HARMAN Luxury Update - DECEMBER 2022

Happy Holidays

By David Tovissi

Vice President and General Manager
HARMAN Luxury Audio

As we close out a very successful year, I've spent the past few days reflecting on what we accomplished together in 2022. The year kicked off with COVID still preventing most of us from getting together at CES in Las Vegas. Once again, we were forced to launch our latest NPIs without an audience reacting to them in person. We were anticipating the industry's reaction to our 50th Anniversary ML-50 Limited Edition Monaural Amplifier and were stoked to be able to play them for our customers and the press but that never happened because we once again reverted to a virtual HARMAN Explore event.

We also introduced our first premium wireless headphones designed and engineered by the Luxury Audio Group. We were fortunate enough to send out 50 of the Mark Levinson N5909 headphones to reviewers across the globe prior to CES for them to try out and review. Their reactions to these luxury headphones were unanimous - they all stated that the N5909s were the best sounding over-the-ear wireless headphones they had ever heard. That was not a surprise to us since we collaborated with the HARMAN X team to develop them. We designed the headphone to measure as closely to the HARMAN Headphone Curve as possible without any DSP. The results of our drive for perfection were recognized during and after CES. We received many Best of CES Awards for the Mark Levinson N5909 and are still receiving accolades from everyone who has reviewed them.

Another product we announced in January 2022 was our first ever Active Studio Monitor for the home. The amazing JBL 4305p started shipping later in the spring and was the highlight of the High End Show Munich in May. The show in Munich was really the first time that most of us were able to meet face-to-face at an event in several years. So it was exciting to watch the expressions of those who came to our stand to listen to our products. The JBL4305P won the hearts of the attendees on Press Day, Dealer Days and most importantly the weekend days that were open for the public.

The excitement of the High End Show Munich gave us the affirmation that our products were special. It also pushed us to have other industry leading products for the next trade show we would be exhibiting at, late September's CEDIA Expo 2023 in Dallas, Texas. This show was the first chance for many of our systems integrator partners to see our JBL Synthesis Flagship loudspeakers and subwoofers. The SCL1 and SSW1 display at the front of our booth was one of the most frequented places where attendees would stop and take a selfie of themselves next to the display before getting in line for the two demo rooms.

Experiencing the breathtakingly immersive sounds of our JBL Synthesis demo rooms delivered a great experience to attendees. It was fun watching the expressions on the faces of those coming out of the demos. Top Gun Maverick was released for download on our Kaleidescape players just in time for CEDIA and the scenes from that movie brought back memories of watching the original Top Gun movie at CES in the early 80s. Everyone came away totally blown away by our reference cinema presentations.

This year at CEDIA Expo we also launched the JBL Stage 2 series of architectural loudspeakers and the Stage XD line of Extreme Durability loudspeakers. Both of these introductions were welcomed by the attendees and the products are now shipping and available in warehouses across the globe. The Stage 2 Architectural loudspeakers pack a lot of HARMAN proprietary technology at very affordable price points. They expand the portfolio of JBL architectural speakers and provide dealers with confidence and now, budget flexibility in proposing and installing JBL loudspeakers into their projects.

After CEDIA our team participated in several regional shows including the famous Tokyo International Audio Show. We were well represented at that show and came home with several awards including the Grand Prix Award for the Mark Levinson ML-50 Monaural Amplifier. It was a great way to close out the year of celebrating Mark Levinson at 50.

Oh, by the way, we just received our first production of the Mark Levinson at 50 hard-bound luxury collector's book which documents the history of the brand and the many iconic products that we have introduced to the audiophile community over the past five decades.

Later in this newsletter you will hear from Jim Garrett about what to expect at next month's HARMAN Explore which will be the centerpiece of our CES 2023 experience in Las Vegas. I am proud of the fact that HARMAN Luxury Audio will be leading the company in new product launches at this year's event. If you are attending CES 2023, make sure you register to attend HARMAN Explore at the Virgin Hotel and Casino. We would love to show you what we have been working on during the pandemic. Here is the link to register for HARMAN Explore.

Thank you for making 2022 a memorable year for all of us at HARMAN Luxury Audio. Have a great holiday and a prosperous new year.

What's New

HARMAN Explore 2023 Luxury Audio Preview

By Jim Garrett

With the holiday season now upon us and a very successful calendar year 2022 coming to a close, I would like to give our newsletter readers a sneak peek of what we have in store for you in 2023. Our HARMAN Explore event is back in person after a three-year hiatus and is taking place in Las Vegas January 4-7, 2023, running concurrent to the Consumer Electronics Show (January 5-8). In preparation for the big show, the Luxury Audio team has been hard at work preparing to kick-off the New Year with some very exciting new product announcements! While we can't share too many details in advance of the press releases dropping on January 4th, I can give you a high-level overview of what we have planned.

The Luxury Audio portion of the Explore exhibition consists of four demonstration rooms and two additional areas where we will be showcasing a variety of our award-winning audio products. In these spaces, we'll be announcing seven new JBL products for 2023 across three different product families.

Announced last January at our virtual Explore event, the JBL 4305P Studio Monitor powered bookshelf loudspeaker system has won numerous accolades for "Best Wireless/Powered Loudspeaker" through-

out 2022. If you've had the chance to give it a listen, I'm sure you understand why it has generated so much excitement this past year. As the smallest and first powered model in the Studio Monitor range, the 4305P brings a lot to the party along with its passive stablemates, the 4309, 4349 and 4367. For 2023, the range expands again with an exciting new model that takes performance to the next level. You'll find this product both in the Studio Monitor demo room and in the JBL Lounge within our Luxury Audio space.

The JBL Classic Series – led by the iconic L100 Classic loudspeaker – was on a roll again in 2022 with the addition of the first all-in-one powered loudspeaker taking its place as a multiple award-winner alongside the passive models. The L75ms music system offers a wealth of wired and wireless connectivity to suit a variety of applications from music, to video, to gaming, and does so in an attractive retro design that echoes historic models like the JBL Paragon from the 1960s. And let's not forget the limited-production Black Edition models that were announced in September of 2022. These are now heading into production and bring a sophisticated new look to the Classic Series models L100, L82, L52 and L75ms. All four can be found in the JBL Lounge at Explore 2023.

New for 2023, the Classic Series will be expanding with a complete range of electronics sporting a timeless retro design based on the JBL electronics models from the 1960s. As part of this family, the SA750 integrated amplifier will be making a return as a regular product model sporting wood side panels in the same natural walnut veneer as used on the loudspeakers. We'll also be introducing a model that will provide a solid foundation for the rest of the loudspeakers in the Classic Series, as well as the Studio Monitor range. We think you'll love what you'll see with the expanded model lineup for 2023.

One of the most exciting announcements will be found in our JBL Lounge and is what we are calling a "luxsumer" product. It's a crossover that ties old school with new school and is perfect for music lovers young and old. It's the ideal companion to a wide variety of JBL products from portables, to soundbars, to Party Boxes, and our Luxury Audio loudspeakers and electronics. We can't wait for you to see this one and take it for a spin!

In addition to these exciting new JBL products, our space includes a JBL Synthesis immersive audio theater room and a Mark Levinson showcase with our award-winning wireless headphones and a reference two-channel system based on our 50th Anniversary ML-50 monaural amplifiers.
If you'll be at our event, I look forward to showing you these products in person. For those not coming to Las Vegas, stay tuned to our Newsletter site for more information on the new products and a recap of the show.

From The Audio Files

JBL L75ms Integrated Music System | Soundstage! Network Product of the Year 2022

The JBL L75ms has landed on another prestigious Product of the Year list! SoundStage HiFi has included the L75ms as one of their Products of the Year 2022.

SoundStage Products of the Year 2022

Training Tips

Training Module Updates December 2022

By Kevin Kent

New Product Launches Mean New Learning Modules for Early 2023
Stay tuned, and be sure to watch your inbox for new learning module announcements coming from the HARMAN University right on the heels of #HARMANEXPLORE/, the Consumer Electronics Show from Jan 4-7. We have several new trainings to launch around the numerous product launches. The trainings will highlight our latest innovations blended with the great sound and performance that we know you will appreciate. We are very excited for you to find out and learn about these newest product offerings.

In the January edition of the newsletter, we will provide a recap of 2022 and highlight some of the feedback we received from the post-training surveys. Your voice is critical for us to improve our training content, and we're grateful for your feedback.

"Wishing everyone a happy, healthy and safe New Year" – HARMAN University Team

As always you may access all the training courses by clicking here.
Once you sign in, if these courses are not populated on your home page, click "Go to Courses" to sign up. Stay tuned next month as more training becomes available.

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Meet The Team

Meet the HARMAN Luxury Audio Team

Name: **Matthew Herman**
Position/Job Title: **Luxury Audio Project Manager, Loudspeakers**
With HARMAN Since 2022

With Meet The HARMAN Luxury Team, our goal is for you to get to know us better. In each edition we feature a different member of the team, and this month it's Matthew Herman, Luxury Audio Project Manager, Loudspeakers.

How would you describe what you do in your current role?

I am a project manager for the Luxury Audio group within Harman. I work with extremely talented teams to successfully launch products against on-time, on-cost and on-quality metrics.

What did you study in school? Did you always imagine yourself doing something like what you're doing now or did the fates just take you in that direction?

Early in my career, I realized I had a passion for working with product and people; I was determined to find a career that supported this. In college, I studied Apparel, Merchandising and Management with a focus in product development and commercialization. After graduating college, I have held jobs as a Product Development Manager and Program Manager for tech and non-tech companies. I am where I am today, because HARMAN supports my passion for developing exceptional products and working with and leading talented teams.

How did your career path lead you to HARMAN?

My experiences and skills in program management and genuine love for technology and audio has led me to HARMAN. I'm so thankful for my journey and excited for the future.

What is the most important thing you have learned over your career?

The most important skills I've learned in my career are to be calm in chaos, to dive into the details, and to be champion for the team and organization.

Any other advice you would share with people just starting out in this industry?

Absorb everything, ask questions, and reflect on daily learnings.

What are you most proud of in your life?

I'm proud of my educational and post-college work experience. I've learned that with passion, a positive attitude and a strong sense of ownership, there's no limit to what we can achieve.

When did you realize you had a passion for music or audio? Was there any one band, song, or movie that did it for you?

I knew I had a love for music at an early age - I remember my grandfather playing the piano while I sat next to him. He taught me a lot about music and was the catalyst to my appreciation and interest in music.

What current technology impresses you the most?

I'm fascinated with Internet of Things (IoT) and SmartThings technology and how we as consumers utilize these technologies. Also, I love cars, so technology regarding the future of the automobiles and transportation interests me.

Favorite music genre?

I like most all music genres, but I'm a sucker for pop-punk.

The desert island question, of course. If you were marooned for eternity and could listen to only three albums, what would they be?

Blondie - Parallel Lines
Guns N' Roses – Appetite for Destruction
The Cure – Three Imaginary Boys

You have the floor. In closing, tell us anything else you want us to know about yourself.

I'm very thankful and excited to be here, also I'm looking forward to working and getting to know you

all!

Tech Talk

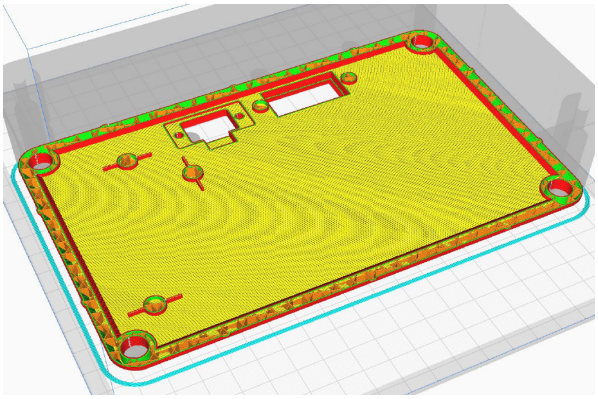
Additive Manufacturing in Speaker Development

By Erik Lundin, Sr. Mechanical Engineer

Traditional machining creates parts by removing material from a piece of stock or blank. This allows for very fine tolerances, from a large selection of materials. For the past 60 years, computers have been able to control milling machines, lathes, routers and more, to repeatably produce parts with complex 2D and simple 3D geometries. Cheap access to computing power, especially during the 1980s, allowed ever more complex and compact systems. Even with modern multi-axis machines, however, parts with internal geometries and undercuts remain very difficult to produce.

This is where additive manufacturing, often colloquially referred to as 3D printing, comes into play. The

ability to very rapidly and inexpensively produce complex parts has entirely changed the world of research, product development and production. Parts which could not be made in the past are not only possible to create now, but they can be created on a desktop in a matter of hours. Parts with internal voids which would've required the welding of an assembly of complex individual parts can be created hands-off. Even parts which were not possible to create in the past, such as parts with hollow walls, are common. The picture here shows an enclosure where the walls are hollow but filled with an automatically generated mesh of thin ribs for an incredible strength-to-weight ratio.



The pipeline for prototyping a part begins with an engineer creating a 3D part in software. But from there, additive manufacturing has greatly streamlined the process. Entire sets of 2D drawings detailing specifics about the parts to be produced, as well as tooling, can usually be bypassed entirely if the part is to be printed.

Then and Now

While the idea of depositing a flowing material through a computer-controlled nozzle and then hardening it has been around since 1945, it remained largely in the realm of science fiction until the 1970s and 80s. Initially, ideas included using XYZ plotters to deposit UV-cured thermoset polymers, selective sintering of powdered metal, and systems which work very similarly to inkjet printers. Early stereolithography machines, which use selective curing in a bath of photosensitive polymer to create a part layer-by-layer before hardening, has been around in limited use since the early 1980s. Modern machines, often referred to as resin printers, are widely available today and are very useful for small parts, or ones that require very fine surface resolution. In such a printer, a print bed is suspended near the surface of a vat of resin. Light is used to partially harden a layer of the part before the bed is lifted up out of the resin. A new layer is hardened and the process continues. Once the part is done, it is cured by exposure to UV light. By the early 1990s, Fused Deposition Modeling machines became more readily available. These deposit a thermoplastic filament through a high temperature nozzle in a layer which hardens as it cools before the next layer is deposited on top of it. Modern ones have much greater precision, and the ability to print many types of plastic, but work in largely the same way. The most popular current materials for FDM are PLA and ABS. PLA, or polylactic acid, is a renewable polymer once mostly used for temporary parts. It can be printed at relatively low temperatures, but is not as durable as some other plastics. Recent advances in composition have led to a rise in popularity of PLA, even in production parts. ABS stands for Acrylonitrile Butadiene Styrene, and is a widely used commodity plastic, found in millions of household items.

Idea to FDM Prototype

Once a 3D model has been created in software, it goes through an additional software process called slicing. This process is mostly automated and involves dividing the 3D model into a stack of 2D shapes, each the thickness of the deposited material. The first layer is printed either directly on a print bed, or onto a disposable sheet which provides adhesion for the material without the risk of sticking during removal.

Because the next layer must be printed on top of a previously printed layer, it is sometimes necessary for the slicing software to create temporary structures, known as supports, which will be removed once

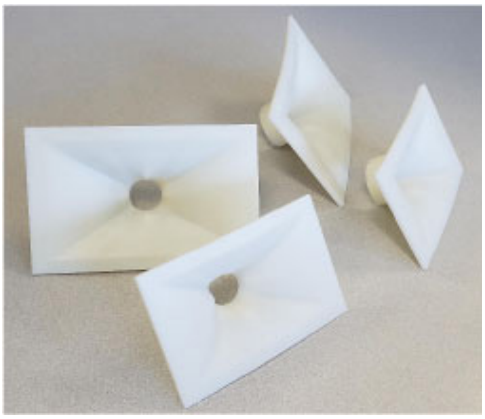
the part is finished. Some printers are equipped with dual print heads, so that the supports can be printed out of a material that disintegrates in solvents which don't affect the main material.

On single-nozzle printers, the shape of the supports is designed such that they don't adhere well to the main part. Weak points are intentionally created which can be leveraged after printing to simply break the supports from the part. To the extent possible, parts are designed and oriented to minimize the use of supports.

Once the part is printed, and any supports are removed, we are left with a functional plastic part which can be sanded, painted and treated just like any finished plastic product. While the rapidly dropping cost of microcontrollers and electric motors have driven an incredible boom in hobbyist use of both FDM and stereolithography machines, additive manufacturing is here to stay in product development. As part of the development of high performance speakers, the process of perfecting components for which the physical characteristics are vital to their function was once long, expensive and sometimes a road block between ideas and a final product. Now, what once took weeks or months can be done in hours or days, allowing many more iterations of a design along its path to becoming a reality.

Real World Applications

Our first example is a tweeter waveguide. The prototyping process started with a series of surfaces generated by an Acoustic Engineer using proprietary software. These surfaces were exported as a set of lines which define the boundary surface seen by the sound waves as they leave the tweeter. In CAD software, features were created which would hold the tweeter in place in this waveguide. The surfaces were generated using the previously mentioned lines, and structures were added which would hold the waveguide in place in a testing environment. Once the 3D model was approved, it was ready to be sliced and sent off to the printer.



The parts in this case were ready the next day, but production time can vary from a few hours to several days, depending on size. Because the waveguide contains many small features, it was printed on a Stratasys polyjet printer, which uses a hybrid technology between FDM and resin printing to produce very smooth surfaces at high resolution.

The part was cleaned off and could then immediately be tested and evaluated just like a production speaker. Testing found that there were improvements to be made, and thanks to our ability to do the 3D printing in-house, these changes could be almost immediately tested.

Our second example is an entire speaker cabinet for a product which was going to be produced from injection molded ABS. While a 3D printed part made from ABS will not have exactly the same physical characteristics as its molded equivalent, it did allow us to evaluate many important factors in the design.

One of the critical factors to both molded ABS parts and speakers

is the stiffness of the walls. Plastic molding allows much thinner walls than traditional wood cabinets, but great care must be taken in shaping the cabinet in ways that make it inherently strong. A common addition to the walls of a molded part is a network of ribs which can act to stiffen a wall with the minimum amount of added weight.

The fast turnaround of a large, traditional FDM machine allowed us to print several iterations of the cabinet with different rib configurations. Testing could then proceed both for audio quality and mechanical properties.

Summary

While none of this can take the place of simulation, it allows a progressively better understanding of both the strengths and the limitations of our simulation technology. It also allows us to verify results and ensure maximum performance well in advance of actual production. Never before have we had such an abundance of evidence of how our work is going, nor has it ever been more direct and immediate. There is no perfect speaker, but in our pursuit of making the right compromises, the ones that give you the best possible sound, we will continue to let evidence light the path.