# Dolby Atmos for sound bar applications

June 2018

Since its introduction in the movie theatre in 2012, Dolby Atmos® has revolutionized cinema sound and reinvigorated home entertainment. Dolby Atmos introduces the concept of object-based audio, in which sounds are represented as individual objects that can be located anywhere within the space above and around the listener. With Dolby Atmos tools, content creators can precisely place and move sounds anywhere in your living room, including overhead, to make entertainment incredibly immersive and lifelike.

## Dolby Atmos and audio objects

Dolby Atmos in the home is an object-based audio format with the capability to reproduce up to 128 simultaneous objects that may be present in the original cinematic mix. Every sound in a scene — a mosquito buzzing, a helicopter taking off, a car horn blaring — can be represented as a separate audio object that can be positioned and moved throughout the three-dimensional space. The car speeds from left to right; police officers search the upstairs floor, walking back and forth; the hawk swoops through the woods, clipping tree limbs as it flaps its wings to gain altitude.

Using sophisticated content creation tools that represent the audio objects in a three-dimensional space, filmmakers can isolate each audio object in a scene and decide exactly where they want it to be and how they want it to move. In the final sound mix, the audio objects are combined with *positional metadata* — data that describes each audio object, including its location, its size or intensity, and its movement.

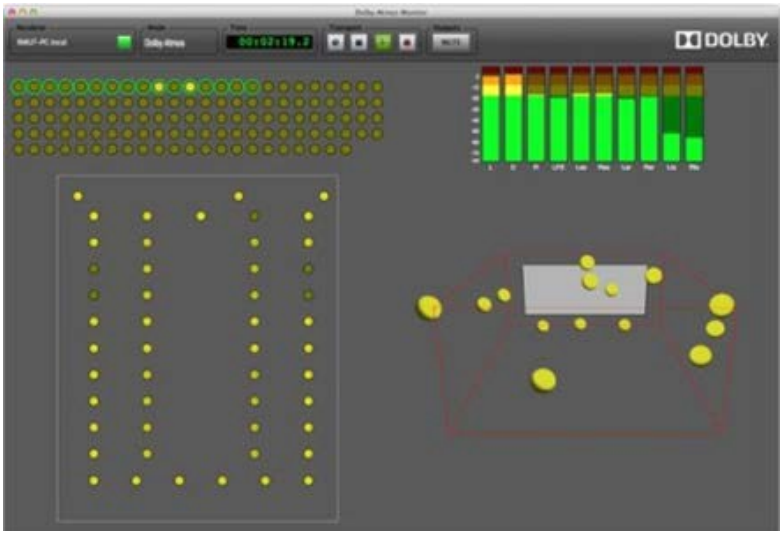


Figure 1. Filmmakers can use this Dolby Atmos tool to position and direct audio objects throughout the three-dimensional space.

In playback systems in the cinema as well as in the home, the Dolby Atmos object audio renderer is the intelligence that directs the system. Informed of the speaker count, the type of speaker, and the location of the speaker, the Dolby Atmos object audio renderer decodes the positional object metadata, then scales and adapts the Dolby Atmos soundtrack in real time for optimal playback, based entirely on the defined capabilities of the playback system. A key benefit of the Dolby Atmos object audio renderer is its ability to scale a soundtrack to different room sizes and speaker configurations, providing an optimum presentation of the original soundtrack in each listening environment.

## Dolby Atmos in content today

Major Hollywood studios and studios worldwide are partnering with Dolby to create Dolby Atmos cinematic presentations. A substantial portion of feature films created today use the Dolby Atmos format. In North America alone, Dolby Atmos has debuted in the home on Blu-ray Disc™ and Ultra HD Blu-ray™ Disc with the support of home video companies, including Paramount, Warner Bros., Universal, Lionsgate, Fox Pictures, and Sony Pictures Entertainment, and more announcements are scheduled. In addition, Dolby Atmos content is being created in Japan, China, India, France, Spain, Germany, and the United Kingdom. Dolby Atmos is also supported by streamed media (over the top [OTT]), as well as by broadcast providers in North America, China, and France, with more announcements in the near future. Furthermore, Dolby is working with artists, mixers, and music producers to bring the Dolby Atmos experience to homes worldwide.

Additionally, game developers are integrating object-based Dolby Atmos compatibility, with games already on the market and more on the way. In PC systems and in gaming consoles, playback of video games through a Dolby Atmos system heightens the “wow” factor, bringing gamers a new level of reality and total immersion in the game environment.

## Compatibility

Dolby Atmos content is fully playback-compatible with most home theater systems. Dolby Atmos audio tracks will play on any conventional channel-based system that support Dolby® TrueHD (Blu-ray Disc) or Dolby Digital Plus™ (streaming media) and will deliver traditional 5.1 or 7.1 sound, depending on the system configuration.

Content providers benefit from not having to maintain separate Dolby Atmos mixes, and consumers don’t have to worry about the new Dolby Atmos mixes playing on their older systems.

Because of the freedom that Dolby Atmos provides for mixers to position audio objects in the score, consumers with traditional systems often comment that they enjoy a more intense movie experience from their channel-based systems during playback of a content encoded with a Dolby Atmos soundtrack.

# Bringing Dolby Atmos to the home theater

The unique scalability of Dolby Atmos object-based audio enables a highly compelling and immersive listening experience from a variety of playback platforms and speaker layouts. With support for as many as 34 discrete speakers, the scalability of Dolby Atmos enables a virtually unlimited number of playback and speaker configurations in the home theater. Today, a home theater enthusiast can choose to integrate from as few as eight speakers up to and including 34 speakers in a reference playback system. In fact, Dolby Atmos supports more than 30,000 possible speaker positions within the home theater.

Dolby Atmos debuted in the home theater in 2014, first introduced in audio/video receivers (AVRs), preprocessors, Dolby Atmos enabled speakers, and home-theater-in-a-box (HTIB) systems. Supported speaker configurations include 5.1.2 and from 5.1.4 up to and including 7.1.4. (Note: the first digit refers to the number of traditional listener-level surround speakers, the second digit refers to the number of subwoofers, and the final digit refers to the number of overhead speakers in the Dolby Atmos setup.)

The scalability of Dolby Atmos also enables even more “lifestyle-friendly” speaker configurations, including sound bar products.

# Dolby Atmos in lifestyle-entertainment solutions

When high-definition television (HDTV) on flat-panel displays was introduced, manufacturers promoted sound bar products as a solution to improve the audio so that it matched the quality of the video. As display products became thinner, on-board speakers became smaller, and the sound of the television set was compromised to become nearly unlistenable. The construct of a sound bar could match that of the display product and fit unobtrusively into most households — a major consideration for the marketplace. Unfortunately, most of these products merely replace the sound missing from the on-board television sets, and most devices do not deliver the degree of quality and immersion that a multispeaker home entertainment system provides.

More advanced sound bars have come to market equipped with next-generation decoders (for Dolby Digital Plus and/or Dolby TrueHD) and sophisticated virtualization techniques to provide a deeper sense of immersion than is available from traditional 2.0- or 2.1-equipped sound bars.

With a wide variety of form factors, prices, and designs, the sound bar is the fastest-growing area in home entertainment today. This space is ripe for invention and innovation for consumers who demand more entertainment value and quality from their playback investment.

The unique scalability of Dolby Atmos allowed Dolby engineers and researchers to rethink the sound bar as a platform for delivering a high-quality immersive audio experience. Years of research and testing have resulted in a package of interoperable components designed to deliver a highly immersive listening experience from object-based audio and channel-based content — all from the form factor and convenience of a sound bar. The result is a highly versatile entertainment solution that can fit into a wide variety of lifestyles and environments.

# The importance of overhead sound

In real life, sounds come from all around us, including overhead. Having the ability to re-create overhead sounds is a key element in making Dolby Atmos sound so realistic. If we see a helicopter take off onscreen and then hear its blades cutting through the air above our heads, the experience makes us feel like we're really in the scene, not just watching it.

Dolby Atmos cinemas re-create these overhead sounds with an array of overhead speakers above the audience. But this is impractical in most home entertainment applications. In sound bar applications, Dolby has two different approaches to delivering height effects. These different approaches yield a variety of product options and prices points for consumers.

# Sound bars with Dolby Atmos upward-firing elements

Through our knowledge of psychoacoustics and sound physics, Dolby has developed technologies that create overhead sound from speakers that are located only a few feet off the floor. Dolby Atmos enabled speakers fire sound upward, where it reflects off the ceiling to accurately reproduce overhead sound. This technology has been further refined for integration into sound bar products that produce the Dolby Atmos experience.

Figure 2. Dolby Atmos enabled speakers reflect sound off the ceiling to produce an incredibly lifelike overhead sound.

The Dolby Atmos enabled speakers are enclosed in a sealed baffle within the sound bar cabinet. During construction of the sound bar, careful attention is given to avoid horizontal diffusion of sound intended for overhead effects; the use of a specialized pinna filter in the sound bar further amplifies the perception of overhead sound originating from the Dolby Atmos enabled speaker elements.

The ideal ceiling height for Dolby Atmos enabled speakers is between 7.5 and 12 feet (2.3 and 3.7 meters). However, testing at Dolby confirms that listeners can achieve a high-quality overhead experience from Dolby Atmos enabled speakers in environments where the ceiling height ranges up to 14 feet (4.3 meters). In fact, the system is so robust that recessed lighting fixtures, chandeliers, crown molding, and heating or air conditioning vents in the ceiling do not noticeably interfere with the Dolby Atmos experience.

# Dolby Atmos sound bars with height virtualization

Dolby Atmos height virtualization processing leverages Dolby's deep understanding of human audio perception to simulate an immersive audio experience while using fewer speakers. For height effects, virtualization is used to create the sensation of sound above you, originating solely from listener-level speakers. For systems without discrete surround speakers, virtualization of surround effects is employed to create enveloping, 360-degree audio without speakers behind or to the side of the listener.

On a technical level, Dolby Atmos height virtualization applies carefully designed height-cue filters to overhead audio components before they are mixed into listener-level speakers. These filters simulate the natural spectral cues imparted by the human ear to sounds arriving from overhead. For surround virtualization, a combination of head-related transfer functions (HRTFs) and cross-talk cancellation are employed to approximate for the listener's ears the binaural cues of surround speakers. For both types of virtualization, special care has been taken to equalize the associated filters so that the timbre of the audio remains natural anywhere in the listening environment.

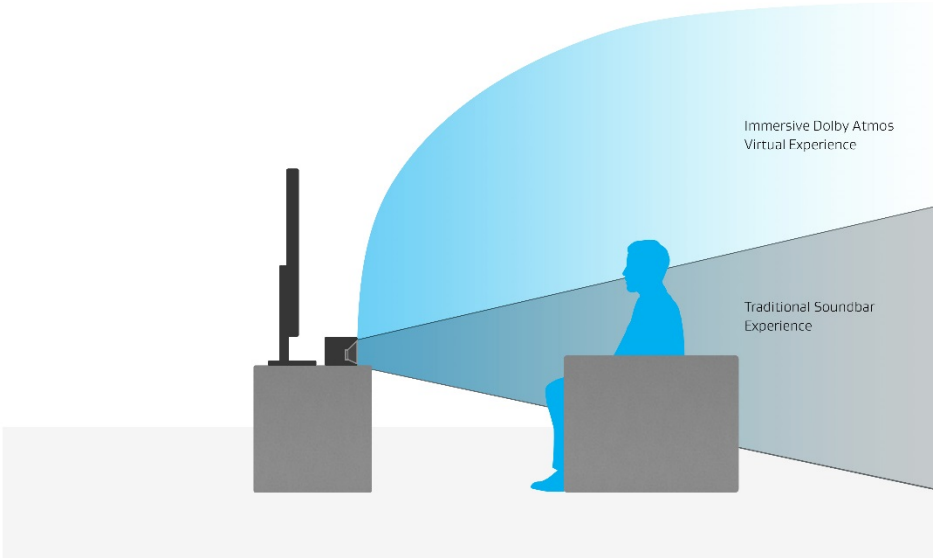


Figure 3. This illustration shows the difference between the Dolby Atmos virtual experience and the traditional sound bar experience.

Content encoded in Dolby Atmos will provide the most realistic audio effect from a product that delivers the Dolby Atmos experience. The discrete height elements in the Dolby Atmos mix feed the Dolby Atmos height virtualizer, are processed by the algorithms, and then mixed in to the corresponding listener-level speakers.

Dolby can support a number of output configurations with the Dolby Atmos height virtualizer, using 2 to 7 listener-level channels to create the sensation of either 2 or 4 overhead speakers.

# Flexibility in design and performance

In designing a sound bar with Dolby Atmos, manufacturers have a high degree of flexibility that enables them to distinguish their products in the marketplace.

A defining aspect of Dolby Atmos is the reproduction of a height layer of sound above the listener. This requires the use of Dolby Atmos enabled speakers or virtual processing in the system. For sound bars that use upward-firing elements, speaker drivers can be integrated into the top of the sound bar or included in the package as stand-alone modules that match the design of the sound bar.

Such modules likely would be positioned to the left and right sides of the sound bar. Every package that includes a Dolby Atmos enabled sound bar will incorporate at least two — and, if the sound bar is equipped with separate rear surround speakers, possibly as many as four — dedicated Dolby Atmos enabled speakers to reproduce overhead audio objects in the mix.

For enhanced wraparound surround effects, manufacturers may choose to incorporate side-firing speakers in the system. In most cases, these will be built into the sound bar to ensure a compact aesthetic. However, it is possible to enclose side-firing drivers into individual Dolby Atmos speaker modules and have them perform two functions.

At a minimum, a sound bar with Dolby Atmos will incorporate a stereo pair of front-firing speakers. With a subwoofer added to the package, the configuration is described as 2.1. Using Dolby Atmos enabled upward-firing elements adds an additional count of height speakers to the nomenclature and starts at a minimum configuration of 2.0.2. Adding a subwoofer to this product makes it a 2.1.2 configuration. Individual designs may vary, up to and including a system incorporating three front drivers, two side drivers, two separate rear surround speakers, a subwoofer, and four Dolby Atmos enabled speakers (7.1.4).

Most systems incorporate wireless subwoofers, and some manufacturers are already including wireless surround speakers for an even more immersive experience.

While certain requirements are designed into the specification to ensure optimum performance from the built-in Dolby Atmos enabled speakers, manufacturers have the flexibility to distinguish their products and incorporate unique designs that fit the lifestyle — and budgets — of their customers.

# Ensuring optimum performance from a sound bar with Dolby Atmos

Here are some guidelines to ensure the best listening performances from a sound bar with Dolby Atmos.

**Setup guidelines for Dolby Atmos enabled sound bars with upward-firing elements**

For optimum playback performance with dramatic overhead effects, mount the Dolby Atmos enabled sound bar at or slightly above a seated listener's ear level. You can place the sound bar on a console in front of the TV display or on a shelf or wall underneath the TV. The upward-firing Dolby Atmos drivers in the sound bar must have clear line-of-sight access to the ceiling. For best results, avoid mounting the sound bar in a

cabinet or underneath a soffit, as this will disrupt the reproduction of the overhead layer of sound that is essential to the three-dimensional Dolby Atmos experience.

When possible, position the sound bar in front of the TV display so that the screen does not disrupt or interfere with the direct pathway of the overhead sound.

The ceiling surface is also an important contributor to the performance of a Dolby Atmos enabled sound bar. The ideal ceiling height is between 7.5 and 12 feet (2.3 and 3.66 meters). The ceiling should be constructed of an acoustically reflective material, such as wallboard, plaster, hardwood, or any rigid, non-sound-absorbing material. For optimal playback, the ceiling should be flat. A shallow vaulted ceiling will provide acceptable performance.

The performance of the Dolby Atmos enabled speakers is so robust that a popcorn-finished ceiling, chandeliers, and can-style lighting do not interfere with or negatively impact the effect. It is best to avoid ceilings with acoustic tiles, as these tend to absorb the overhead sound of a Dolby Atmos playback system.

If the sound bar has built-in side-firing (surround) speakers, for optimal performance you should ensure that the sound from these speakers is in the direct line of sight with the side walls and that the speakers' first reflection to the listener is unobstructed by furniture or other sound-absorbing materials.

For an ideal playback experience, a Dolby Atmos enabled sound bar should be located at least 4 to 5 feet (1.2 to 1.5 meters) from the listener's seated position. Avoid sitting too close to the sound bar, and avoid positioning the sound bar so low that you are looking down on the top of the sound bar, as this will disrupt the sonic effect.

**Setup guidelines for sound bars that deliver a virtual Dolby Atmos experience**

For ideal results, place the sound bar below your television at approximately ear level and orient the seating position so that it directly faces the television. Avoid placing any obstructions between the sound bar and the listening position. The Dolby height virtualizer is extremely flexible and does not require any special room considerations to work. All viewers within the seating area will experience an enhanced height sensation that previous sound bars do not provide.

# Content playback

Dolby Atmos object-based audio can be delivered via Dolby Digital Plus and Dolby TrueHD audio codecs. Both formats also support delivery of traditional channel-based audio. By contrast, the Dolby Digital format supports only channel-based audio.

A sound bar with Dolby Atmos is designed to support a wide variety of Dolby Atmos and traditional channel-based content and sources, including:

- Blu-ray and Ultra HD Blu-ray Disc media with Dolby TrueHD and Dolby Digital Plus soundtracks
- File-based and over-the-top streaming media formats supported by Dolby Digital and Dolby Digital Plus
- DVD video discs supported by Dolby Digital

- Cable, terrestrial, and direct broadcast systems supported by Dolby Digital and Dolby Digital Plus
- Video game consoles that support Dolby Atmos content through Dolby Metadata-enhanced Audio Transmission (Dolby MAT) transport
- PCM and other content decoded and upmixed with Dolby surround sound

## Making connections

A Blu-ray player that fully conforms to the Blu-ray specification can play a Dolby Atmos encoded movie without a firmware update. The Blu-ray player will need to be connected to the Dolby Atmos enabled sound bar via HDMI® and set internally to support audio bitstream out. Note that many Blu-ray players default to secondary audio (also referred to as "mix" mode), a playback configuration in which third-party content is mixed with the primary soundtrack and output as a Dolby Digital or other channel-based signal. The user must disable this feature to ensure full decoding and playback of Dolby Atmos content.

Dolby Atmos content will be delivered to the sound bar through a connected Blu-ray player, set-top box, video game console, digital media adapter, PC, or mobile device (for example, a tablet or smartphone) via HDMI and bitstream output.

There's also no need to buy new HDMI cables. The current HDMI specification (v1.4 and later) fully supports transmission of Dolby Atmos encoded audio.

## Building the perfect sound bar: ingredients

A sound bar with Dolby Atmos employs many of the following Dolby ingredients, designed to work in unison to produce an extraordinary, enveloping, three-dimensional audio experience:

- Advanced Dolby Atmos decoders, including Dolby Digital Plus and Dolby TrueHD
- Dolby Metadata-enhanced Audio Transmission (Dolby MAT)
- Dolby Atmos object-based rendering
- Dolby Surround upmixing
- Dolby Surround Virtualizer
- Dolby audio processing

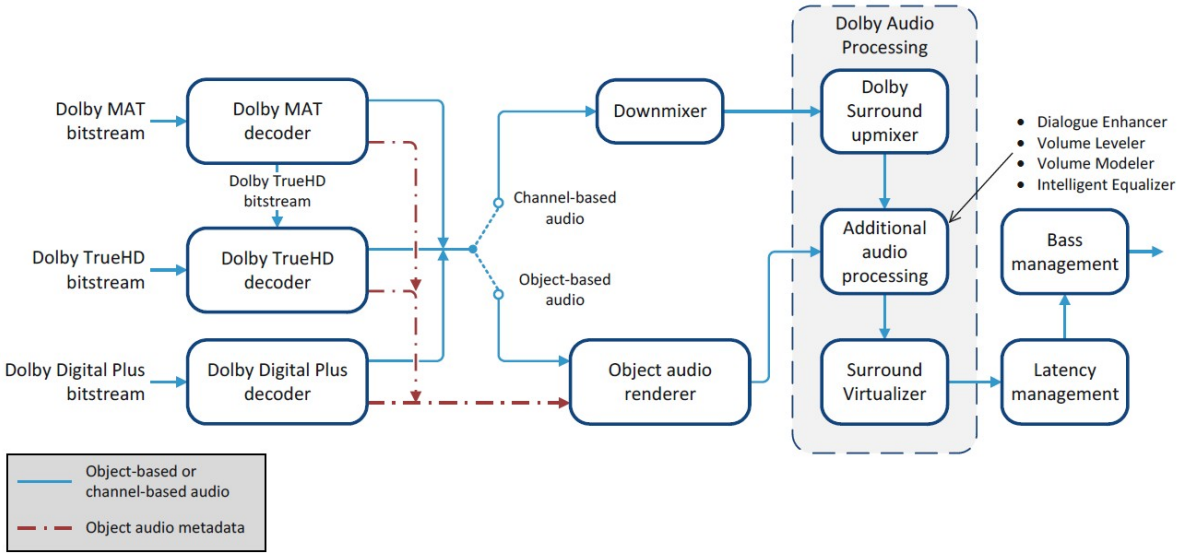


Figure 4. This diagram traces the path of the audio signal through the Dolby Atmos enabled sound bar.

## Dolby Atmos in Dolby TrueHD

Dolby expanded the Dolby TrueHD format employed in Blu-ray Disc media to allow the format to support Dolby Atmos content. Prior to Dolby Atmos, Dolby TrueHD provided lossless support exclusively for channel-based audio, such as 5.1 and 7.1. We have added a fourth substream to Dolby TrueHD to support Dolby Atmos playback. This substream represents a losslessly encoded, fully object-based mix.

Dolby Atmos signals encoded in Dolby TrueHD are transmitted from a Blu-ray player to your sound bar with Dolby Atmos through an HDMI connection. The sound bar receives the Dolby TrueHD soundtrack and its associated object-based audio and positional metadata, and then decodes, processes, and renders the sound to the specific speaker configuration in the device.

Dolby Atmos audio can be encoded with Dolby TrueHD at multiple sampling rates (including 48 kHz and 96 kHz) and bit depths (16-bit and 24-bit). Dolby Atmos enabled sound bar products will also support legacy Dolby TrueHD bitstreams at multiple sampling rates (including 48, 96, and 192 kHz) and bit depths (16-, 20-, and 24-bit) to provide full backward compatibility with legacy Blu-ray Disc media and Dolby TrueHD music files.

## Dolby Atmos in Dolby Digital Plus

Dolby Digital Plus has been updated to include a new decoder capable of processing content encoded for Dolby Atmos. This module employs new bitstream metadata to extract Dolby Atmos object-based audio and then outputs this information for further processing by the object audio renderer, which adapts and scales the Dolby Atmos mix for the onboard speaker system in the sound bar. The sampling rate for Dolby Atmos content is 48 kHz, the same sample rate as for Dolby Digital Plus content.

Dolby Digital Plus is employed for over-the-air (OTA) and cable broadcast delivery and is the preferred audio codec for multichannel OTT or streaming media content.

## Full compatibility

Both audio decoders are designed to be fully backward compatible with legacy channel-based Dolby Digital Plus and Dolby TrueHD soundtracks.

## Dolby Atmos in Dolby MAT

A Dolby MAT encoder resides in a Blu-ray player to pack the variable bit-rate Dolby TrueHD bitstreams for transmission over the fixed bit-rate HDMI. A Dolby MAT decoder is concurrently employed in the Dolby TrueHD decoder in the sound bar to unpack the Dolby TrueHD bitstreams. With the introduction of Dolby Atmos, we have expanded the Dolby MAT technology to support encoding and decoding of Dolby Atmos metadata incorporated in lossless pulse-code modulation (PCM) audio.

A key benefit of Dolby MAT 2.0 is that Dolby Atmos object-based audio can be live encoded and transmitted from a source device with limited latency and processing complexity. Among the likely sources are broadcast set-top boxes and game consoles. The Dolby MAT 2.0 decoder in the Dolby Atmos enabled sound bar outputs the object-based audio and its metadata for further processing inside the device. The Dolby MAT 2.0 container is scalable and leverages the full potential of the HDMI audio pipeline.

## Dolby Atmos object audio rendering

The Dolby Atmos object audio renderer is the intelligence of a Dolby Atmos enabled sound bar. Dolby Atmos content consists of both audio objects and positional metadata, which includes information describing where those sounds should be placed and how they should move, along with other data, such as the type of audio object represented. The Dolby Atmos object audio renderer is informed of the types of speakers and their location in the sound bar. Programmed with this information during the development of the Dolby Atmos enabled sound bar, the object audio renderer scales and adapts audio information to the specific speaker configuration of the device.

The adaptability of the Dolby Atmos object audio renderer is the key to scaling object-based audio mixes to lifestyle-oriented playback devices such as a Dolby Atmos enabled sound bar.

## Dolby Surround upmixer

Home entertainment enthusiasts have a wide selection of channel-based content, as well as Dolby Atmos content. The Dolby Surround upmixer is designed to maximize the listening experience of channel-based content (stereo, 5.1, and 7.1), employing all the built-in speakers in the sound bar to re-create an accurate, spacious, and immersive rendering of music and movie soundtracks while simultaneously honoring and maintaining the artist’s intent for the mix.

Unlike previous wideband upmixing technologies, which operated in the time domain, the Dolby Surround upmixer operates in the frequency domain, processing multiple perceptually-spaced frequency bands for a fine-grained analysis of the source signal. The Dolby Surround upmixer can individually steer frequency bands, producing surround sound with precisely located audio elements and a spacious ambience. Spatial imaging is complemented through the use of onboard or external Dolby Atmos enabled speakers.

The Dolby Surround upmixer accepts channel-based audio in any of the following channel configurations:

- Two-channel stereo: Left and Right channels
- 5.1 channel: Left, Center, Right, Left Surround, Right Surround, and Low-Frequency Effects (LFE) channels
- 7.1 channel: Left, Center, Right, Left Surround, Right Surround, Left Rear Surround, Right Rear Surround, and LFE channels

The output of the Dolby Surround upmixer is configured to match the output speaker configuration of the sound bar. When the input signal does not conform to one of the typical design configurations, downmixing is applied prior to the Dolby surround upmixer.

## Dolby Surround Virtualizer

The Surround Virtualizer employs a combination of advanced head-related transfer functions (HRTFs) and crosstalk cancellation so that listeners hear the sounds as if they were coming from a multiple-speaker surround configuration.

The specific HRTFs used present an optimized experience for a large number of listeners in the room. The virtualization filters are carefully calibrated to produce an uncolored natural sound, even for listeners outside of the "sweet spot."

The Surround Virtualizer enhances the Front Left, Front Right, Surround, and Overhead channels of the multichannel signal to create an enveloping virtual surround effect, compensating for the rectangular form factor of the sound bar.

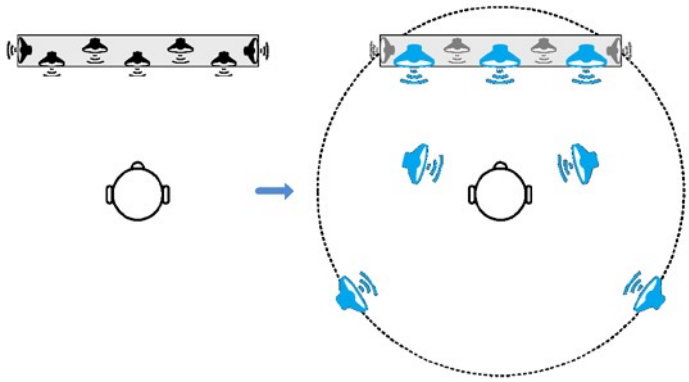

Figure 5. The Surround Virtualizer soundstage gives the listener a sense of aural spaciousness.

# Dolby audio processing

Employing advanced cognitive and psychoacoustic models of human audio perception, Dolby audio processing is a technology bundle intended to work seamlessly to deliver a superior audio experience for all audio content (Dolby Atmos and channel-based audio), including music, movies, and games. Manufacturers can employ Dolby audio processing to provide a consistent high-quality listening experience across their system designs. Elements of this technology bundle include the following:

- Volume Leveler and Volume Modeler
- Dialogue Enhancer
- Intelligent Equalizer

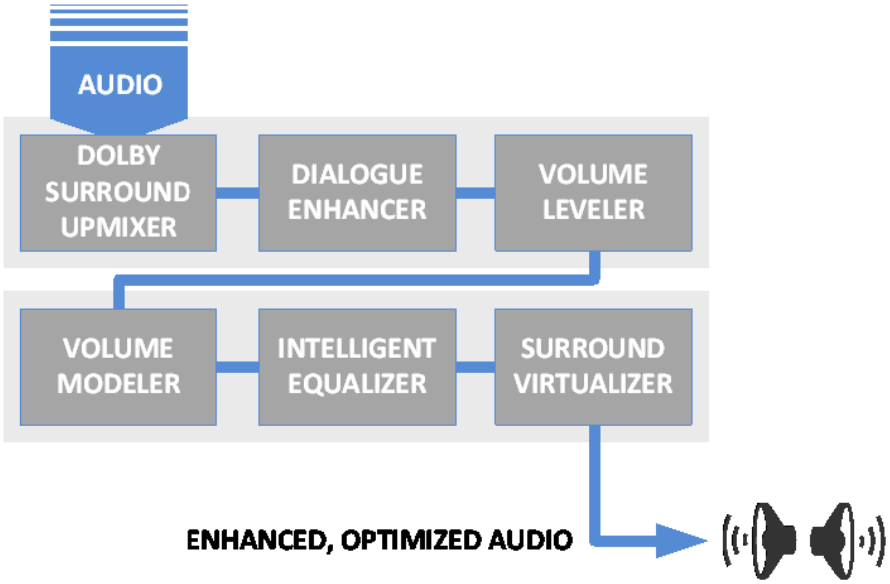


Figure 6. This diagram shows the flow of the Dolby audio processing signal.

# Volume Leveler

The Volume Leveler feature maintains consistent playback levels regardless of the source selection and content. For example, when the user switches between different songs in a playlist or switches from listening to music to watching a movie, the volume stays the same. This feature continuously analyzes the audio based on a psychoacoustic model of loudness perception to assess how loud a listener perceives the audio to be. This information is then used to automatically adjust the perceived loudness to a consistent playback level.

To maintain the quality of the playback performance, Dolby Atmos uses *auditory scene analysis*, a cognitive model of audio perception developed through years of research into the science of sound.

This feature ensures that the loudness of the audio is not adjusted in the audio signal at inappropriate moments, such as during a naturally fading note in a song. The Volume Leveler is able to adjust individual channels of the audio and individual frequency bands within a channel to prevent unwanted compression-based “pumping” and “breathing” artifacts. The result is consistently leveled audio, free from the artifacts associated with traditional volume-leveling solutions.

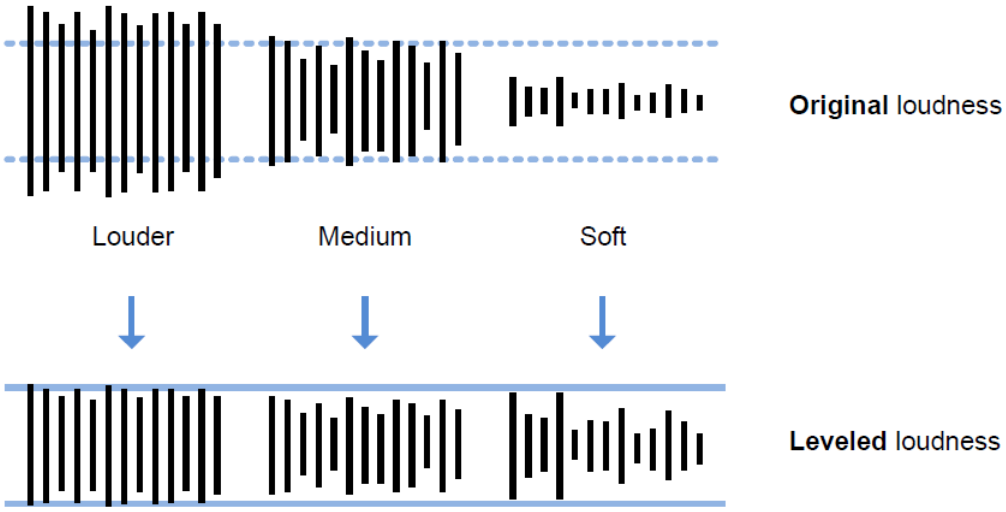


Figure 7. The Volume Leveler adjusts and maintains consistent volume levels across content.

## Volume Modeler

In the recording studio, audio is mixed at what audio professionals refer to as the reference level, typically around 85 decibels. Although this is generally considered loud, it’s the volume level at which most people can perceive the entire spectrum of audio in a mix and hear the intended tonal balance.

This is important because of how we actually hear. Typically, the lower the volume, the less distinctly we can hear the highs and lows — treble and bass. Traditional volume controls, however, treat all frequencies alike. So when you turn down the volume, you seem to lose the highs and lows, and the tonal balance suffers.

The Volume Modeler compensates for that. It analyzes the incoming audio, groups similar frequencies into critical bands, and applies appropriate amounts of gain to each. You’ll always hear the correct tonal balance, whether at whisper level or dance-party loud.

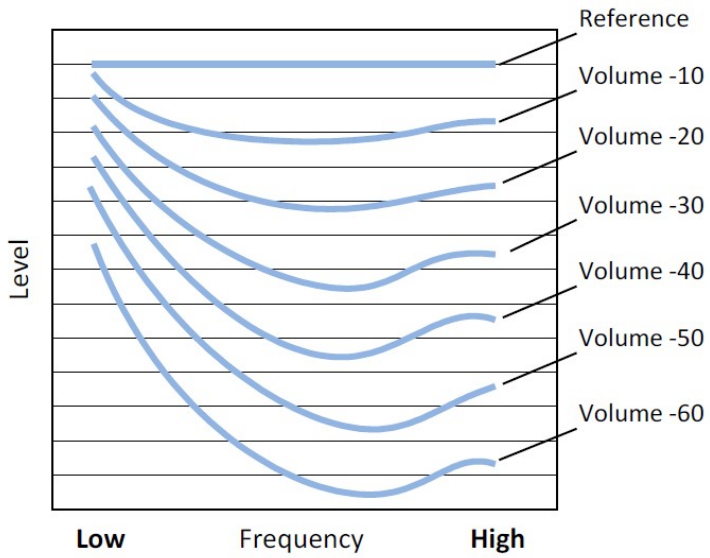


Figure 8. The Dolby Volume Modeler adjusts the frequency response for different volume levels to compensate for the way people perceive loudness.

## Dialogue Enhancer

The Dialogue Enhancer dynamically applies processing to improve the intelligibility of the spoken portion of a recording. This postprocessing feature is designed to improve dialogue perception and understanding for all listeners. This involves monitoring the audio track to detect the presence of dialogue.

The Dialogue Enhancer analyzes features from the audio signal and applies pattern recognition to detect the presence of dialogue from moment to moment. When dialogue is detected, the Dialogue Enhancer performs two types of dynamic audio processing:

- Dynamic spectral rebalancing of dialogue
- Dynamic suppression of intrusive signals

The dynamic spectral rebalancing of dialogue enhances the middle to high frequencies, which are most important to intelligibility. In simple terms, the speech spectrum is altered where necessary to accentuate the dialogue content in a way that enables the listener to more clearly distinguish the content.

Dynamic suppression of intrusive signals lowers the level of middle to high frequencies of sounds in the audio mix that are not related to dialogue. These are sounds that are determined to be interfering with the intelligibility of the dialogue.

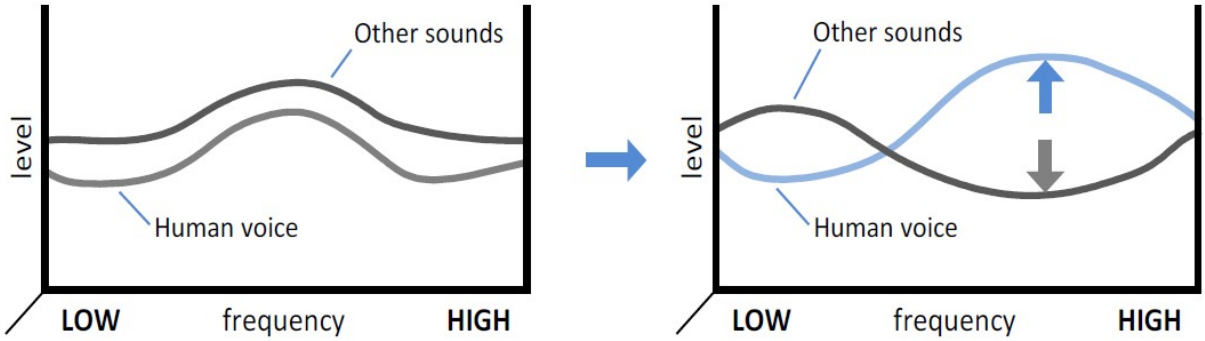


Figure 9. The Dolby Dialogue Enhancer clarifies the speech spectrum by suppressing interfering sound.

## Intelligent Equalizer

The Intelligent Equalizer feature provides consistency of *spectral balance*, also known as timbre or tone. This is accomplished by continuously monitoring the spectral balance of the audio and comparing it to a specified tone, known as the *reference tone*. An equalization filter dynamically transforms the original audio tone to the specified reference tone.

This process is different from existing equalization presets found on many audio systems (such as presets for jazz, rock, or voice), where the presets apply the same change across a frequency, regardless of the content.

Typically, when a user sets a bass boost level in a traditional equalizer, the setting may not be appropriate as the bass content in the source audio increases. Too much bass can cause distortion.

The Intelligent Equalizer does not adjust the bass if sufficient bass is evident in the signal. When the source audio does not have enough bass, the Intelligent Equalizer boosts the bass appropriately. The result is the desired sound without overprocessing or distortion.

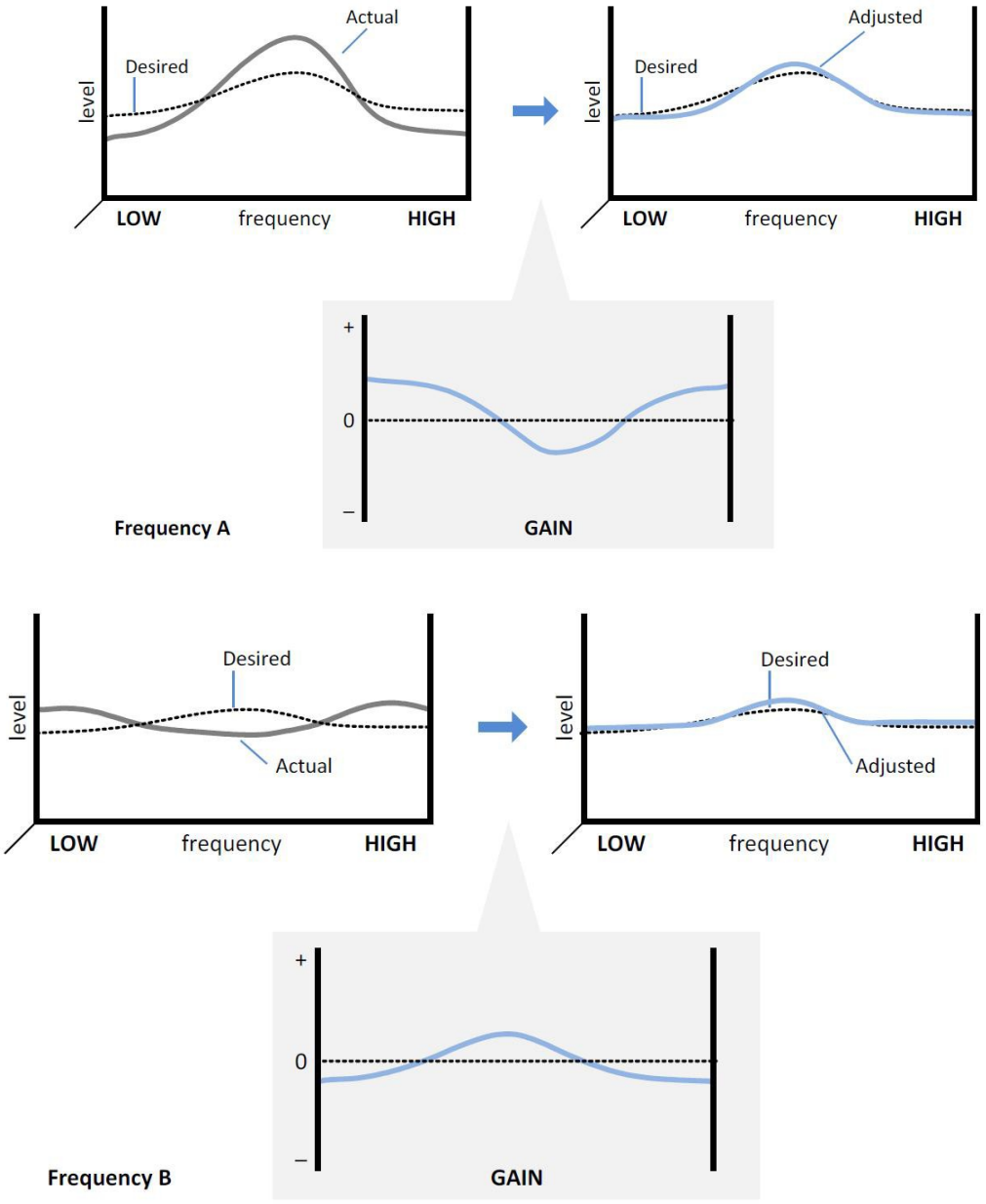


Figure 10. The Intelligent Equalizer dynamically adjusts audio by applying a compensating gain (volume) curve.

## Conclusion

Dolby audio processing is a package of audio enhancements designed to work in tandem to deliver consistent high-quality listening experiences from a variety of content — Dolby Atmos movies, Blu-ray and DVD content, broadcast and streaming content, video games, and even stereo music.

The scalability of Dolby Atmos, combined with sophisticated upmixing, virtualization, and digital audio processing techniques developed by Dolby, enables the most realistic and immersive experiences currently available in a sound bar.

Today we can bring a Dolby Atmos experience to the home through established delivery methods, while maintaining full backward compatibility with legacy playback systems. Years of engineering and research into accurately translating the Dolby Atmos experience from the cinema to the home have resulted in a sound bar listening experience that is simply unequaled and must be experienced in your home to be believed.