



LOUD MOVIES EXPLAINED

By
John F. Allen

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Wherever one travels throughout the world, we find people and cultures of all kinds with one thing in common, they all love great sound experiences. Whether it be at symphony concerts, listening to a favorite singer, the sound of pounding on big drums, waves gently kissing a deserted shore or simply humming in the shower, we all love to experience sound. Unfortunately about the only place one can go to hear truly clear sound is somewhere where there is no sound system.

The sound levels being forced on some audiences can be obscene. I was once invited to accompany an acoustician whose firm was being asked to determine if the sound levels at an event at a Las Vegas venue could actually break the concrete floor that was vibrating excessively. I put my hand on the floor, felt it moving more than I would have believed possible and then ran out of the room. The sound levels were in the 130 dB range. Awful! In this case these painful sound levels were being done on purpose. Who knows why as anything resembling entertainment value would seem to be gone. Though this may have been an extreme example, it does point to an issue that we often hear about, excessively loud sound systems. Such is the often pathetic state of the world of audio.

While the rest of the audio world delivers products of inconsistent quality, the motion picture industry is virtually alone in producing soundtracks of consistent high quality

and beauty. Yet complaints about loud movies have increased. This should not be happening. As the topic is discussed and debated within the industry, concerns have grown that government intervention could become a reality, undoubtedly with unintended and negative consequences.

What is behind these complaints? After all, aren't all movie theatre sound systems calibrated according to industry standards? It may be a surprise to learn that the root of the problem is not what so many seem to think. In fact several things are to blame. The bottom line is that it's not the movies that are too loud, it's the movie theatres. Realizing that this subject can be a political land mine for some, this article will nonetheless attempt to explain why so many complaints continue to happen and what can be done about them. Rest assured, it is a solvable problem.

FEATURES

While the rest of the audio world delivers products of inconsistent quality, the motion picture industry is virtually alone is producing soundtracks of consistent high quality and beauty

There is indeed an issue with feature film sound levels in movie theatres. In fact every time I speak to someone about what I do, the first thing they ask is, "Why are movies so loud?" As I said, it isn't the movies. Theatre sound systems

are mis-calibrated because the present standards cannot be properly implemented by the theatre technicians, given the typically inadequate equipment they are issued. This is not their fault. The responsibility falls on those who have failed to equip their technicians with the equipment they need.

Training is also a serious problem. It doesn't exist in any formal sense, perhaps due to a general lack of interest. Indeed, no one seems to be asking for it. I have offered to do some training from time to time for different exhibitors as well as technical service providers. The answer usually is, "No thanks, we're too busy." One exhibitor did bring about 20 technicians to Boston to spend a day with me. Because I could not teach them everything, I concentrated on teaching them how to teach themselves. They were eager to learn and do it right. But one day was not enough to cover a proper calibration or allow hands-on practice.

Every one of the technicians came with the wrong type of microphone. Furthermore, even

if they could be used in theatres, these microphones were not calibrated. Some were off as much as 5 dB. If this is what they have, how can any technician be expected to do their job?

WHY SOUND LEVELS ARE SO CONSISTENTLY SET TOO HIGH

Thanks to the standards we have as well as Dolby's services at the studios, every film from APOCALYPSE NOW to all the films running today, can be presented without touching an equalizer. With fewer exceptions than ever, there is no need to touch a fader either. This is truly an unprecedented achievement. The faders in properly equipped and calibrated sound systems are all at 7.0 and always have been. But this is only possible when the sound levels are set correctly.

A fader setting of "7.0" is supposed to mean that a film will play at exactly the same sound level as when the fader is at "7.0" on the mixing stage. But the fader does not control the sound level the audience hears. Rather it's controlled by the sound levels set by the theatre technician when the fader is at "7.0."

Unfortunately, due to a collection of unseen errors that are built in to their calibration procedure, the sound levels the technicians set are typically 6 dB high and can be as much as 10. To put this in perspective, a 1 dB increase in an eight channel sound system can seem like 6 to 9 dB to an audience. This is why faders are turned down. It's not the movies or the standards. Sound systems are being turned down because they are accidentally playing the films too loud. There is more than one reason why this occurs and each of them, unfortunately, causes films to be played too loud when the fader is at "7.0."

PINK NOISE, IMPROPER EQUALIZATION AND MICROPHONES

Let's start with the most basic: It's almost impossible to believe, but it's true. Since optical stereo soundtracks were introduced over 40 years ago, the pink noise generator levels used in the studios to set levels and those used in theatre cinema processors have not matched. For the theatres, this alone causes movies to play 1.4 dB too loud, even if the rest of the sound system calibrations are perfect. SMPTE recently addressed this issue with an important new standard that, for the first time, matches the pink noise generator levels in cinema processors to those historically used in the studios. However, until all the cinema processors are updated with the new pink noise standard, this problem will still persist in the theatres. The simple and essential work-around is to calibrate the measurement microphone 1.4 dB higher than normal.

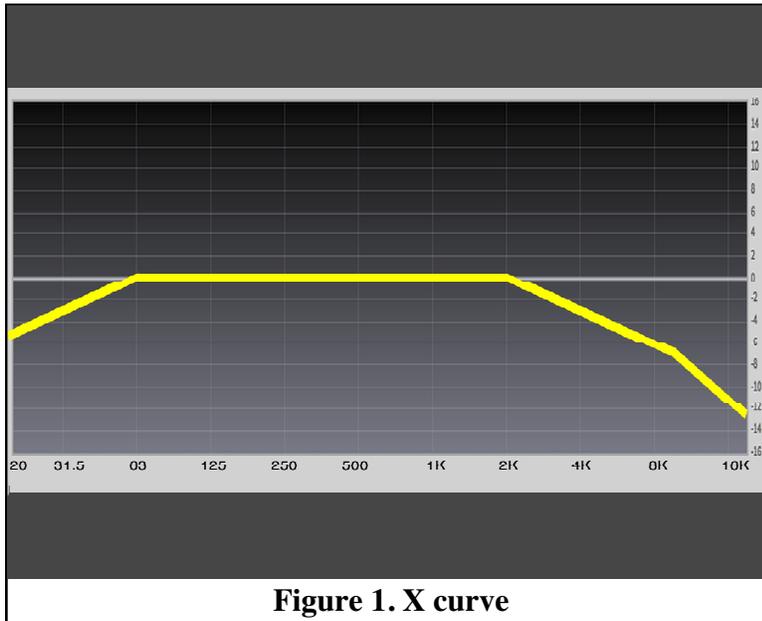


Figure 1. X curve

Virtually every system in today's movie theatres is mis-equalized. With all the technology we have, there is no measurement system that measures what something sounds like. Don't believe anyone who tells you there is. Therefore, technicians must interpret the measurements that current science allows. Training for such interpretation has not been available. This leaves them with little choice but to do everything necessary to conform their frequency response

measurements to the X curve, typically without allowing for tolerances. See figure 1. This results in excessive equalization that can remove some of the sound spectrum in several narrow bites. The sound system's tone and dialog intelligibility are then diminished, causing a reduction to the overall measured sound level. Mistakenly reducing spectrum causes films to play another 2 dB, or so, too loud. This is because the technician then increases the gain in order to make up for the narrow spectrum losses that have been inadvertently created. The number he or she gets on a meter may look correct, but it's been corrupted by a corrupted sound spectrum. With just these first two errors alone, we are now up to presenting movies at least 3.4 dB louder than they are made if the fader remains at "7.0".

Correctly addressing sound system calibration errors requires an investment in both equipment and training

As I have said, technicians almost always use an inappropriate type of microphone when setting sound levels. The appropriate microphones are available, but everyone complains they cost too much. As a result, technicians using the wrong microphones get the wrong measurements. Level measurements

in movie theatres as well as a surround array's frequency response are best done using a random incidence microphone. They cost \$1,000.00 or so. They must also be calibrated. The most reliable calibrators I have seen come from Bruel and Kjaer and cost \$1,400.00. This is before the cost of an analyzer. With few exceptions, technicians have not been

equipped with these necessary items. Using the wrong microphone, especially an uncalibrated one, means that a theatre's sound system can be another 1 to 3 dB too high. All told, when you add up these common errors built into each and every sound system calibration, the films will play much louder than they were made. The faders now must be set lower, typically around "5.0."

When one sees a fader set to "5", it does not mean that all the films are too loud and must be turned down, it means that the sound system is calibrated too loud and must be turned down. A tour of almost any booth confirms how common this situation is throughout the world.

If reducing faders was all we needed to do, then none of this would matter and things would be fine. Unfortunately, the measurement errors technicians encounter when measuring the screen channel levels are not the same with the surround channels. This means that the balance between the screen and surround channels will be incorrect. Dialog intelligibility can also be compromised. In other words, there is no other way to set levels but the right way with a calibrated random incidence microphone. Dolby's Doug Greenfield further recommends that rather than relying on Sound Pressure Level meters, technicians should use the in-band gain method with a real time analyzer for setting the main screen channel levels. By focusing only on the principal dialog bands of 500 to 2000 Hertz, this method all but eliminates sound level measurement errors caused by missing spectrum. See figure 1. This is the same procedure as technicians have used for years when setting subwoofer levels. Just as this works for more accurately setting subwoofer levels, it will also work for the other screen channels.

Misguided suggestions to modify standards or create new ones will not help as the technicians are presently unable to implement the standards as they currently exist

SMPTE spent several years attempting to come up with a modern calibration procedure. In my opinion, the documents that were produced, while containing some good information, sadly fail to properly address the mis-calibration

issues. To see such an opportunity missed is very frustrating. It could be another 20 or 30 years before SMPTE looks at sound system calibration again.

Correctly addressing sound system calibration errors requires an investment in both equipment and training. However, nothing is perfect. Even with the best equipment and calibration techniques, a trained listener is still needed for final adjustments. It's actually

not as hard as one might think. If the above mentioned matters were corrected, complaints about movies being too loud would all but end. As a further benefit, I believe that attendance would increase as well.

EQUIPMENT CHOICES

All that being said, there is still one major issue that probably cannot be solved, and that is some of the equipment that has been installed in theatres over the years. When politics gets involved or when systems are selected for price over performance, the sound the audiences get to hear includes levels of sound system generated distortion that are not only hopelessly fatiguing to listen to, but make the sound seem louder than it really is. The only solution is slightly turning down the fader. While this may deprive the audience of the full experience of the film, their ears will at least find their time in the theatre less uncomfortable.

So while it can be said that movies are generally not made too loud, it also needs to be fully understood that the dynamic range that comes with digital soundtracks is too much for many and perhaps most of the sound systems in today's movie theatres. There is simply no other way to say it. Perfect calibrations can do nothing about it. Excessive sound system distortion can only be addressed by replacing the offending sound equipment.

Audiences can and do enjoy dynamic movies without complaint, but the sound must be clean and clear. I believe that the levels of distortion in today's theatres have diminished attendance. There are simply too many people that have told me that they don't go to the movies any more. Loud sound is one of their main reasons.

TRAILERS

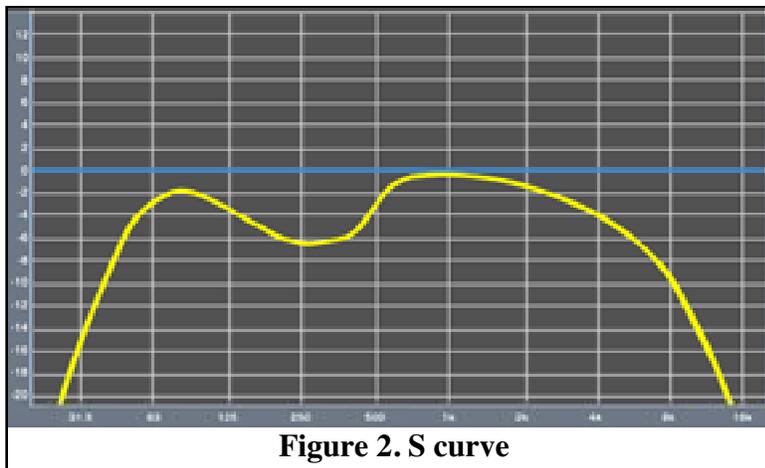
The sound level of trailers is a totally separate issue. The TASA agreement was an important and welcome development. But it did not and will not solve the loud trailer problem. Before we had TASA, the recording levels from trailer to trailer varied widely. Some were 5 dB louder than feature films, others might be even 10 dB louder. This was an impossible situation. Although most report that they do not, exhibitors can easily set a lower fader setting for trailers with automation. It costs nothing to do this. But before TASA, running trailers with such different levels meant that even a lower fader setting was not enough.

TASA, at least, normalized the levels. Trailers at a fader setting about 5 dB lower than features are at least tolerable. But they still suffer from poor sound quality due to their compressed recordings. Trailers should sound just as good as the features. Every time the TASA standard has been lowered, the trailer levels have gone down -- at least for a month or two. Then even more compression gets applied to make them louder again while staying under the TASA limit. The real issue here is the trailer maker's belief (without proof) that louder sells more. However, I fail to see how assaulting and offending audiences with every trailer they see helps anyone. In the end, it just provides one more reason to stay home. I am on the side that says better quality sells more.

STANDARDS

Misguided suggestions to modify standards or create new ones will not help as the technicians are presently unable to implement the standards as they currently exist. If exhibition was to be truly interested in solving just the calibration issues, this could be done. As stated earlier, it is a solvable problem. But a problem must be correctly recognized before it can be fixed. Continuing to falsely blame the movies for being too loud maintains neglect and solves nothing.

This industry is always in need of good technical training programs. Some manufacturers have provided them in the past, but with few exceptions it has been a long time since I have heard of anyone doing an up to date course on sound system calibration.



At least one major circuit stands out as an exception and deserves to be commended. Several years ago Regal began investing in Dual Fast Fourier Transform (FFT) analyzers. In addition, they have been doing extensive training expertly conducted by their own Jonathan Bartow, so their technicians can learn to use this modern technology properly.

This measurement system helps us get closer to the ultimate goal of measuring what we will hear from a speaker than can simple Real Time Analyzers. As one might expect with a different measuring system, the measurement looks different. It has been found that a

modified X curve called the S curve is the proper target. This new method along with the S curve also has the advantage of working in rooms large and small with little or no tolerances. See figure 2. As I has said, no measurement system is perfect, but Regal has made a critical step in the right direction. Any circuit could and should do the same. Industry wide training programs are acutely needed. NATO could be a big help should it wish to be.

It is up to the exhibitors and technical service providers to fix the sound level problems in motion picture theatres before someone else tries to. The sooner the better. If, as feared, government enacts some form of regulation, it would only make things worse. As an example, a bill was introduced in a state legislature that would have mandated that movies could not be louder than 85 dB. I spoke to the person behind this. He was very angry and probably for good reason, but had no idea what he was talking about. I tried to explain that 85 dB was a peak dialog level. I asked him, "What about music?" He didn't know. I asked him which weighting scale he was proposing for this 85 dB? He didn't know. In the end the legislature realized that they did not have the competence to deal with the subject and the bill was dropped. Theatre owners dodged a bullet that time. The next time they may not be so lucky.

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John F. Allen is the founder and president of High Performance Stereo (hps4000.com) in Las Vegas, Nevada. In addition, he has served as the sound director of the Boston Ballet and has mixed live concerts of the Boston Symphony, the Boston Pops orchestras, military bands, jazz ensembles as well as other orchestras. He is also the inventor of the HPS-4000® motion picture sound system and in 1984 was the first to bring digital sound to the cinema. His in depth articles on the subject of sound have appeared in industry publications for the past 38 years. John Allen can be reached by E-mail at johnfallen@hps4000.com.