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WWW.MYCINEMATECH.COM

# Acoustic Room Systems

*Why the acoustics of a room are much more important than you think*

*By Chris Klein*
*Director of Acoustics*
*CinemaTech, Inc.*
*chris@mycinematech.com*
*+1 (541) 942-7668*

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***Questions:.*** What is the largest signal processor in your home theater system? What is the most integral component in making your system the best it can be? If you answered "the room" to both questions above, you have a better understanding of great sound and acoustics than the average person.

**The Single Greatest Component**

In any home theater system the room is the single component that will make or break how the system will sound. In today's market there are great speakers, amplifiers and pre-amps to choose from at many different price levels. With so much great gear to choose from, it's easy to get caught up in the electronics and forget the most important component, the theater itself! Recent data shows that fewer than 10% of all home theaters currently address room acoustics. There are many reasons why this seems to happen, but the most common is a lack of understanding by the customer and the dealer.

In this article I hope to give you information on room acoustics that will assist you in making decisions to better your listening environment so that you can receive the peak experience in your home theater. I will not get into specific products or manufacturers. You aren't looking for a sales pitch. So let's begin with the basics of room acoustics.

**What does an acoustically correct room sound like?**

I used to drive a car that I felt handled well and seemed to have good pick up and a smooth ride. That was until I drove the BMW 740 IL on a business trip. When I went back to my car, I could easily tell the difference. Similarly, most people think their room sounds fine until they get into a

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room that has great acoustics. An acoustically correct room should proper tonal balance, precise imaging and impeccable speech articulation and intelligibility.

**Tonal Balance**

The easiest way to explain tonal balance is to think of an orchestra. In an orchestra many instruments make up the spectrum of sound you hear. The tubas are in the bass range, the violas and French horns in the middle, and flutes and piccolos are in the high range in an acoustically correct room all the different frequencies should behave evenly. This is seldom the case. In an average room usually the biggest culprit is the bass, or low frequencies.

Boundary reflections in the low frequency range causes bass to smear become muddy and can cause volume fluctuations. This is most evident in the corners of the room. Corners are pressure zones that cause bass to resonate, which makes certain frequencies become louder, while others may get lost completely. Unwanted reflections in the mid and high frequencies can ruin tonal balance, speech articulation, and imaging.

**Imaging**

Imaging is the term we use for where special cues are in a room. This is extremely important when it comes to two channel listening with music. When you listen to a good recording you should have an image of where the instruments and voices are in the room. You should be able to say "I hear the drums in the back, the vocalist sounds like she is in front of the drums, the piano is to the left, the guitar is on the right, etc." If the reflections in the room are not properly controlled none of this will happen.

Another tell tale sign of a problem is when a loud speaker becomes too evident in the image. What I mean by this is that you should not be hearing the sound coming from the loud speaker. For example, as your favorite actor is walking across the screen, his voice should be with him, not trailing or coming from any other place. His voice should move smoothly across the screen, not jump from one speaker to the next. The same goes for surround speakers. A plane flying overhead should move from front to back, not jump from the front speakers to the rear with nothing in between.

**Speech Articulation and Intelligibility**

Another serious problem in movie listening is that many people have trouble discerning the voices over the music or background sounds. This is because they are getting an imbalance between high, mid, and low frequencies in their system. All too often, the highs have been absorbed with soft

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material on the walls, carpet, furniture, bookshelves, etc, but the low frequencies are still booming around the room. Often times people put in soft acoustic panels and use too much absorption in the higher frequencies and end up with an over damped room. Rooms where too much high frequency control is implemented make you feel as if you have a head cold when you are in them.

This is also where speech articulation and intelligibility come into play. Speech is made up of low and high-pitched sounds, just like music. Vowel sounds are lower in frequency than are consonant sounds. Try for yourself. Say A, E, I, O and U and listen to the pitch of the sound. You should hear a drone tone, a bass sound that is the same for all vowels and then you hear the midrange, which is different for each vowel. Now say the sounds that an S, a T, or a K make and you hear the low drone tone plus the midrange vowel sound but then something new, a hiss type noise in the upper frequencies, the sibilance. If you are listening in a room with heavy carpet, curtains and large fabric couches, where the higher frequencies have been controlled, but the lower ones have not, the vowels and up lasting too long. They will begin to overpower the quieter sibilance and that is when people complain they can't hear what is being said in a movie. Turning up the volume doesn't help; you just get a louder version of what you heard at a normal volume. In addition to this, as we age, our hearing abilities in the high frequencies diminish and in order for us to discern dialogue the acoustics in the room become even more important.

**Treatment Methods**

It is extremely important that we pay attention to all the above aspects when treating a room, and not just absorbing all the upper frequency ranges. Bass absorption needs to be implemented, usually starting in the corners. This takes care of many low frequency boundary reflections. Mid and high frequency absorption is used for reflections that help improve imaging and speech articulation. Diffusion is used to help with flutter echo and reverb without making the room sound "over damped" or too dead. Do not let someone tell you that the room is 'acoustically treated 'because they put a few fiberglass panels on the wall!

**Décor and Design**

"I want the theater to look spectacular, "is usually one of the first things we hear from the customer and interior designer. It is important to know that the acoustician wants exactly what the customer and the designer want, a great looking room that sounds as good as it looks. The best acoustical systems are just that, engineered systems that allow the designer to create a look and feel that the designer wants, while providing specifically designed products that create great acoustics without being seen.

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It is possible to have great acoustics and beautiful interior design. However, many custom audio video dealers are hesitant to bring up acoustics for a number of reasons. Some of these reasons may be lack of knowledge, fear of the designer, or that they feel more comfortable focusing on selling electronics. These are all real concerns, but as we have stated, they can all be overcome and the balance between design, acoustics and electronics can be struck. If your dealer has not brought up acoustics, ask them why or look for another dealer. The bottom line is the dealer is doing a disservice to his customer if he does address acoustics.

When you are planning your theater make sure your dealer uses an acoustics company that specializes in small room acoustics. Large room acoustics, like corporate facilities, auditoriums, churches and the like are very different and not applicable to a private home theater. Small rooms are very different from large rooms because your ears are close to the acoustical products that are being used. Every product has its own idiosyncrasies and it is important to know how they differ in "near field listening" as opposed to what you hear in a large room when you may be 50 feet away from the acoustical products.

This may all sound overwhelming to the average buyer, but it is no different than looking at the electronics and wires and connections. Most people would not buy all the electrical components of a very high-end home theater and try to install it all themselves. The same is true for acoustics. When you make the decision that you are going to invest in a state of the art theater experience and you want the best, do it right and hire the professionals. They have the tools and knowledge to make certain that the job is done correctly so that the listener enjoys a great theater experience.

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*Christopher Klein is the Director of Acoustics for CinemaTech. Prior to joining CinemaTech Christopher was one of the owners of Acoustic Room Systems along with his partner Frank Rose. Before starting ARS Christopher was the Market Development Manager for Owens Corning's Acoustic System Business.*

*ARS and CinemaTech joined forces in April of 2005, becoming one company providing the finest in home theater design, furnishings and acoustics.*

*Christopher also worked for Acoustic Sciences in Eugene Oregon for 7 years as the National Sales Manager and chief Studio Designer. Chris managed all design projects at ASC, including home recording studios for Michael Jackson, members of Pearl Jam, Pete Droge, Steve Wariner, and Dolly Parton among others.*

*Chris has an AA in music theory and has been a professional musician for over 25 years.*

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