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## Mixing Music In Dolby Atmos

Roberto Cabanillas

*California State University, Monterey Bay*

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Roberto Cabanillas  
Professor Sammons  
MPA 475

## Mixing Music with Dolby Atmos

### **Introduction**

The way we listen to music has come a long way. First came phonographs and radio broadcasting. Afterward came vinyl and cassette tapes that could be played at home or in the car. Next, compact CDs were invented to be used with portable CD players. Then came MP3 players, Bluetooth devices, and streaming services. Of course, all these formats involved speakers. Audio was first being listened in mono; this is where audio is being listened to from one speaker position only, usually in the center. Then came stereo, this was audio being reproduced in two or more channels, thus giving the listener a sense of multi-directional audio. This audio was being reproduced to listen to from the left and right. Stereo is now being used in all aspects of entertainment, which include movies, music, and TV. As time went on, a new way to listen to audio was introduced and that is through surround sound. In surround sound, there are three or more channels so audio can be heard in many directions. With the introduction of surround sound comes Dolby Laboratories and they have changed how things are listened to in movies. As we moved forward Dolby Laboratories introduced Dolby Atmos and changed not only how we listen to movies once more but also music.

### **Brief History of Dolby**

Dolby Laboratories started out with one man: Ray Dolby. Ray Dolby was an innovator in audio technology. Dolby went to work for Ampex, before beginning his graduate studies, there

he became an important figure. As a chief electronics designer he introduced the first workable recording system for videotapes. He went on to study at Stanford then went to England to pursue his graduate studies. During his time in graduate school, he was one of the few students that got to travel to India where he became a science advisor as part of a UNESCO project. During his spare time in India, he was working on his ideas of noise-reduction systems (“Dolby, Ray”).

When Dolby got his hands on a Phillips pre-recorded cassette tape he found out that there was a problem. He sought to fix this problem, which was poor sound quality. At one point while he was recording music in India he found that there was a hissing that bothered him that came from the Ampex tapes. So, he “came up with an idea of getting rid of this hiss, by separating the high and low frequencies. By splitting the sound into two channels after recording, the hiss could be eliminated. Through this audio compression and expansion, he was not only able to eliminate undesired noises but also to maintain the clarity of the recording” (“Dolby, Ray”).

After getting back from India, Dolby started Dolby Laboratories in 1965 in London with just “\$25,000 of his own savings and with funds from friends. With four initial employees, the audio company focused on refining and marketing his noise-reduction system” (“Dolby, Ray”). Dolby’s noise-reduction technology became an important tech for all studios to have: “It eliminated the hiss from all tape speeds, and ensured that cassettes had high sound quality” (“Dolby, Ray”). By the 1970s, because of Dolby Laboratories, the overall quality audio was better than ever before.

In 1975, Dolby Laboratories introduced Dolby Stereo and once again changed how we listen to audio. Through Dolby’s advances soundtracks were able to be projected at a higher volume and grander scale without hiss (“Dolby, Ray”). Dolby Stereo has played an important

role in how we listen to audio especially in movies. The film industry at the time was only using two channels to hear their movies. When Dolby Stereo was introduced to the film industry it went up to four channels, which were left, right, center and surround (“Dolby Stereo: Sweetwater”).

The film industry received a boost in audio and Dolby Surround came from Dolby Stereo. Dolby surround sound was first introduced in 1982 to enhance the sound in movie theaters. With Dolby Surround a normal stereo signal will get two channels. If you play it on a Dolby Surround-enabled decoder device, the device separates the full four channels (Briere and Hurley). During 1982 having four channels meant that more sounds would be present. As time progressed Dolby Laboratories added 5.1 and 7.1 to Dolby Surround. The channels include “centre, left, right, left surround, right surround and the LFE (Low Frequency Effect), also known as the subwoofer channel” (“Ray Dolby: A Life in Sound.”). After a series of achievements in sound, Dolby Laboratories introduced Dolby Atmos in 2012. In Dolby Atmos, “specific sounds, such as footsteps or raindrops, can be programmed by commands to come through specific speakers in a movie theater to create sonic illusions in various parts of a movie theater” (“Dolby, Ray”).

In 1974, Universal came out with their type of surround sound called Sensurround system that was used in one of their films called *Earthquake*. Sensurround was used to create powerful ultra-low-frequency rumbles that shook audiences and theaters in concert with explosions and other appropriate onscreen stimuli (like *Earthquake*’s titular event) this gave the audience a sense of immersion (Kerins). Sensurround aimed to immerse the listener into thinking that they

were experiencing the movie. Sensurround didn't last; after five films, a new system was introduced into film, which was Quintaphonics (Kerins).

Quintaphonics was first used in the film 1975 film *Tommy*. Quintaphonics expanded quad's four channels to five: three across the screen (L, C, R) and stereo surrounds (LS, RS) The matrix allowed placement of sounds in any corner of the theater To facilitate the smooth movement of sounds around the theater (Kerins). For Quintaphonics to have all those specs in 1975 placed it way ahead of its time. To have sounds placed in any corner of the theater and to stabilize on-screen audio was a revolutionary aspect at the time. Despite its powerful aspects, Quintaphonics didn't last and that's when Dolby Stereo came into play.

Dolby Stereo did have many complications leading up to making its way to becoming a standard in the film business. In many ways Dolby Stereo was a big step back to what it was capable of. First, it "did not even provide for a surround channel, and when one was finally added it had only about half the frequency range of the front channels" (Kerins). Accordingly, Dolby Stereo wasn't even considered a true surround sound system. As time moved forward, Dolby Stereo succeeded in giving studios and exhibitors a better-sounding and no more expensive alternative to mono sound. It required costly magnetic striping and a heavy dual projector arrangement, but Dolby Stereo deserves the credit for being the first to supply the film industry with improved dynamic and frequency ranges and of course "cleaner" sound (Kerins).

### **What is Dolby Atmos?**

Dolby Atmos was one of the last projects that Ray Dolby patented and set into motion. Dolby Atmos is an "object-based audio technology that places sounds above, below and around

listeners, based on the placement and number of speakers in the home” (Tribbey). The technology that Dolby Atmos is based on is a three-dimensional space. Using specific tools an engineer is able to place sounds or “objects” in any direction within that. There is not a sense of panning left or right; it goes further beyond that. Dolby Atmos will let you place objects top, bottom, side to side and even in more specific locations of the three-dimensional space. Dolby Atmos was intended to be used for the film industry at the beginning of its creation. It has since branched out to music and is progressing every year.



Figure. 1 Dolby Atmos speaker set for *Brave*

Dolby Atmos first premiered with 2012 Disney’s Pixar’s *Brave*. Within the theater for the premiere, speakers were hanging off the ceiling and in addition to the regular speakers that were already located within the theater. Knowing that there are all those speakers positioned in that

space the creativity and freedom a mixer will have is immense. In Fig. 1 above which was provided by Dolby Laboratories shows the Dolby Atmos set for Disney's *Brave*. As you can see the overhead speakers were hanging from the ceiling and placed above the audience. The listeners in the theater will be immersed when they hear sounds from directions. It's been a long time since 2012, and Dolby Atmos has slowly been gaining ground. It has since been supported in many popular movies such as *Blade Runner 2049*, *Mad Max Fury Road*, and *Avenger: Endgame*. It has also made the move to streaming services such as Netflix and Amazon Prime Video. In addition, there are now devices like soundbars, speakers, headphones and cell phones that are supported by Dolby Atmos. Now anybody that has these specific devices will be able to experience a new way to listen to audio and not just in a theater ("Dolby Atmos: What is it?").

One the things that Dolby Atmos has been leaning towards is music. The thing that caught my attention in Dolby Atmos was being able to place sounds in a specific location. The capabilities and opportunities that Dolby Atmos is giving producers and mixers are unique and should be taken advantage of. At this moment, Tidal and Amazon Music HD are releasing tracks that are supported by Dolby Atmos devices. In addition, works from various artists are being re-mixed in Dolby Atmos and being re-released to be experienced in a new way. About three years ago a German record label Mindmap released a social immersive audio compilation mix *atmos* by Fritz Hilpert. It was nominated for Best 3D Surround Sound Album at the 2017 Grammys ("Dolby Atmos: What is it?").

### **Mixing in Dolby Atmos**

Avid Pro Tools was the first DAW to receive Dolby Atmos capability though only within Pro Tools Ultimate. Dolby can now be used in Ableton Live, Apple Logic, and Steinberg Nuendo. I don't have a speaker set up that will allow me to work in a big setting such as a music studio or theatrical setting. So the best thing for me is to just work with Ableton Live and Avid Pro Tools that I have installed in my own computer. I have a pair of studio monitors and a pair of dynamic stereo headphones that I will be using when producing and mixing. I will be producing my music in Ableton Live, then mixing down in Pro Tools and using Dolby Atmos within Pro Tools to create my mix.

There are two main tools that are essential for mixing in Atmos. These are the Dolby Atmos Monitor Application, which is now called the Dolby Atmos Renderer, and the Dolby Atmos Panner plug-in, which is now called the Dolby Atmos Music Panner.

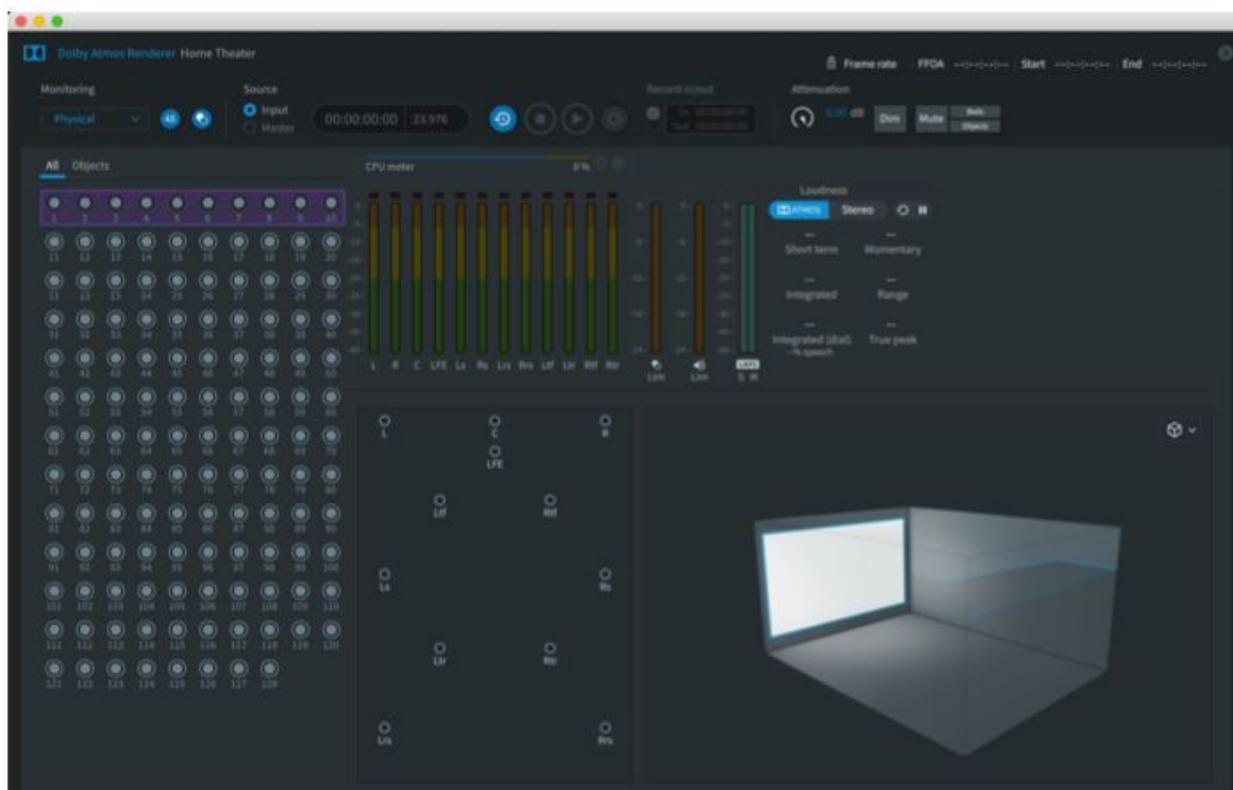


Fig. 2 The Renderer in Pro Tools

Working together with a supported DAW, the Dolby Atmos Renderer will let you visually see where you are placing the sounds or object you are working with. The Dolby Atmos Renderer “provides the software components required to monitor, create, and play back Dolby Atmos Masters” (*Dolby Atmos Renderer Guide v3.4* 31). There are several components in the Renderer that play key roles while mixing in Atmos. The room configuration display is one of these key components. This component, if the right speaker setup is being used, will visually represent where the playback is coming from within the speakers that are being used in the session (*Dolby Atmos Renderer Guide v3.4* 289). Another is the object view. In the Dolby Atmos Renderer, this serves as “the main window is a virtual 3D room, which provides a visual representation of object position, size, and signal level” (*Dolby Atmos Renderer Guide v3.4* 293). The way that objects view works is there is a representation of a square room. Within that square room is where you’ll see the objects that are being mixed in Dolby Atmos. In addition, inside the 3D room you’ll be able to see where the objects are positioned. There are two ways that you are able to view the objects mode. One is theater mode and the other is person view. The difference between the two is that in theater mode there is a screen that shows on one of the walls to make it seem like the positioned objects are inside a theater. In person mode, there’s a silhouette of a person in the middle of the room and get a sense of where to position the objects. I will be using person mode since I will be mixing in headphones. Another key feature of the object view is that you are able to rotate the 3D room space side to side and even have an overhead view to get a better sense of where the objects could be positioned. Another key component that the Dolby

Atmos Renderer has is the input status indicators, which “display beds and objects being rendered in the Dolby Atmos session during monitoring or recording, or when playing back a master” (*Dolby Atmos Renderer Guide v3.4* 287). These indicators are the circles to the left that can be seen in Fig. 2. The indicators show how many objects are in the mix ,and they also show the loudness of each bed or object by blinking green, yellow, and red.

The Dolby Atmos Music Panner allows you to position objects in a three-dimensional space while mixing in Dolby Atmos. The Dolby Atmos Music Panner goes hand in hand with the Dolby Atmos Renderer. They have to coexist together; if one is missing then they won't be able to function. In Dolby Atmos, there are objects and beds. An object “is a discrete audio element that can be placed anywhere in the three-dimensional soundfield” (*Dolby Atmos Music Panner v1.1* 15). When using objects there is more freedom for the mixer to place objects anywhere in the 3D space. Beds “can be thought of as a traditional channel-based stem with the rules and expectations of stem configurations (such as 2.0, 5.1, and 7.1). These are fixed locations in space that are tightly constrained to traditional speaker environments, including theatrical environments where a speaker array might be used” (*Dolby Atmos Music Panner v1.1* 15). In a sense a bed is already premixed to automatically set up objects within a mix. The mixing engineer wouldn't have to manually set up objects. Beds are helpful not only because they are already premixed but because it helps with the workflow of an engineer, and if they already have a 2.0, 5.1, or 7.1 setup then they wouldn't have to go through the trouble of setting everything up within the software.



Fig. 3 Dolby Atmos Music Panner

With the Dolby Atmos Music Panner you're able to automate in almost any direction. In the Music Panner you are able to Pan X, Pan Y, and Pan Z. With Pan X you are able to place the objects left and right; in Pan Y you are able to place objects front and back; and in Pan Z you are able to place objects top and bottom. There is a feature in the Music Panner called Elevation Mode that helps automate objects in interesting ways. In this mode you are able to choose from

manual, wedge, sphere, and curve. Manual is a straight line; wedge is a pyramid line; sphere is a circular line; and curve is a curved line. This mode “allows for manual adjustment of the z (top/bottom) dimension in the virtual room, or defining the shape of the ceiling using an elevation shape”( p. 57). For example, I can have an object such as an electronic melody be placed in sphere mode and have it move in a circular pattern on top of the silhouette in person mode in the three-dimensional space

Another interesting feature that the Music Panner has is positioning objects to the tempo of the DAW that is being used. For this purpose, the Music Panner has a sequencer. The sequencer is used “for creating up to 16 steps (paths) for the object to traverse in sequential order. When the sequencer is on, the sequencer syncs to the DAW tempo, and each path plays over a set length of time (such as four beats)” (*Dolby Atmos Music Panner v1.1* 33). One of the ways that the sequencer can be used is to sequence an object such as a bassline to follow one of the line modes from the Elevation Mode.

There are some other ways to get placement in a 3D space similar to what Dolby Atmos is doing. There are free and paid plugins or applications that can be used to place and manipulate sound in a 3D space. One good example that uses ambisonic to its full potential would be Waves’s 360 Ambisonic Tools. Ambisonics is a full-sphere surround sound format. It covers left, right, above ,and below. Ambisonics approaches “an audio scene as a full 360-degree sphere of sound coming from different directions around a center point. The center point is where the microphone is placed while recording, or where the listener’s ‘sweet spot’ is located while playing back” (“Ambisonics Explained”). Waves tools include the B360 Ambisonic Encoder, the Nx Virtual Mix Room, and the Nx Head Tracker. The encoder will convert mono, stereo and

surround into 1st-order ambisonic B-format and lets you precisely position elements in a 360 audio mix. The Nx Virtual Mix Room lets you accurately judge the mix depth, balance and panning over headphones. The Nx Virtual Mix Room also will let you monitor 7.1, 5.1, and 5.0 surround sound on stereo headphones. The Nx Head Tracker for headphones is a bluetooth device that you put on your headphones and tracks your head movements. This device works hand in hand with the Nx Virtual Mix Room to make better decisions when mixing with Waves Ambisonic Tools (“Ambisonics Explained”). The big difference between the Ambisonic Tools and Dolby Atmos is that Dolby Atmos treats sounds as objects in the 3D space. These objects can be placed in any directions in the 3D space. When mixing object-based audio such as in Dolby Atmos objects are able to be placed in the environment that the mixer is aiming for such as a movie theater.

### **Dolby Atmos Music EP**

Creating music and then mixing it in Dolby Atmos is a challenging task. To create my mixes in Atmos, I will be using the Production Suite, which Dolby describes as “for engineers, sound designers, and others who use Dolby Atmos Renderer software in-the-box (on a single computer) for editorial, premix, and sound-design workflows” (*Dolby Atmos Production Suite v3.4 Quick Start Guide* 5). I will be creating a three-track EP that will be mixed down in Dolby Atmos. The EP will include electronic music, which is a genre well suited to being mixed in Dolby Atmos. Remember that Dolby Atmos is an object-based audio technology. I can take bass lines and synth melodies and place them in specific locations. I can have drum instruments hitting in all sorts of different directions. I can also have vocals or back-up vocals be placed in

different directions. In a sense, that 3D space that Dolby Atmos creates for me to mix in will become an unknown territory for me to explore: an open canvas for me to paint. The possibilities will be endless. I chose the genre of electronic as a whole, in which I will include hip hop elements as well, because, to me, it has the most freedom when it comes to sounds and location.

When I began to work in Dolby Atmos I had already imagined the type of music that would have worked perfectly. Electronic music was my first choice then came the question of what genre within that will work hand in hand with Dolby Atmos. I began to question each genre and subgenre within electronic music. I came to a conclusion that techno and its counterparts will work amazingly with Dolby Atmos. Techno music as a whole can be considered to have a repetitive four-on-the-floor beat, which is a kick drum that hits every beat in a 4/4 time signature. Drum machines, synthesizers, and sequencers are free to be used when producing techno. There are a number of subgenres that come from techno such as minimal techno, acid techno, and ambient techno. I believe that techno is best suited for Dolby Atmos because of its progressive and repetitive nature. Dolby Atmos will let me place my objects wherever I need them to be placed.

The first track is going to be an introduction to Dolby Atmos. The main component of this track will be an ambient atmospheric sample. Also, the track will have a slow piano chord progression playing throughout the song. There are very minimal drums in this track because I didn't want them to clash with the sample that I'm going to use. The second track is going to be a groovy techno track. I will be placing a deep immersive kick and bassline that will be heard all throughout the space and melodies that will come off the ground and towards the top. The third and final track will be a dark techno track. It will be significantly louder than the groovy techno. It

will have a bass line that will be playing throughout the track. I also will be using vocal samples as well. I want to immerse the listener into a dark space with music. I think I can achieve this through Dolby Atmos. I will be mixing down in headphones, and this EP will preferably be heard in headphones.

### **Track One “Patience”**

The first track of the EP is an introduction to what Dolby Atmos is capable of. This track will be the most minimal of the four. I wanted to create this song to use the full effect of the Dolby Atmos Renderer and the Dolby Atmos Music Panner. I went with an electronic atmospheric/chill genre for the intro song. Atmospheric music tends to bend the rules of music theory and just flow. There is more emphasis in tone and atmosphere than regular music that has structure and rhythm to it. The purpose of this song is in fact to serve as an intro to the full EP. The music that I produce always tends to sway to calmness and happiness. In a sense this three-song EP will be an extension of how my feelings are portrayed deep down. From the beginning I knew that with “Patience” was going to be something calm. I was listening to ambient music and other downtempo music to get inspiration.

As “Patience” is an introduction to Dolby Atmos, I decided to keep it simple and not make it too complicated when listening to this song. I started to mix each object one by one to get a good sense of the space that I was mixing in. I started off with the ambience sample object that I have been playing throughout the song. While mixing in Dolby Atmos the Music Panner is going to be the key component in placing my object in the space. The sequencer that is implemented with the Panner does a wonderful job in sequencing where I want the sounds to be

placed or move them in different directions. When I turn on the sequencer it gives me the option to either free draw it, use a straight line, use elliptical paths, or use rectangle paths. With the ambience sample I chose to draw in a circle around the space. The sample will be rotating within the song. The second object that I mixed was the piano. I didn't use the sequencer on the piano because it's not a constant sound that plays throughout the song. Since I was mixing in stereo I have two channels to work with. In the Dolby Atmos Music Panner there is an option that lets me mirror the object. I placed the piano object slightly to right in front and slightly to the left in the back. One of the features that sets Dolby Atmos from all of the other ambisonics programs is that it lets me go in the Dolby Atmos Renderer and change the binaural render mode from near, mid and far. If I chose the near option the object will sound near within the space. If I choose mid then the object will be placed in a neutral state where I could hear the sound clearly. Finally, the far option will let me place the object as if it were sounding far away in the space. I went with the near option for the piano object. The next track was a synth object that I mirrored as well and had go around the space in a rectangle path. I also set the binaural render mode to far, and I placed the synth object above all of the other sounds. I did by turning the Z parameter all the way up. The next track that I mixed in Dolby Atmos was the plucks synth object. I use the sequencer to sequence straight lines that will allow the object to travel side to side. The vocal sample object was sequenced to go around in a circle.

## **Track Two "Un\_Broken"**

In song number three, “Un/Broken,” I went with the subgenre of groovy techno. This track has an uplifted melody, a funky bassline, and powering drums. In this track the drums and other percussion instruments are all placed in different places in the Dolby Atmos 3D space. I had a clear vision where I would like to place the melody and the bassline. They will be “colliding” or to say feeding off of each other.

With the introduction for Dolby Atmos done within “Patience,” I went ahead and pushed some boundaries with “Un\_Broken”. I started mixing the drums objects with this track. This techno track has two kicks. One is louder than the other. The one with less sounds acts as a support for the louder one. I placed one of the kick objects behind the listener. From the beginning I didn’t want the drums to clash one another so I placed the objects all around the three-dimensional space. I kept the snare and the tambourine objects where the listener will be able to hear them properly. Also, I didn’t add any sequences to them. The next objects that I mixed were the three bass objects. I stacked each track above each other starting with the sub-bass at the bottom then working my way up to the loudest bass track object. I sequenced four different circles in the Music Panner. One was positioned close to the listener, and then I kept expanding wide with each circle up until the edge of the space. The next thing that I mixed was the synth lead objects. I placed these objects up on top of every other object. The last object that mixed was the FX riser. I sequenced a line that will start at the from the back and ends in the front. I placed the FX track in as if it were to come at the listener really fast and then end in the back of the listener.

While mixing this track I was able to find out more about how Dolby Atmos works. When mixing in Dolby Atmos you really need to pay attention to the volume both in the Dolby

Atmos Renderer and the DAW that you are using. The DAW I used to mix was Avid's Pro Tools. I had to make sure that it wasn't getting too loud within the Renderer and if it did I had to go into Pro Tools and mend the volume from getting too high.

### **Track Three "Rooted Darkness"**

The last song is in a genre that I thought I would never be producing, which is dark techno. I wanted to produce something that would be different from what I make typically. I tend to make electronic music that has a type of structure of music that goes well with empowering and energetic melodies. With dark techno, I am going to immerse the listener in a space they never been before. I am going to take the space that the Dolby Atmos Renderer gives me and turn it into a dark space. The vision that I have for this track since the beginning of choosing techno was a dark club room with this song playing. The deep bass lines will be placed and sequenced in a circular pattern in the Dolby Atmos Music Panner. Also, the drums will be placed close to the listener in the Music Panner.

With this track I took notice of the binaural render mode within the Dolby Atmos Renderer. This option allows me to either set the object to be near or far with the Dolby Atmos three-dimensional space. I started to mix the main bass object first. There aren't many objects in this track, so I chose to keep it simple with the mixing. I sequenced a circle around the space. So, the main bass object will travel in a clockwise pattern. Then came the vocals object. There is a distorted vocal and a chanting "Go" sound that I placed within the track. I sequenced a line for the "Go" object that will let the vocal sample object travel across vertically. I didn't sequence anything to the distorted vocal object; instead I mirrored the X trajectory and then placed the

objects where both vocal samples wouldn't clash with each other. I continued with the drums. I placed the six drums objects above each other in the three-dimensional space. I did place two hi-hat objects with one next to the left ear and one next to the right ear. The binaural render mode does an important job when dealing with far and near objects that are in the three-dimensional space.

## **Conclusion**

All in all, I see Dolby Atmos leading the way of how we listen to audio. Dolby Laboratories have always pushed the boundaries of sound and it won't stop with just Dolby Atmos. The history of Dolby Laboratories shows that they are able to push forward and Dolby Laboratories have created a division that mainly focuses on music with Dolby Atmos at its side. Streaming services such as Amazon Music and Tidal have already adapted Dolby Atmos Music and are streaming music that can be heard through Dolby Atmos compatible devices ("Music in Dolby"). Amazon also has its own device, Echo Studio, compatible with Dolby Atmos. At the current time the only way that someone would be able to stream Dolby Atmos Music would be if they have a device that is enabled with Dolby Atmos, plus a streaming service that offers Atmos Music, and music that has been mixed in Dolby Atmos.

With the use of the Dolby Atmos Renderer and the Dolby Atmos Music panner, audio engineers are re-mixing popular songs that can be listened to in Dolby Atmos. With devices being made that will let listeners experience Dolby Atmos, Dolby Laboratories are also sending out encoding and mastering tools that will help other streaming services such Netflix, Disney Plus and HBO Max be compatible with Dolby Atmos. In the meantime the only way that Dolby

Atmos will work with these streaming services is if the listener has a TV or attached sound system that is compatible with Dolby Atmos. Dolby Laboratories will still push their capabilities so that everyone can experience Dolby Atmos.

There are still things that can happen in the future for Dolby Laboratories and Dolby Atmos. Dolby Atmos might not be for everyone, but I believe that Dolby Atmos can be used to its fullest potential within cinema and especially music. I think one of the main reasons why artists are not making more music in Dolby Atmos is because not a lot of people have the devices necessary to experience Dolby Atmos at its peak. I believe that at some point in the future newer devices will replace the old ones and at that point in time Dolby Atmos will be experienced everywhere: TV, streaming services, speakers, phones, headphones, and even cars. Dolby Laboratories will always be pushing boundaries to innovate how we listen to sound and Dolby Atmos will push those boundaries further.

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