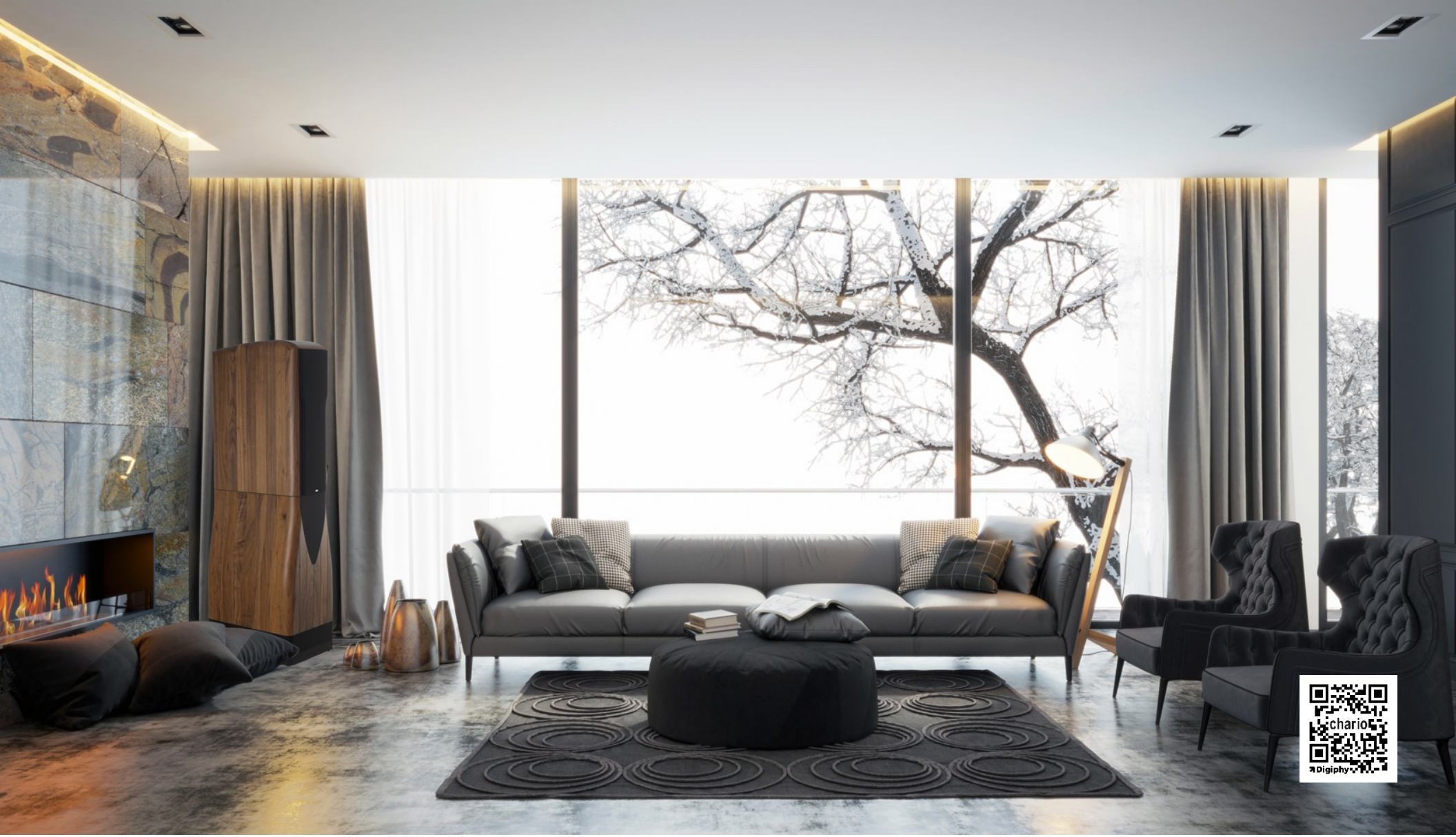

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chario

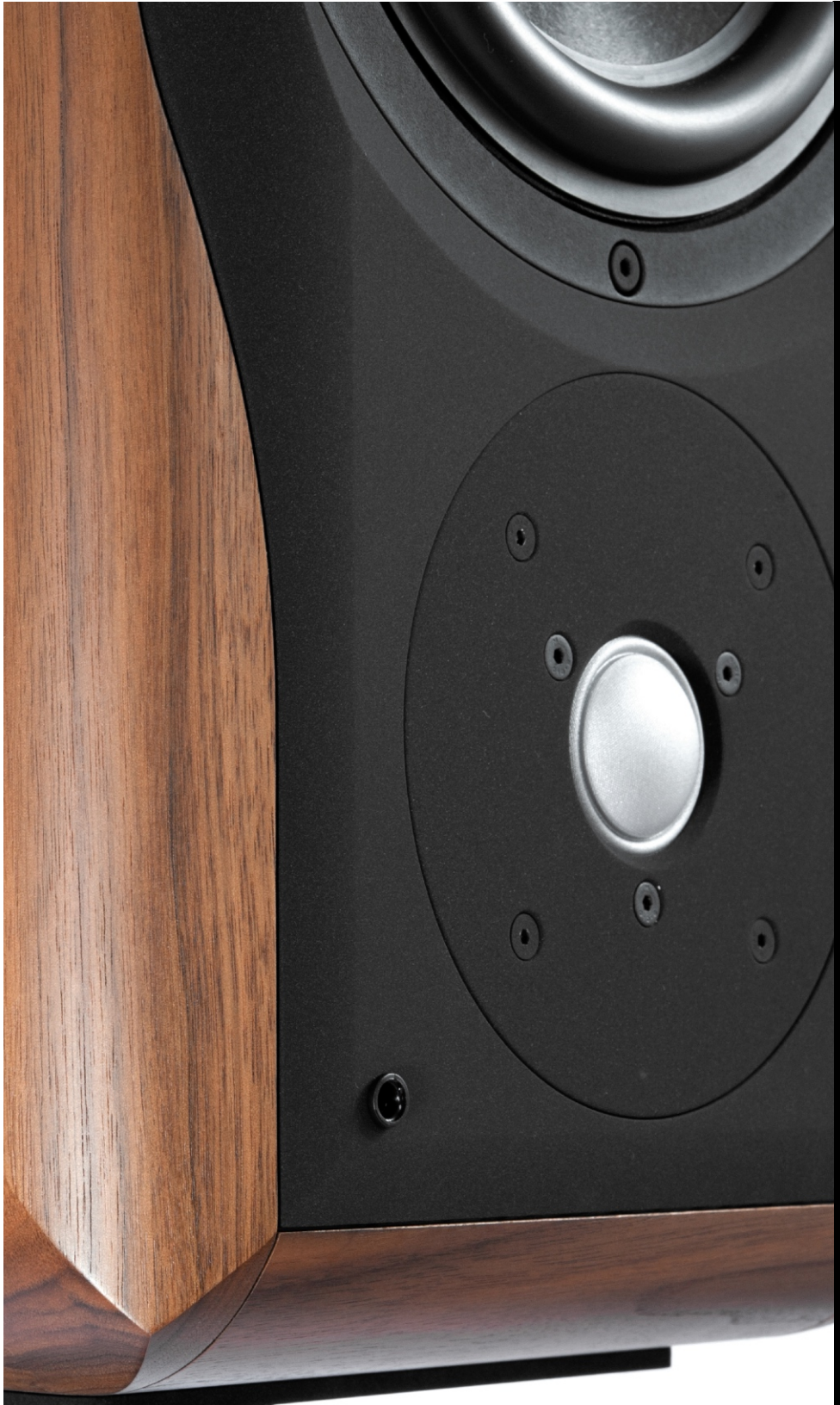
Background Information

The Italian loudspeaker manufacturer Chario was founded in 1975 by two engineers, **CHA**rlie and Ma**RIO** (hence the name). Both were research scientists at the University of Milan who were interested in *how*—and *what*—humans hear. The focus of their research involved how the shape of the human body influences the ways that humans perceive sound: the shape of the shoulders, the torso, the head, the ears, even our hair, and what each of these forms does to affect what we perceive. During their research, they discovered that humans are extremely sensitive to phase distortions above the range of 1,500Hz.

They also found that, unfortunately, all the loudspeakers they were using for their research had a crossover point to transition from the midrange driver to the tweeter above 1,500Hz, creating exactly the type of phase distortion that humans are sensitive to. To eliminate this problem and further their research, they looked for an accurate loudspeaker that didn't have a crossover point within this range. To their surprise, they were unable to. When they tried to build their own, they discovered that the fundamental issue was the tweeter: there weren't any tweeters available that could handle frequencies low enough to push the crossover point below the range where humans are most sensitive to phase distortions. At the same time, it was obvious that a midrange driver could never accurately reproduce high frequencies, so that also wasn't a solution. So, using university resources, they designed their own drivers, creating tweeters that could handle frequencies low enough to eliminate the tweeter-midrange crossover point entirely.

They also realized that in a home environment where there will be other objects beside the speakers in the room, such as tables, sofas, chairs, and people, in-room low frequency response will be affected by these objects. The first reflection off the floor will be interrupted and low frequency response will suffer. As you may have noticed, most Charios have an "upside-down" arrangement when looking at the driver array and they sit somewhat high relative to other loudspeakers. The woofer is elevated above the tweeter so that it can radiate into the room—and to the listener—coherently with the tweeter, but without the sound being marred by reflections off the floor or by other objects in the room. Some models even have a subwoofer incorporated into their design with a very specific crossover design that allows it to function seamlessly in tandem with the other drivers even though it's located relatively far away from them and fires at a different angle.

The University of Milan; Milan, Italy



While these developments make Chario's loudspeakers unique by themselves, the insanely broad tweeter frequency range and woofer placement have benefits for other reasons as well: high- and mid-frequencies have a narrow dispersion pattern and tend to beam or be directed at the listener by aiming the tweeter. Broadening the range of the tweeter results in less "beaming," and widens the dispersion of the high- and mid-frequencies so that the speaker presents a much broader but still precise sound field. In addition, low frequencies have a wide dispersion field, so mounting the woofer as far away as possible from the assumed first reflection point—the floor—prevents low-frequency phase distortions where the reflected sound arrives at the listener's ear at a different time than the direct sound. Since tweeters have narrower dispersion, they should be placed at ear height. Since woofers have wider dispersion, they should be mounted further away from the floor. Thus, the Chario speakers have the woofer mounted high in the cabinet and above the tweeter. This puts the woofer high above the reflection surface and precludes the harmonic distortion that comes with it, while at the same time allowing the tweeter to be placed at ear-height for proper imaging, clarity, and focus.

During their development of a loudspeaker that was optimized for human perception and in-room sound, Charlie and Mario discovered a common speaker design flaw: in general, speakers are designed to function at their best in lab or anechoic environments where there is no furniture, the rooms are perfectly symmetrical, and the measurement equipment consists of a microphone pointed directly at the center of the loudspeaker. This completely discards the premise that loudspeakers will be placed in non-ideal acoustic home environments with furniture, windows, hallways alongside the listening space, etc. To Charlie and Mario, this was design going in the wrong direction. Why create a speaker that will never meet its greatest potential because it was specifically designed for an environment that does not exist in a home? But the inverse could also be true: designing a speaker that simply sounds interesting but isn't technically adept isn't the proper way of doing things either. Their speakers also had to be exceptionally well-engineered.

The theoretical premise was that if you build a speaker that is optimized for how test equipment measures in an anechoic chamber or a very specific lab environment, you've been designing the loudspeaker for the wrong location. Likewise, creating a loudspeaker without technical knowledge or regard for acoustic engineering and loudspeaker mechanics prevents you from building a high-quality speaker that accurately reproduces music.

The Academy S Series T32 Tweeter

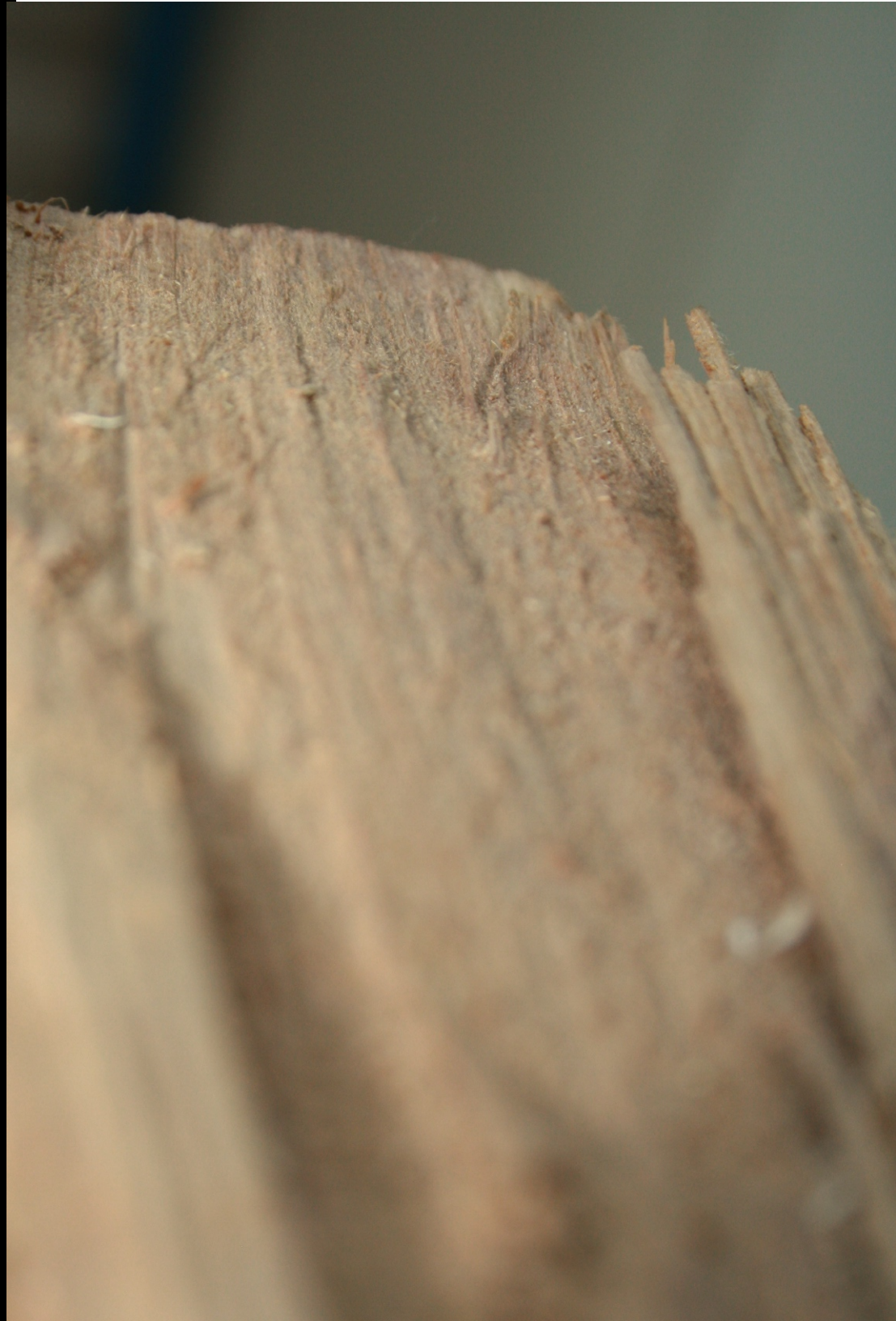
Chario approach design much differently from most loudspeaker designers. Speakers are generally designed and evaluated with a microphone and a computer, and everything is tweaked based on measured data – cabinet, crossover, and the drivers they buy to complete the design. Some manufacturers may go so far as to use an anechoic chamber and tweak their designs based on results in this environment. Neither way works with human physiology, neither optimizes the speaker to work with the mechanics of human hearing, and neither takes into account the speaker's response in a home's atypical or varying acoustical environment. Instead, they're optimized for acoustic isolation and a microphone.

Chario are different. They use science and measurements and yet always engineer their products for the way humans perceive sound and the way a loudspeaker responds within a somewhat typical room.

Here is where the typical automobile analogy comes in: Let's say you buy a very nice sports car. The development team has tuned the car for a racetrack, but you live on a bumpy dirt road and everywhere you drive there are stoplights. This car is capable of performing extremely well in a very specific environment and under narrow test conditions, but that environment doesn't exist on the roads where you use your car on a daily basis. You then buy another very nice car, but this time it says, "Chario" on the bootlid. It's also been designed to perform at an extremely high level, but when setup properly and used on the roads you drive everyday it performs far beyond what you'd expect because it's been designed from the onset to work *where you're actually using it*.

Materials:

Chario prefers to use natural wood cabinets, citing that when Bechstein, Fazioli, Bösendorfer, or Steinway use metals, synthetics, and other materials they'll follow suit. In most cases, massive, slabs of Italian walnut are clad to an internal HDF (high-density fiberboard) braced cabinet to both stiffen the body of the speaker and damp vibrations that would otherwise modulate the sound from the drivers. Chario is very proud of this walnut: they have an entire warehouse with the sole purpose of drying and aging the wood for use in their loudspeakers without cracking, warping, or distortion. Occasionally, speaker delivery has been delayed because the moisture level in the walnut is too high.



An unfinished slab of Italian walnut

While this may be seen as a drawback in some instances, we prefer to see it as dedication to the old-style craft of working with premium hardwoods and a strict adherence to quality control.

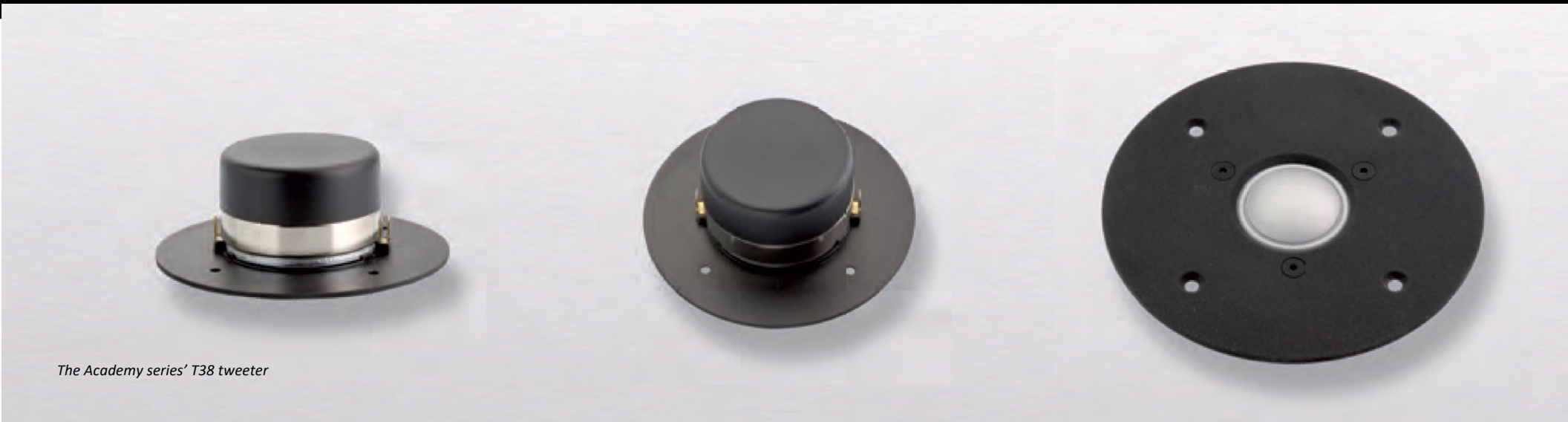
In their highest performing products, the entire body of the cabinet is made of interlocking slabs of Italian walnut with only a small portion of the cabinet's bracing made from HDF for damping purposes. They prefer to use the wood's natural ability to damp unwanted frequencies and yet still work with the music to produce excellent results.

Drivers:

Once again, humans aren't sensitive to phase distortions between 800 and 1,500Hz. It's the shape of the human ear, head, chest and shoulders that define the range where humans are (or are not) sensitive to these distortions. Loudspeakers create phase problems at the crossover point and nearly all loudspeakers crossover from the tweeter to the midrange driver above these frequencies. Chario developed the idea of a tweeter that played accurately to well below this range and negated the need for a midrange crossover and driver altogether in their smaller speakers, though some of the larger speakers need a lower midrange driver for greater power dispersion. In other words, the tweeter handles such a broad frequency range that it completely bypasses the source of the problem. The Chario loudspeakers in the Aviator series (their mid-level range) all have a tweeter that can—and does—play cleanly down to approximately 1,200Hz. In the case of the Academy series, the tweeter goes even further and performs accurately down to 1,000Hz. This is quite an accomplishment indeed!

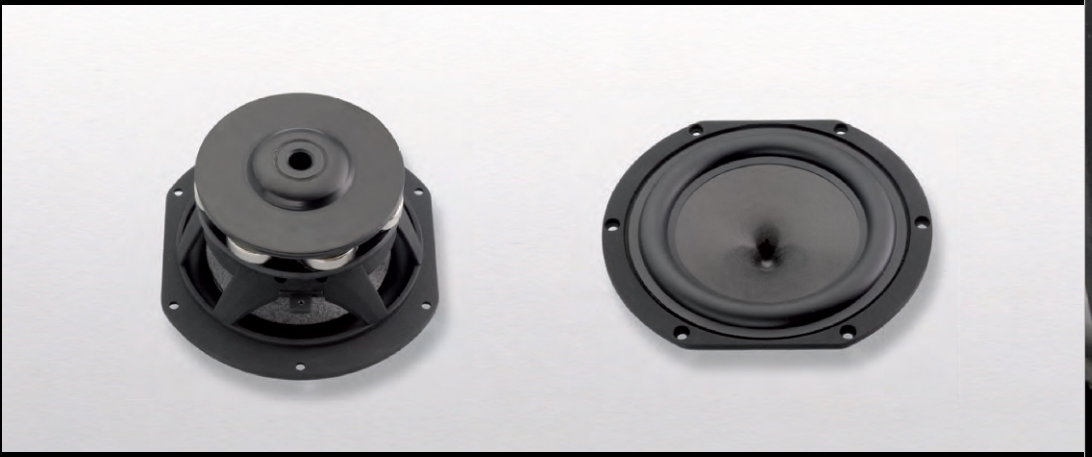
Yet nearly all loudspeaker companies place the critical tweeter/midrange (or mid-woofer in a 2-way) crossover point here—*where we're most sensitive to it*—because the off-the-shelf tweeters they use only provide this range without distortion. Why do they use these tweeters? Because they're inexpensive, or perhaps because they lack the resources to manufacture their own. Or maybe both. Chario designed their drivers to be able to play from the highest highs to well below the range where we're phase sensitive to eliminate the problem entirely. Moving the crossover point = eliminating the audible distortion. If you put the crossover point where we can't hear the distortion, the result is a speaker that has a very coherent, single-driver-style sound.

All Chario tweeters are treated silk domes, however in their highest performing range, the Academy S, the tweeter's silk dome is treated with an aluminum vapor deposit. This gives the tweeter dome a unique silver color and strengthens the fabric dome without the penalty of excessive weight, allowing this particular tweeter, the T38, to achieve an amazing frequency response from 1,000Hz to over 45kHz.

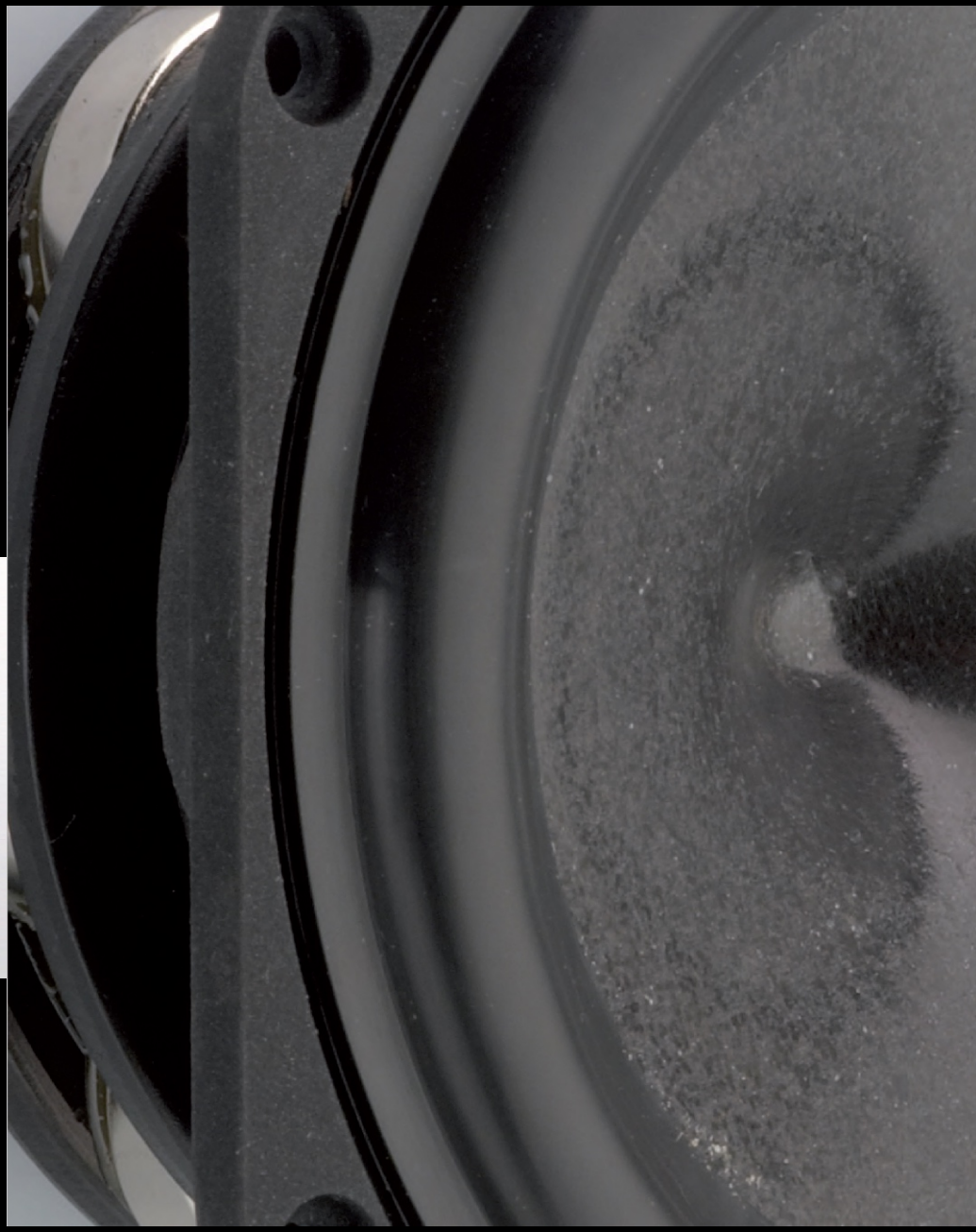


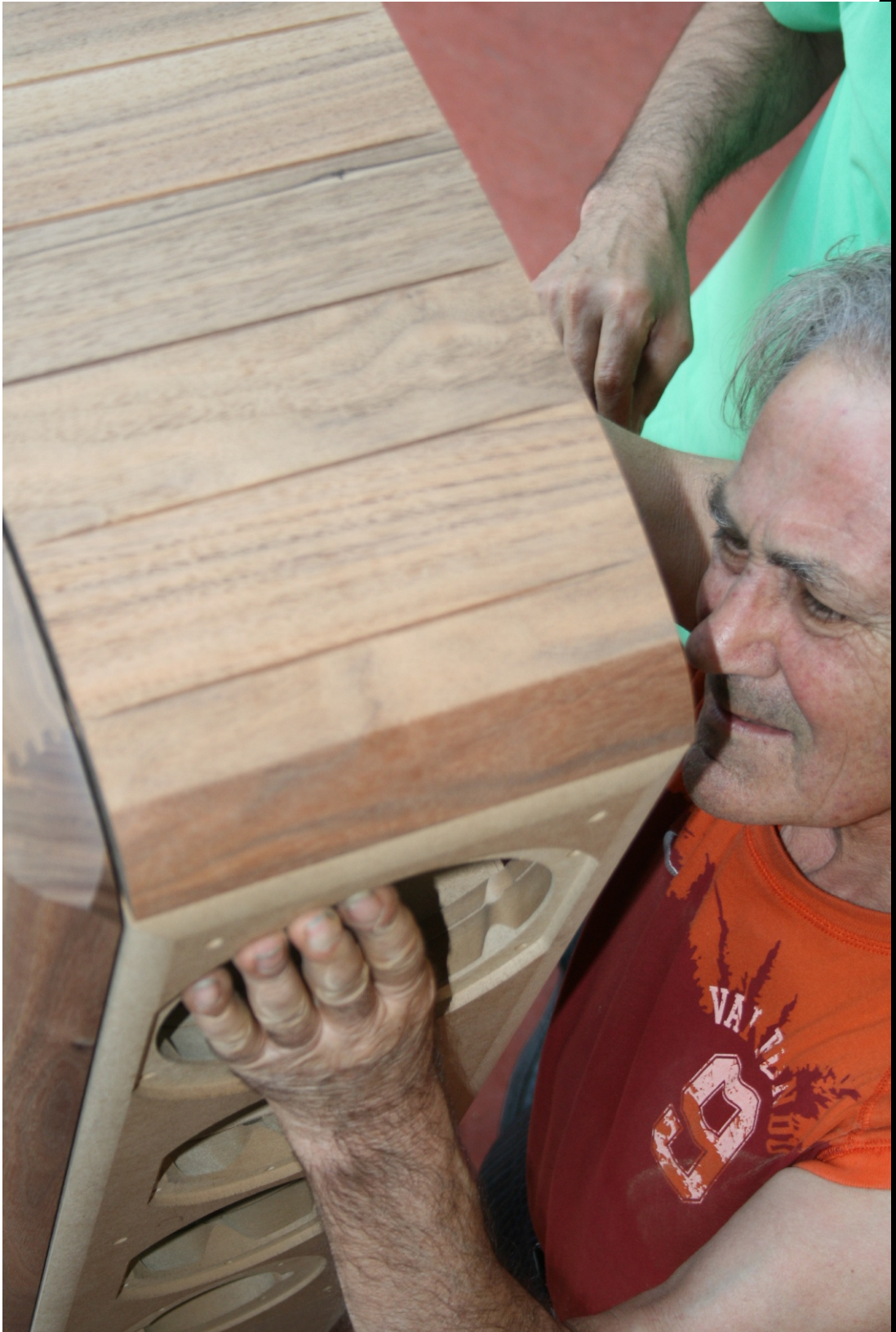
The Academy series' T38 tweeter

Every loudspeaker designer looks for the same properties in a woofer cone: strength and stiffness. In many cases, only one (or maybe none!) of these properties is available in woofers that can be purchased off the shelf. This is because extremely stiff materials are generally heavy and expensive, and when a hole is cut into the center of the driver cone it loses a lot of its strength. In the Aviator and Academy lines, Chario makes use of Rohacell for their woofer cones. Rohacell is an incredibly stiff and strong yet extremely light material. It's a PMI (polymethacrylimide) based foam with a hard resin surface that is particularly strong, has extremely high rigidity, and inherent acoustic damping by way of its sandwich construction. Because of its natural damping properties, it's used extensively in the aviation industry. Chario designed their driver cones with a flared parabolic shape to minimize flex and physical distortion when under physical stress. At the same time, this design eliminates the need for a dustcap—an additional source of weight and a potential weak point where the woofer cone material would be non-continuous. This strength and stiffness allow the woofers to achieve an extremely wide frequency response, from the mid-bass down to sub-bass, without an audible resonance or breakup point.



The motor assembly is another Chario breakthrough. While doing mechanical research, they mounted small magnet assemblies around the motor in a circular array. These additional magnets allowed them to focus and concentrate the magnetic field around the driver's voice coil with a smaller but more efficient magnet motor assembly.





Chario Products, 2023:

(FS = floor standing, SM = Stand Mount)

Chario offers three basic families of products: **Academy S**, **Aviator**, and **Constellation Mk. II**.

- The top-of-the-line **Academy S**:
  - → **Serendipity** (FS), $57,000 (pair)
  - → **Sovran** (FS), $27,250 (pair)
  - → **Sonnet** (SM), $10,750 (pair, includes stands)
- **Aviator**, the overachieving mid-level solution:
  - → **Aria** (FS), $25,700 (pair)
  - → **Cielo** (FS), $10,500 (pair, includes stabilizers)
  - → **Amelia** (FS), $8,400 (pair, includes stabilizers)
  - → **Nobile** (SM), $4,400 (pair, includes stands)
  - → **Ghibli** (SM), $3,800 (pair, includes stands)
  - → **Balbo Center Channel** (FS), $3,550 (each)
- The **Constellation Mk. II**, the series with a *massive* price-to-performance ratio:
  - → **Pegasus** (FS), $6,650 (pair)
  - → **Cygnus** (FS), $5,150 (pair)
  - → **Delphinus** (SM), $3,150 (pair, includes stands)
  - → **Lynx** (SM), $2,175 (pair, includes stands)

There is also the extremely limited edition **Belong** series. Belong is limited to a maximum of 50 pairs per year due to cabinet construction: cabinets are formed from solid white Corian with carved Italian walnut top and bottom panels.

- → **Type S** (SM), $14,950 (pair, includes stands)

All basic principles remain the same as you move up within the three families – the changes are better driver technology, more robust cabinets, and crossover precision. Essentially…GOOD, BETTER, BEST.