Subject: Re: Constrained spatial loading
Posted by Wayne Parham on Tue, 27 Jan 2004 02:19:00 GMT
View Forum Message <> Reply to Message

If a room's ceiling is eight feet high, then the expansion from the apex of the corner at the floor-wall-wall junction is purely conical for eight feet. At that point, another boundary is encountered - The ceiling makes the expansion become more like a parabola.The thing is, that doesn't really matter too much because the walls don't set directivity below the Schroeder frequency. Room modes set in and they form pockets of energy, making any talk of the directivity set by expansion sort of meaningless at very low frequency. The Schroeder frequency is about 100Hz to 150Hz in most rooms, so you can generally expect the corner to provide constant directivity down to that point. Below that, the locations of standing wave modes set the energy distribution in the room.The Schroeder frequency marks the approaximate frequency where sound transitions from behaviing as a reverberent field to having discrete modes. Above the Schroeder frequency, modes are so closely spaced they're indistinguishable and sound can be thought of statistically, as a balanced field. Below that, discrete modes form that have fairly well defined boundaries. You can find hot and cold spots in the room, places where certain frequencies are strong and other places where they're weak. You can model the energy distribution in the room with an FEA program, or measure it with an array of measurements made on a grid.If the corner expansion were to go on indefinitely, or even if it didn't but the ceiling and opposing space were open, then the wall angle could set directivity down to a very low frequency. Even if the room is not open but is very large, this can happen. In that case, the Schroeder frequency is low, so directivity can be maintained down to a low frequency. In some large indoor spaces, the Schroeder frequeency is below the passband, so the room acts something an outdoors space. Of course, when you get near a boundary, that boundary has an influence but the opposing boundaris are far enough away that they don't create room modes in the passband. In that case, a speaker placed at the corner apex of the room will have constant directivity even at low frequencies. The walls set the pattern, in this case.