

(Research Article)  
**Horizontal reverberant field, an approach in acoustic analysis of multipurpose hall design**

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**Abstract**

According to evidences, it has been observed that the reverberation time is longer than expected and that the cause is a horizontal reverberant field established in the region near the ceiling and far from the audience. Although there are no unfavorable comments about it, this has been also observed in the Boston Symphony Hall, Massachusetts, and the Stadthalle Göttingen. This study is on based of two scaled modeling that the walls and ceiling contained openings in which either plane or scattering panels could be placed. With plane panels, the model reverberation time (RT) was measured as 53% higher than the Sabine prediction, compared with 8% higher with scattering panels. But the second model was lecture theatre with a movable 6 m or 8 m high. In this case, the amount of absorption was increased until the point was reached where speech had acceptable intelligibility, with the early energy fraction,  $D > 0.5$ . For this acceptable speech condition, the measured mid-frequency T15 was 1.47s, whereas the Sabine predicted RT was 1.06 s. The sound decay was basically non-linear with  $T30 > T15 > EDT$ . Exploiting a high-level horizontal reverberant field offers the possibility of acoustics that are better adapted as suitable for both speech and unamplified music, without any physical change in the auditorium. Optimum using of this secondary reverberation in an auditorium for a wide variety of music might also be beneficial.

**Keywords:** Architectural acoustics, Acoustical design, Horizontal reverberant field, Multipurpose halls, Acoustical simulation.

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