Academy

High End Performances

chario

high end collection loudspeakers

Index

ACADEMY PROJECT

The rationale behind the Academy Series is really underpinned by just a few concepts. The idea was to use a two-stage strategy to make the listener feeling they were “right there”:

1. Pulling out existing ambience information from standard recordings, presenting pressure variations on the listener’s ears in a new, unprecedented way. 2. Cutting down the negative in uence of initial listening ambience bounce.

The aim is, of course, to achieve credible surround audio ... But the laws of physics can’t be broken. Some limitations are only natural in the recording/reproduction/perception audio chain, and will resist despite our best efforts to replicate in our own-surroundings an acoustic event orig inating in a large dedicated venue. The loudspeaker membrane is rmly glued to a cylinder of special material which is wrapped with a very fine-copper wire. This is the moving coil, which is then set between the polar expansions of a large permanent magnet. When the audio signal’s electrical current crosses the coil the force generated sets the coil/membrane group in movement. A device known as a spider (in practice a ring with concentric corrugations anchored to the mobile coil and the loudspeaker rack) is applied to keep the entire mobile device perfectly centred. On the right, a spider from an academy woofer, produced in Nomex© DuPont, a cutting-edge meta-aramid material, also used to make the coveralls worn by re ghters and Formula One racing drivers.

Philosophy

Music and Science are often thought to be two sides of the same coin and as such cannot be seensimultaneously.

This apparent dichotomy encourages audio system designers to address problems from two quite opposing standpoints. Some trust in their emotions and some rely on their PC. Pure and simple. But looking deeper at the scientific side of the coin, this false impediment will disappear and the mind corrects the confusion of the eyes. This is when music and science blend together. So there are basically two ways to offer the listener the pleasure of the musical experience: To be a maker of musical instruments to be an audio system designer. Let's think about how a sound takes shape. We already know that air particles must be made to oscillate back and forth to propagate acoustic energy. Good examples of vibrating bodies are a stretched drum skin, the prongs of a tuning fork, plucked strings ...

But there are also musical sources that in appearance aren't out right vibrating bodies, for instance a trumpet or a clarinet, which physically actually rely on the mass oscillation of a volume of air. In any case, the condition to be met is that air molecules must be forced to vibrate in contact with any surface moving quickly. The air vibration should last long enough for our system of perception to translate the neurosensorial stimulus into a hearing sensation, otherwise we won't be aware of any sound. So what is the aim of a skilled musical instrument maker? Simple: they have to discover the secret that ensures the instrument continues tovibrate as long as possible. Now this is what we usually call resonance, so we can say that the main scope of a vibrating body used to make sounds that please the ear is to release gradually the energy it received from the instant impact of a bow ... a plectrum ... a drumstick ... a reed ... The more harmonious (in the usual meaning of this word) the resonance is, the greater the pleasure it offers. However, to understand this in full, we should now take a closer look at how a loudspeaker works. To assert the validity of the original statement it would be natural to consider a musical instrument loudspeaker analogy, but that's not such a good idea ... Both loudspeakers and musical instruments feature a rigid structure that contains a volume of air acting as an acoustic load in the speaker and a resonator in the instruments. If they worked in a similar way, neitherwould offer any musical quality since the air volume acts differently in each. Actually, to reproduce thecomplex structure of the energy released by a violin, it must be passed through the electric signal generated by microphones via an audio system that has no resonance at all, otherwise sounds not present in the recording will be heard.

All physical systems tend to retain acquired energy through inertia and a loudspeaker is no exception, hence the speaker engineer could be seen as the counterpart of the musical-instrument maker. So a speaker designer becomes the master craftsman's alter ego. Both make devices to generate sound but while the engineer is the sworn enemy of resonance, the craftsman is its loyal ally ...

Not just a speaker, they are art masterpiece.

A

Academy Series

Nevertheless, not all resonances are acceptable for a musical instrument and some compromise will be required to control damping and purity of timbre.

Similarly, not all resonances can be perfectly damped in a loudspeaker, so compromise must be accepted and some residual energy will always be present during reproduction.

At this point, the game seems to be over: the exact proportions of desirable and undesirable sound having been defined for rendering hd audio system listening as realistic as possible. Sadly there is no universally valid analytical relationship between the two conditions. Every designer sticks to their guns, based on listening experience and data gathered through measuring and simulation. Unlike competitors, though, Chario Loudspeakers doesn't offer absolute answers, but prefers relative solutions that are scientifically acknowledged and subject to ongoing enhancement. Since these are topics closely linked to emotions, it's impossible for anyone to map out a single path to the objective. In any case, we're sure our point of view will be appreciated by those audiophiles worldwide who've been loyal to us since 1975.

We prefere solid wood, because the silent voice of natural wood speaks to Humanity of Life.

Raw Massive wood has to be dry for at least six month before to work with it, to ensure the stability of its structure.

Technology

The rationale behind the Academy 'S' Series is really underpinned by just a few concepts.

Represent the step forward in terms of technology.

The rationale behind the Academy 'S' Series is really underpinned by just a few concepts. The idea was to use a two-stage strategy to make the listener feeling they were "right there":

1. Pulling out existing ambience information from standard recordings, presenting pressure variations on the listener's ears in a new, unprecedented way.

2. Cutting down the negative influence of initial listening ambience bounce.

The aim is, of course, to achieve credible surround audio ... But the laws of physics can't be broken. Some limitations are only natural in the recording/reproduction/perception audio chain, and will resist despite our best efforts to replicate in our own surroundings an acoustic event originating in a large dedicated venue. An accurate audio recording contains large amounts of environmental information associated to the reverberated field. Intense energy content bounce, similar to direct field, channel recording venue size information and are closely linked to source localization sensations. The ambience, field depth and "air" amongst instruments information (basically responsible for the holographic effect), however, are contained and carried by the long-term energy decay field, whose fate is to be lost in the room's background noise.

Many listeners think they are unable to perceive this type of signal, whereas it is really very easy to realize they are "absent", because the associated sensation is loss of virtual stage depth, as if the entire orchestra were standing in one horizontal line. This form of source geometric distortion is especially noticeable when listening to musical programmes coded with lossy compression algorithms, or programmes that have not been compressed but reproduced using an audio chain with one or more low resolution links.

When these weak signals have been recovered, how will they be used?

We could try to "surround" the listening position with several speakers, although this isn't a realistic proposition as the hearing system would immediately pick up on the low coherence of the virtual images which, in this case, would be the reason for distortion of the geometrical representation. Moreover, if we were to force the right and left front sources also to emit ambience signals, our brain would be confused by the presence of contradictory sources to associate to just one inducer for both the direct and reverberated camps. So information on the binaural plane has to "dispersed" in a controlled manner to reconstitute the original situation with acceptable approximation, without compromising localization of the sound front.

The academy serendipity project is based on the theory that an upturned vertical array, with differentiated alignment gains and delays, acts as a distributed source (antithesis of the pulsating sphere) that can provide the listener's ears with counterlateral signals able to widen the sound perspective to the limits of correct localization, turning to good use the adverse condition of interaural crosstalk typical of stereo systems with front speakers (blumlein). On the subject, a short digression on the three perception hypotheses developed by chario in its Psychoacoustics Laboratory at the head offices in Vimercate.

First perception hypothesis

Floor bounce control versus timbre

colouration Acoustic measurement of loudspeaker systems is normally performed in suitable bounce-free chambers. This is a fundamental condition for testing the exact functioning of the entire system without it depending on the place where the trials are performed. The geometry of a domestic setting, however, shapes speaker response and consequently modifies the listening experience completely. Since there are endless speaker/room/furniture combinations, a computer-aided simulation can only outline a general performance that is useful for assessing reproduction balance but insufficient for describing the hearing sensation. Current psychoacoustic models are still incomplete and provide reliable results only when the acoustic event is fully controlled. Now, because any free-standing tower system has a fixed driver-to-floor distance, once the listening distance has been established, distortion caused by initial floor bounce can be calculated. So if there are no more bouncing surfaces at less than a metre, the first energy bouncing from the floor can be controlled by the appropriate combination of crossover filter and vertical driver array. This type of interference is especially annoying because the listener is aware of both the loss and the excess of energy within a frequency band that is an octave wide, which generally resembles the central octave of a piano, in other words the set of musical notes most recurrent in western compositions. The musical octave relationship between the dip and the peak implies a dramatic timbre alteration in the complex tone generated by the sound source because in a worst-case scenario, floor bounce adds an incremental difference of almost 10db between the fundamental and the second harmonic.

Second Perception Hypothesis

WMT™ configuration and direct/ bounced correlation

WMT™ is a Chario Loudspeakers exclusive feature for control of energy from at least three drivers: woofer, midrange and tweeter. The three don't overlap in the standard way that combines three distinct frequencies; instead, the almost complete woofertweeter response is integrated by the midrange working in a single octave range. This proprietary crossover filter enables gradual, uniform reduction of off-axis system response, thus ensuring homogeneous distribution of energy in the room, benefitting the first bounce field. The WMT™ configuration also enables control of the energy directed upwards and downwards, with a substantial reduction of initial bounce. The psychoacoustic effect achieved for the listener by this exclusive operating principle translates into greater detail and transparency at mid frequencies without having to raise them to unnatural levels that ruin both timbre precision and stage depth.

Third Perception Hypothesis

Venue ambience versus equal loudness contour

Musical instruments can produce sound levels of 120 dB SPL, although this huge amount of energy is not available for ordinary home listening for two key reasons:

1. Small rooms quickly reach saturation point if levels are increased

2. The electroacoustic technology currently available doesn't allow direct emission speakers to release very high pressure. It is therefore reasonable to take 110 dB SPL as a feasible maximum for short fortissimo (fff) sections. Moreover, however quiet a domestic environment may be during the day, there is always at least 45-50 dB SPL

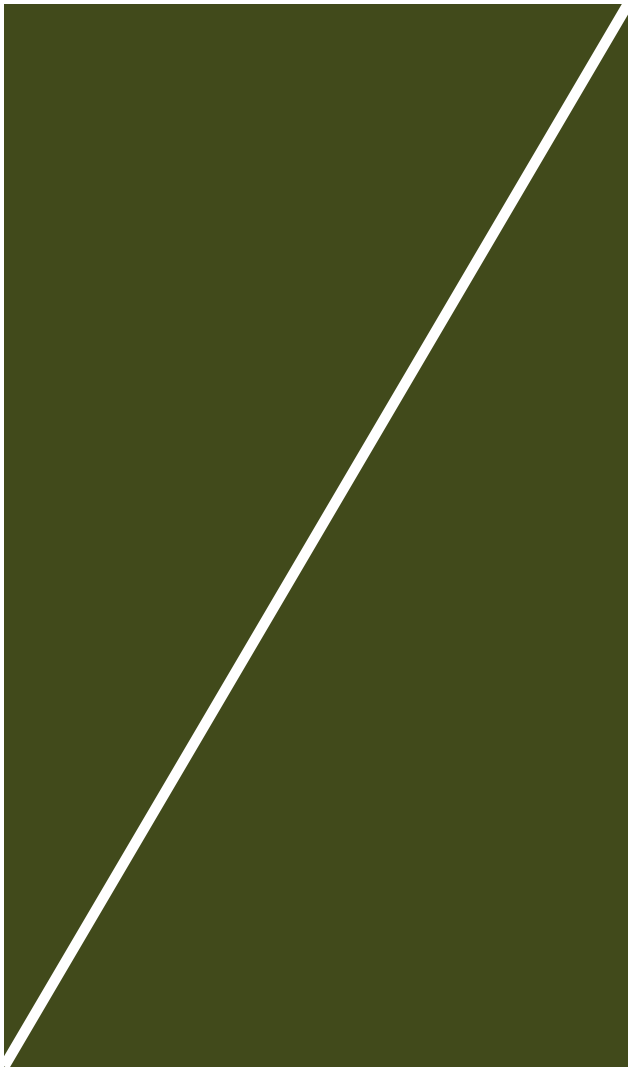
background noise, so the actual signal dynamic range is no greater than 60 dB (the difference between 110 and 50).

It is no coincidence that the same figure of 60 dB defines reverberation features for any closed space and if this is the recording venue, our hearing system associates the sensation of space to any signal captured by microphones. These extremely weak signals have to be reproduced correctly to recreate an ambience effect (the illusion of being seated in the original recording venue) in the listening point. Human hearing works in a very complex way but there's no doubt that it adjusts its sensitivity response to sound intensity and frequency content. If the system's frequency response is shaped to the loudness level curve envelope for 45 Phon, it is near to the goal of reproducing ambience information aligned with human ear sensitivity displayed at 40-50 dB SPL (beyond which it is lost in typical domestic background noise) emission levels. The particularity of this original solution is that it is very effective in offsetting the inherent paradox of the loudspeaker system reproduction principle. It is established that during a concert in a closed venue, human hearing is reached by two distinct sound fields: one is direct and comes to the source along the line-of-sight; the other is reverberated and comes from all the surfaces of the enclosed space. The reverberated field not only suffers delays because of multiple bounce, but also has no single arrival direction – statistically speaking – as it comes from all directions except the one already occupied by the direct field. So it's obvious that when listening at home, the memory has no way of comparing the phenomenon, as the direct field and the reverberated field come from the same point. This new situation confuses the auditory system and in an attempt to make sense of this contradiction, activates a process of "directional listening", focusing too hard on the sources.

At this point, it is easy to see that if the ambience information is returned on a linear curve, the brain pays too much attention to the mid frequencies, with consequent collapse of the stereo front "between" the speakers.

The Phase Curve

Human hearing relies on comparison of stimuli to localize acoustic sources correctly when they reach both ears at the same time.



Line between equals spaces is not the central point.

The Duplex Theory explaining how this works is currently deemed the most reliable by researchers. Frequencies below about 700 Hz are processed by defining arrival time to the left and right ear; this is referred to as ITD (interaural time delay). Frequencies above about 1400 Hz are processed by defining the energy flow delivered to each ear and this is referred to as IAD (interaural amplitude difference). It's obvious that the Duplex Theory isn't exhaustive because it fails to offer full explanations for the localization process in the 700-1400 Hz range. In fact, at these frequencies, the head and torso obstruct sufficiently to modify the incoming wave-front (diffraction) reaching the ears, so that the crossover from ITD to IAD is not linear and localization cues are not flawless. The WMT™ Chario Loudspeakers principle takes full advantage of this gap to bluff hearing and simulate the presence of two or more radiators on the front speaker baffle. The listener thinks they are hearing a one-way speaker, the intention being to mask the transition between two neighbouring transducers. An electric analogue filter (crossover) is required to limit both woofer and tweeter output within their respective assigned bandwidths, and this causes an acoustic signal delay in the crossover region, whose mirror effect in the transformed sphere is known as "acoustic phase delay" and is measured in degrees. Careful control of the acoustic phase delay curve for each transducer in a speaker system is a crucial condition for guaranteeing engineering quality.

Academy Sonnet Close View

The Schroeder Frequency

In a standard 3 way system the 80-250 Hz audio band is emitted by a single driver.

Free-standing designs come in a closely-set classic vertical Tweeter/Midrange/Woofer array, quite high above the floor, even though low-frequency electrical power is split among two or more woofers so as to increase dynamic headroom.

The most important aspect is the physical distance between the subwoofer and the woofer, both designated to emit acoustic power below the Schroeder Frequency, which is about 250-300 Hz for a standard living room (80m3). This frequency limits a listening environment to no more than three resonance modes for the first octaves (32-250 Hz), triggering a hearing phenomenon called <bass booming>, activated by an irregular distribution of energy accumulating around a few spectral components.Apart from the well-known timbre alteration, another very detrimental effect exists in stereokinetic perspective reconstruction. It is commonly described as a mono effect at low frequencies or “collapsed volume”. Lack of spatiality, meaning decrease of air volume around the sources, is due mainly to the similarity of bounced energy to the direct energy coming along the line-of-sight from the speakers. In fact, when the minimum size of a closed space is greater than the maximum wavelength being radiated inside it, the schroeder frequency assumes a very low value and no stationary field is established.

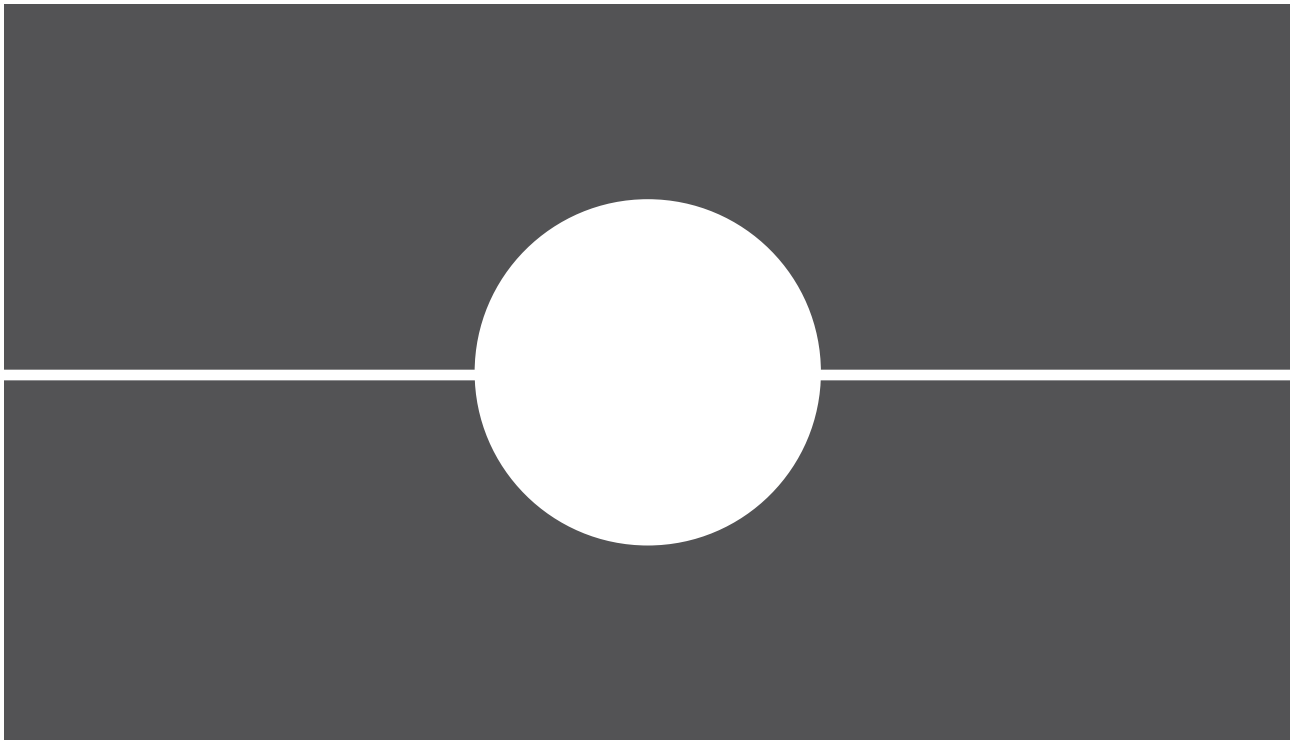
This means that in stereo the perception of air between and around the speakers is completely described by the particle vector velocity, which is crucial since the reverberated field is really stochastic, that is to say chaotic. In small, closed spaces, like those for home listening, the stationary field overlaps and from the psychoacoustic standpoint tends to erase low-frequency ambience information contained in the original recording. The shelf-mounted systems are fitted with a single radiator that emits the Schroeder Frequency, so the distance between a woofer and subwoofer will be d=0 m (Acoustic Doublet, Page 102). The first free-standing system is a standard three-way with two parallel woofers, for which about d=0.2 m distance can be assumed in most cases. The second free-standing system includes three woofers, which can have split frequency, so a d=0.2 m distance can be assumed. In all practical cases there is no significant gap between two adjacent frequency components within the critical band. It is easy to understand that for all possible frequency combinations there is only one sound ray reaching the listener’s ears, since all the components in frequency share the same origin in space. This is not a specific feature in itself: it is a condition if a coherent wave-front is required to carry correct information to the listener by a direct path.

Correlation and Coherence

To associate doublet-type emission to a significant measurement, the correlation concept should be brought into play for indicating the degree of similarity between the two audio

In this case only pressure values measurable near the listener's head in a home setting are of interest. However, the two signals are sinusoidal and of the same frequency so

the correlation can lead to the occasional contradiction, since it is defined as the phase difference cosine. Each time the two components reach the receiver at 90°, the correlation coefficient will be null, in open contradiction with reality. It then becomes necessary to add more, unequivocal information, moving on to the coherence function. This implies that for the scope of home audio, crossovers with infinite slope do not allow for an efficient use of the overlapping area. The relative acoustic phase between the two speakers for low frequencies was decided on the basis of a minimum 2.5 m listening distance and a minimum 1.3 m wavelength for stabilizing the stereo-kinetic front and reducing (compatibly with overall quality) the direct field/bounced field correlation.



Let’s start getting the point.

Academy Serendipity

The Academy Series flagship is the refined expression of all the research typical of Chario Loudspeakers development since 1975. It would take too long to describe the structure and the working principles so we prefer to sum up the <Serendipity Project> through concepts that have made it famous worldwide; NRS 2π, Hyper Exponential Hourglass, Reversed Vertical Array, Silversoft Dome, Rohacell®, Full Apex™, Polyring, Neodymium, Overlapping Points, WMT™ Alignment, SoundCap®

Hidden Pieces

Composite material of ecological origin will show isotropic behaviour, losing energy in all directionsinside its fibres.

Composite material of ecological origin will show isotropic behaviour, losing energy in all directionsinside its fibres. Solid wood, on the other hand, used in swallow-tailed staves, is the best solution for achieving a rigid structure.

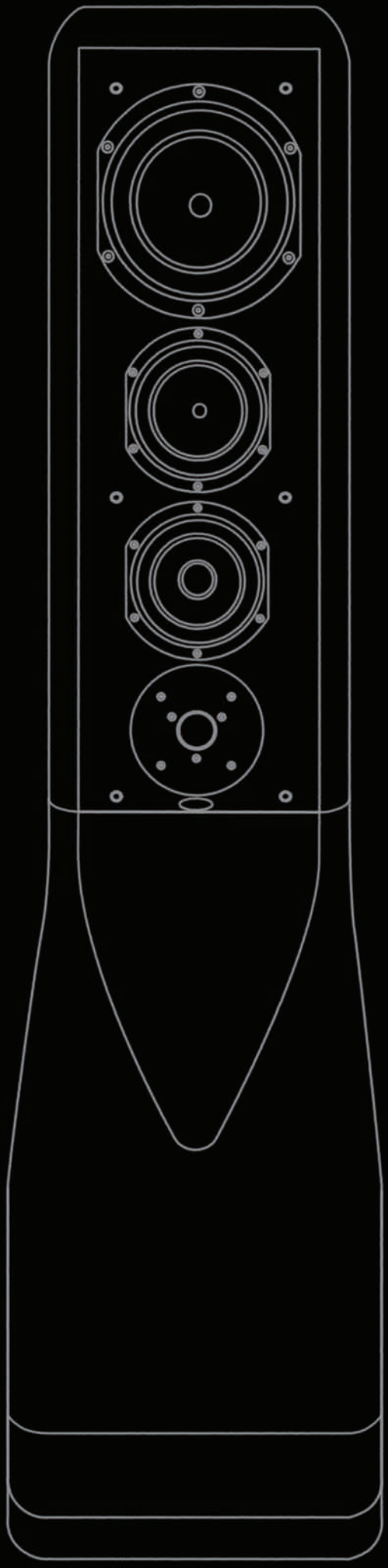
The objective of combining the best characteristics of natural wood and wood fibre is achieved by pairing panels on orthogonal planes.

Serendipity infrastructure actually has the task of damping the mechanical vibrations generated by woofers and confining them inside the cabinet.

Theimage on the left shows the tensor surfaces, reflex duct and the structure that houses the two 320 mm subwoofers in the proprietary NRS isobaric configuration.

Walnut Wood

It is a medium-sized plant, whose height can reach 30 meters, with erect trunk and wrinkled bark; the name of the plant comes from the internal channels carrying chlorophyll. The leaves are deciduous, alternate, compound, with 15-23 serrated edges, spear-shaped leaves, 6-12 cm long, pale green on both pages. The plant carry unisexual flowers, the fruits are round, solitary or in pairs; the outer husk has rough surface and contains a blackish walnut, round, very woody and wrinkled that contains within it a seed with a strong, unpleasant taste. This plant has an high stability, if the wood is treated with vaporization process, medium-high hardness, high durability to the heartwood, poor for the sapwood, very good processability. Odorless.



Technical Details

Low Frequency Load	NRS 2π sr Vented Isobaric Compound
Vent Geometry	Bidimensional Hyper-Exponential Hourglass Type
Confi guration	5 -way Reversed Vertical Alignment Free-Standing
Drivers	1 Tweeter 32 mm SILVERSOFT™ dome NeFeB motor 1 Midrange 130 mm ROHACELL® Poly-Ring NeFeB motor 1 Woofer 130 mm ROHACELL® Full-Apex™ Poly-Ring NeFeB motor 1 Woofer 170 mm ROHACELL® Full-Apex™ Poly-Ring NeFeB motor 2 Sub 320 mm Natural Fibres - 2 Waves Surround HF motor
Sensitivity	93 dB SPL normalized to 1 m / 2.83 Vrms / decorrelated L/R pink noise in IEC 268 -1 compliant listening room
Low Frequency Cut Off	23 Hz @ -3dB referred to C_4 WETS
Overlapping Points	240/500/1250/1850 Hz (See plot)
Rated Impedance	Modulus 4 Ω (min 3.0) Argument ± 36°
Size & Weight	1610 x 400 x 580 mm (H x W x D) / 100 Kg
Cabinet	Solid walnut and HDF. The structure comprises two cabinets: the lower contains two subwoofers; the upper contains two woofers, one midrange and one tweeter. The two wood cases are separated by four cylindrical proprietary-engineered elastomeric puffers acting as vibration decouplers to dissipate mechanical energy by orthogonal elongation
Speakers Orientation	Speakers should be tilted inward facing the listener
Listening Distance	Optimum speaker-listener distance > 3.5 m
Listening Layout	A carpeted floor in front of the speakers is recommended
Side and Back Walls	Should be at least 1m away from the speaker front baffle

SERENDIPITY

A Flagship in a Nutshell

The Serendipity speakers a refined synthesis of all the studies that have characterized the project activity of Chario Loudspeakers since 1975, the year the company was founded. Speakers designed only using natural walnut solid wood. A few concepts are necessary to understand the Serendipity operation principles. The idea is to give the listener the illusion of being there through a dual strategy: to extract the environmental information contained in the standard audio recordings, presenting the pressure changes to the listener's ears in a new and never experienced way before; and reduce minimizing the negative influence of the first environmental considerations in which the audio system is armed. With these concepts was created a speaker that synthesizes the results of years of research both in psycho-acoustic and in the use of high-tech materials. To obtain what we intended to obtain, a 5-way system, equipped with 1 tweeter, 1 midrange , 2 woofers and 2 subwoofers contained in a cabinet composed of two parts, the lower one dedicated to the subwoofer and the upper one for other drivers. Joined together by four cylindrical dampers which have the task of dissipating negative energies for the good yield of the speaker.

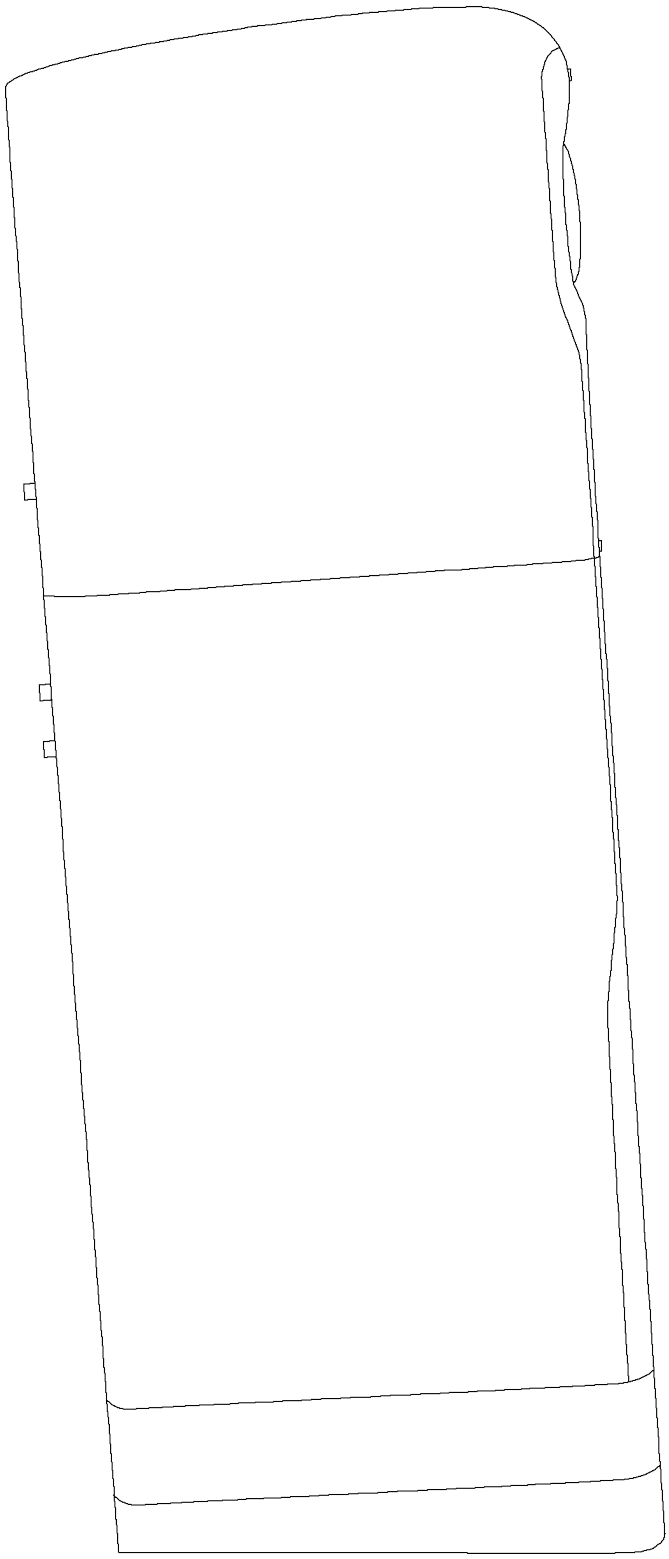
Academy Sovran

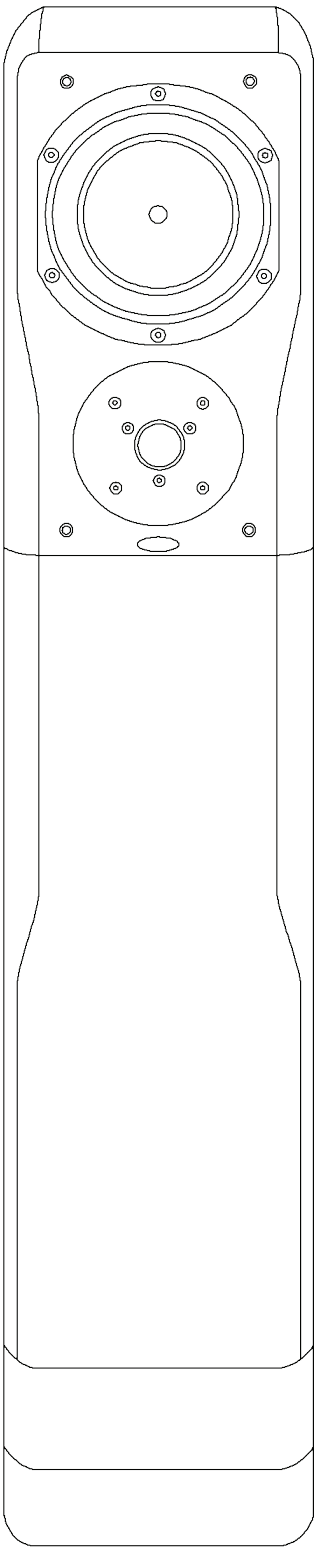
The first three-way loudspeaker system able to control energy diffusion at low frequencies, using Chario Loudspeakers prioprietary Doublet Radiation principle. A decisive step ahead, laying the theoretical foundations for a different approach to sound issues in small environments. Natural wood changes shape depending on ambient temperature and relative humidity. In other words, it adapts to climate conditions, generating outright tensions inside its fibres, which modify the macroscopic layout. This fact is well-known to master cabinet-makers, who actually adapt techniques when assembling the various parts of any prized solid wood cabinet. Firstly, the right board has to be chosen and cut using precise criteria to avoid creating isolated and incompatible sections. Secondly, the right storage area and drying process are defined for the rough wood. Thirdly and lastly, the sections are assembled in a precise order, to allow the moisture-absorbing capacity of each element to develop over time, settling to achieve soundness, not breakage. That's why the CNC machines only cut and mill. The rest is time-honoured craftsmanship...

Handcrafted

Natural wood changes shape depending on ambient temperature and relative humidity. In other words, it adapts to cli- mate condi- tions,

Natural wood changes shape depending on ambient temperature and relative humidity. In other words, it adapts to climate condi- tions, generating outright tensions inside its bres, which modify the macroscopic layout. This fact is well-known to master cabinet-makers, who actually adapt techniques when assembling the various parts of any prized solid wood cabinet. Firstly, the right board has to be chosen and cut using precise criteria to avoid creating isolated and incompatible sections. Secondly, the right storage area and drying process are de ned for the rough wood. Thirdly and lastly, the sections are assem- bled in a precise order, to allow the moi- sture-absorbing capacity of each element to develop over time, settling to achieve soundness, not breakage. That's why the CNC machines only cut and mill. The rest is time-honoured craftsmanship ...





Technical Details

Low Frequency Load	**Subwoofer** NRS 2π sr Vented Isobaric Compound Woofer Back-Firing Slot with Aperiodic
Vent Geometry	Bidimensional Hyper-Exponential Hourglass Type
Confi guration	3 -way Reversed Vertical Alignment Free-Standing
Drivers	1 Tweeter 32 mm SILVERSOFT™ dome NeFeB motor 1 Woofer 170 mm ROHACELL® Full-Apex™ Poly-Ring NeFeB motor 2 Sub 200 mm Natural Fibres Poly-Ring NeFeB motor
Sensitivity	90 dB SPL normalized to 1 m / 2.83 Vrms / decorrelated L/R pink noise in IEC 268 -13 compliant listening room
Low Frequency Cut Off	35 Hz @ -3dB referred to C_4 WETS
Doublet Crossover	100 Hz
Mid-High Crossover	1180 Hz / LKR4 Derived (Δf = 45°)
Rated Impedance	Modulus 4 Ω (min 3.0) Argument ± 36°
Size & Weight	1220 x 240 x 440 mm (H x W x D) / 47 Kg
Cabinet	Solid walnut and HDF. The structure comprises two cabinets: the lower contains two subwoofers; the upper contains one woofers, and one tweeter. The two wood cases are separated by four cylindrical proprietary-engineered elastomeric puffers acting as vibration decouplers to dissipate mechanical energy by orthogonal elongation
Speakers Orientation	Speakers should be tilted inward facing the listener
Listening Distance	Optimum speaker-listener distance > 3.0 m
Listening Layout	A carpeted floor in front of the speakers is recommended
Side and Back Walls	Should be at least 1m away from the speaker front baffle

The Acoustic Doublet

The Acoustic Doublet proprietary theory that was developed for the Academy Sovran project allows even small-scale systems to use speaker/room interferences that will give listeners wave-fronts containing spatial information. This type of information is linked to the size of the source and length of wave emitted and it's unlikely to be conveyed to the listener by bookshelf loudspeakers, since a physical distance of at least 1m is needed between sources.This is one of several reasons why Sovran adopts Reversed Woofer/ Tweeter Alignment, which keeps the woofer as far as possible from the subwoofer and at the same time provides the best angle for modelling the energy response around the second crossover region


chario

SOVRAN

HOURGLASS DUCT

The pressure that pushes the air inside the reflex duct is extremely high. To view the phenomenon you can exploit the analogy of hydraulic lines that push the water upward. As the salt loses fluid pressure and this in turn reduces the speed, turning a powerful jet and turbulent in a weak jet and silent. Similarly, to the air in a reflex duct at a high speed of the particles corresponds to a whirling motion, while a low speed of the particles ensures a laminar flow silent. Obviously it is not advisable to reduce excessive air velocity, otherwise it also reduces the power of the acoustic wave emitted, rendering the action of the reflex port. The theory itself as a maximum value of 130 km/h because they do not occur disturbances worthy of note, suggesting at the same time a duct with a cross section increasing at the ends. In the photograph above, the view of the integral reflex duct section with Hourglass hyper-exponential two-dimensional Serendipity.

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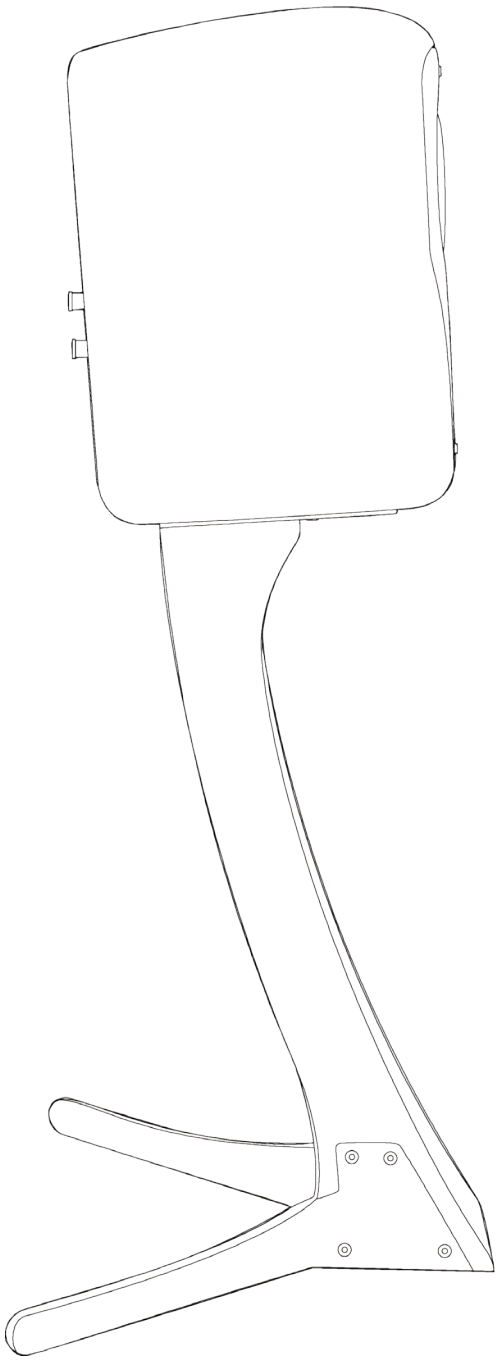
Academy Sonnet

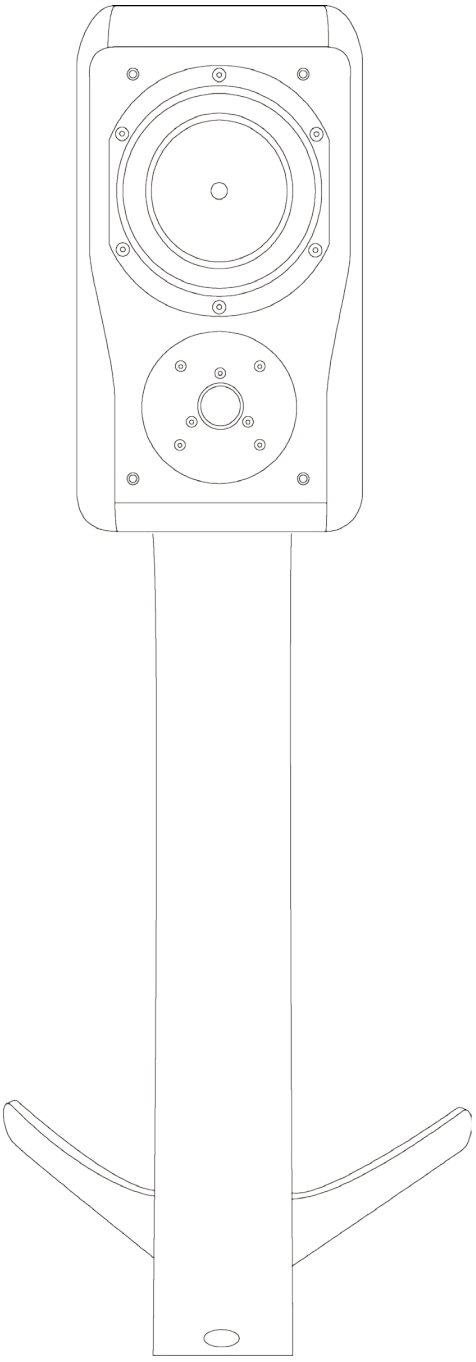
Listening to music on small-sized systems is a reasonable and quite understandable preference, given that they are easily installed in many venues. Although the compromises required make this sort of design almost impossible, Sonnet offers a solution to bypass the Laws of Physics. To integrate this strict definition, while we can safely say that we perform miracles to do our best at Chario Loudspeakers, we are nonetheless proud to say that we are strangers to miraculous designs.

Virtual Image

An image speaks more than a thousand words ...

An image speaks more than a thousand words ... impressive Sonnet is eye-catching but appearance takes a back seat to the thrill of listening, as the ear falls under its spell and the speaker-literally vanishes to leave room for the most incredible live stage experience you ever try





Technical Details

Low Frequency Load		Back-Firing Vented
Vent Geometry		Half-Exponential Hourglass Type
Confi guration		2 -way Reversed Array
Drivers		1 Tweeter 32 mm SILVERSOFT™ dome NeFeB motor 1 Woofer 170 mm ROHACELL® Full-Apex™ Poly-Ring NeFeB motor
Sensitivity		90 dB SPL normalized to 1 m / 2.83 Vrms / de-correlated L/R pink noise within IEC 268 -13 compliant listening room
Low Frequency Cut Off		55 Hz @ -3dB referred to C_4 WETS
Xover Frequency		1180 Hz
Alignement		LKR4 Derived (Δf= 45°)
Rated Impedance		Modulus 4 Ω (min 3.0) Argument ± 36°
Size & Weight		445 x 235 x 340 mm (H x W x D) / 14 Kg
Cabinet		Solid walnut and HDF. The structure made by one cabinet: containing one subwoofers and one tweeter
Speakers Orientation		Speakers should be tilted inward facing the listener
Dedicated Stand		
	Weight	13 kg
	Size	750 x 540 x 460 mm (H x W x D)
	Finish	iron black anodized nish (Top Plate & Legs) Varnished HDF (central section)

REVERSE ARRAY

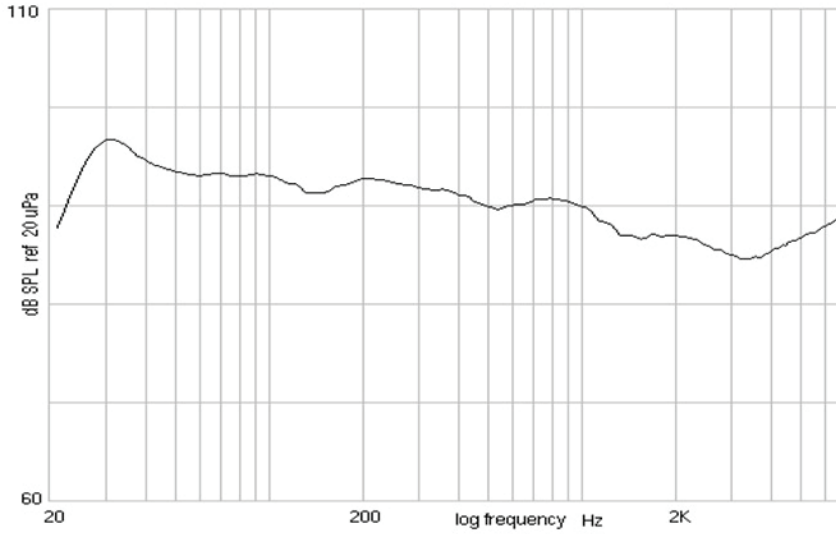
Two-way bookshelf systems usually have the tweeter in the upper position of the cabinet. If the designer is also aiming for time alignment of the two transducers, the plinth must be given a suitable back tilt. Sonnet fits in with this principle except that the tweeter is underneath. That's the explanation why the cabinet should be tilted forwards Perhaps the solution to the Riddle lies in the Sonnet operating theory of approaching issues that common sense isn't aware of...


Sonnet
Academy
Hand-Crafted in Italy
chario


SONNET

Plots and Graphic

On-axis frequency response, coherent radiation on binaural plane, decorrelation cues, First floor-ceiling bounce, individual speakers frequency response WMT™ alignment, overlapping points, impedance modulus & argument, horizontal directivity index, front stage localization



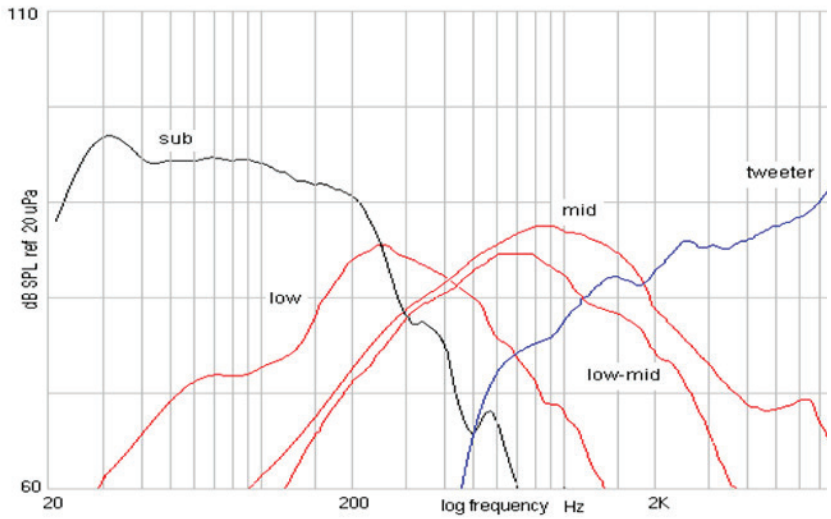
On-axis frequency response & psychoacoustic compensation

Serendipity

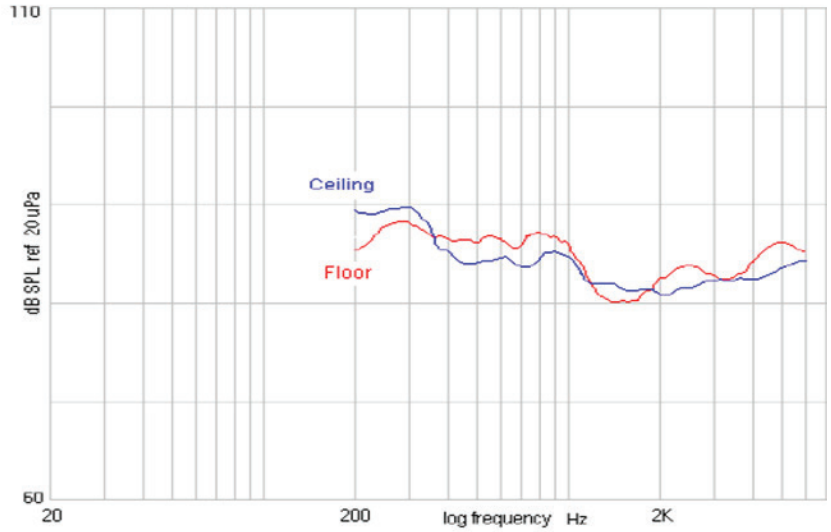
The Academy Series flagship is the refined expression of all the research typical of Chario Loudspeakers development since 1975.

Serendipity it's made by two parts, the upper one anf the lower one, connected together nearly in the middle. The subwoofer cabinet acts as base, to develop the typical and sinuous shape of the speaker. Serendipity lower part it's equipped with a push-pull down-firing woofers with a 320 mm diameter, position at a precise, precalculated, distance to the floor.

A stretched black textile all around the bottom part of the speaker make this part cover to the eyes. The subwoofer placed on the vertical axis of the speaker have also the function to work out of fase, absorbing vibration.



Individual speakers frequency response WMTTM alignment & overlapping point



First oor-ceiling bounce & sagittal plane decorrelation

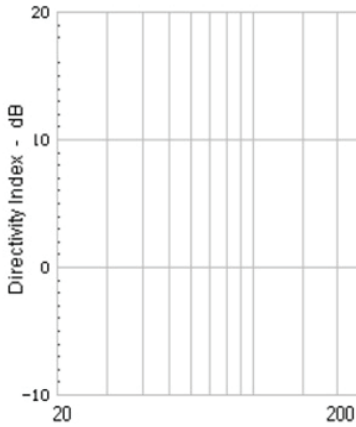
WMT™ Alignment

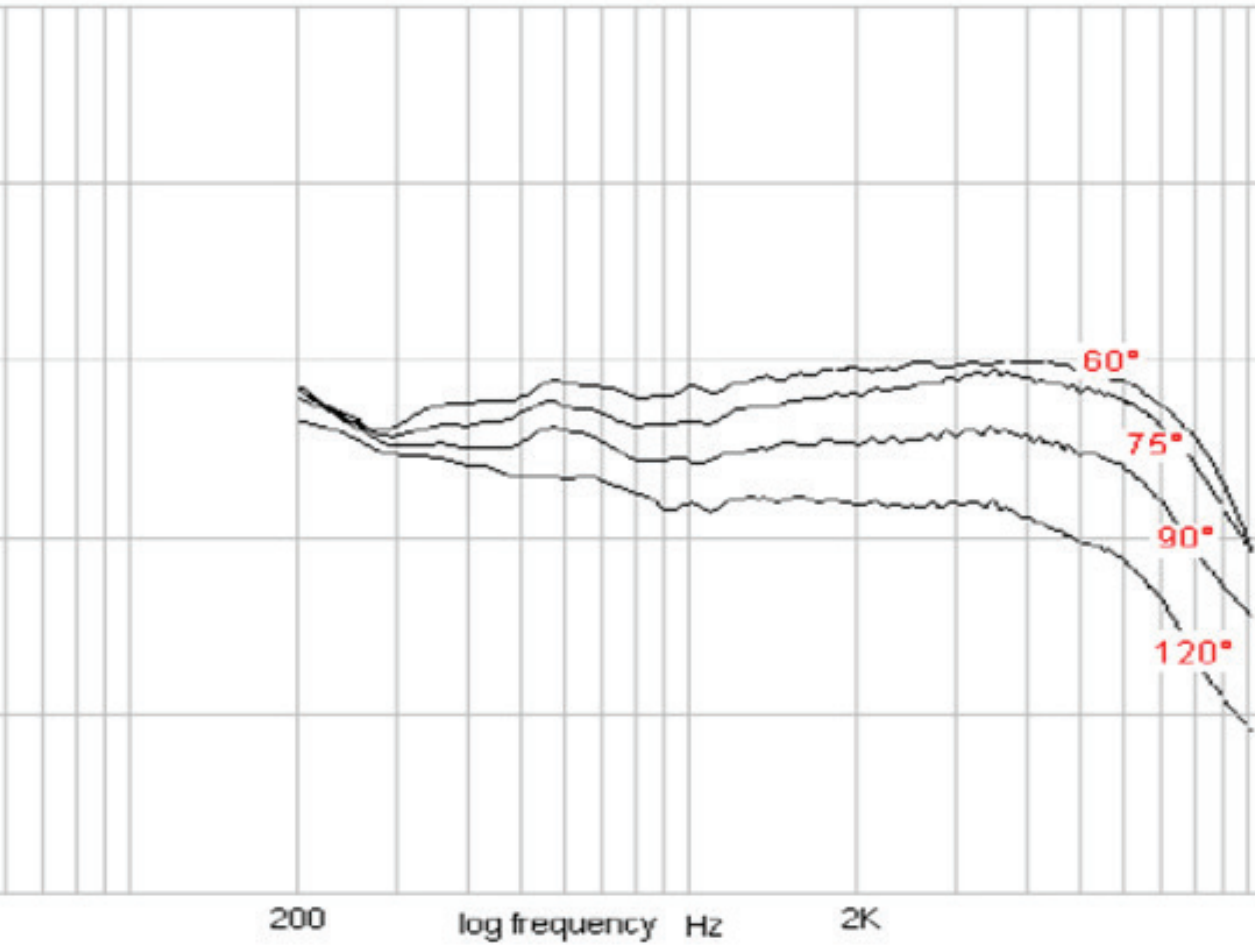
Chario Loudspeakers prioprietary WMT™ alignment can be exploited to the full as it poses no contrast.

WMT™ Alignment: energy beams reflected from ceiling and floor reduced in amplitude respect to primary central beam and further differentiated both in time and spectral content (de-correlated)

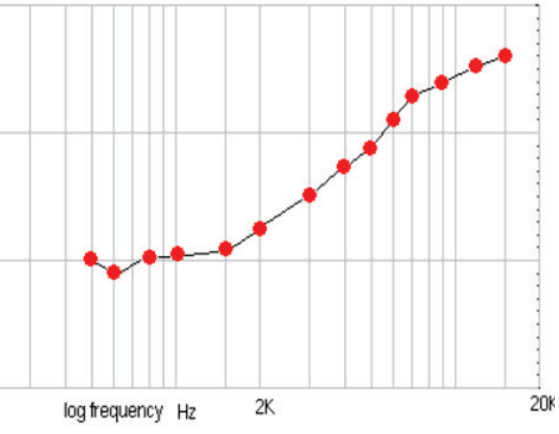
Multiple reflections within confined volume of the two phasors sub at the bottom of the speaker and woofer placed in the front vertical axis of the cabinet . Due to their physical distance and reversed woofer polarity, the acoustic pressure at boundaries (i.e. power response) is incoherent.

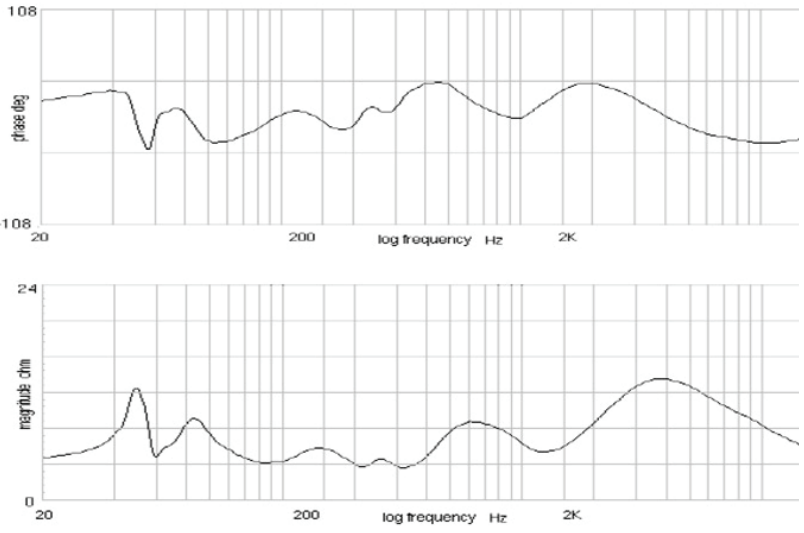
Prioprietary principle developed at Chario Loudspeakers Psychoacoustics Lab in 1985 , originally implemented in the Hiper 3, then applied to all two-way systems and above. It filters the three adjacent radiators (Woofer-Midrange-Tweeter) using a combination of Butterworth/ Bessel/Linkwitz-Riley polynomials controlling respective phase delays to model each complex transfer function (double pressure integral) responsible for energy control of initial floor/ceiling bounce. The Midrange speaker takes the 700-1500 Hz band, where the perception system fails to localize sources (statistically random). This fault is exploited by WMT™ to spread middle frequencies radiation over the whole front baffle, whose seamless frequency perception also resolves the problem of adapting various radiation impedances due to different diameters of the three speakers. inventin porem quam qui dest eum, estion cum que ipsus ipide volum arcimoluptat mo incid ut alis naturit re erem reicid quod qui ut eosam quis quamus de voluptata voloris rae cuptaesequam fugitat ibustio



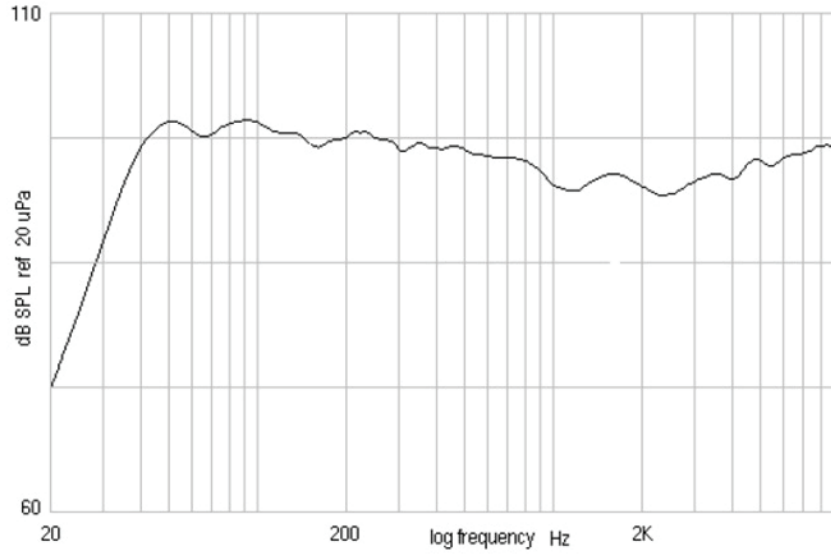


Coherent radiation on binaural plane – decorrelation cues





Horizontal directivity index front stage localization and Impedance modulus & argument

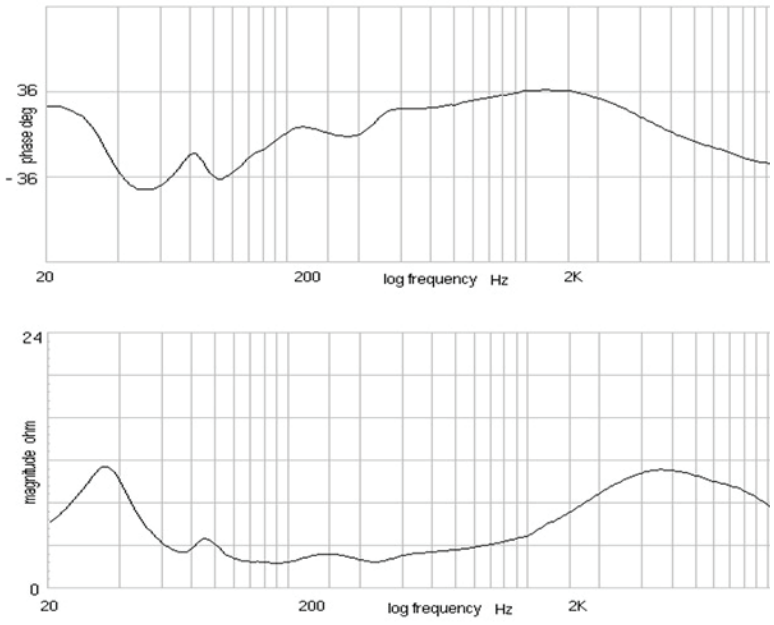


Frequency response

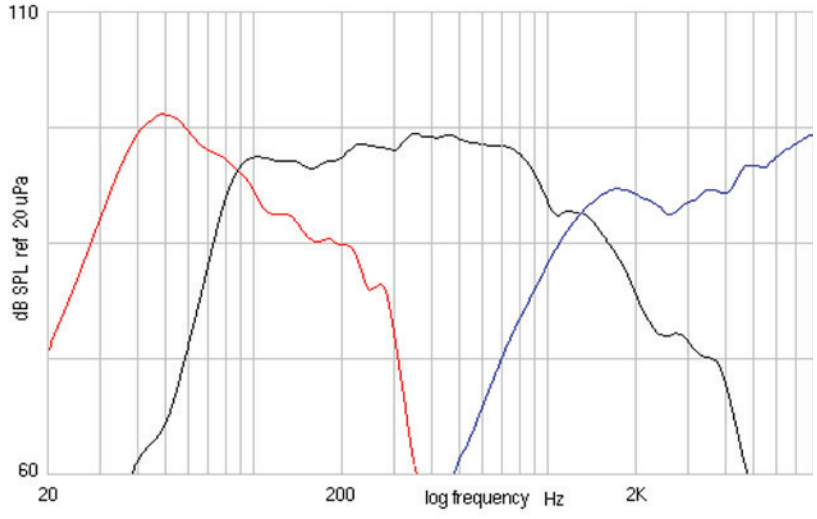
Sovran

The first three-way loudspeaker system able to control energy diffusion at low frequencies, using Chario Loudspeakers prioprietary Doublet Radiation principle®. A decisive step ahead, laying the theoretical foundations for a different approach to sound issues in small environments

As in Serendipity, the Sovran infrastructure is intended to stiffen the unit thus damping the mechanical vibrations and con ning them inside the cabinet. There is another feature, however, that illustrates the complete extent of this original approach, which may seem complex in its realization, but is actually user-friendly in its basic principles. Just remember that the source with the most impact on any loudspeaker cabinet is the subwoofer. Vibration transmitted in this way to the structure has two negative effects: (1) the cabinet acts as an additional uncontrolled radiator; (2) the other speakers oscillate around their point of resting, modulating emission and reducing sound detail perception. The solution is simple and elegant: physically separate the subwoofer, which is why the cabinet comprises two vertical units, connected by four proprietary form and geometry puffers, extensively uncoupling the two cabinet masses. The image on the left shows the tensor surfaces, re ex duct and the structure that houses the two 200 mm subwoofers in the proprietary NRS® isobaric con guration. The demarcation line between the upper and lower sections can be seen at the base of the tweeter bore.



Impedance modulus & argument

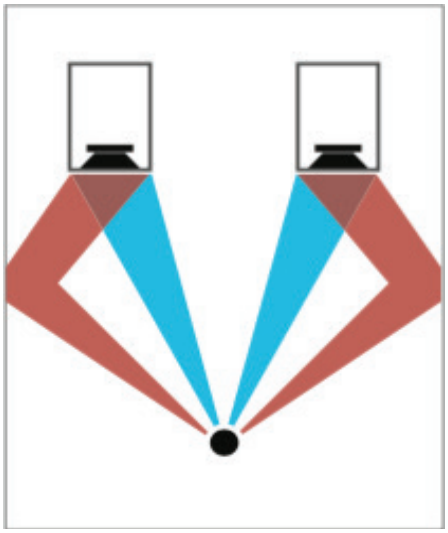


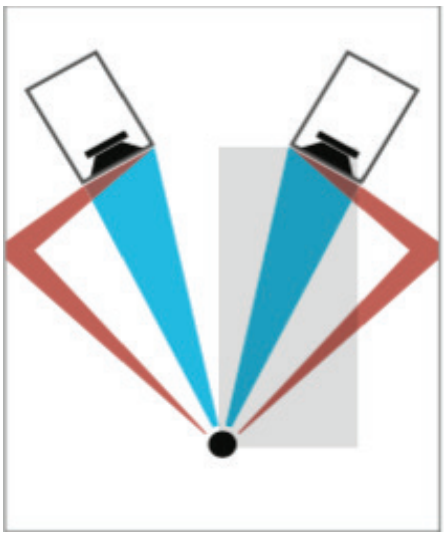
Single speaker frequency response

Parallelism and Tilting

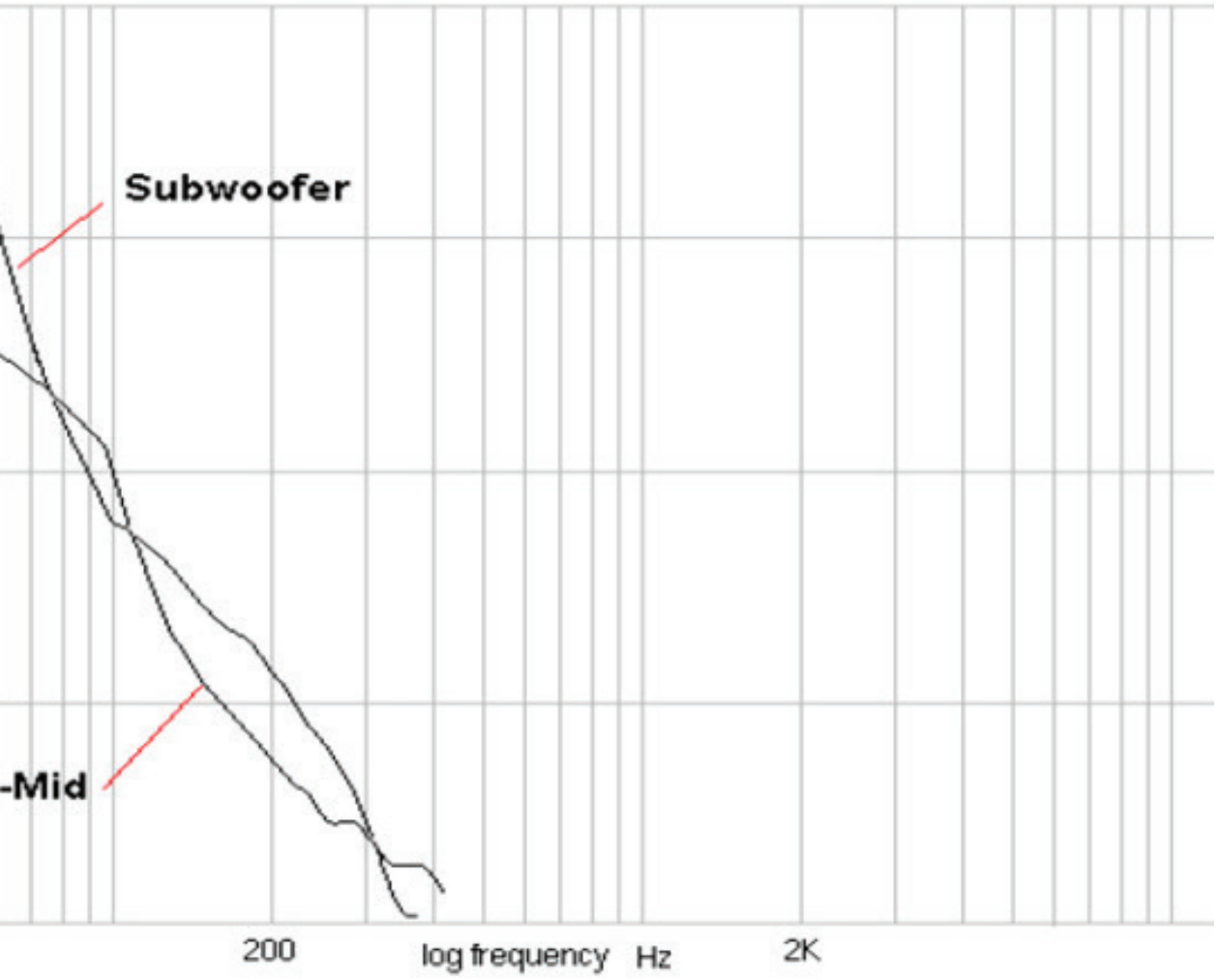
The two differnt layout on which Sovran can be settle into environment

Here you can see Sovran set parallel to the front wall. The standard stereophonic triangular layout provides the listener with two wave-fronts of similar energy content: direct path (blu) and reflected path (red). This layout exploits the early side-reflection (Haas effect) to enlarge the sonic stage beyond the physical distance of the two speakers.

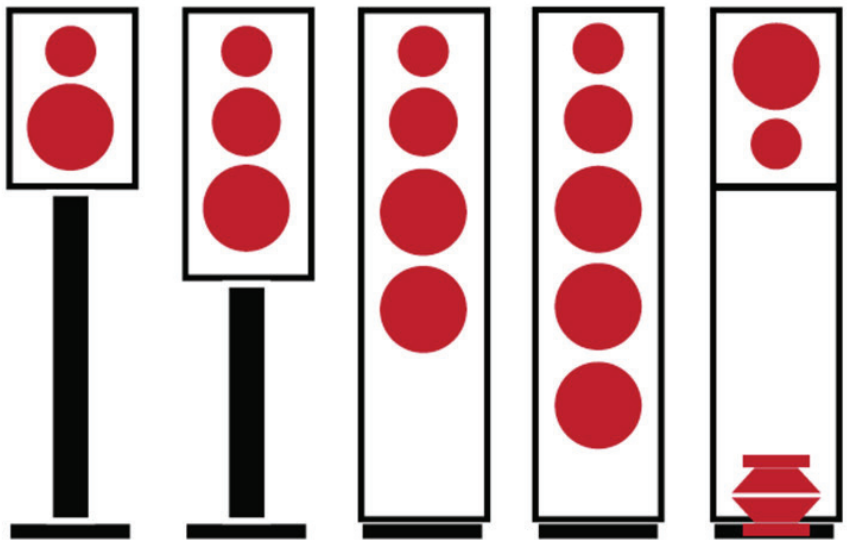




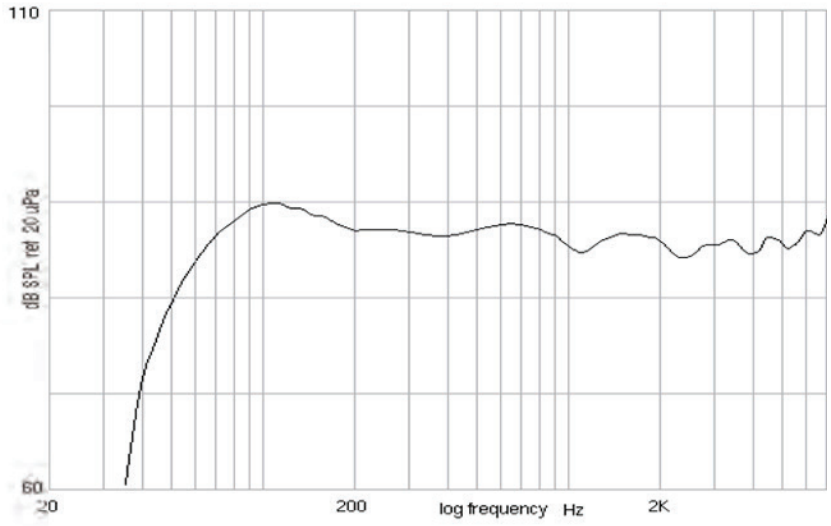
Sovran are tilted toward the listener. The standard stereophonic triangular layout provides the listener with two wave-fronts of different energy content: direct path (blue) and re ected path (red). This layout exploits the early side-re ection reduction to deepen the sonic stage beyond the front wall.



Relative acoustic phase



Acoustic Doublet

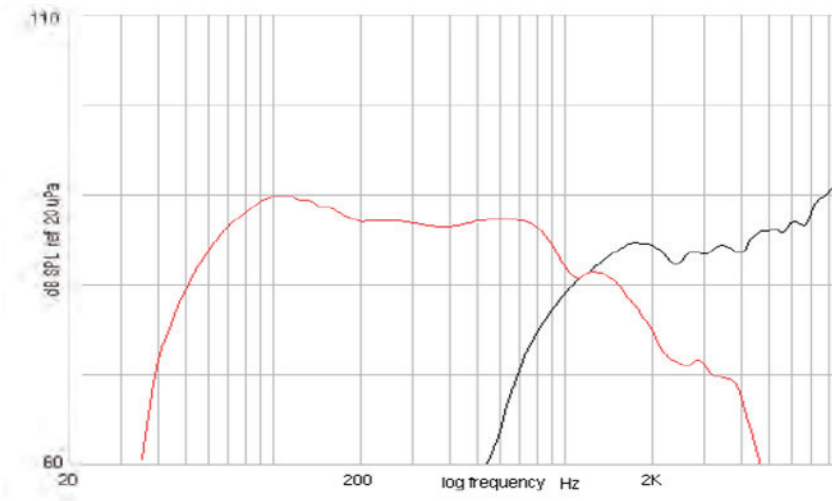


On axis frequency response

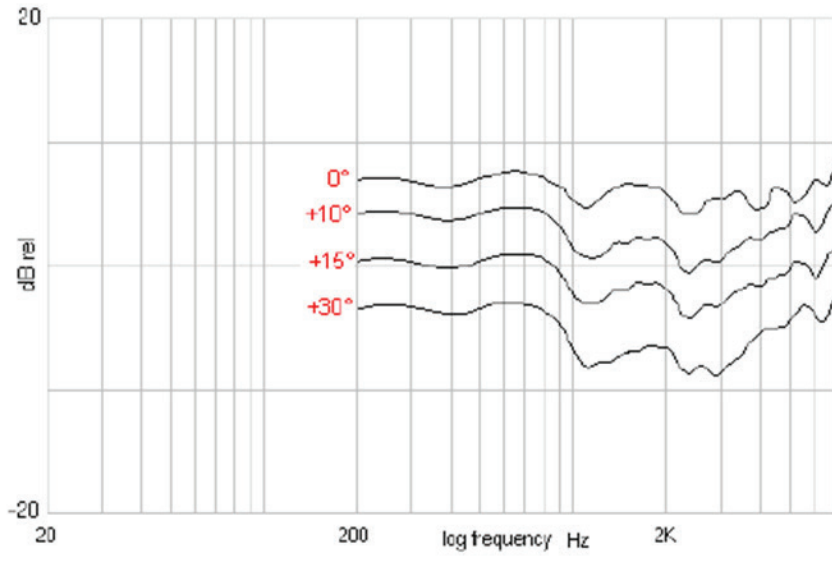
Sonnet

Free your emotions

The series Chario Academy is the absolute leading edge of technology in the specific area of the home speakers: Chario Academy Sonnet is the entry model in the series. This 2-way Bookshelf, equipped with two speakers, one 18cm woofer and a 32mm tweeter, specially made to provide the most natural reproduction possible, through the return of the totally devoid musical message from interpretations, so without any tonal aberration that causes a own tonal footprint of the speaker. This key parameter is due to the more than 40 years of Chario scientific research story in the various fields, contributing to the creation of the Academy Sonnet. From electromechanics, discipline that studies the electromagnetic phenomena, passing through electroacoustics, which analyzes the acoustic behavior of electromechanical devices. From the environmental acoustics that studies the envelope generated by acoustic sources in confined spaces, to the psychoacoustic analyzing the behavior performed by the auditory perceptual synthesis with the cerebral system. The Psychoacoustics is definitely the most important, as the foundation of the Music Therapy, which is widely used in medicine for the treatment of autism and many other mental disorders. Chario Academy Sonnet is designed to optimize its performance if tilted inward facing the listener, with side and back walls at least 1m away from the front baffle speaker and listener at the distance of 3.5 meters from the speakers. If positioned on its dedicated stand, which brings the loudspeaker at a predetermined heights, from the floor, or in bookcase or on a shelf that place it at a height above the floor between 70 and 80 cm. Chario Academy Sonnet requires an acoustically balanced environment, that means, with the presence of absorbent surfaces such as carpets or rugs, curtains, sofas and armchairs in fabric or velvet and filled with furnishings that reduce the width of the parallel reflective surfaces such as walls, floor and ceiling of the room. In this conditions the level of realism will let you discover once again your music, no matter if classical or modern, and emotions will take over.



On-axis frequency response per single speaker

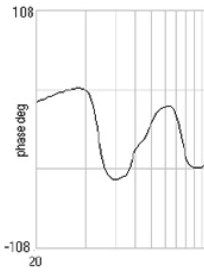


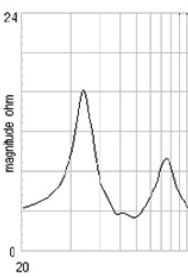
Upward vertical radiation

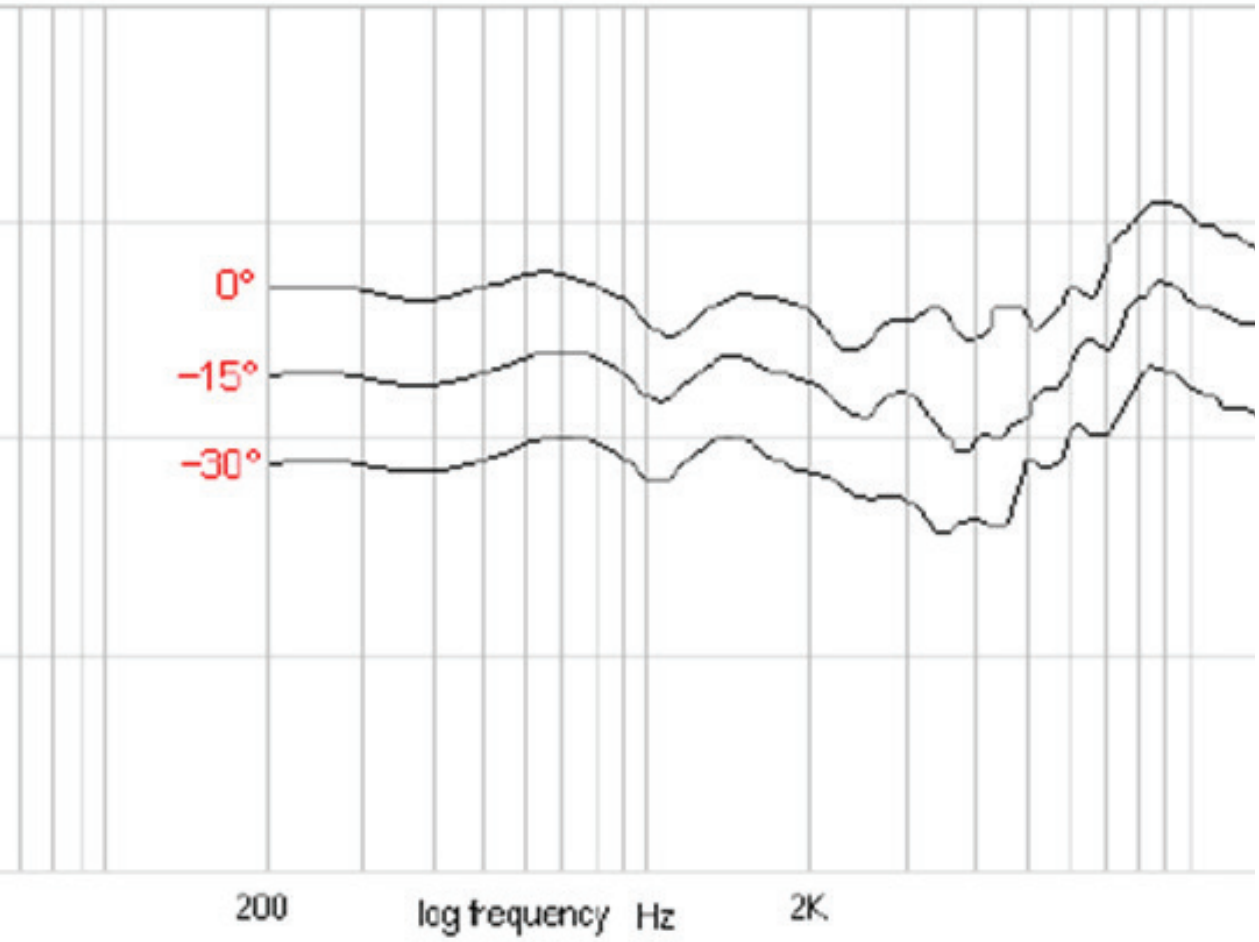
Chario

A Piece of History

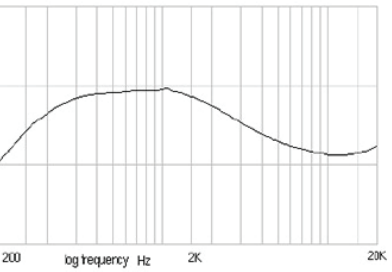
Chario was founded in 1975 by a group of investors , music and electronics lovers . in the last 40 years Chario as grown until to became one of the largest Italian company that designs and manufactures high quality loudspeaker systems for domestic use , nowadays is a prestigious name in international markets. The company's success is due to the combination of rigorous technical solutions and serious and transparent trade policy. Behind the design of the speakers Chario is psychoacoustics discipline that transforms complex mechanical oscillations in pure sensation, called music, which escapes any technical definition. Since its inception Chario adopted unconventional solutions for their speakers such as a Selective Expansion System built in 1975 , the first 7-way system housed in a wooden livery , an high impact and elegance product called Grand Millennium Academy, which was followed by the current "S" series with 5-way system with absolute reference performance: Serendipity, a speaker made in natural massive walnut weighing 100kg, equipped with a tweeter T32 Silversoft™ and membranes in Full Apex™ geometry. Just two examples of some of the product who made the history of the brand and, in some case also changed the stereofonic history forever.

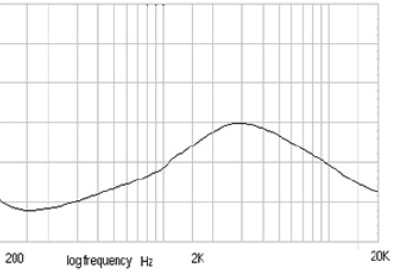


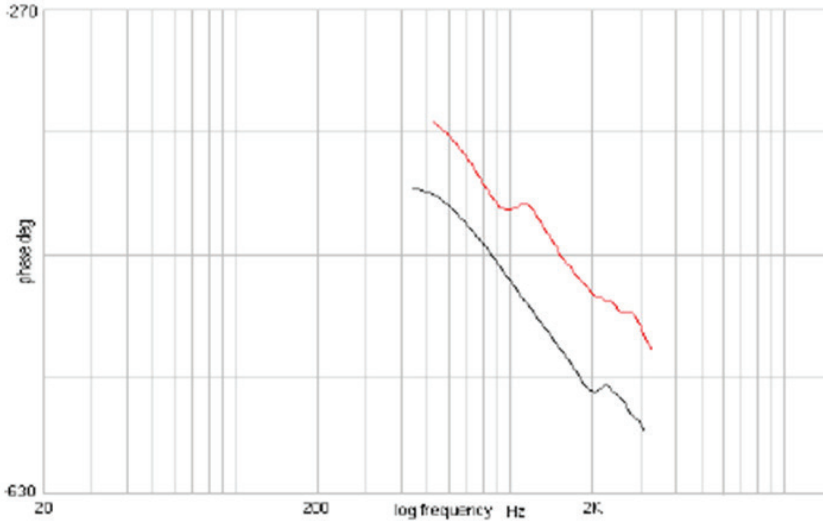




Downward vertical radiation

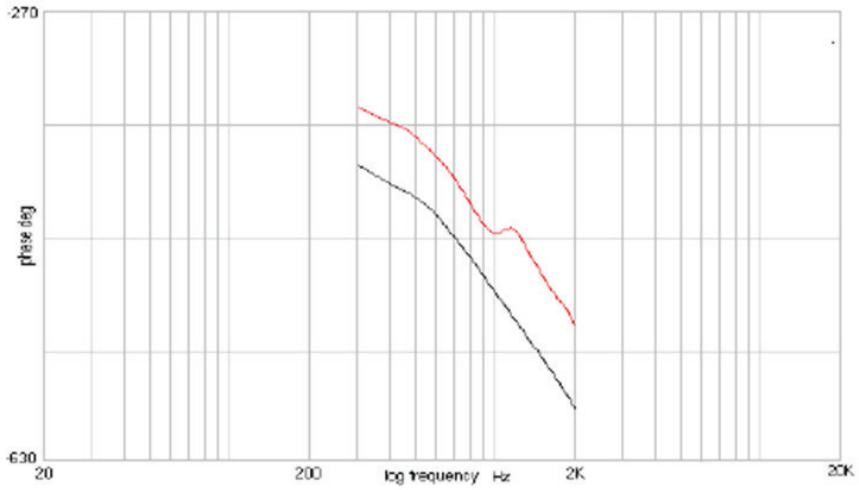


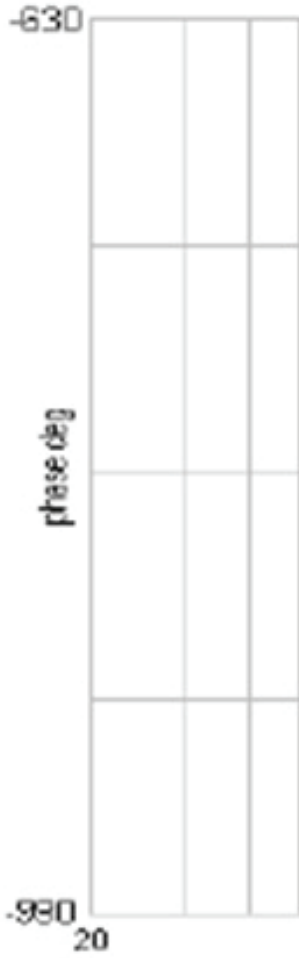




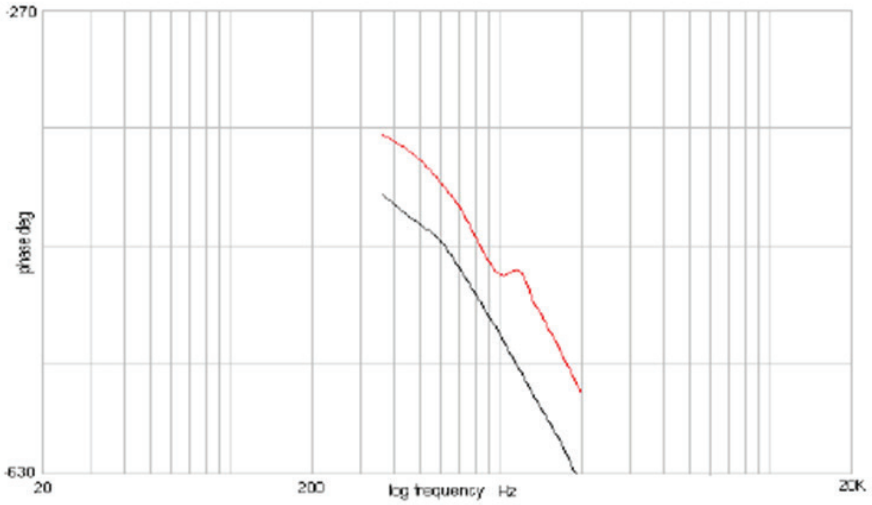
Impedance modulus & argument and Phase difference @ constant slope 0° horizontal

Sonnet Diagram

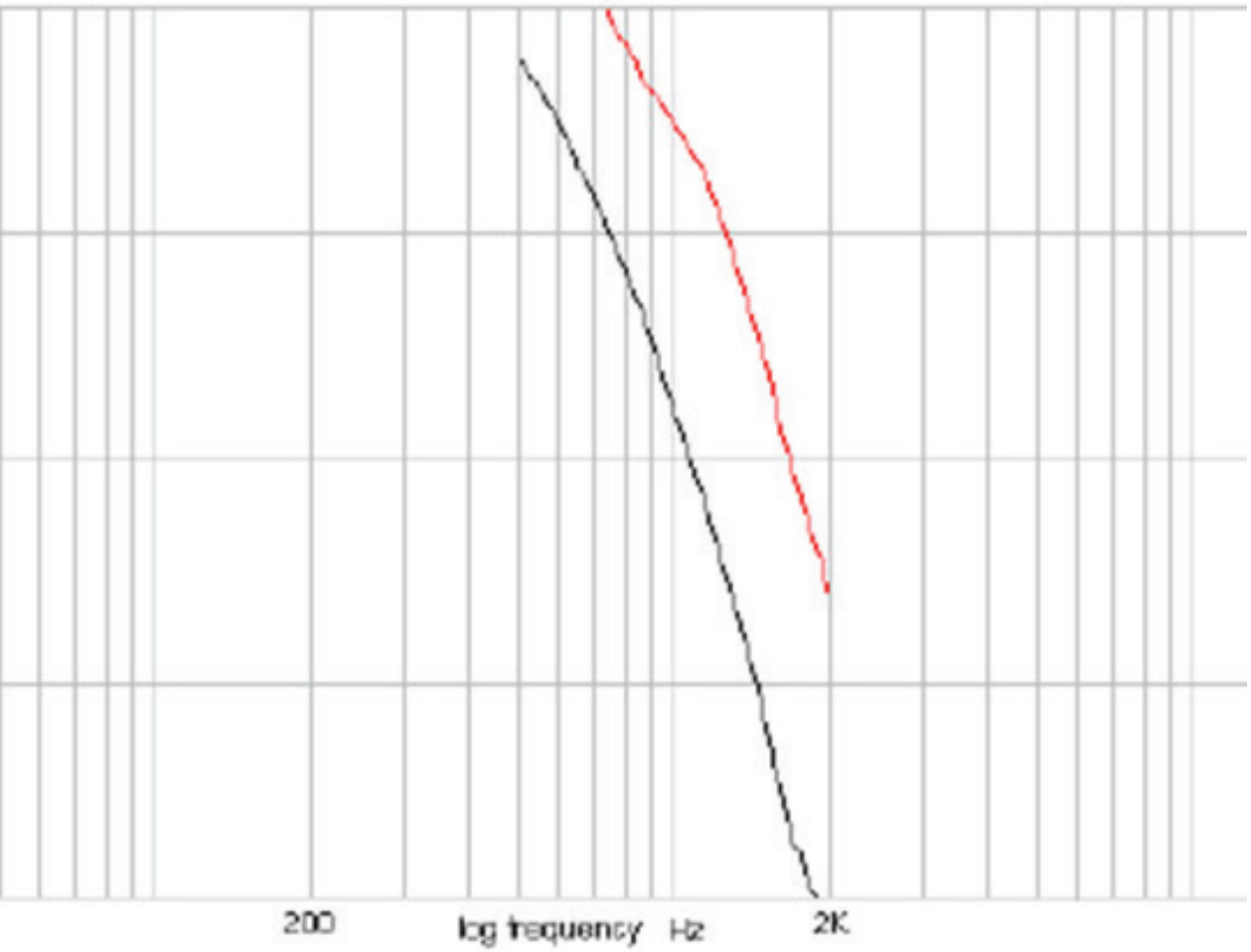




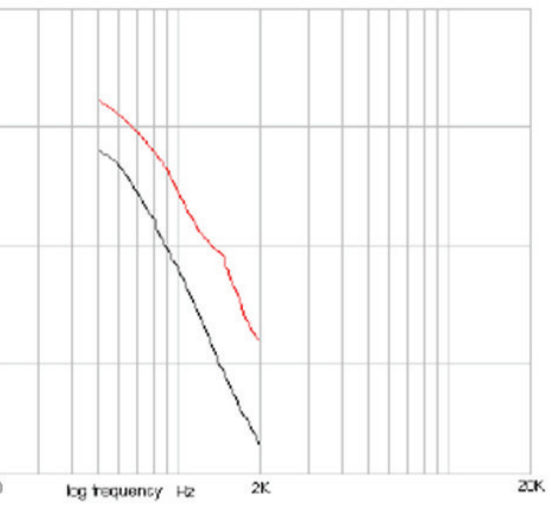
Phase difference @ constant slope 15° horizontal

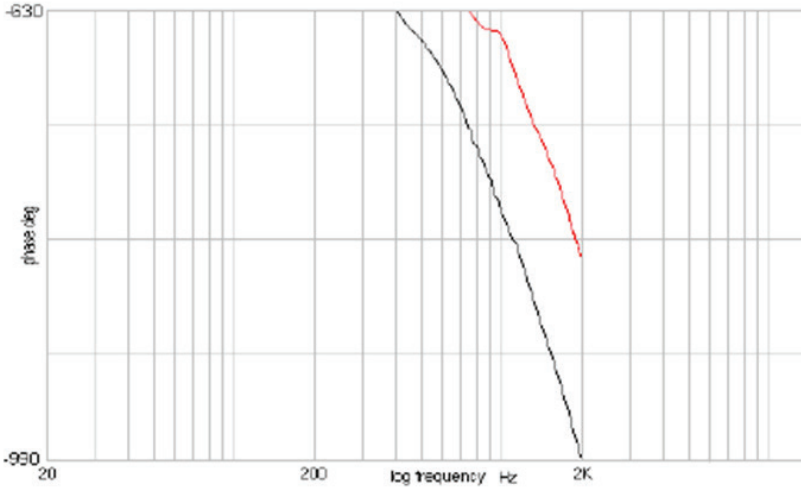


Phase difference @ constant slope 30° horizontal



Phase difference @ constant slope 75° horizontal





Phase difference @ constant slope 45° horizontal and Phase difference @ constant slope 60° horizontal

Space for Details

The unique application of Academty drivers

There are basically two ways to design a tweeter: with a rigid or a soft dome. The first solution ensures theoretical functioning beyond hearing limits, but requires complex damping to diminish very pronounced resonance. The second solution is inherently lacking pronounced resonance but structurally inclined to oscillate in section to the detriment of linearity. Chario Loudspeakers confirms the unfailing innovation of its philosophy by choosing the third option: a very soft silk dome, treated in both sides with deposits of aluminium vapour to build up stiff but intrinsically damped layers.

A progressive reduction of the speaker surface achieves a beneficial trade-off, using state-of-the-art materials that decrease the mass in movement and significantly increase bending resistance, indispensable for resonance-free functioning as the reproduced frequency gradually increases. Rohacell® has been seen to be a winning choice because of its heat-formed sandwich of two polymer layers with a urethane interior offering high molecular damping. Exclusive Full-Apex™ geometry was applied to get the best out of this material, raising speaker surface rigidity towards the FEM (Finite Element Method) theoretical model.

Relieved of the need to reproduce medium-low frequencies also, the Academy 'S' Series midrange focuses all its attention on the best way to "hand over" to the tweeer, with the intention of camouflaging listening transition from a cone radiator to a dome radiator. This goal was reached by installing an aluminium plug on the pole piece to equalize off-axis energy emission, with radical elimination of the cavity effect.

A Silk Dome membrane coated with an ultra fine layer of vaporized aluminium that's the secret of our Academy tweeter. A 32 mm moving coil and Neodymium magnet. It's voice can be heard from 1kHz, the monopole moving coil transducer equivalent of what planar membranes achieve in the field of dipole transducers. We rest our case.

There are basically two characteristics required of a transducer for the extreme lower frequencies in the audio spectrum, as the 320 mm subwoofer used on Academy series: high thermal capacity and long excursion. These objectives are achieved by using large diameter moving coils.

These do have a significant mass that requires the inclusion of quite a heavy vibrating diaphragm to adapt the respective mechanical impedances at the junction point. The underpinning relies on natural fibres in an anisotropic cofiguration, which can withstand the acceleration brought by a very high induction magnet, required for ensuring the right damping that gives the "punch" feel.

Woofer

SubWoofer

Closer Details Academy

The Philosophy behind every Chario product since 1975

Our R&D Laboratory is always at the starting block for new projects and research programmes. Compared to marketing-oriented manufacturing, this authentic approach to audio matters makes chario loudspeakers an outsider that always anticipates fashions and trends, which we then originate, inspired by our philosophy:

"Science is our goal,
Listening is your aim"

The use of Chario Loudspeakers' Overlapping Frequencies™ proprietary configuration does not include standard operation of individual transducers, so it is possible to manage design dimensions and parameters to enhance impulse response. In this perspective, the use of Neodymium pads as permanent magnets set around the pole piece allows for better heat dissipation as well as fastest acceleration of the moving mass.

A quick look into the features of the 32 mm Tweeer used on Chario Academy “S” Series:

Fabric dome
Fabric suspension
Kapton voice coil
Former vented pole piece
Symmetric drive

The copper sleeve reducing eddy-current goes all the way to the bottom of the center pole piece. Chario think this is the way it has to be made. The dome itself, realized as well as all other drivers on Chario own design, are both, surround and dome, made from the same fabric, realized through the moulding of a single piece of fabric to obtain a structure, the most integral and resistant possible. The surround almost rises vertical to make a solid connection to the voice coil former. This improve energy transfer from the voice coil to the dome and enhance high frequency response.

A close view of the T 32 used on Academy Line

Chario Academy Serendipity

The Cross Overs are made specifically for each speaker and are designed using the highest quality components. As all other components, they are entirely made in Italy the brain and soul of the whole speaker.The listening environment is considered the most influential factor for proper playback. The speaker system must be designed keeping in mind that the speaker will probably be used in a space free, or partially free, of sound field control.

Movements and Perceptions

The phasors path of sound, effect and perception in the acoustic environment

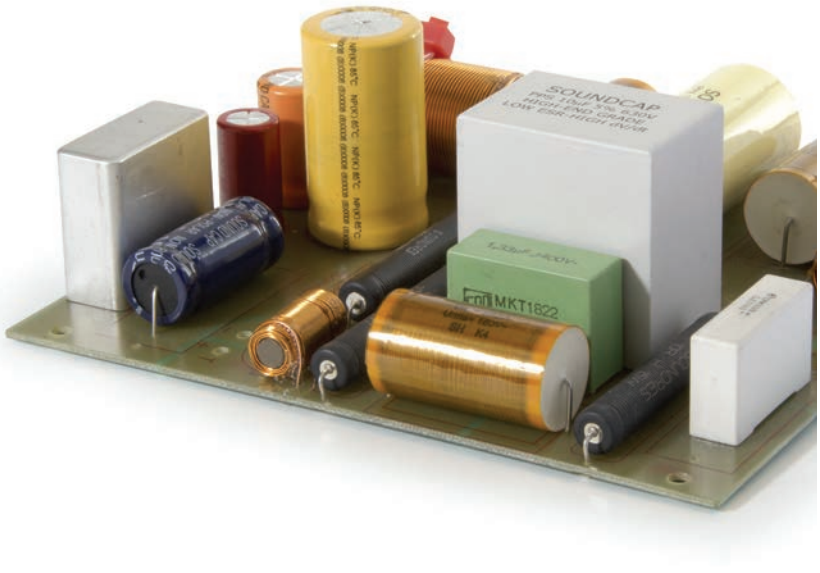
While the one-way movement of a woofer voice coil is guaranteed by the spider, the same cannot be said for the membrane. There are two reasons for this:

° Voice coil and membrane do not constitute a single, in nitely rigid unit

° The membrane surface is subject to impact with air molecules.

The addition of an external ring suspension cleverly resolves the problem and offers the moving mass just the right amount of compliance. Above all, however, it defines the volume of air moved by the loudspeaker, ensuring maximum excursion. Other, less evident functions could also be mentioned, including the task of providing the membrane with the correct termination impedance to reduce the effects due to velocity changes at the joining point (basket). From a psychoacoustic point of view, however, to emphasize the phenomenon, the perception of the first sound bounce should be considered if a credible sound is to be carved into space. Of course, since all relevant range frequencies share the same application point, it must be said that the reflected energy field is an imperfect replica of the direct field. In other words, they are coherent because their wavelengths are of the same size as the cofined air volume (listening venue). If we compare a Sonnet and Sovran, located in the same acoustic environment, we could notice that because the wavelengths range from roughly 1.5 m to 7.0 m, human hearing does not perceive a noticeable variation in the coherence function if different components are emitted by free-standing arrays, which will be no more than d=0.4 m apart.The acoustic framework will be quite different for Academy Sovran, which has about 1.1 m between the subwoofer and the woofer. The two sources are mathematically different because they overlap at about 100 Hz thanks to an overlapping crossover, allowing an extensive interference pattern to reach from 80 to 250 Hz, in which both sources emit the same phase component but with a different amplitude that greatly reduces the two perceived wave-front coherence.

Academy Sovran close view



Academy Sovran Woofer 170 mm ROHACELL® Full-ApexTM Poly-Ring NeFeB motor and the cross over adopted by the model

ACADEMY SERIE

chario

Limited Edition Art

2016 Chario® Academy “S” Series catalogue