VENUE FOR POP-ROCK EVENTS– ROOM ACOUSTIC CASE STUDY "EuroRegio2016"

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Extended Abstract

Popular musical acts that require amplified music, in particular pop-rock events, are relevant, popular and frequent cultural happenings. Many of these concerts take place at small or medium size rooms with a high variety of uses and less effective acoustic treatment regarding the amplified music acoustic needs, namely at low frequencies. The study of such rooms has been barely systematic and many times devaluated. Pop and rock concerts, as well as other trendy contemporary music events are unique experiences, highly dependent on the amplification of band sound. Unlike speech, the bass level at rock concerts cannot simply be turned down in the overall mix in the PA speakers in order to achieve intelligibility [2]. Moreover, the low frequency response plays an important role as the source component, can hardly be aimed or directed at the audience. On the other hand, complexity increases when the room acoustic low frequency response is to be controlled.

The first scientific studies that included objective measurements of the acoustics of 20 rock music venues in Denmark as well as a questionnaire for the subjective assessment of those venues with professional rock musicians and sound engineers as expert listeners was published in 2010 [1]. Since then, the subject is having more and more attention as new or refurbished halls open [3] and more halls are studied, with very different volumes and capacities [4].

For this matter it is intended to present a case study concerning a room specifically dedicated to pop-rock events – Caixa da Música in Paredes de Coura, Portugal. With a rectangular shape, the audience area has the approximate dimensions of 14m x 11,1m x 3,5m (L x W x H), while the stage approximate dimensions are 9,3 x 3,9 x 2,6 (L x W x H). The stage height is 0,90m and the total volume is ≈ 640 m^3. Surface materials range from concrete (floor and walls) glass (back wall) to sound absorbing coverings concentrate on the ceiling and right hand side (facing the stage) wall. The vertical surfaces have very distinct sound absorbing performance distribution. Beneath the stage there is some storage room, protected by an acoustically transparent mesh.

Room acoustic measurements were undertaken before opening. The room was empty and the back glass wall was fully exposed (projection screen rolled up). Two omnidirectional sound source locations were considered at the stage area and two receivers locations at audience. The room acoustic measurements were based on ISO 3382-1:2009 Acoustics -- Measurement of room acoustic parameters -- Part 1: Performance spaces. IRIS integrated hardware and software was used with sweep time settings of 10s and impulse response time settings of 3s. A maximum of three samples were considered for averaging each measurement condition.

Impulse Response Functions (IRF) were obtained for each source-receiver configuration. The *in situ* measurements allowed to determine the room's acoustic response, for a frequency range between 63 to 8.000 Hz. Room acoustic parameters such as T30, EDT, LF C80, D50 were determined at each location. Average results for the empty room are presented at the graphics to follow. In addition a 3D sound intensity distribution, for a given source and receiver position, is also shown – color code for different time window.

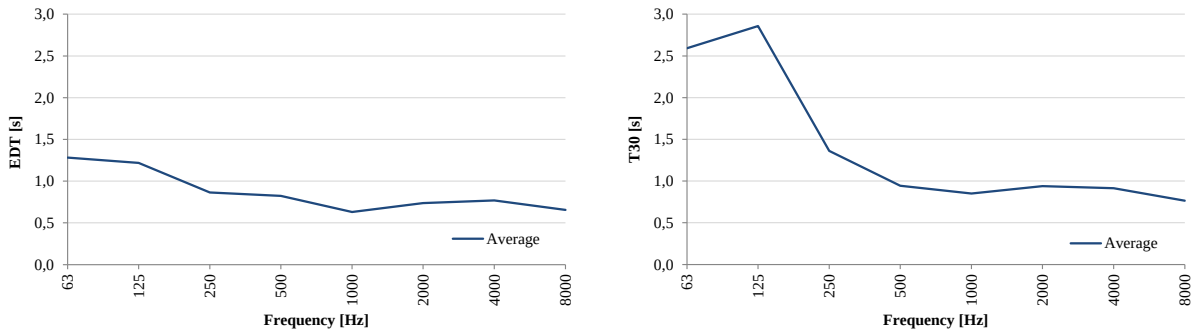

Figure 1 – Room's EDT and T30 average values.

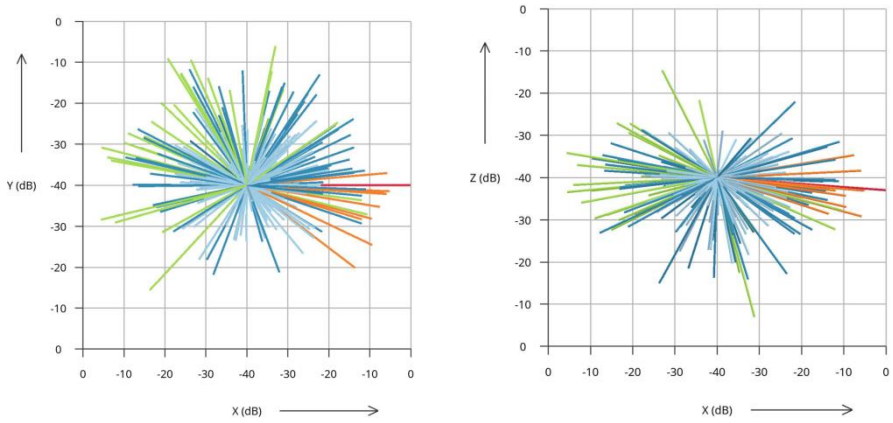

Figure 2 – 3D sound intensity distribution for a particular receiver's location (plan and cross-section visualization). Red trace indicates sound source location at the stage.

The measured results are compared to recommended criteria for empty venues [1], [3] and [4]. Analytical predictions, made with different absorption exponents or different formulation, are also compared with the measured data. A final comparison between the measured results (ex.: reverberation time, IRF, among others) and a computer predictions is accomplished by modeling the room using a commercially available ray-based software. Once the models are calibrated, estimations for different audience scenarios are made. The predictions are analyzed and commented. All the previous issues will be included in the oral presentation.

References

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