



Each sound source associated with this type of distributed-speaker sound reinforcement system covers $\Theta \sim 60^\circ - 90^\circ$ and is directed straight down at its location. For long rooms, because the sound propagation delay time $\Delta t_{pd} = d/c$ is finite ($d =$ listener-speaker separation distance, $c = 343 \text{ m/s} =$ propagation speed of sound @ *NTP*), noting that $\Delta t_{pd} = 100 \text{ msec}$ for $d = 34.3 \text{ m}$, in order to avoid causing distracting echoes between direct sound from the human speaker and the overhead sound-reinforcement loudspeakers, the arrival time of the sound-reinforced sound from the overhead speaker nearest to a given listener should be delayed such that it either has the same arrival time, or arrives \sim a few *msec* later than the arrival time of the direct sound from the human speaker. Nowadays this is very easy to accomplish using modern *DSP* (Digital Signal Processor)-based power amplifiers, simply by programming in the appropriate Δt_{pd} delay time to the *DSP*-based power amp - either manually, via front panel controls on the unit, or by connecting e.g. a lap-top computer up to the *DSP*-based power amplifier {via *RS-232 DB-9* (9-pin) connector or a *USB* cable}, and using software supplied by the *DSP* power amp's vendor to set/adjust/optimize the appropriate sound propagation delay time Δt_{pd} (amongst many other possible parameters...).

Note that in such long/narrow auditoriums, distributed loudspeakers should not be placed along the walls of the narrow/long auditorium, because the “crossfire” associated with the sound from several of the opposing loudspeakers will be distracting to the listeners in the audience.

For the same reason, e.g. placing two loudspeakers on either side of the stage (where the human speaker is standing) or on the left & right-hand sides of the front wall of the auditorium should also be avoided, because listeners seated e.g. at either points *A* or *B* as shown in the figure below will hear sound from one of the speakers before they hear the direct sound coming from the human speaker on the stage. If, for some reason, such a front-of-the-room/two-speaker sound reinforcement system is deemed necessary/is unavoidable, the sound from both loudspeakers should be delayed electronically such that the direct sound from the human speaker is always heard first by listeners in the audience.