The critical frequency of a room $f_{crit}$ occurs where different [*lmn*] modes first begin to overlap each other. Above $f_{crit}$, the reverberant nature of the room is such that the energy density is uniform throughout the room, i.e. everywhere within the volume of the room acts as a diffuse sound source {for the reverberant field}. The frequency region between $f_C \leq f \leq f_{crit}$ is the so-called modal region, which is dominated by discrete axial, tangential and/or oblique standing wave modes, well-separated from each other in both frequency and also in 3-D space.

For concert halls, auditoriums, *etc*. the spatial dimensions of such large rooms ideally should be such that $f_{crit}$ < lowest frequency to be played/reproduced in the room, i.e. the frequencies of all music is in the reverberant/diffuse field region of the above graph. For small rooms, because of the smaller room dimensions, the criterion that $f_{crit}$ < lowest frequency to be played / reproduced in the room is almost impossible to achieve; however at least $f_{crit}$ should be below some particularly desirable portion of the audio frequency spectrum, if at all possible.

**Acoustic Feedback – And How to Avoid It:**

Almost all of us have at some time or another been in an auditorium or a musical venue using a PA system where a live performance of music, or a speech has been disrupted by problems associated with acoustic feedback – *i.e*. loud howls, squeals or whines at certain frequencies. Acoustic feedback is actually one specific example of the more generic process known as positive feedback, which, when sufficiently large, can cause an amplifier (or more generically, a system) to act as an oscillator. Acoustical feedback in a sound system occurs when a microphone at a particular location in the room/auditorium picks up a sound output from a loudspeaker and sends the picked-up signal back to the amplifier, where it is re-amplified, output again to the loudspeaker, which then gets picked up again by the microphone, *etc*. This process is shown schematically in the figure below: