Project Hall

d&b audiotechnik

Integrated Loudspeaker Systems

Ease Simulation Report

COMPANY NAME

Prepared for:

Project Hall

Location Venue

Prepared by:

LOU GARCIA

Electronics & Engineering Singapore

2019

Contents

Note:

All simulations are for reference purposes only and are based on the given data information at the time of plotting, CAD or site measurements will be amended at any time. AV / Project Engineer shall make all necessary provisions for any changes due to on-site constraints hereafter. All simulations are based on direct sound, predicted room RT, and simulated STIPA based on room acoustics and are subjected to change in later provisions.

EASE PLOTS AND REPORT SIMULATION BY:

LOU GARCIA | Systems Applications
Electronics & Engineering Singapore
Office Address

Loudspeaker Placement and Aiming

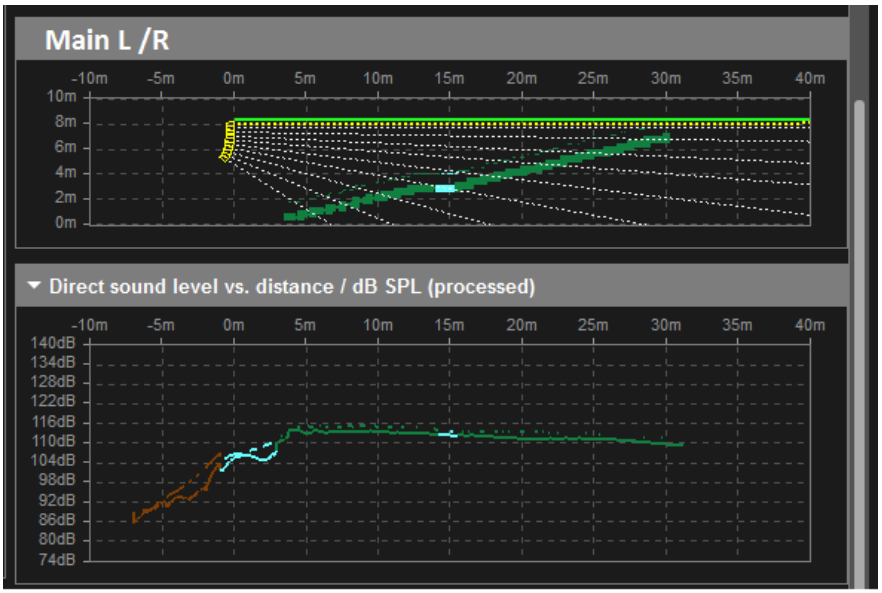
Simulation and plotted by Lou Garcia

d&b Main System with Subwoofer + fills

	Brand	Model	QTY
Main FOH L/R	d&b	KSL8	8
Main FOH – Bottom	d&b	KSL12	2
Subwoofer - Centre	d&b	SL-SUB (array)	6
Front Fills	d&b	E6 55X100	5
Stage Fills (front image)	d&b	E12 80X50	2

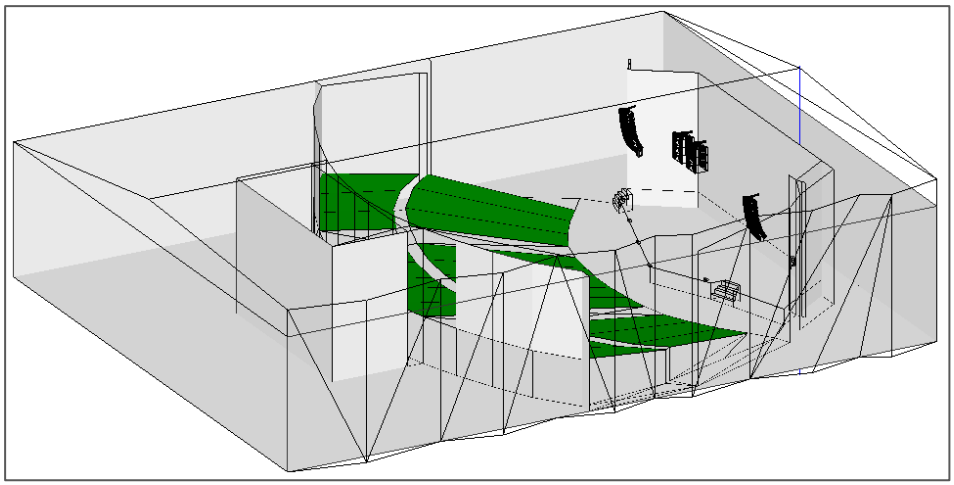
Reference | 1 Loudspeaker and Subwoofer

Image 1 – Main cluster aiming and SPL (data from ArrayCalc d&b)

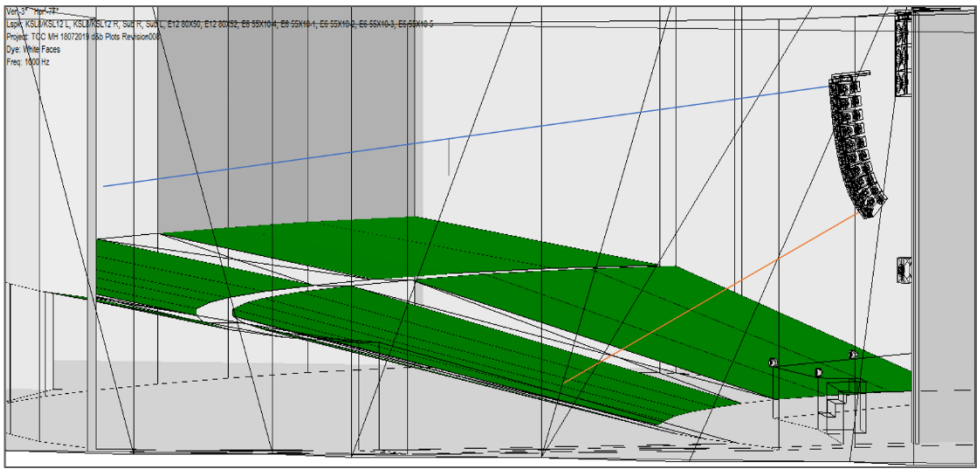


Venue Views

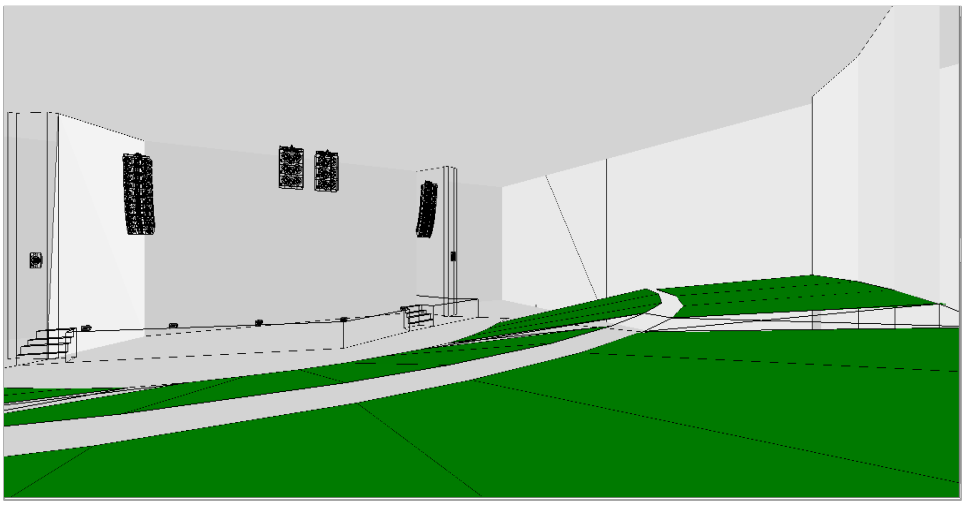
3D View: of the main cluster, subwoofers and fills



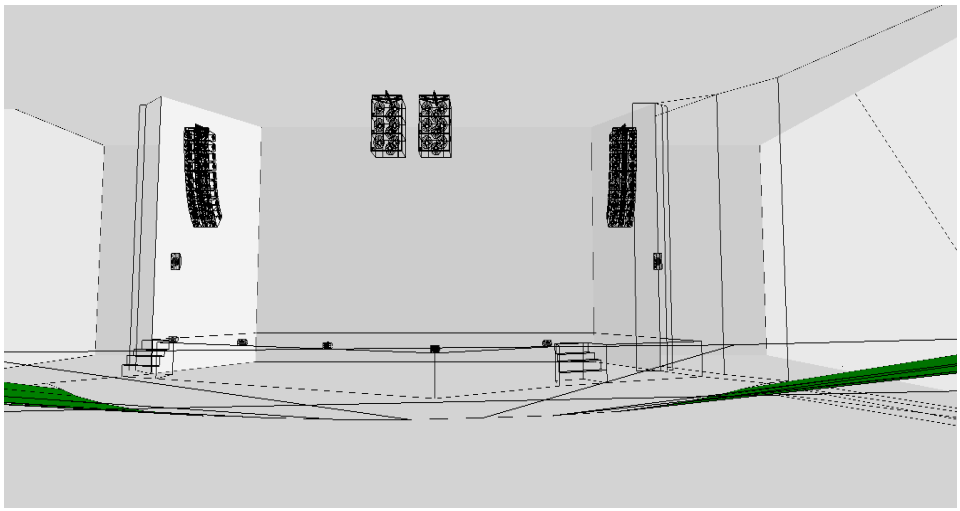
View from Left stage



Audience View Upper Area

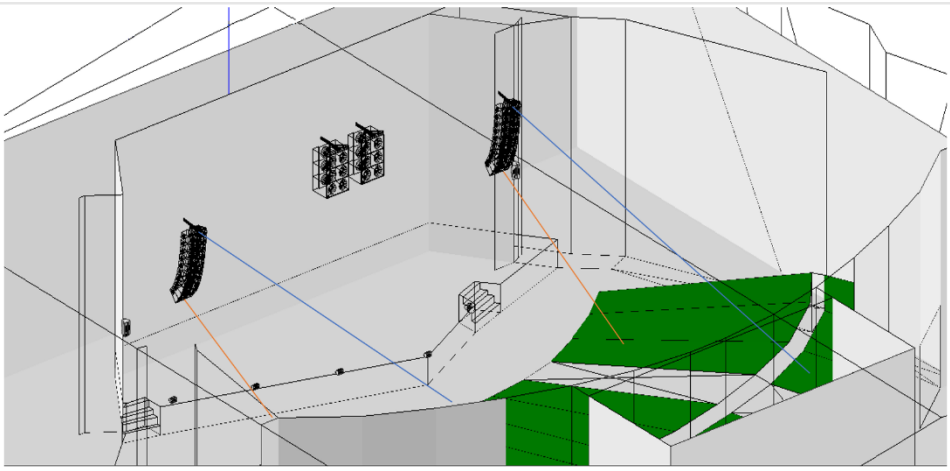


View from audience middle, showing main left & right cluster and sub array

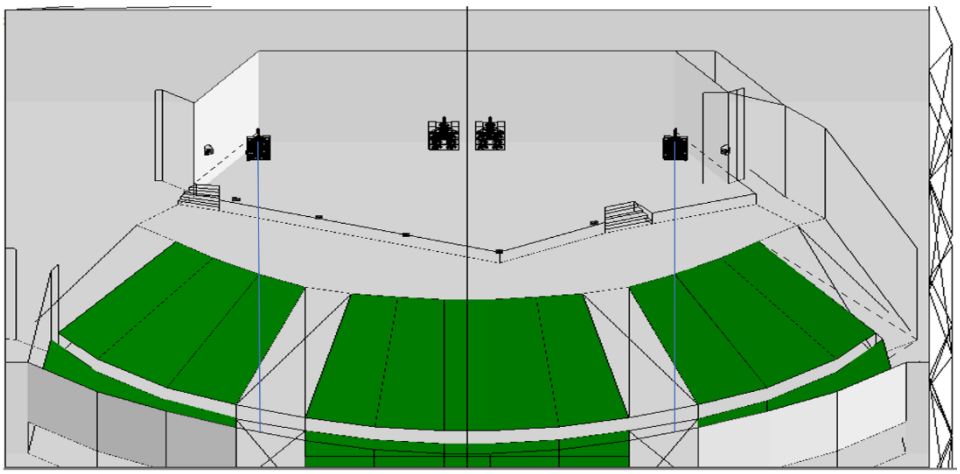


Audience Area elevation has been adjusted; lowered down

View from above left audience area. Beam@lower speaker to focus on 2-3 row seater



View from above center audience area



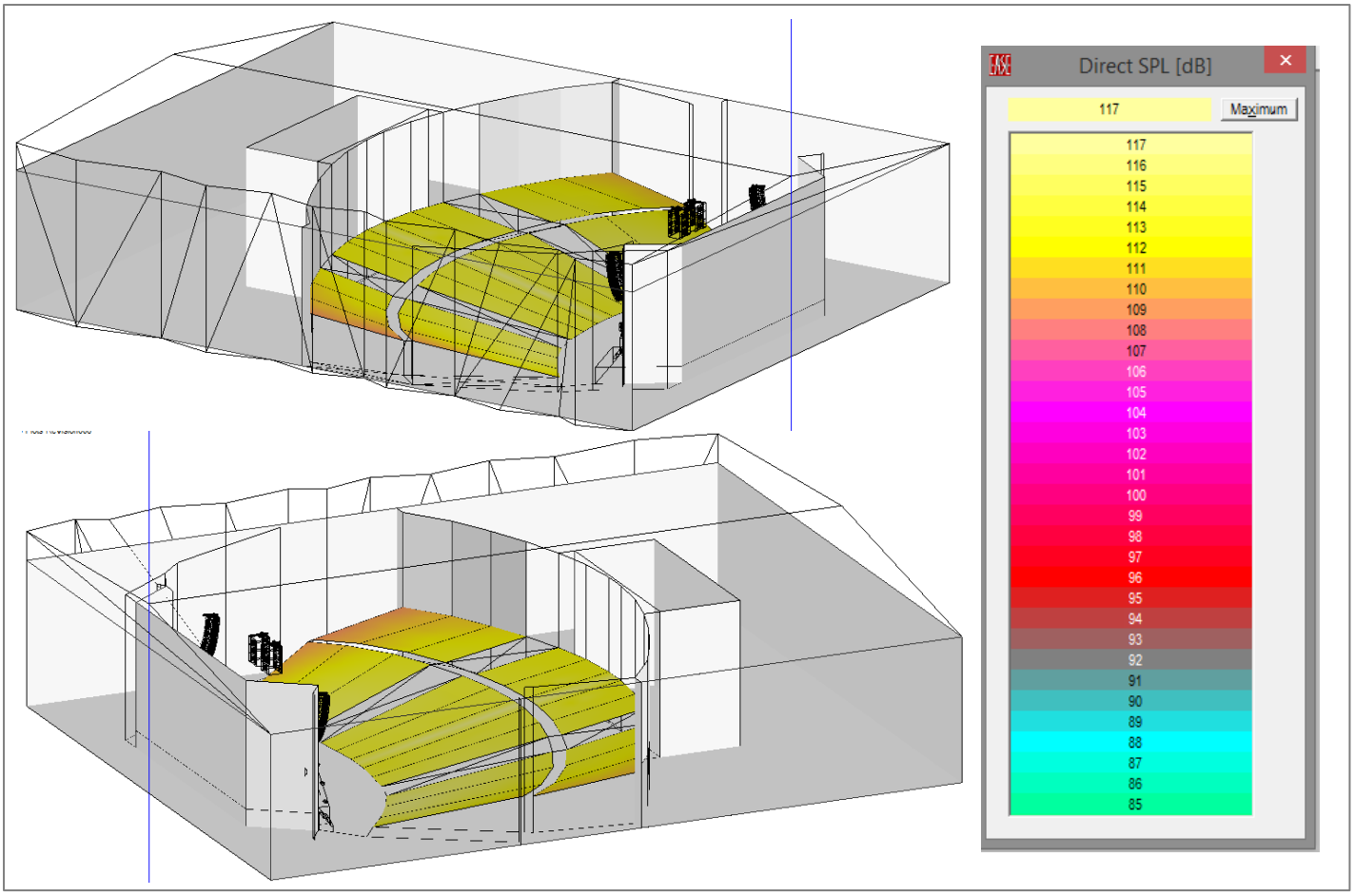
SPL Simulations

Simulation and plotted by Lou Garcia

EASE Broadband SPL (100Hz – 10kHz) Max 117 dB SPL

(Main array cluster and subwoofers)

3D View



Reference | 2

EASE 3D Simulation with Area Mapping

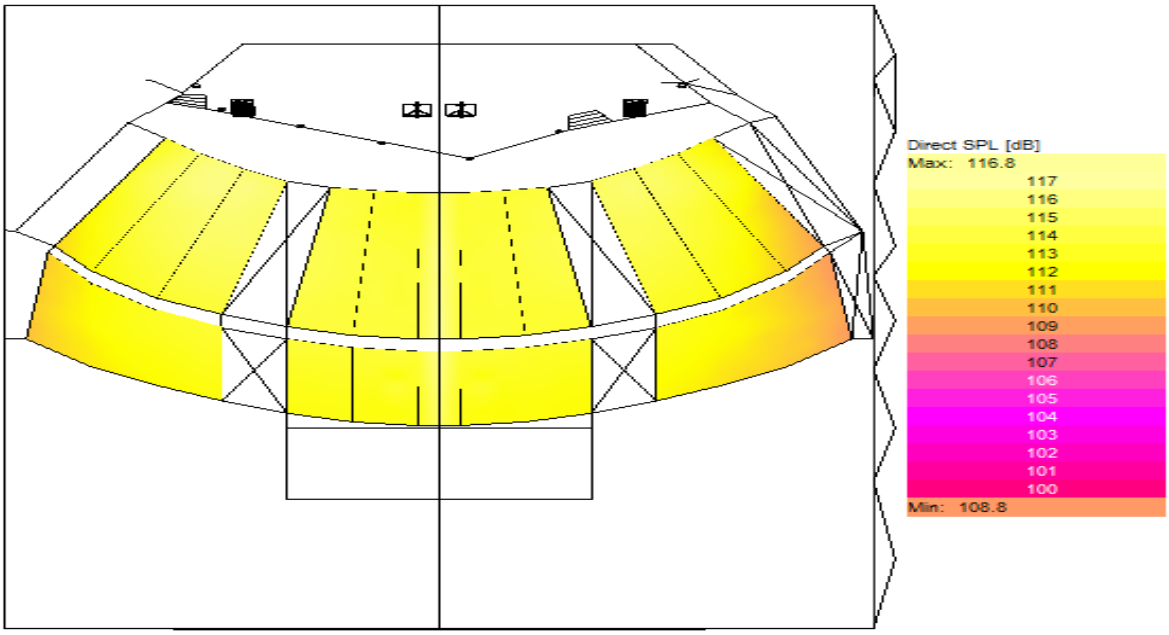
SPL simulation shows the coverage across the audience area with around +/- 3 dB of deviation and a maximum achieved level under simulated given data of 85 - 117 dBA SPL in about 90 percent of the coverage area. Broadband Direct SPL measurement.

The A-weighted (dBA) is used in this simulation. It has a frequency curve that reflects the loudness perceived by the human ear.

Direct SPL (Frequency Range from100Hz – 10kHz)

(Main array cluster and subwoofers)

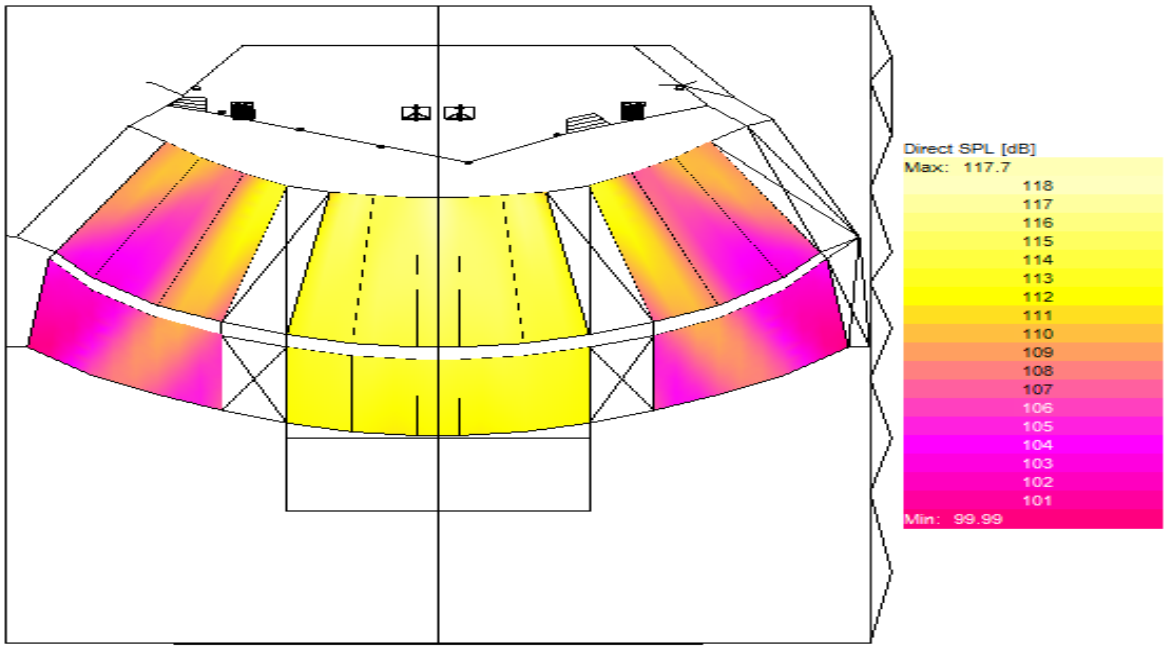
2D View



2D Standard Mapping – Broadband A-weighted

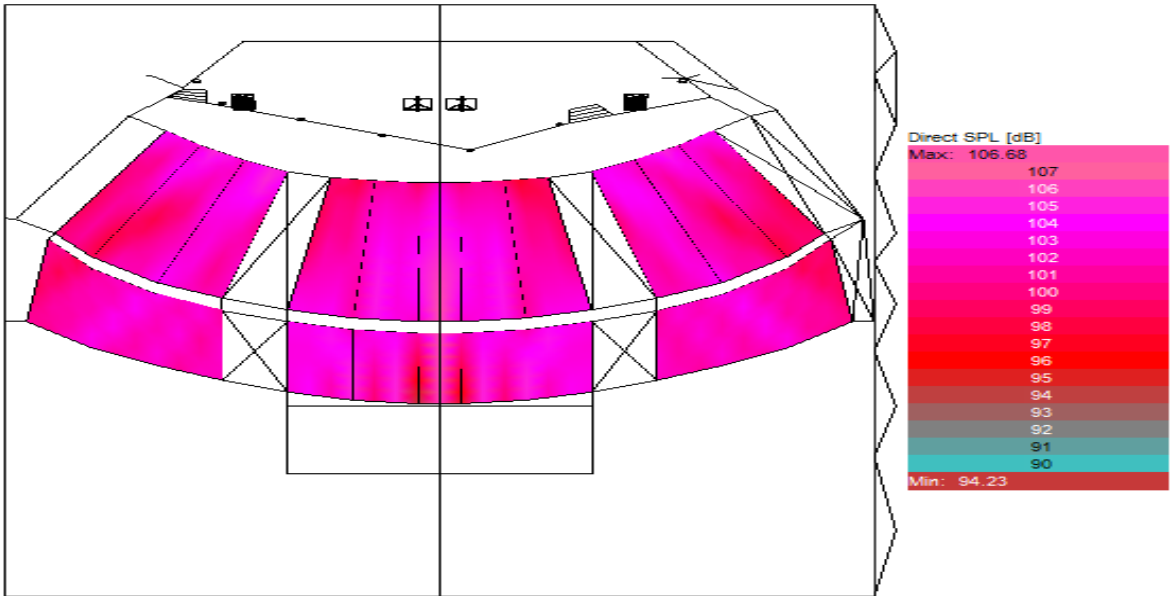
SPL simulation shows the coverage across the audience area with around +/- 3 dB of deviation in about 90 percent of the coverage area.

Frequency Unweighted: 100Hz – 125Hz



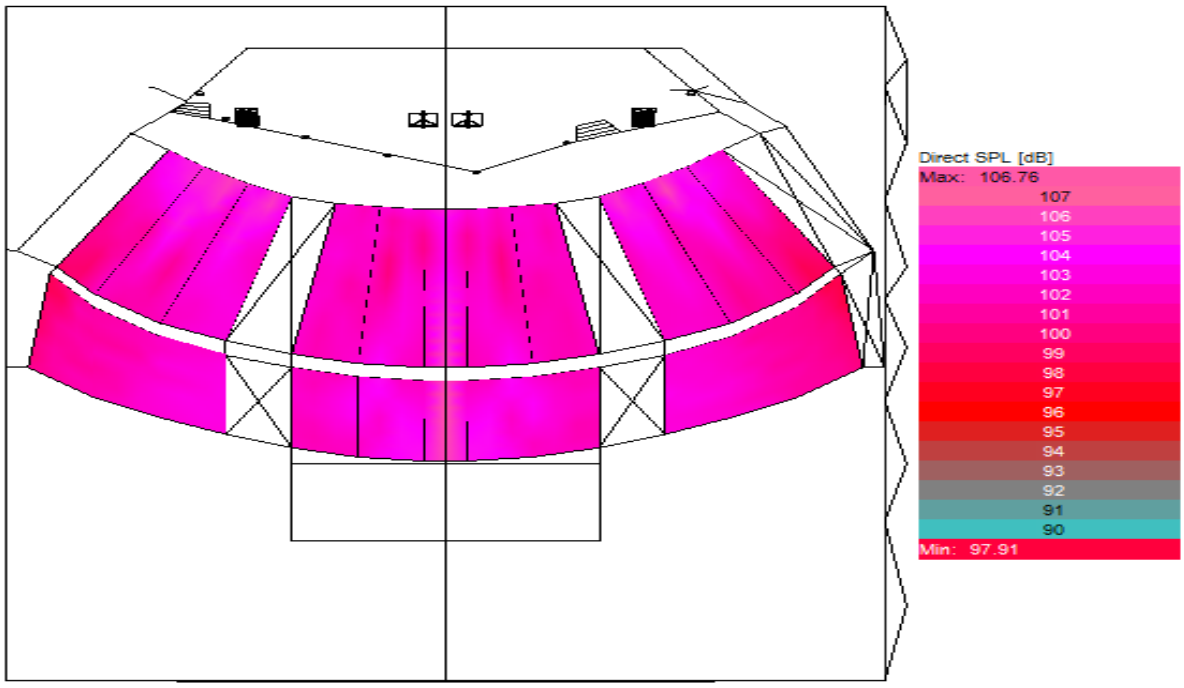
100Hz -125Hz Unweighted

Frequency Unweighted: 250Hz and 500Hz.

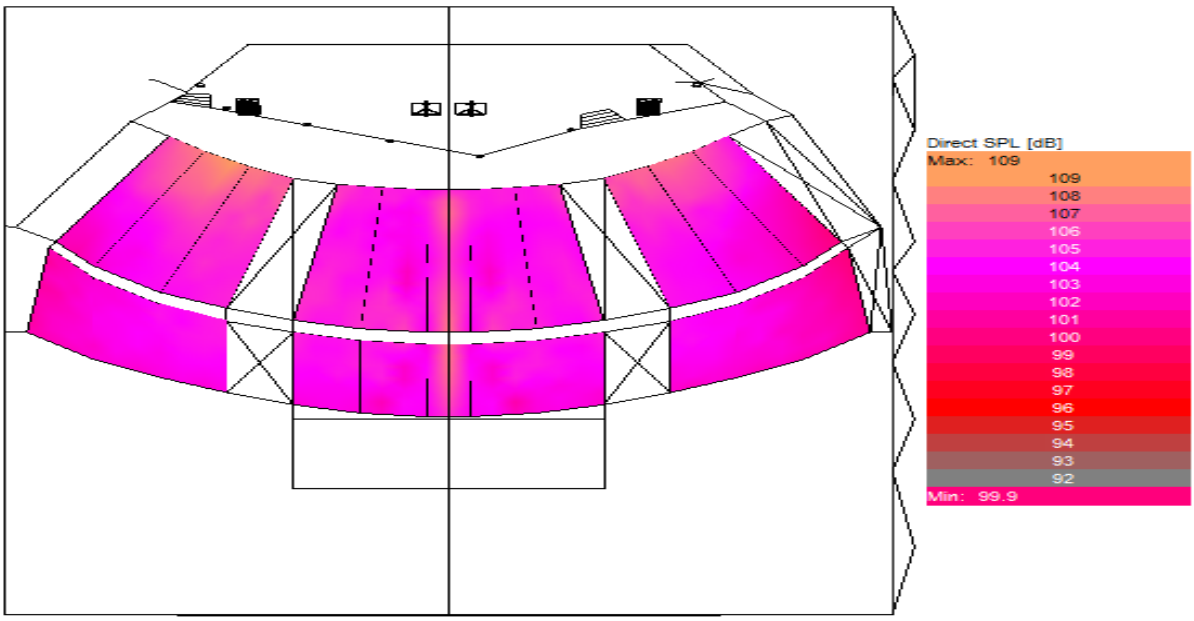


250Hz - 315Hz Unweighted

500Hz – 630Hz Unweighted

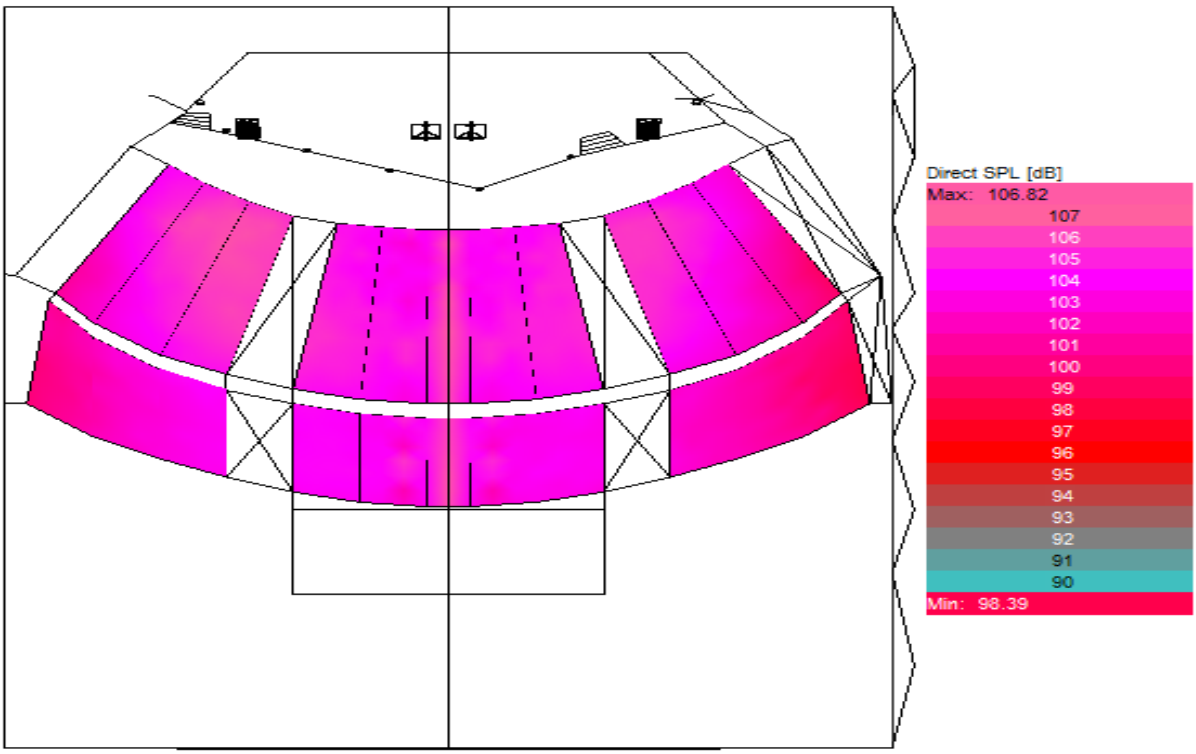


Frequency Unweighted: 1000Hz and 2000Hz.

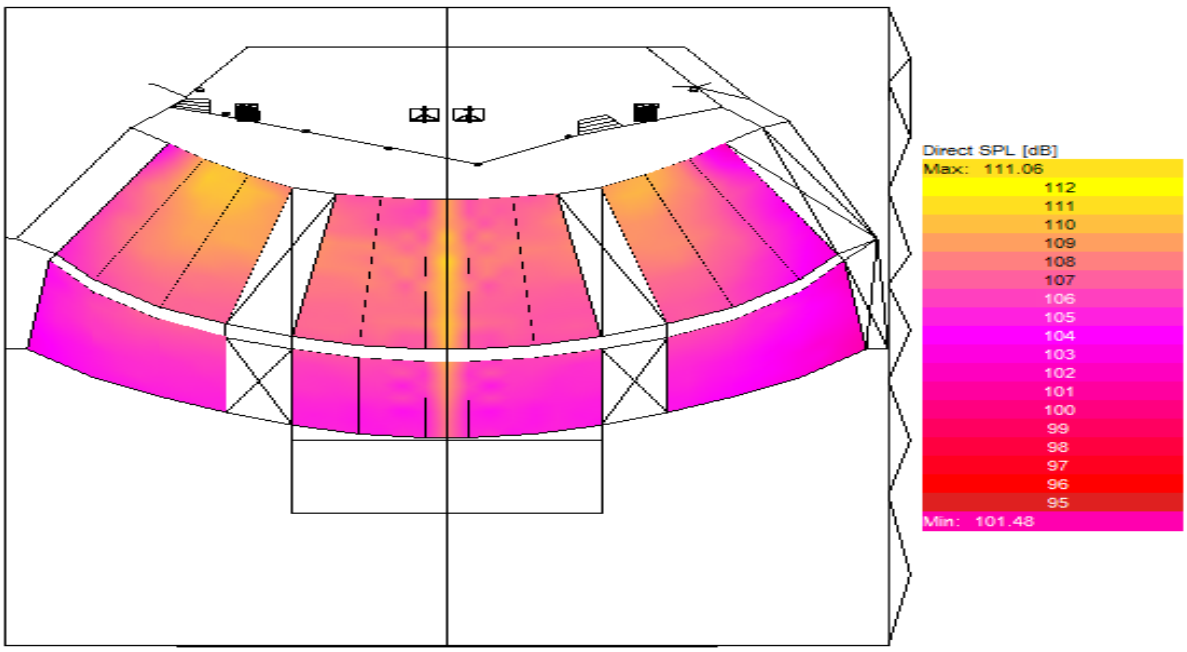


1000Hz – 1250Hz Unweighted

2000Hz – 2500Hz Unweighted

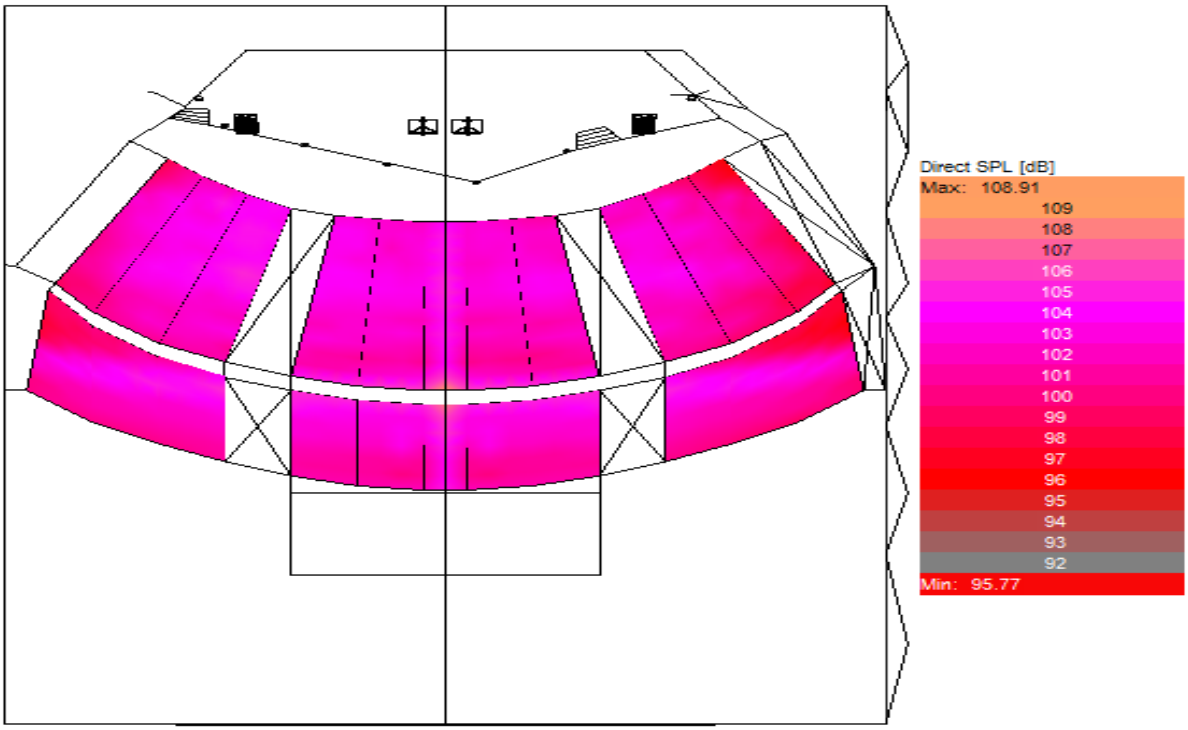


Frequency Unweighted: 4000Hz and 8000Hz



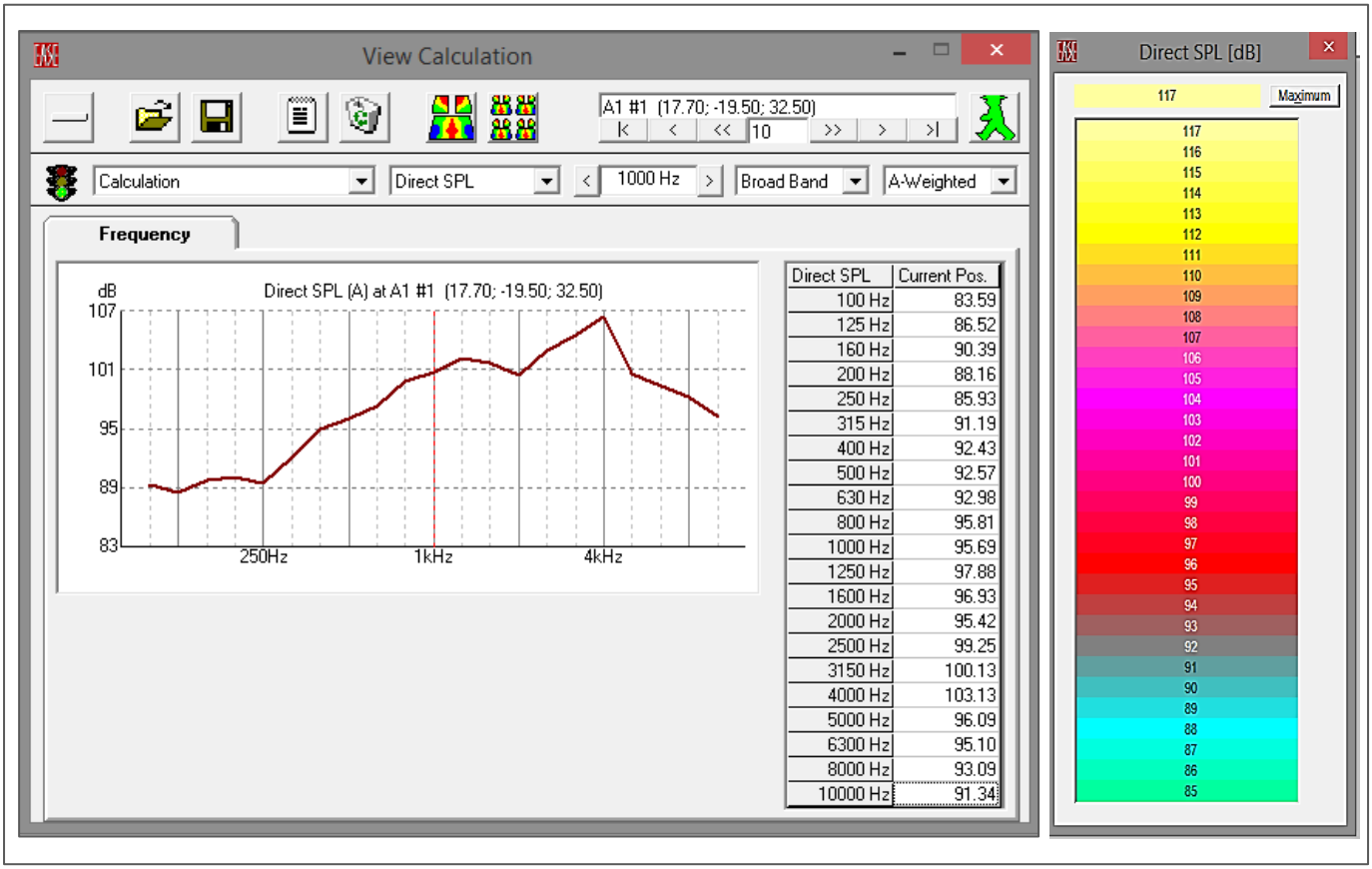
4000Hz - 5000Hz Unweighted

8000Hz - 10000Hz Unweighted



Direct SPL (100Hz – 10kHz)

(Main array cluster and subwoofers
Broadband A-Weighted)



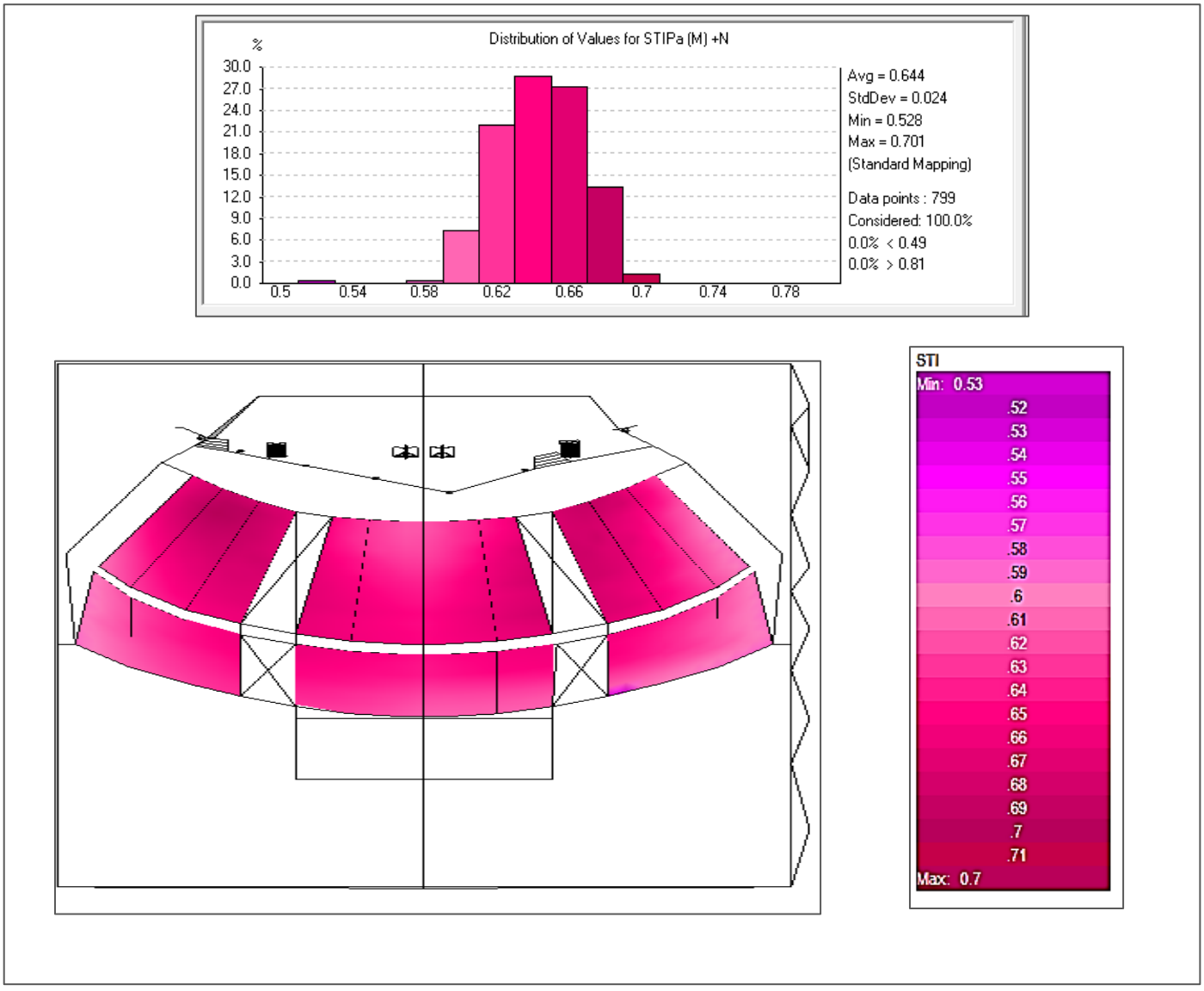
Frequency coverage across the broadband spectrum. Maximum achieved level under simulated given frequency tabulation data: 84 - 117 dBA.

The A-weighted (dBA) is used in this simulation.

PREDICTED STI-PA

(Avg = 0.59)

3D View

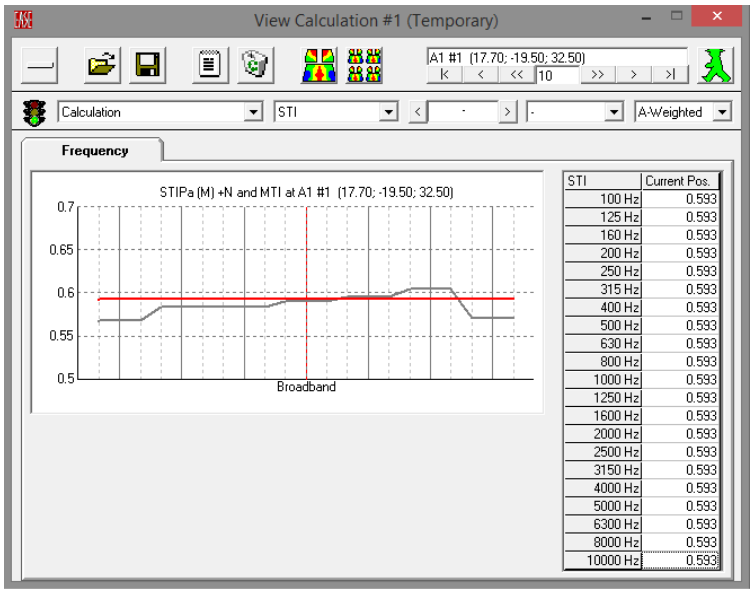


Reference | 5

STI value	Quality according to IEC 60268-16	Intelligibility of syllables in %	Intelligibility of words in %	Intelligibility of sentences in %
0 – 0.3	bad	0 – 34	0 – 67	0 – 89
0.3 – 0.45	poor	34 – 48	67 – 78	89 – 92
0.45 – 0.6	fair	48 – 67	78 – 87	92 – 95
0.6 – 0.75	good	67 – 90	87 – 94	95 – 96
0.75 – 1	excellent	90 – 96	94 – 96	96 – 100

PREDICTED STI-PA

(Avg = 0.59)



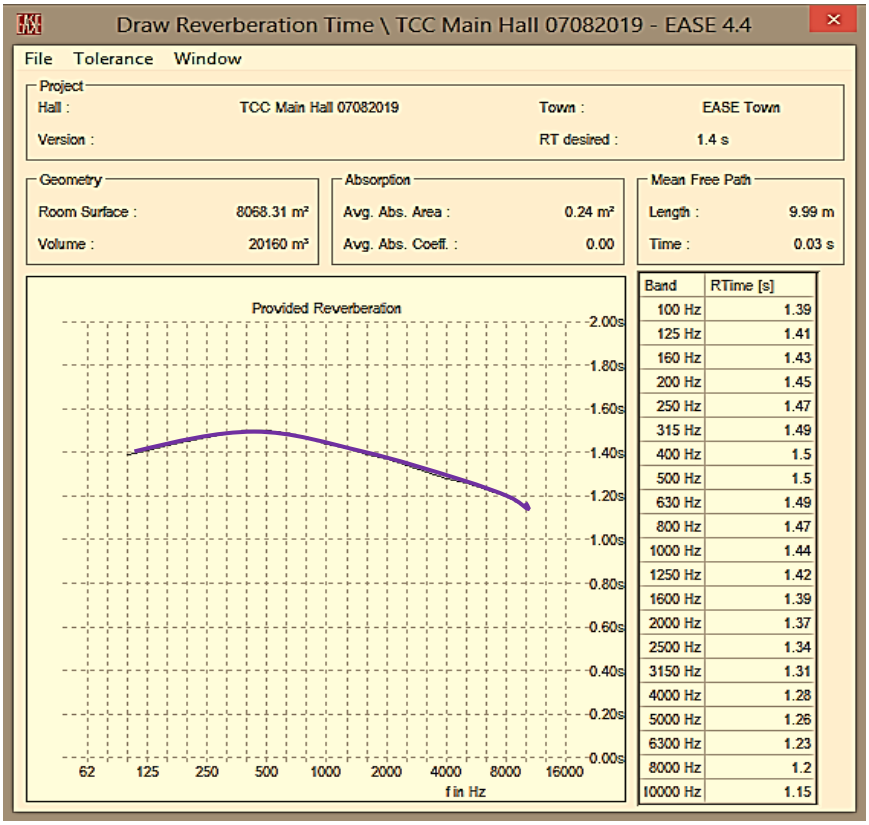
STI-PA is fair 0.6 as reverberation in the room has been stated as 1.5ms targeting Mid frequency range. Room RT has been optimised.

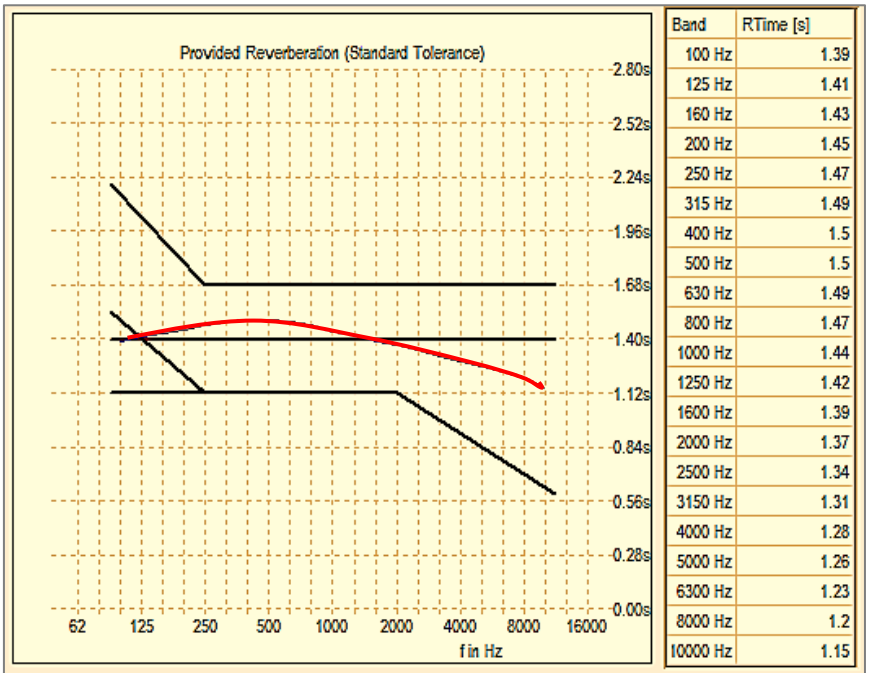
STI value	Quality according to IEC 60268-16	Intelligibility of syllables in %	Intelligibility of words in %	Intelligibility of sentences in %
0 – 0.3	bad	0 – 34	0 – 67	0 – 89
0.3 – 0.45	poor	34 – 48	67 – 78	89 – 92
0.45 – 0.6	fair	48 – 67	78 – 87	92 – 95
0.6 – 0.75	good	67 – 90	87 – 94	95 – 96
0.75 – 1	excellent	90 – 96	94 – 96	96 – 100

SIMULATED ROOM REVERBERATION (Optimised Room RT)

Reverberation time has been found to influence sound pressure level and its intensity in continuous source.
Interaction between room acoustics and source excitation will impact over-all total SPL

250Hz - 1.47 MS, 500Hz – 1.5 MS, 1000Hz – 1.44 MS and 2500Hz – 1.34 MS, 4000Hz – 1.28 MS





Room Reverberation has been optimised; 1.15ms – 1.50ms

TERMINOLOGY

STI Speech Transmission Index

Another frequently used intelligibility measure is the *STI Speech Transmission Index,* which is a single number between 0 and 1. *STI* is calculated from a set of other numbers called MTF Modulation Transfer Function. It considers how the transmission from source to receiver is affected at different frequency bands and how much these frequency bands contribute to speech intelligibility.

STI value	Quality according to IEC 60268-16	Intelligibility of syllables in %	Intelligibility of words in %	Intelligibility of sentences in %
0 – 0.3	bad	0 – 34	0 – 67	0 – 89
0.3 – 0.45	poor	34 – 48	67 – 78	89 – 92
0.45 – 0.6	fair	48 – 67	78 – 87	92 – 95
0.6 – 0.75	good	67 – 90	87 – 94	95 – 96
0.75 – 1	excellent	90 – 96	94 – 96	96 – 100

Optimize RT is a quick and easy way to investigate what can be done to correct the room acoustics.

Room RT - designed to create a diffuse or random incidence sound field

Sound Pressure or Acoustic Pressure is the local pressure deviation from the ambient (average or equilibrium) atmospheric pressure, caused by a sound wave.

Reverberation Time RT in a room at a given frequency is the time required for the mean-square sound pressure in that room to decay from a steady state value by 60dB after the sound suddenly ceases. This is one of the most vital, though not the only, measures of a room's acoustic properties and can be a guide to the suitability of a room for a given purpose. Sabine and Eyring equation used in Ease simulations.

Speaker Profile

KSL8
Line arrays
Medium to large format 3-way line array loudspeaker

- Components LF: 2 x 10" + 2 x 8"; MF: 1 x 8"; HF: 2 x 1.4" exit compression driver with 3" coil
- Dispersion 80°
- SPL max 145 dB
- Weight 58 kg / 128 lbs

KSL12
Line arrays
Medium to large format 3-way line array loudspeaker

- Components LF: 2 x 10" + 2 x 8"; MF: 1 x 8"; HF: 2 x 1.4" exit compression driver with 3" coil Dispersion 120°
- SPL max 144 dB
- Weight 58 kg / 128 lbs

SL-SUB Subwoofer
Large format flyable cardioid subwoofer

- Components 3 x 21"
- Dispersion Cardioid
- SPL max 144 dB
- Weight 138 kg / 304 lb

E6 loudspeaker
Point sources
2-way compact coaxial loudspeaker

- Components 6.5"/1"
- Dispersion 100° x 55° rotatable
- SPL max 123 dB
- Weight 5 kg / 11 lb

E12 loudspeaker
Point sources
High-performance 2-way coaxial loudspeaker

- Components 12"/1.3"
- Dispersion 80° x 50° rotatable
- SPL max 134 dB
- Weight 16 kg / 35 lb

-end of report-