



Prediction Set #5: 4 Danley-SH95-Alcons

Prediction Successful

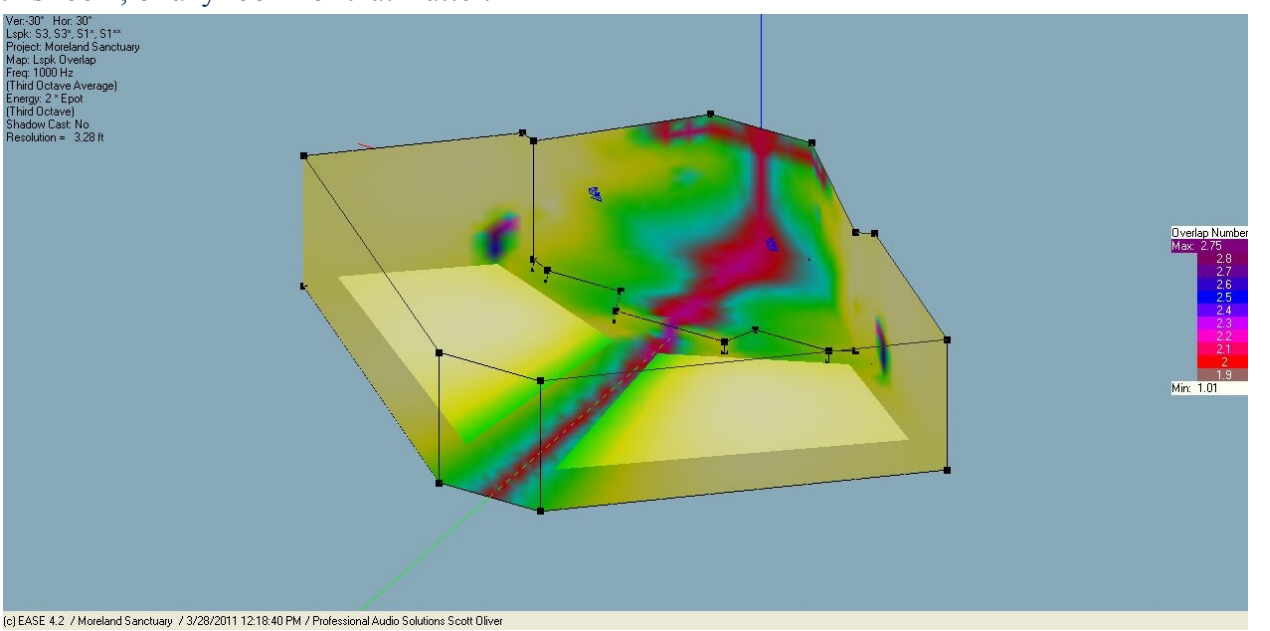
"Articulation Loss of Consonants". In other words, speech intelligibility loss. Percentage. As long as there is green in the seating area, speech articulation will be great. No problems here.



Prediction Set #5: 4 Danley-SH95-Speaker Overlap

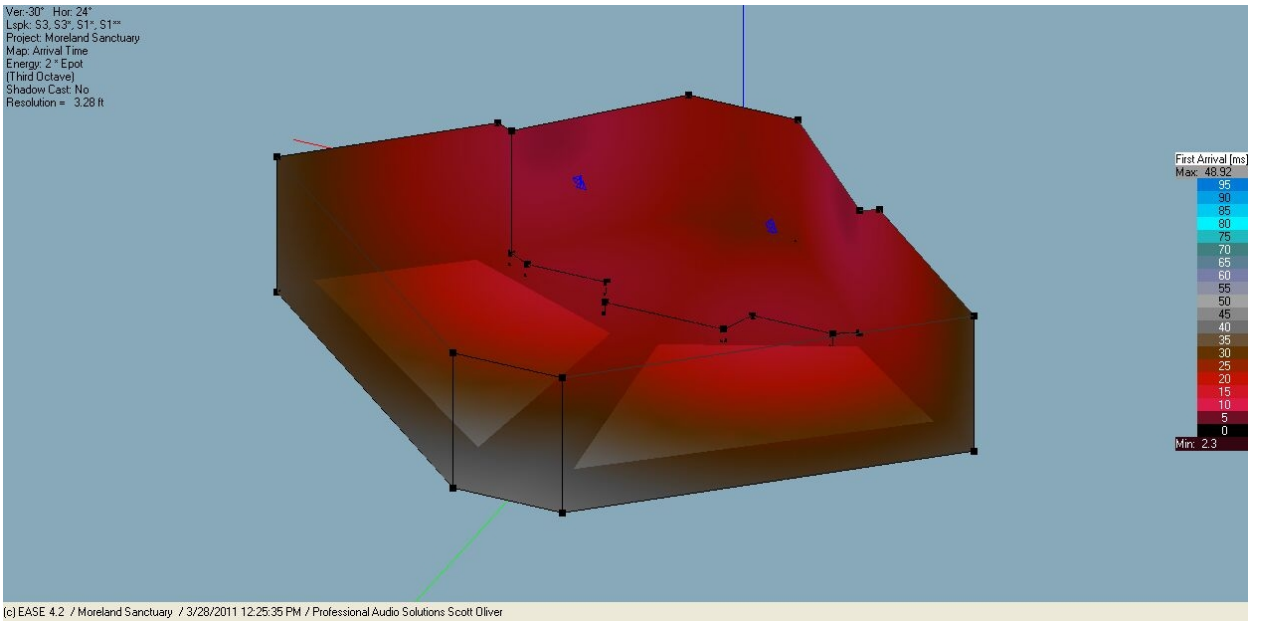
Prediction Successful

Shows how much each speaker is overlapping the other. Overlap is in the center isle. Perfect for this room, or any room for that matter.



Prediction Set #5: 4 Danley-SH95-Arrival Time

Shows how long in milliseconds how long it takes the sound to get to the listener areas. The maximum for this room is 40MS. Totally acceptable.

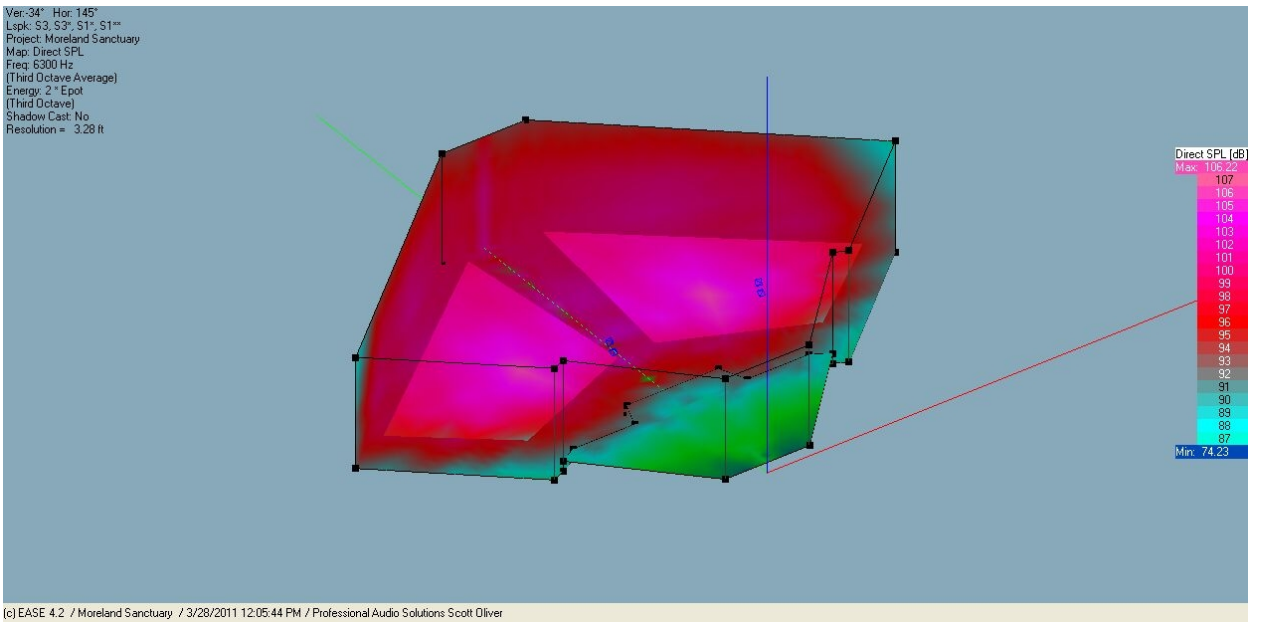


Prediction Set #5: 4 Danley-SH95-Rear Wall Energy

Prediction Warrants Acoustic Treatments

This view angle of the room shows where acoustic treatments will need to be applied. For this room to sound right, with minimal reflections directed back towards the stage, the rear wall will absolutely need to be treated. Seeing is believing.

- **Due to the low ceiling in your sanctuary, it is impossible to create enough speaker height (triangulation) to keep direct sound energy off the rear walls. It is our recommendation that the rear walls be treated with custom sound absorption panels. Engineering for these panels will determine the amount of panels, the shape, and the materials to be used. This design is 100% dependent on the speaker system approval.**



Conclusions: Proper and effective engineering have yielded a system design that fits this room perfectly. The key to this installation's success is in following the 6 coordinates for each speakers location (these are output from EASE for the purpose of installing the system) precisely so it will perform in real-life just like it does in the successful model. Ignoring those coordinates or deviating from them without further modeling will yield compromised results. Additionally, ignoring the necessary acoustic treatments will yield compromised results as well.