

**Faithful Sound
Reproduction**



**Uniform Loudness Distribution®
Lucid ULD® III
Loudspeakers**

Althar Audio strives to protect the integrity of sounds.

We recognise the delicacy of sound, beginning with its creation at the source, amplification through the electronic reproduction system and finally, its interaction within the roomspace.

To this end we have coined the Hearacritic Oath, to guide our efforts, “First do no harm”, to sounds!

Think of it as the 4 S’s of Sound.... Source, System, Speaker & Space. We deal separately with System and Speaker because the speaker is such a huge determinant in the final outcome.

Source

As far as instruments and singers are involved, often due to style or preference, a singer or artist will work at a certain sonic amplitude to get the effect or performance they desire. This is understandable however, many artists will tell you that it is difficult to perform at a high level for a long period of time as it can become quite fatiguing so many artists carefully control their dynamic range, pacing themselves throughout the performance allowing the system amplification, sound engineer and loudspeakers to compensate and create the desired outcome. This is desirable for a number of reasons one of the most important being that there are actually multiple sound sources in the typical venue.

Often discounted is the amplitude of the 1st source, **the instrument or singer!** This source excites the room in its own way however it is often a source which in combination with other sound sources can lead to a negative effect on the performance as we will discuss later.

System

The sound reproduction system can be considered to consist of all the electronic equipment, mics, mixers, amps, and stage and in-ear monitors and again we will address the loudspeakers separately as they play such a pivotal role.

Mics

Microphones are myriad in number, type and character. Dynamic, Condenser, Ribbon, Large Diaphragm and more, the choices are almost endless but we are constantly surprised at the number of performers who pay very little attention to this crucial selection of the system chain. If we think back to the days of stereo and vinyl, a great home stereo relied upon spending a much greater proportion of your dollars on the speakers and the phone cartridge than on the remainder of the system and for good reason, the cartridge represented the input (Source) and the Loudspeakers represented the output. This is also true of faithful reproduction. This does not mean you need to purchase a \$4,000 mic and a \$200 amp but more that you make a careful selection of the introduction of your voice to the system in your microphone choice. Remember, “Garbage in Garbage out” and it is not just how your vocals are reproduced, (hopefully as unchanged as possible) but this is a key step in accurate reproduction and even more importantly, providing the maximum gain before the onset of feedback! The uneven frequency response of a mic will wreak havoc on the entire system chain and can present EQ issues which far surpass the time required to set up and take down your system. **In other words, keep the Shure 57 or 58 but audition new microphones!**

Preamps

Preamps & mixers have come a long way in just the past 3 years with much better signal to noise ratios due to extremely quiet pre-amp stages and electronic design. If you have not auditioned a new mixer you owe it to yourself. There is also the convenience of the new wireless models which can be controlled by iPad and iPods, etc. from anywhere in the venue. These two points alone make it worthwhile to assure you are once again, “doing no harm to sounds” while you may find it affords an improvement in setup and use as well. **Advice, get a new mixer.**

Amplifiers

Though your amplifiers may be some beautifully designed units, in great shape all boxed up in racks etc., their time may be past. With the onset of Class-D amplification circuit design the mosfet components utilized now perform as electronic switches, instead of as linear gain devices. The benefits are much higher efficiency with more of the power being used to amplify your source while less is dissipated as heat. These amps also require much less power for the same sound output with the added advantage of running extremely cool at and possessing much lower weight than conventional amplifiers. **Suggestion, get a new Class-D amplifier!**

Monitors

Monitors are often a must for many performers and venues, however the stage monitor is often one of the biggest offenders of damaging your performance as well as the audience experience. Often, the mix in the stage monitors can actually do more harm than good and many artists will find that during a show the monitor mix can become the source a negative effect on their performance. Getting rid of floor wedges can improve the overall clarity of the mix for the performers, decrease the overall volume on-stage and remove a source of spurious noise in the room in general. With the recent introduction of high quality even low cost in ear monitors (IEM), an artist can get the information they need to put on the performance they desire without all the negative effects caused by the use of floor wedges. The biggest benefit is the ability to save the artists hearing for the duration of their career. With in ear monitors the audience mix or crowd noise can even be added back into the monitor's mix if desired with the addition of a mic or two on the stage to pick up the audience response.

From the beginner to the seasoned performer, consider the use of an In Ear Monitor.

Speakers

The speakers or loudspeakers are actually the most critical components of the sound reproduction system and there is not enough room in this document to address and discuss every facet of loudspeakers design. Sound is a complex waveform with an almost unbelievable amount of information presenting multiple frequencies at changing amplitudes with a high possibility of errant artifacts being introduced due to a number of factors, i.e. grill interaction, cabinet resonance, crossover artifacts, phase issues and more. Suffice to say, it is rare to find a well behaved loudspeaker. The majority of loudspeakers currently available are based upon theories and data pre-dating 1950! And while the most advanced Spiral and J-arrays might have powerful software and networking features, the fact of the matter is that many of the design considerations and construction techniques have remained the same.

At **Althar Audio** we have focused on the research, design and manufacture of a new class of loudspeaker, the Frequency Amplitude Beaming Transducer. We reviewed and identified 10 problem areas most commercial loudspeakers possess and developed unique solutions to incorporate into a new class of loudspeaker. Many speakers use a drilled or cast protective grill that only passes about ½ of the sound with the rest of the sound bouncing off and reentering the speaker cabinet to wreak havoc. Crossovers which artificially accentuate certain frequencies can lead to feedback while phase issues introduced by crossover networks can further degrade the integrity of the sound signal. Cabinet resonance is an additional problem with certain reproduced frequencies being emitted from the cabinet itself only to constructively and destructively erode the desired primary wave in an out of phase and time signal. All of our solutions work in concert to create an almost unbelievable reproduction of the original signal from the performer with a very musical, coherent waveform envelope preserving every subtle nuance. Do I need to suggest you audition one of our Frequency Amplitude Beaming Loudspeakers?

We will now address the final "S" of sound, SPACE. Space issues which will also address the way sound engineers are forced to design the layout of the equipment in the performance space.

Space

The space a performance is staged in has possibly the most far reaching effect on the audience perception of the reproduced sound. There is a whole area of scientific study which deals with the human psychological and physiological responses associated with sound. This study of perception deals with the human systems ability to perceive frequency, amplitude, location, (Localization) and masking effects.

Frequency

We can detect audible frequencies from 20 hertz to over 20,000 hertz, (with some people able to discern frequencies in air up to 40,000 and in new research, to 200,000 hertz underwater!). Our bodies possess the ability to detect frequencies below 20 hertz from about 4 to 16 hertz directly through touch.

We are able to discern subtle changes of just a few hertz in the midrange and even smaller "beats" of two frequencies which are only one or two hertz apart, as heard when a twin engine aircraft passes overhead with the engines beating.

Amplitude

Amplitude differences are astonishing with the ability to start at just a few micropascals to over 100 Billion micropascals and beyond only limited by the possibility of impending hearing damage.

Localization

Localization is based on the slight difference in loudness, tone and timing between sound detected by each ear. Localization can be described in terms of three-dimensional position: horizontal angle, vertical angle, and the distance for static sounds or velocity for moving sounds.

Masking

Masking effects can be experienced when a loud noise like a truck enters into the range of a street side conversation.

How do these 4 psychoacoustic, physiological and perceptual variables combine with the effects of sound reinforcement in a venue with its particular physical characteristics, and audience presence?

One can quickly see that the perception of sound and music relies upon many interactive factors and can create an extremely complex problem which simple guidelines, rules and practices simply cannot master. It is very easy to see now why every single venue is unique and changes dynamically, with each band and audience.

There are some tried and true rules one can use to guide equipment setup, EQ and power level settings. The conventionally accepted layout to speed set-up and help attain decent results is:

1. Speakers at the front of the Stage
2. Microphones behind speakers
3. Monitors on stage

Rethinking the way you currently work will require some study, scrutiny and change but the end result will work to both simplify your setup and teardown times and improve overall sound.

Let's start on the path to faithful reproduction.

“Thou shall not create feedback”

Let's face it... one of the most complex issues at any event using amplified sound is managing feedback. Feedback, or the Larsen effect named after Søren Larsen, is a loop of sound between an input device, (Guitar or microphone) and a loudspeaker which keeps increasing in loudness through re-amplification until it becomes a howl, ring or squeal.

The actual resulting frequency is determined by the microphone pickup pattern, loudspeaker emission pattern, the distance between the two and the resonance frequencies of the microphone/guitar, loudspeaker, room and complicated amplifier Phase Shift effects.

While feedback can lend a specialized musical effect especially in Rock as seen in the early Beatles "I Feel Fine" and work by many others, most feedback is to be avoided at all costs. This irritating howl ruins the performance and can even lead to the destruction of expensive equipment as well.

Feedback is most often a condition of errant behavior of a particular device or devices rather than just the result of your stage setup. All too often stage setup, including equipment selection, mic and speaker placement are dictated not for sound quality or artistic expression but to simply reduce the sensitivity to the initiation of feedback in order to be able to provide more gain. Dictating stage setup based upon feedback avoidance through the traditional practice of “Mics behind the speakers!” comes at a high cost. These include decreased sound quality, a more complicated setup, poor stage aesthetics, degraded sight lines and more. It also often makes it more difficult for the performers to get the mix they want with the added cost of a more complicated soundfront for the sound engineer to deal with throughout the show.

So just where does feedback begin? The truth is, an errant frequency response curve in a peaking or damaged microphone or a nasty crossover point or coloration peak of a loudspeaker are the major causal factors which initiate feedback. (Fig. 1)

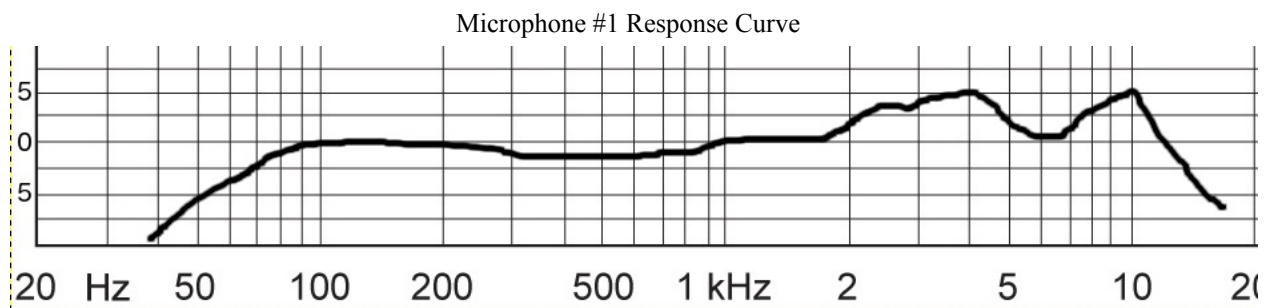


Figure 1

In the response curve depicted above we see a microphone with a 5 db peak near 4 and 10 khz. This microphone is setting you up for trouble. If the loudspeaker or room has a similar peak, there will be very little “gain before feedback” available. If the loudspeaker has the same 4khz rise you can see that when the mic picks up the exaggerated sound output of the speakers it is up 10 db at the first go around and much more through each successive cycle.

This is why it is common practice to place the loudspeakers ahead of the microphones by a good amount. When the speakers are positioned in this manner, the performers will need stage monitors in order to hear themselves.

Microphone EQ'ing is also still required to tame certain issues with a technician spending up to 40 minutes per mic and even more time is required with the complicated equipment setup and all the soundboard work. Another issue is the lower quality of the performance as the room is now awash in multiple sources of direct and reflected sounds. See fig 2.

The traditional stage set up.

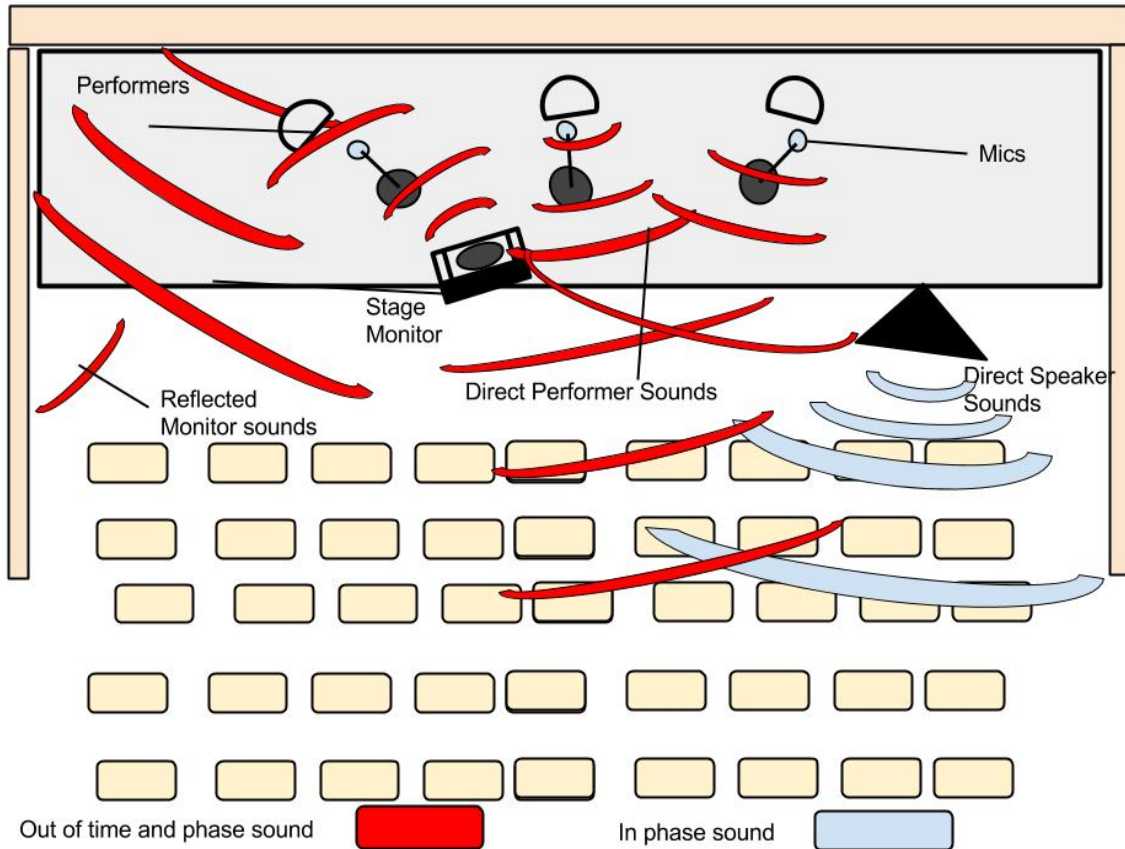


Figure 2

Loudspeakers in front of microphones produce the primary sound wave.

Live performers create a secondary sound wave.

Reflections from stage monitors create tertiary sound wave.

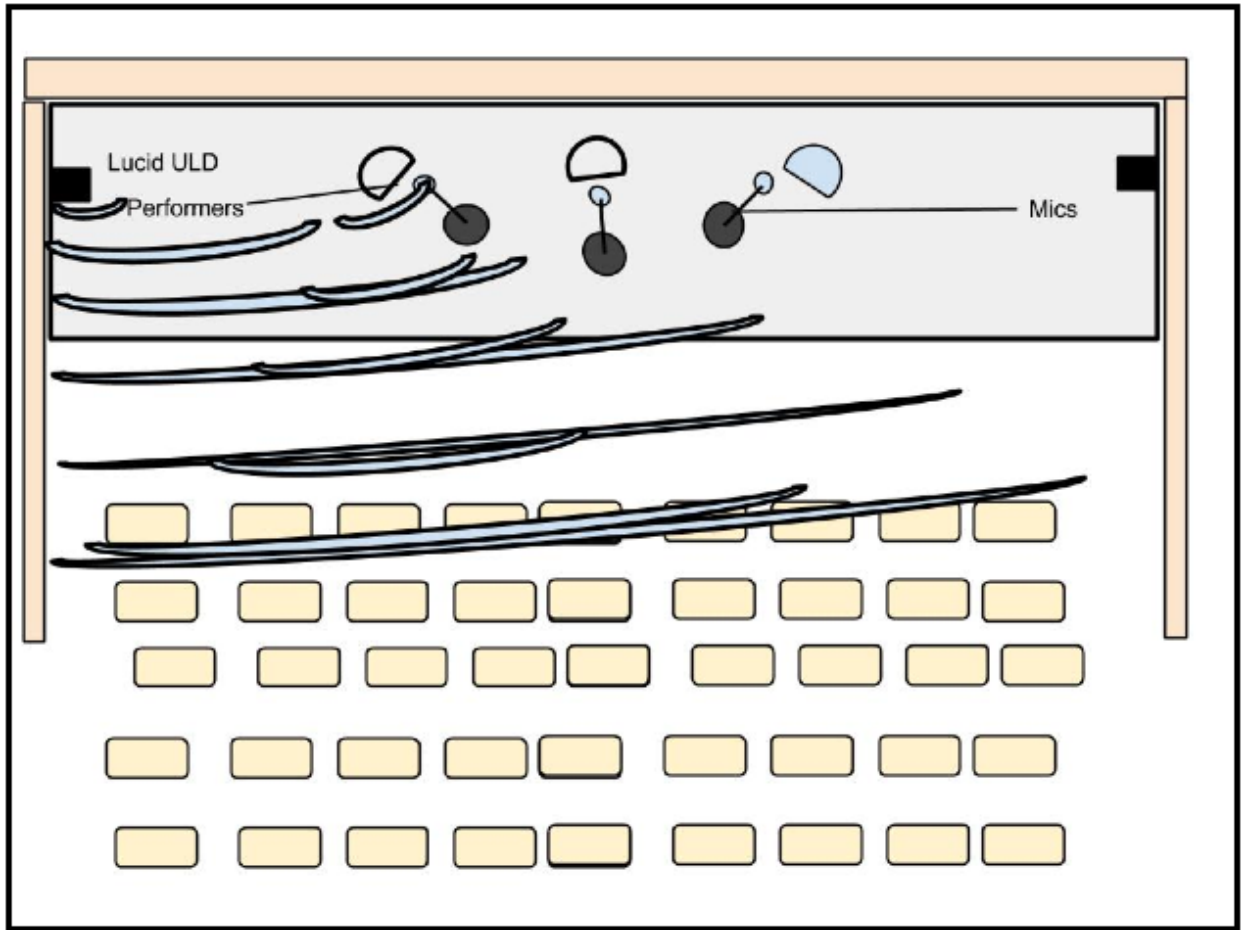
In the psycho-acoustics of sound, the first sound that hits our ears is dominant. The next sound is often heard as distortion or a blurring of the original sound perceived and so on. In the above drawing we can see that the sound from the main speaker is the first to reach the audience then the direct vocals of the singers then reflected sound from both the mains and the monitors.

This triple hit of sound is what blurs the image and destroys the immersive quality of the performance. The whole room becomes excited. i.e. floor, ceiling and wall surfaces, and all these surfaces reflect out of time sonic images which erode the desired sound. Further, since the dominant sound originates at the main speakers, it actually takes

the audiences' attention away from the performers. In most sound situations for groups of up to a few thousand there is now a much better solution. The Lucid Environment[®].

The Lucid Environment[®] by *Althar Audio*

Lucid ULD technology featuring our exclusive Frequency Amplitude Beaming[®] engine solves the issues of reflected sounds, feedback sensitivity, lack of gain, complicated EQ'ing and the need for stage monitors. One reason is the extremely flat frequency response our systems emit due to the many unique design features. With no errant peaks in



our frequency response, there is much less sensitivity to feedback and much greater gain available before feedback occurs.

Simply set up a pair of Lucid ULD's and you're done. The Lucid Environment permits the loudspeakers to be placed in the same plane as the performers or even behind them, with practically no concern of feedback. Due to their wide, (over 180 degrees) dispersion they do away with the need for stage monitors while effectively time aligning the performers' direct sounds with the sound reinforcement system. Now, sounds from speakers and performers reach the ears of the audience at the same time, in phase with great articulation and immersive effect. Lucid ULD's eliminate ground wave propagation and many room reflections while any remaining sounds they emit are encapsulated in a coherent envelope. The elimination of reflections which would occur with the use of traditional stage monitors assures there is much less errant sound in the mix. In addition due to the wide dispersion of the stereo

image, performers can actually be “positioned” on stage in the mix creating an even more convincing staging effect since both loudspeakers can be heard from every seat in the house. We hope to show you the benefits which can be derived through the use of Lucid Uniform Loudness Distribution loudspeakers.