

Example of the Video Text

Sound Fields: Video Clip 1

1. It's About Time

The speed of sound vibrations through air is very slow compared to the speed of light. The result is a human detectable time offset between the direct sound that arrives at a listener, and reflections produced from room surfaces within the space. The longer path length for the reflections make them arrive later in time. The arrival time, level and direction of a reflection determine whether not it is considered useful.

2. Room Acoustics

The room is passive. It generates no sound of its own. When sound is introduced into the room from a source, a number of sound fields develop. Rooms are usually analyzed initially in the time domain, since the arrival of reflections is a function of time. There exists a ratio between the level of the direct sound and the level of the reflected sound at any listener position. This ratio determines how well information from the sound system is conveyed to the audience. Let's look at how the room response is evaluated

3. Room Impulse Response (RIR)

A hand clap in the space will produce a series of reflections at a listener position. Each reflection is a modified facsimile of the original event. This series can be broken down into several distinct sound fields. The hand clap is a crude *room impulse response* test. The RIR is displayed here as an echogram. It is a simplified graphical representation of the log-squared impulse response. In formal investigations, the hand clap is replaced with methods that are calibrated and consistent. It is important to understand that regardless of the method used to collect it, the impulse response is the most fundamental acoustic test. It is the primary means of analyzing the acoustic behavior of a room. The room will have the same effect on any sound coming from the loudspeaker as it does the impulse.

The sound fields produced by the impulse include, the direct sound field, the early-reflected sound field, the late-reflected sound field, and the reverberant sound field. For pure acoustics work, the impulse may be a balloon pop or it may be a starter's pistol. For sound system work, the stimulus may be pink noise or a sine wave sweep that is played through a loudspeaker, recorded, and mathematically processed to yield the RIR by an analyzer. This method allows the RIR to be collected without using an actual impulse. The result has a dramatically improved signal-to-noise ratio. The room impulse response is shown. It is a time domain plot in which pressure is the dependent variable and time is the independent variable. If you want to know *why* a listener position sounds the way that it does, you collect and analyze the room impulse response.