

An Interview with Yoav Geva of YG Acoustics

Laurence Borden

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INTERVIEWS

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Yoav Geva

LB: Yoav, welcome to dagogo. Please begin by telling us how you first became interested in audio.

YG: Thanks for the opportunity to address Dagogo readers! To your question, I come from a musical family: My father is a bass-guitar player, my brother an opera singer, and I play keyboards; so music was a big part of my life for as long as I can remember. During my upbringing, "Kid-friendly" light-classical concerts were a staple, and audio was a natural extension thereof, because listening to records together as a family was the next-best thing.

LB: Many new audio companies begin as an extension of do-it-yourself effort by the designer. In contrast, YG Acoustics burst on the scene in 2002 with sophisticated designs and manufacturing. Did you have a background in manufacturing? What other events helped the launch?

YG: My background is actually software. YG Acoustics' first, and perhaps still most important, invention was a crossover-design algorithm, which has evolved over the years into our now - famous DualCoherent™ crossover technology. I originally developed this algorithm for my DIY speaker projects which I had been building as a hobby. The algorithm ended up working far better than expected. Back then, in the early 2000s, I was still living in Israel. So, I submitted my invention to a contest held by Israel's Ministry of Industry. I was fortunate enough to win, with what the contest's committee called a "bizarre yet intriguing application," and received a government - grant to start my company. The expertise in manufacturing actually came second, and took many more years to develop.

LB: Let's turn to speaker design. A speaker consists of three main elements: the cabinet, the drivers, and the cross-over. In designing a speaker, do you begin with one element and design the others around it?

YG: Actually, I start a design by defining the goals, and then work simultaneously on all three elements to achieve it. Producing everything in-house gives my team and me the flexibility to optimize and improve all elements at once. For instance, if we find a problem with a driver while designing the crossover for it, then we can further optimize the driver and eliminate the problem at its source, rather than attempt to "cover it up" with the crossover. This is significant because any "cover-up" would always have negative side-effects. At YG Acoustics' performance-level, the careful listener both deserves and expects a thoroughly optimized design without such compromises.

LB: The role of the cabinet is to securely house the drivers, and dissipate unwanted energy. There are of course numerous approaches to achieving the dissipation of energy. At one extreme are so-called resonant cabinets, which are often described as functioning like musical instruments; at the other end are cabinets that are rigid, massive, and relatively inert. What factors guided your approach to cabinet design, and what elements - if any - proved to be especially important?

YG: There are numerous approaches, but if one examines today's ultra-high-end leaders including YG Acoustics, the rigid approach prevails and for good reason. The logic is that whereas a musical instrument must resonate to have its characteristic sound, these resonances are already included in the signal as recorded by the microphone, and therefore are already included in the recording. On the other hand, a speaker that plays back this recording should not add its own resonances to the sound, because they have nothing to do with the recorded instrument. Instead, the speaker should reproduce only the real instruments' resonances by being true to the recording. Currently I am proud to say that in this category our YG Acoustics Anat III is the "quietest" speaker that we've yet measured, and represents the current state-of-the-art. An additional important parameter in cabinet design is eliminating friction: The air inside the cabinet should act as a near-ideal air-spring. This low-friction property, technically known as QL, has long been accepted as a critical parameter in cabinet design, but has posed a serious challenge to designers. The reason is that low friction means good air-flow, which in turn means fewer internal braces to block the air. However, braces have long been used by designers to increase rigidity and eliminate resonance, which creates a conflict. YG Acoustics' solution is to improve rigidity through highly-optimized geometry with extremely tight tolerances and better materials, thus avoiding the need for excessive bracing. Thanks to this approach, I am proud to say that currently not only is the YG Acoustics Anat III the least-resonant speaker that we've measured, it's also the lowest-friction one. That's why our speakers sound open and natural, free from "boxiness."

LB: It is generally agreed that an "ideal" speaker (a theoretical concept) would be a point source. Multi-driver speakers deviate (or have the potential to deviate) from this ideal in a number of ways: lack of flat frequency response; phase issues; uneven dispersion / power spectrum; disparate distortions; amongst others. How do these parameters influence the design of your drivers and cross-overs?



Anat III Professional

YG: You are absolutely correct, but only if the room were an anechoic chamber, only if the speaker were of microscopic size, and only if the recordings were mixed for playback in an anechoic chamber. Of course, in practice none of the above is ever the case, so things become more complicated. Please let me illustrate this: The recording already includes the concert-hall's acoustics and wall-reflections, so if one has a theoretically-ideal omnidirectional point-source speaker in their room, then it adds the listening-room's back-wall-reflections to the sound. One ends up with two different rooms' acoustics melded together and played - back at once. Not surprisingly, this is completely unnatural and thus sounds nothing like live music.

Therefore, the speaker must be optimized very carefully to avoid all of the problems that you correctly mentioned, but it must be done in a way that works in practice rather than only in theory. What we do in our design process is create a speaker that acts acoustically as if it were a near - point - source, but with uniform yet controlled dispersion. Minimizing relative - phase between drivers through both mechanical time - alignment and an accurate-phase crossover is key, as is keeping dispersion uniform and distortion low. Our uniquely - optimized DualCoherent™ crossover driving our BilletCore™ and ForgeCore™ drivers currently comes as close to the goal as we've measured from any design so far. Nonetheless, this is a never - ending quest for perfection, and the audio industry is still quite far away from a comprehensive solution.

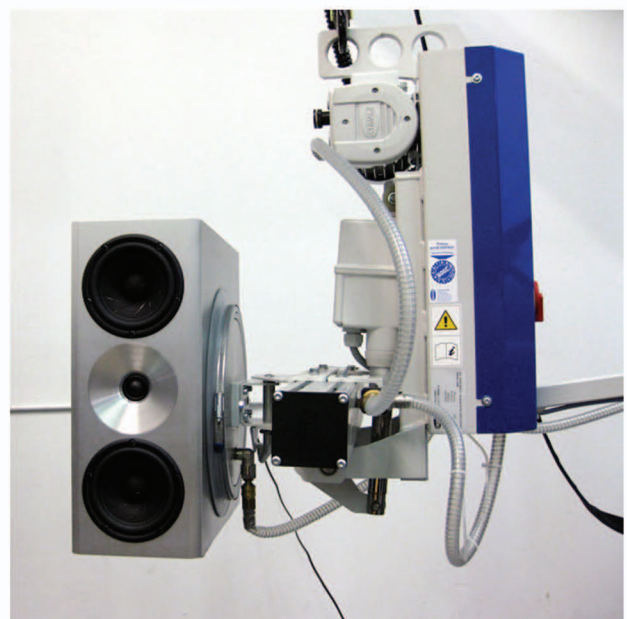
LB: As you mentioned, we do not listen to our audio systems in an anechoic chamber; the room is thus an inevitable part of what we hear. There are various ways one can deal with this fact. Some speaker designers favor near-field listening so as to minimize room contributions. Others feel that a smooth off-axis response is critical, so that the reflected sound has the same or similar tonal characteristics as the direct sound. What are your views on this subject, and how do you incorporate them into your speaker designs?

YG: When dealing with room acoustics, I would distinguish between two issues: dealing with standing-waves in the room at low frequencies, and obtaining an even in - room power-spectrum in the midrange and upward. Standing-waves vary substantially between rooms, and can be extremely powerful at low frequencies. The more full - range the speaker, the more room-modes can be excited by it. For this reason we supply our full - range models, Anat III and Kipod II, with active bass modules that are adjusted to the room's acoustics by our authorized installers. Only this type of adjustable, practically customized solution for every room, can keep powerful standing-waves under control.

In the midrange and upward, the key is that the in - room power-spectrum is a sum of two signals: the direct sound that goes directly from the speakers to the listener's ears, and the reflected sound that hits the room's surfaces or objects in the room before reaching the listener's ears. The uniform yet controlled dispersion that YG Acoustics uses is the best solution here, since it addresses precisely the two considerations that you have mentioned in your question: It keeps room contributions in check, and whatever reflected sound exists has similar tonal characteristics to the direct sound.

LB: YG Acoustics places considerable emphasis on measurements, which form the basis for your controversial claim of manufacturing "the best speakers on earth. " While few dismiss entirely the role of measurements, many feel - rightly or wrongly - that measurements don't tell the entire story. And of course many like to bandy about the famous "If it measures good and sounds bad, it is bad. If it sounds good and measures bad, you've measured the wrong thing." Please share with us your view on measurements, and how they guide your designs.

YG: I'd like to split my answer into two. First, regarding our statement that we make the best speakers available, what matters is not what we state, but rather what the listener thinks after auditioning our speakers. I'd like to use this opportunity to invite each



Vacuum lifters handle speakers at the YG Acoustics factory to prevent scratches

and every one of your readers to listen and form their own opinion.

Second, regarding measurements: At YG Acoustics we view measurements as the scientific tool that helps us improve the design, and listening as the best tool to know whether we've measured everything. No measurement will tell you whether you've measured everything; for that we need the ear.

The key to our approach is how we solve conflicts between measurements and sound when they arise. Rather than take the easy way out and choose the better - sounding option without making any attempt to understand why it sounds better, we run a much more thorough process: We conduct research until we fully understand why one option sounds better, and find a new measurement that explains it completely. We then find a solution that improves on both original options, both in sound and in measurements. It's a more tedious process, but the end-result is always worth it, both sonically and scientifically.

In summary, my employees often hear me use a different saying when we conduct research: "If it measures good and sounds bad, it needs improvement. If it sounds good and measures bad, it needs improvement. Only if both are good, we should dare offer it to customers."

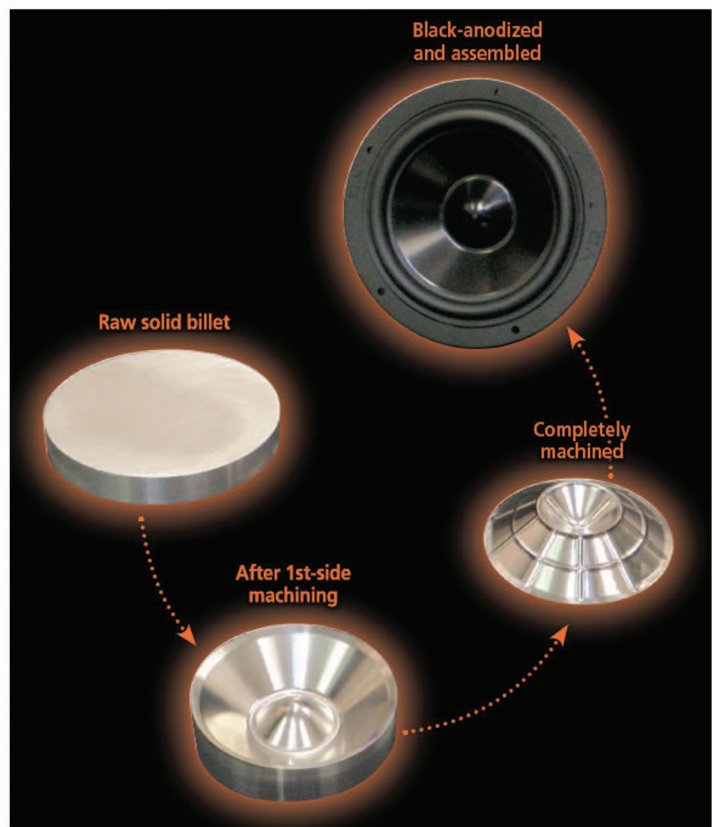
LB: A complaint against YG Acoustics speakers, in particular your earlier models, was that they were "analytical." Do you feel that there was any validity to this? Did it influence the development of your new drivers? And a broader question: If the role of a speaker (or for that matter, any audio component) is to accurately reproduce what is on the recording, what accounts for the sense of a component being analytical?

YG: My experience has been that every generation of speakers that we launched was the finest speaker available at its time. But there is no question that technology improves over the years, so I'd like to invite any reader who may have heard our early products as analytical in the past to revisit and hear what we can do with today's technology.

The underlying reason for improvement is continuous research: Thanks to our new made-in-house BilletCore™ and ForgeCore™ drivers we are now able to optimize frequency-response, phase and distortion all at once. Thus, our current designs have the lowest distortion that we've measured from any speaker, while preserving the excellent frequency - response and phase that we've always been famous for. The result sonically is the same "you-are-there" energy of live music that has always set us apart, and now it's coupled with an even more relaxed and natural sound. To answer your broader question, the best way to create components that are natural and not analytical-sounding is to optimize phase and lower distortion. The challenge for designers, which I'm very proud to say that YG Acoustics has excelled at solving over the years, is how to do so while at the same time preserving proper tonality.

LB: A related question concerns harmonics. Some gear is said to excel at capturing the harmonic content of the music. The implication, though usually unstated, is that other gear reproduces the musical fundamentals, at the expense of the harmonics. Are there any measurements that support this hypothesis, or is it a purely psychoacoustical phenomenon? If the latter, what might account for this - an emphasis on the leading edge of notes, perhaps (is there any measurable correlate of this?), or is it a phase anomaly, or lack of flat frequency response?

YG: Typically gear that preserves both fundamentals and harmonics has a wide



BilletCore™

bandwidth and low distortion. Harmonics are higher in frequency than fundamentals, and usually lower in level. Gear that fails to preserve harmonics is gear that is bandwidth - limited in the high frequencies and/or suffers from distortion that masks the lower - level harmonics. Gear that fails to convey the energy of fundamentals is bandwidth-limited in the low frequencies and/or suffers from distortion that limits dynamics at low frequencies.

LB: Let's turn now to drivers, which many consider the "heart" of a speaker. What parameters do you consider the most important, and why did you take the costly step of manufacturing your own drivers? And please tell us more about what I believe to be your unique process of machining drivers from a solid core of aluminum.

YG: A driver must act as a near - ideal piston throughout its assigned frequency - range in order to have low distortion in that range. At the same time, it must also behave well as far outside its assigned frequency-range as possible, in order to have smooth phase within its assigned range. A good stiffness - to - weight ratio is the key to both criteria. With our current BilletCore™ midrange driver, we managed to achieve immeasurably low distortion in its assigned frequency-range, and push its breakup-modes up to 10 kHz, which is very far outside its assigned range that ends at 1.75 kHz, so its phase is also excellent.

The way that we achieved this is by machining the cone out of solid billet, hence the name BilletCore™. Unlike the commonly-used process of stamping drivers from thin sheets, machining them from solid material allows for much more complex and accurate geometries, with a far superior stiffness - to - weight ratio to any other driver that we've measured. The process takes hours per driver and requires highly sophisticated machinery, and it's completely done in-house at YG Acoustics, so it's costly. But, once one hears it there's no going back. Other drivers just "sounded broken" to us in comparison.

As far as our new ForgeCore™ tweeters go – that's a different story altogether, although the result is remarkably similar: With tweeters, the magnet-system is both the driver's motor and its enclosure. Through machining, we introduce unique YG Acoustics geometries into the magnet-system, to turn it into a better "enclosure" for the tweeter. The result is dramatically lower distortion, and a sense of ease to the sound. So in a way one could call our new tweeters a "cabinet technology" rather than purely a "driver technology."

LB: Aluminum figures prominently in your designs, being used in both the cabinets and drivers. What is so special about this element, and what other materials did you experiment with or consider?

YG: In both cabinets and drivers, the stiffness-to-weight ratio reigns supreme. Aircraft-grade aluminum has an excellent stiffness-to-weight ratio, but so do beryllium, titanium, magnesium and some ceramics among others. We've carefully considered these materials and others for various elements of the design, and some of them are actually used inside our speakers for very specific applications.

The advantages of aircraft-grade aluminum are that it is not brittle, it is safe, it can be machined to very tight tolerances, and it can be finished to produce excellent cosmetics. These four advantages allow us to produce speakers that are reliable, safe, accurate and exude luxury. In short, they work as well in practice as the theoretical design would suggest.

After measuring many materials and construction methods, we found that aircraft - grade aluminum, when coupled with pressurized assembly, produced the least-resonant solutions that we've ever measured.



Edges being polished by a master craftsman at the YG Acoustics factory

LB: The speaker-amplifier interface is critical to optimal performance. At audio shows, YG Acoustics speakers are typically paired with solid state amplifiers. Are there any tube amplifiers you enjoy with your speakers?

YG: You are correct that usually we pair our speakers with either solid-state or hybrid amps at trade-shows. At customers' homes one would find a much wider selection of amps used with our speakers, including some excellent tube designs, and our speakers are designed to work well with all of the above.

The reason that at trade-shows we tend to limit ourselves to solid-state or hybrid is two-fold: first is the plug-and-play nature of a solid-state or hybrid design, in both of which the final driving stage is solid-state. Second is the fact that solid-state equipment is a bit less sensitive to rough-handling during shipping than tube equipment, so we have more confidence that it will reach trade-shows without incurring damage.

LB: Having heard your speakers on numerous occasions, I have consistently been impressed with how tight and "musical" the bass is. Please tell us about your woofer/subwoofer goals and designs, including a discussion of the drivers, cabinet loading, and amplification.

YG: Wow, I hope you're ready for a long response. Getting the bass right involves numerous aspects of the design. First is the driver itself, where our BilletCore woofers' extreme rigidity allows them to track even the most powerful bass signals without flexing or deforming. Then there is the sealed enclosure which we use for all of our drivers, which has superior transient response and phase uniformity, especially when coupled with our Focused Elimination technology to minimize friction and form a near-ideal air-spring for the driver. Cabinet rigidity plays a big role here, to avoid unwanted vibration and keep the bass' micro-detail intact. There's also the issue of how the woofer is driven: Our custom-made bass-module amps were designed specifically for our drivers, so they intimately know the impedance curve of the load. This avoids the need for excessive negative feedback, thus keeping the bass "fast" and well-controlled, and allowing our woofer-amp combo to be characterless enough to blend seamlessly with any amp design that we've ever used on the passive Main Module portion of our speakers. Last but not least, the room-adjustability in our bass modules allow you to hear more of the speaker and less of the room.

LB: In closing , please share with us any additional thoughts about YG Acoustics, and about high-end audio in general.

YG: In 2012, YG Acoustics celebrates its 10 year anniversary. What allows us to survive and to thrive is people just like your readers, who are always interested in pushing the limits of what is achievable in the world of audio, with the ultimate goal of enjoying lifelike music at home. I'd like to thank all of your readers for their interest in music and in audio, and for their relentless pursuit of perfection. It's what keeps us in business and allows us to manufacture with pride in the U.S.

LB: Yoav, thank you for taking the time to speak with us, and for so generously sharing your knowledge. On behalf of Dagogo and our readers, we wish you continued success.

YG: Thank you, Larry, for letting me share my thoughts and make people more familiar with the "inner-workings" of YG Acoustics.



YG Acoustics Full Line