ROOM ACOUSTICS – MEASUREMENTS

In a concert hall, lecture room or control room, the sound produced by an orchestra, speaker or loudspeaker not only reaches the listener directly, but also through reflections. The listener's judgement of the acoustic quality depends on the temporal and geometrical sound energy distribution as well as the spectral changes the sound is subjected to. Room acoustics focuses on the impact of sound reflections on the perceived acoustic quality of a room.

The oldest room acoustic parameter is reverberation time, defined by Sabine in 1898 as the time for residual sound to decay by 60 dB. It relates to the perceived liveliness of a room. Over the past decades, many quality measures have been added. This makes it possible to measure the acoustical quality of a room.

Examples of acoustic quality measures are:

- Transparency
- Definition – how well successive tones or vowels are distinguishable and not "smeared" out in time
- Spaciousness – experience of a large enclosure
- Sound colouration – emphasis of certain frequencies
- Intimacy – to what extent it seems the orchestra is playing in the same room as the listener and not behind a sheet of glass
- Speech intelligibility
- Liveliness – related to the reverberation time
- Loudness
- Feedback – how well performers on stage can hear themselves and each other

By measuring the acoustics in a room, it is possible to predict how listeners will judge the acoustic quality of the room. For instance, it is possible to determine whether the speech intelligibility in a church or railway station is sufficient or how many loudspeakers are needed to raise the speech intelligibility to a satisfactory level. Other examples include measuring lateral reflections, which are important for an agreeable spaciousness, and the reverberation time as a measure of liveliness.

All room acoustic parameters can be determined from the room's response to an impulsive signal. These so-called impulse responses can be viewed in many ways, and help, for example, to find flutter-echoes in certain frequency bands and the walls responsible for these echoes.

It is also possible to perform room acoustic measurements in a scaled-down model of a room. The measurements are then carried out at scaled-up frequencies and the resulting impulse response can be scaled back to a real-world impulse response. If necessary, the design can be changed at an early stage of the development process. In this way, the risk of expensive changes to, for example, a new concert hall, are greatly reduced.

Product Guide

The right solution for handling this application is DIRAC Room Acoustics Software Type 7841 together with, for example, 2238 Mediator, Sound Level Meter