

Characterization of the Room Acoustics

Portable Soundproof Rooms

Client: Arena Atlântico, S.A.

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1. Introduction

The construction of large rooms to hold meetings or events is increasingly necessary in the business market. The most requested rooms are the medium-sized rooms where they can perform various types of events, like; meetings, presentations, performances, shows and multimedia.

Usually these rooms are used for events of short duration and with different needs or capacities of audience. One of the most important requirements is the Acoustic conditions; is crucial to the success of the events the adequate sound isolation and the intelligibility of the sound as well inside the room; this two predicates are the key of the success.

In order to meet the constant demand for mobile solutions for this type of rooms, JOCAVI has developed, in close collaboration with ARENA ATLANTICO, a project for the construction of these acoustic rooms that are easily assembled and adaptable to the audience capacity of each event. We call these rooms Portable Soundproof Rooms, or simply PSRooms.

These rooms are built inside large pavilions using the common structures of aluminium TRUSS; it is then possible to build a room or several rooms, separated by corridors, duly soundproofed with the necessary dimensions for the different types of use. Various different environments can thus be created, with different programs and schedules, without acoustic permeability being a problem. All rooms separated or not by corridors have sound insulation necessary adapted to each situation.

2. Generalities

Nowadays, the current audio-visuals technology and the need of acoustic comfort, in accordance with the existing regulation, makes it imperative for acoustics to be totally controlled and free of any major acoustic defects.

Poor sound insulation, excessive reverberation time, echo-waves, etc., distort the sound produced by the sources, creating like a “trash sound” that disturbs and hinders hearing intelligibility.

The relevant requirements for good acoustics is to provide the soundproofing insulation in accordance to the usage of the room, control of the reverberation time, an adequate sound propagation system (PA) well sized and placed to the purpose of the event for which it is intended.

3. Acoustic Solution Description

The insulation of the walls is done by applying rollers of JOCAVI BASMEL curtains, which are a sound absorber element. These rollers are fixed to the TRUSS structure being thus unrolled to the floor. By each part of the BASMEL rollers (inside and outside the room) a curtain is applied to give the room the final finishing aspect. These three layers composition of these acoustic walls, with a gap space, provide us about 34 dB of sound insulation (see annex I).

The insulation of the ceiling is made through large plates of JOCAVI WATERCOT, which is a dense plate of acoustic insulation. These plates fit together and are placed on top of parallel and perpendicular straps, fixed to the TRUSS structure.

This practical way of constructing smaller spaces within large pavilions has surprising results.

4. Acoustic Room Characterization

These Portable Soundproof Venues are characterized in two ways; As per the noise from the inside to the outside and vice-versa, and as per the sound intelligibility inside the room.

These two predicates combined make these types of rooms acoustically treated, providing a great autonomy of use.

The sound quality inside the room is privileged, through a high acoustic absorption provided by the whole area of walls and ceiling with absorbent materials.

5. Measurement location map

Acoustic measurements were taken to determine the PSRoom characteristics (insulation rate and reverberation time).

The acoustic measurements were done in 2 spots, one inside the PSRoom and the other outside the PSRoom. The two (2) marked spots are 6 meters distant from the wall of the room, thus the distance between the two (2) spots is 12 meters (*see annex III*).

JOCAVI® uses to perform the acoustic analysis the Sound level meter (NTi XL2 + Microphone M4260) homologated with the number AZA-02469-D0.

6. Sound insulation measurement method

Acoustic measurements are made in order to determine the sound insulation rate both ways; from *inside to outside* and from *outside to inside* the PSRoom.

A Sound Level Meter and computerised post-processing was used in order to provide the results. The values are expressed in (dB).

The two (2) marked spots are 6 meters distant from the wall of the room, thus the distance between the *source (pistol)* and the *receiver (sound meter)* is 12 meters.

In this test we used an impulsive noise source that is a starter pistol with 100db acoustic pressure noise capsules.

The insulation rate average was obtained by this method; [dB Laf REFERENCE (-) dB Laf VALUE]
= INSULATION RATE. (see annex I).

7. Reverberation time measurement method

JOCAVI® measures the reverberation time in accordance with ISO3382 Standard.

Reverberation time RT60 measurement represents the time taken for the sound level in a room to be reduced to 1/1000 of the initial value, ie, to the level of -60 dB, after the sound source is suddenly removed. The RT60 reverberation spectrum values are shown in octave bands from 63 Hz to 8 kHz.

In this test we used an impulsive noise source that is a starter pistol with 100db acoustic pressure noise capsules. The acoustic measurements were done in 1 spot marked in plant. (see annex II).

8. Summary

The PSRoom was built inside a pavilion with about 62.000 m3 of volume.

The dimensions of the PSRoom are; (30 mt long, 21 mt wide and 8 mt high), with a volume about 5.040 m3 of volume.

The insulation rate achieved is; 34,5db (125hz to 4000hz) from the inside to the outside and 31,4db (125hz to 4000hz) from the outside to the inside.

In addition to the insulation rate achieved, this acoustic solution provides a very quiet environment inside the PSRoom, the reverberation time is quite low 0.42 sec., comparing with 3.51 sec. outside the room. This difference means a huge reduction of 88,07% RT60 values.

As it turns out, the reverberation time inside the room is very good for the intelligibility of the sound. An environment with such characteristic besides being intelligible is conducive to being able to attenuate to the outside. In other words, the sound insulation achieved in conjunction with the reduced reverberation time inside make remarkable acoustics and are well insulated and treated for the type of programs to be held in the PSRoom.

The results show that the objectives have been well realized as well the recommended solution is easy to install.

I'm very pleased to develop this acoustic report. JOCAVI® team and me are at your disposal for any related information you may need.

My best regards.

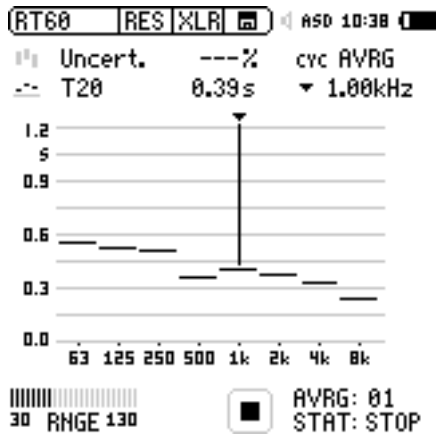
João Carlos Vieira
CEO, Founder and Director

JOCAVI, Acoustic Panels Lda

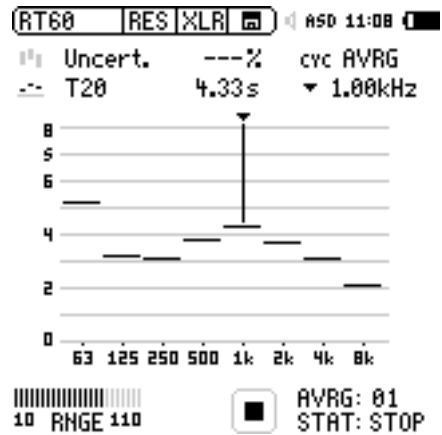
Sintra, 17th of November 2016



RT60 inside PSRoom



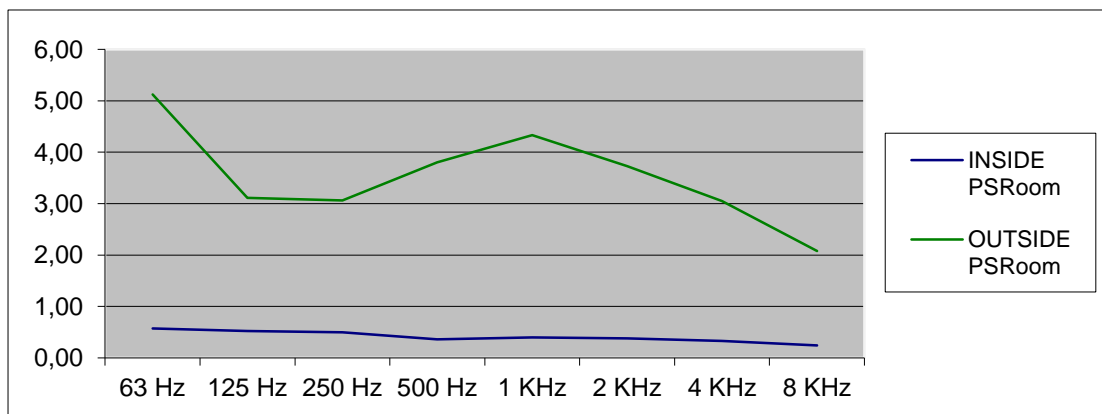
RT60 outside PSRoom



Comparative table RT60 (inside and outside the PSRoom)

	63 Hz	125 Hz	250 Hz	500 Hz	1 KHz	2 KHz	4 KHz	8 KHz	RT60
INSIDE PSRoom	0,57	0,52	0,50	0,36	0,39	0,38	0,33	0,24	0,42
OUTSIDE PSRoom	5,12	3,11	3,06	3,80	4,33	3,73	3,05	2,08	3,51
REDUCTION (-%)	88,87	82,64	83,33	90,53	90,76	89,81	89,18	88,46	87,95

Comparative graphic RT60 (inside and outside the PSRoom)



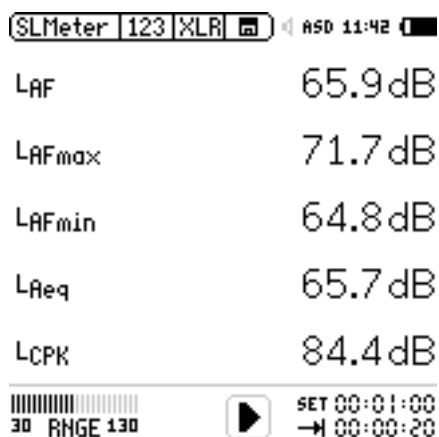
REFERENCE inside PSRoom



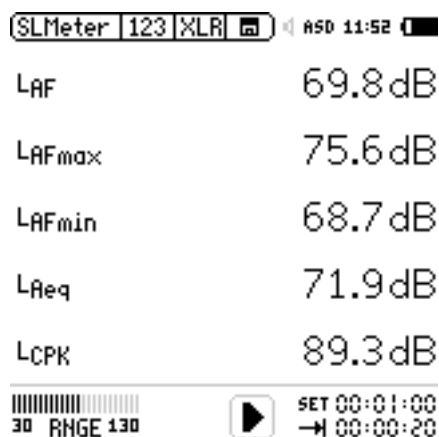
REFERENCE outside PSRoom



VALUES inside to outside PSRoom



VALUES outside to inside PSRoom



Reference table INSULATION VALUES (inside and outside the PSRoom)

	REFERENCE INSIDE PSRoom	REFERENCE OUTSIDE PSRoom	VALUES INSIDE to OUTSIDE	VALUES OUTSIDE to INSIDE	INSULATION ACHIEVED INSIDE to OUTSIDE	INSULATION ACHIEVED OUTSIDE to INSIDE
dB Laf	100,4	101,2	65,9	69,8	34,5	31,4
dB Laf max	101,0	102,6	71,7	75,6	29,3	27,0
dB Laf min	78,1	78,6	64,8	68,7	13,3	9,9
dB A eq	100,1	100,8	65,7	71,9	34,4	28,9
dB L cpk	121,3	122,6	84,4	89,3	36,9	33,3

Reference graphic INSULATION VALUES (inside and outside the PSRoom)

