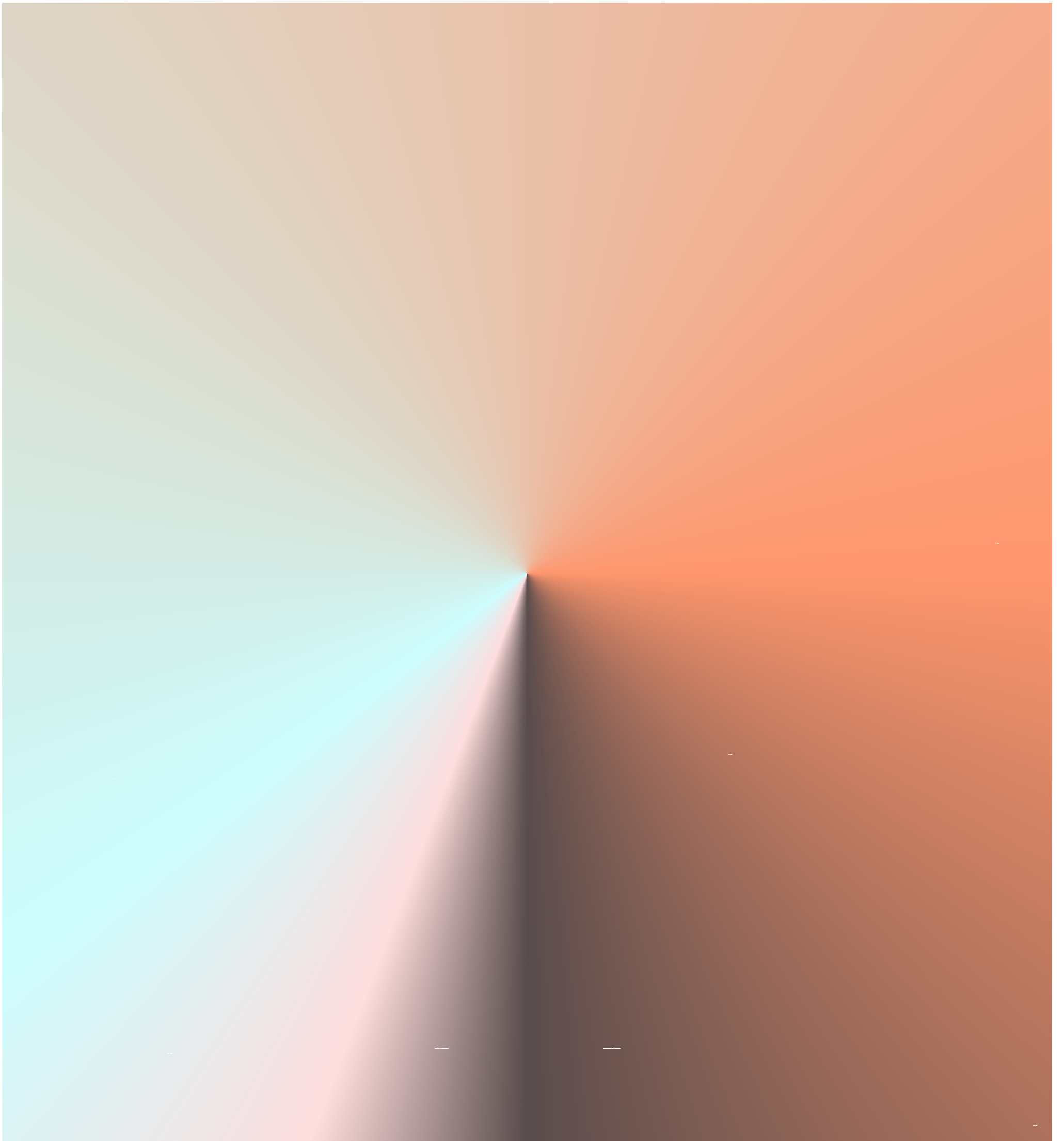


STERE O TYPE



A modular wall-mounted DML audio system based on interchangeable resonant panels.





STERE O TYPE

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Small
Circular
Useful
Objects

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Concept Design Studio - Green
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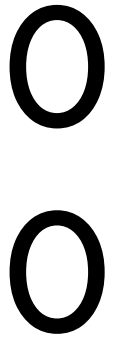
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General Brief

Design a new Small Circular Useful Object.

Small / it must fit in a box of 50x50x50cm

Circular/ it should be environmentally friendly

Useful / It should be useful for a specific task or target.



Project statement

Stereotype is not a traditional speaker, neither a decorative element. It is a platform.

Stereotype is a modular wall-mounted audio system that allows users to customize their listening experience through interchangeable sound-radiating panels.

Instead of relying on a conventional speaker cone, the system uses distributed mode loudspeaker principles, where an exciter transfers vibration directly into a flat surface that becomes the source of sound.

The project is developed as an academic design proposal, but it is conceived and presented as a working prototype. Its ambition is to offer a clear product identity, strong spatial integration, and a unique form of physical sound customization through material choice.



starting point

DML technology and minimizing mass-produced components with a "Parasite" approach

OpenBuffle

Exploiting existing in-house surfaces to generate novel audio experiences

OpenEx

An open source system to build and contribute to the community of DML makers through a coherent framework

Stereotype

designing sound signatures with a centralized, yet open, system

How can we turn sound reproduction into a process of selection and interpretation, rather than passive consumption?



Concept evolution

Rather than reproducing audio in a passive and predictable way, DML panels suggest a more open and exploratory form of listening, where material behavior directly shapes the acoustic outcome.

Openbaffle represents a first attempt to engage with this potential. It explores how the variability of the vibrating surface can generate diverse sound responses, encouraging a more active interaction. However, experimentation remains largely uncontrolled.

With OpenEX, the morphology and the mounting conditions of the panel and its supporting structure become a variable, for a listening experience that remains active, but is now guided.

Building on this evolution, Stereotype's sound signature is curated through a more centralized design and production process. As a result, each panel embodies a defined acoustic character.



OpenBaffle

Concept definition

OpenBaffle originates from a reflection on transducers and Distributed Mode Loudspeaker (DML) technology as a means of reproducing sound with minimal material use. These systems perform best on surfaces that are light, hollow, and flexible, qualities already embedded in many everyday domestic objects, particularly furniture.

Instead of designing an enclosure from scratch, it treats existing objects as "found enclosures," repurposing their material and structural properties.

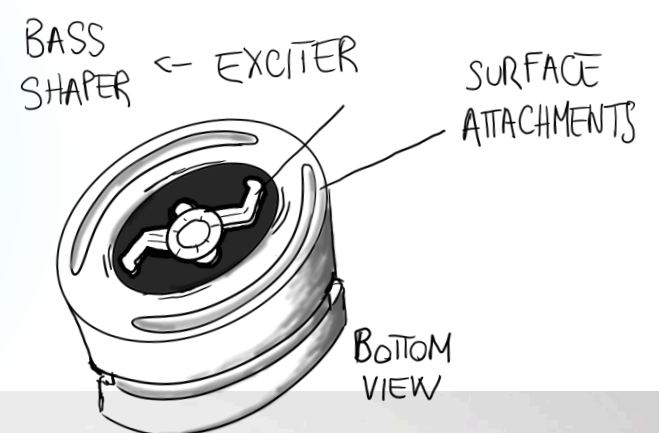
Innovative element

At its core, the system redefines how sound is produced and experienced within the domestic environment.

This approach also introduces a more efficient use of space and resources. By embedding sound reproduction into objects that are already present in the home, the need for additional audio equipment is reduced, avoiding redundancy.

Most importantly, the project shifts listening from a passive act to an active one. Sound is no longer fixed or pre-defined, but shaped through the selection and configuration of the object itself.

A small transducer for different surfaces to tune the sound signature and use less materials.





The product concept is conceived as a portable system, enabling users to easily reposition it and explore different acoustic outcomes within the home.



OpenEX

Concept development

OpenEX (Open Exciters) is an open-source, modular system for designing and building custom Distributed Mode Loudspeaker (DML) panels with user-defined acoustic signatures.

The system combines laser-cut flat panels with 3D-printed exciter housings that snap-fit directly onto the surface, creating a flexible interface between transducer and material. This configuration allows users to actively shape the behaviour of the panel through variations in geometry, material, and mounting conditions.

Through this modular approach, OpenEX enables a wide range of outcomes.

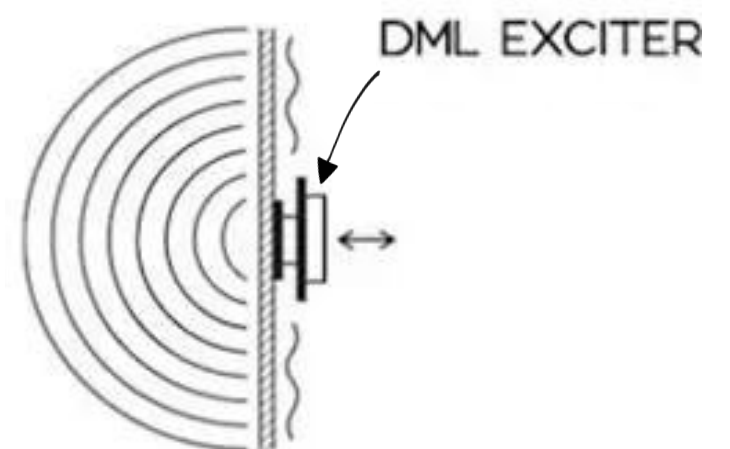
Variability of signatures

Users can download and reproduce acoustic “recipes” from a shared library, or develop entirely new sound signatures by iterating on the system’s open parameters.

Building on insights from previous case studies, the open-source nature of the project is a fundamental condition for the development of the model. It enables continuous experimentation, where users contribute variations, document outcomes, and refine the system collectively.

Through this process, the technology becomes progressively more accessible, sharing distributed knowledge.

An open platform for experimenting a multitude of sound signatures through geometry and materials, with DMLs (Distributed Mode Loudspeakers).

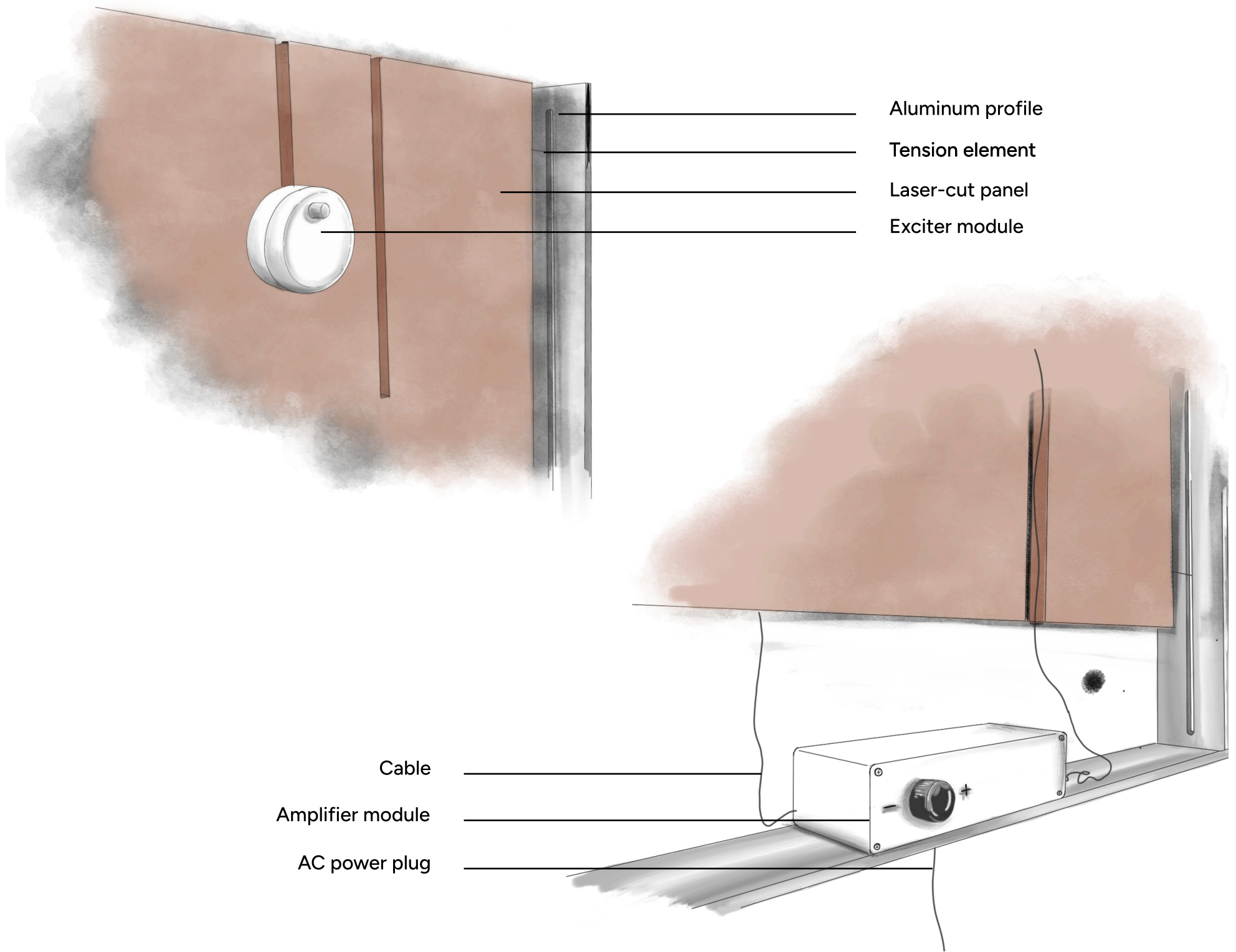




OpenEx can be either wall mounted or freestanding, making its placement around the house versatile.



Components



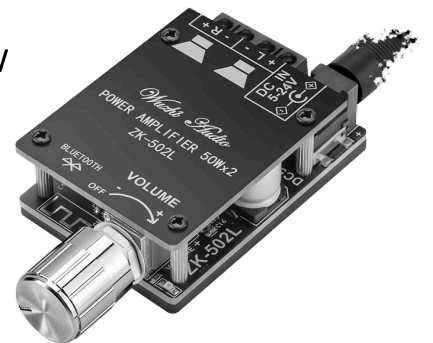
Exciter module

3D-printed PLA shell
Exciter 40W - 4ohm dayton



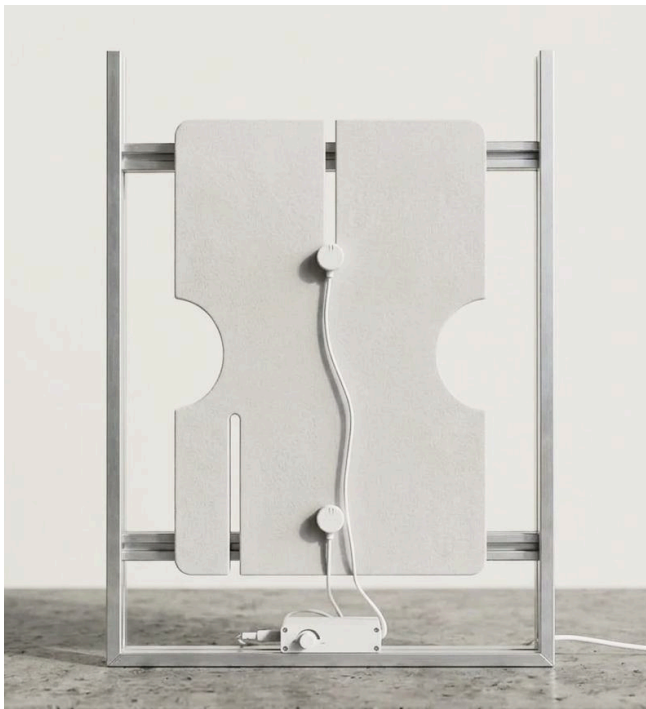
Amplifier module

3D-printed PLA shell
Amplifier (board and bluetooth) 40W



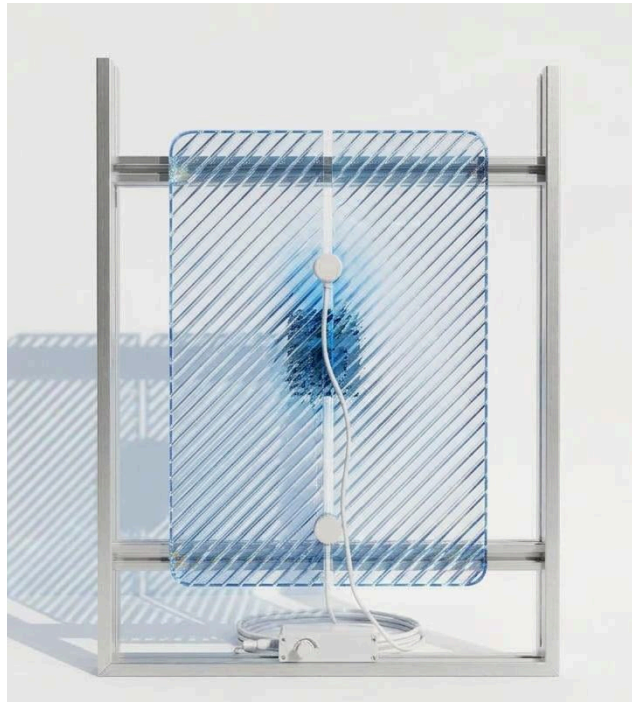


Warm



XPS foam, 30mm
laser-cut holes
Central exciter positioning

Bright



Acrylic, 4mm
Laser-cut engravings
peripheral exciter psitioning

Flat



Plywood, 5mm
Laser-cut engravings
Exciters at a short relative distance

Thin materials generally perform better than thick ones, while increased thickness tends to damp vibration and reduce acoustic openness. This confirms broader guidance in exciter-based audio design, where material selection has a major influence on bandwidth, efficiency, and tonal balance.

Storyboard

Online library

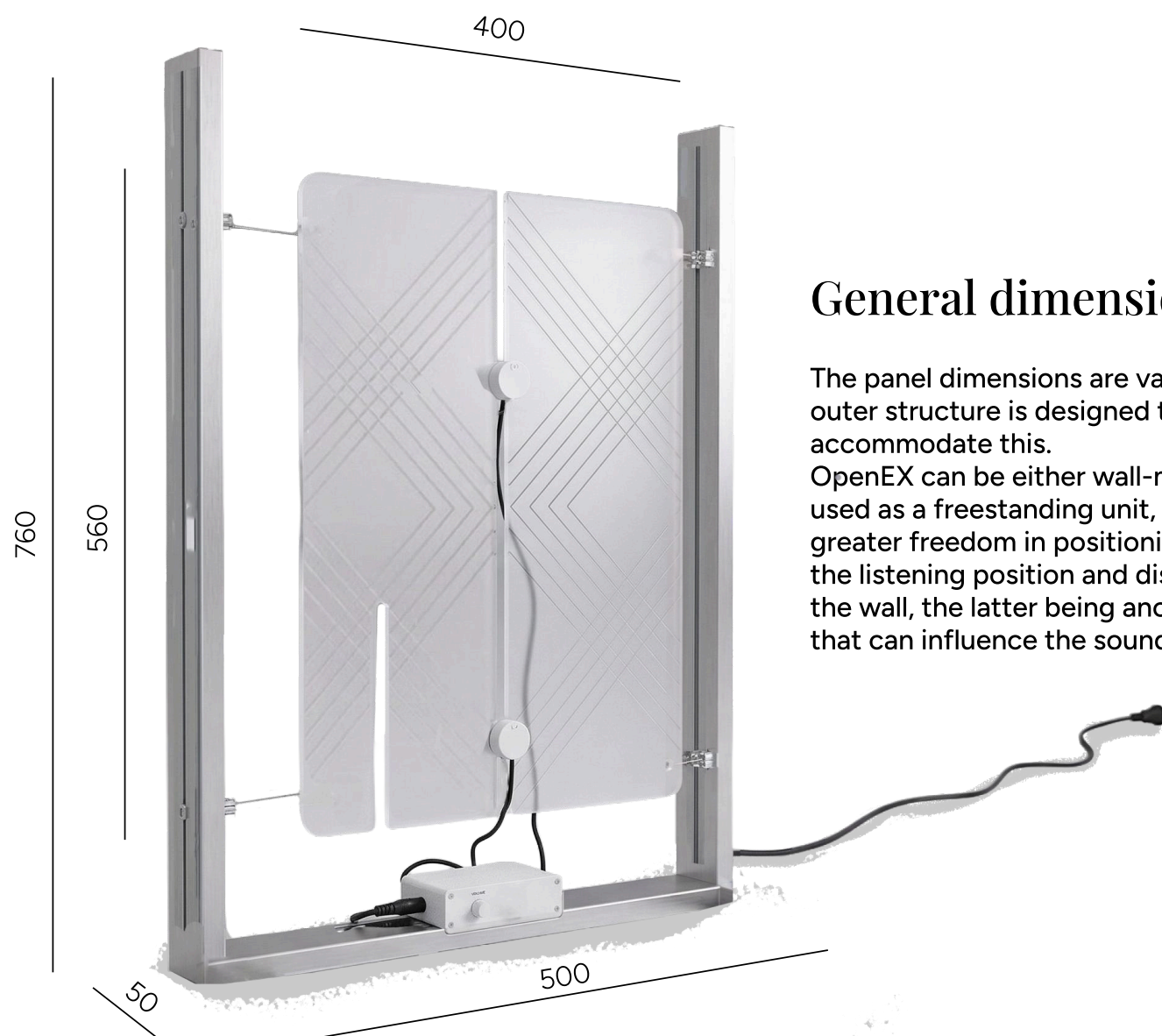
Instructions and fabrication files for laser cutting, engraving, and 3D printing are provided through an online library as downloadable presets. These serve as accessible starting points, enabling users to build the system while establishing a shared baseline for experimentation.

From this foundation, panels can be further customized by individual users, who are encouraged to adapt configurations and develop their own variations. These contributions can then be uploaded to the community platform, where they can be accessed, replicated, and evaluated by others.

Mode of use

After the initial setup and Bluetooth pairing, the first mode of interaction with OpenEX is physical. Users can reposition the two exciters across the panel by sliding them along predefined slots.

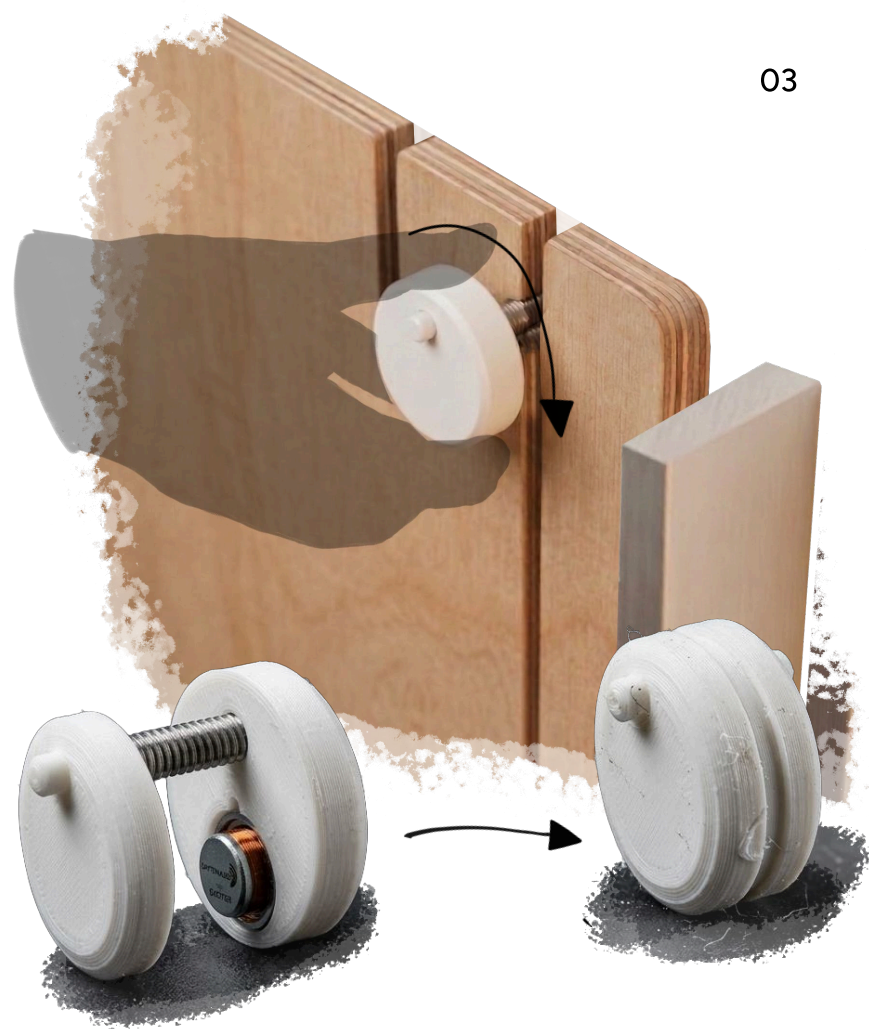
Their relative distance directly influences the acoustic response. When placed closer together, the exciters concentrate energy within a smaller area, resulting in a brighter and more focused sound. As they are moved further apart, the vibration is distributed across a wider surface, producing a more diffused response with a perceptible damping effect.



General dimensions

The panel dimensions are variable, so the outer structure is designed to accommodate this.

OpenEX can be either wall-mounted or used as a freestanding unit, giving users greater freedom in positioning it relative to the listening position and distance from the wall, the latter being another factor that can influence the sound signature.



01. Build your OpenEX in an initial configuration available on the library.

02. Connect it to a device via Bluetooth. How does it sound?

03. Experiment with exciter positioning on the panel.

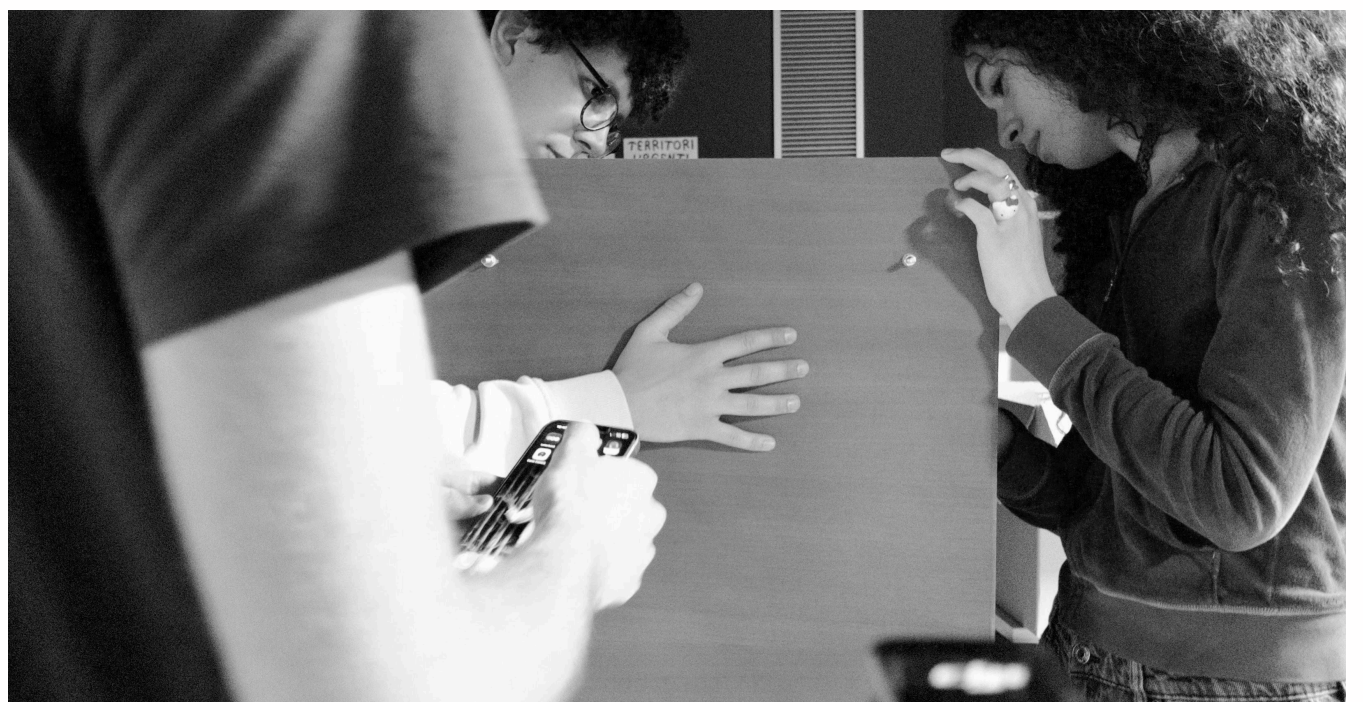
04. Further customize the setup, creating the desired sound signature.

02



Preliminary research

In order to design for sound, it's crucial to understand its basic elements, and in this case, acknowledge the true difference between conventional and distributed loudspeakers. After an exploration of constitutive elements of sound, the research intended to investigate the material parameters influencing sound output in DML systems. As there's a considerable community of makers and DIY people around this technology, it came naturally the idea to hypothesize a framework to parametrize the acoustic elements of a DML panel. In this scenario, a design approach to assist technical and theoretical sides fits well.



Sound is inherently physical

Sound and movement

Sound begins with something moving. When an object vibrates, a string, a loudspeaker diaphragm, or a carbon-fibre sheet, it flexes back and forth, pushing on the air around it. Pressure variations travel as waves through materials. Those molecules collide with their near ones, dispersing the disturbance in all direction as a pressure wave. The endpoint that reaches your ear is a pattern of alternating compressions and rarefactions traveling through the air at roughly 343 m/s. Sound is thus physical, shaped by every material it contacts along the way.

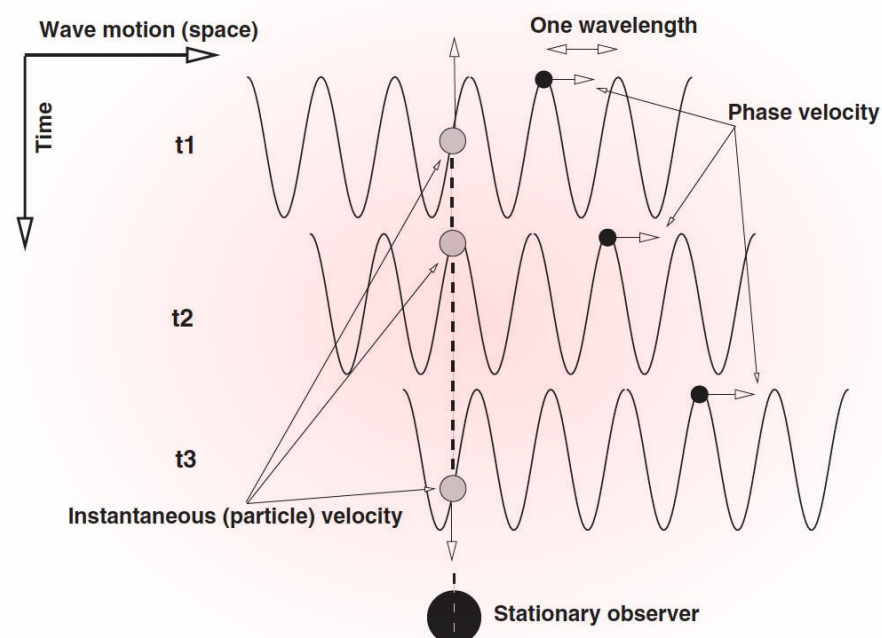
Properties

There are three main properties that define the character of any sound:

- **Frequency:** how many pressure cycles pass a point each second, measured in Hertz (Hz);
- **Amplitude:** the intensity of the pressure change, which is perceived as loudness. Standard unit is **Decibels (dB)**, which is a logarithmic scale that mirrors the non-linear sensitivity of the ear;
- **Timbre:** the texture and color of a sound, determined by its time-frequency profile. Two instruments can play the same note but sound different because their spectra differ;

Sound is behaviour

In everyday life we rarely experience pure tones. Most sounds are complex mixes of many components evolving over time: the attack of a door closing, the rumble of traffic, the shimmer of a cymbal. The “shape” of a sound in time, how it starts, how it sustains, how it decays, is as relevant as the frequency components themselves. A useful way to think, as suggested by Andy Farnell in *Designing Sound*, is that **sound is behaviour**, not just a recording. A panel, a room, and a piece of software all define processes that generate sound when they are excited, rather than simply playing back fixed data.



Velocity and wavelength of a moving wave.

How materials shape sound

Every material that a vibration passes through filters it. When a wave travels from one medium into another, from the air into a wooden panel, for instance, some energy is reflected, some is **transmitted**, and some is **absorbed** and **converted** to heat. Denser, more rigid materials transmit high-frequency energy efficiently. Softer, more porous materials absorb it, cutting the highs and adding warmth. Elasticity determines how quickly a material springs back, governing its resonant frequency. Damping, internal friction within the material, controls how long a vibration sustains before dying away. **Therefore, a material is never acoustically neutral.**



Conventional and unconventional loudspeaker

The Conventional Loudspeaker

For most of audio history, loudspeakers have worked by piston motion: a voice coil driven by an electromagnet pushes a cone back and forth in a single, unified direction. The cone tries to behave as one rigid body, pumping pressure into the room. This approach is efficient and well-understood, but it concentrates sound radiation in a narrow direction and requires an enclosure to manage back-wave interference. The speaker's "voice" is inevitably derived by the box it lives in.

Distributed Mode: A wavy way of thinking

A Distributed Mode Loudspeaker (DML) works on a fundamentally different principle. Instead of a cone moving as one piston, a small electromechanical transducer (exciter), attached directly to a lightweight rigid panel, injects energy at a single point. That energy then radiates outward across the panel surface as bending waves, very much like the rings that spread across water when a stone is dropped in. Because the panel has different dimensions along each axis, and because bending waves travel at speeds that depend on frequency, the surface naturally breaks up into dozens of simultaneous resonant modes. Each frequency excites a slightly different pattern of vibration across the whole surface. The result is a radiating body whose behaviour is distributed in both space and frequency, hence the name.

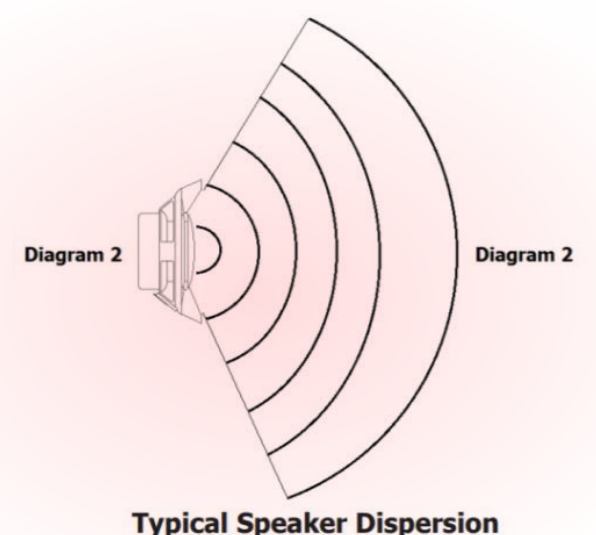
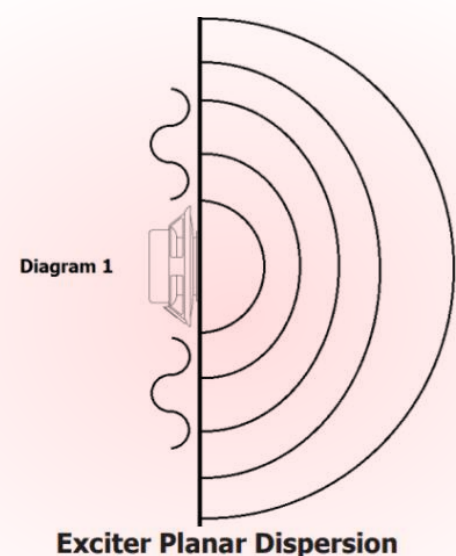
Thus, the sound leaving a DML panel comes from many points at once, spreading diffusely into the room rather than from a tight, directional source. There is less interaction with room reflections, and the listening experience tends to feel spacious and immersive.

- Sound radiates from many points at once over the surface, not from a single concentrated area.
- The radiation is more diffuse and wide in angle, which reduces sharp sweet spots and strong reflections from single directions.
- Listening tests show that well-equalized DMLs can match conventional speakers in overall quality while exceeding them in perceived stage width and envelopment

Dispersion

The vibration of the surface modulates air in such a way that sound is created in a planar-wave way.

Listeners can be positioned up to 90° off-axis of the excited surface and experience the same sound quality as a listener positioned directly in front of the excited surface (diagram 1). Typical speaker dispersion (diagram 2) is such that frequencies above 5kHz tend to become attenuated for angles larger than 15°.

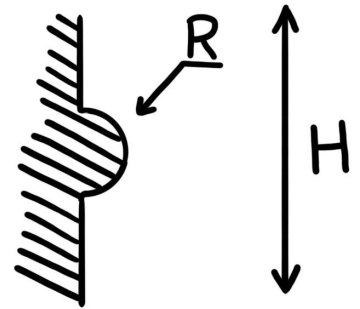


Multiple signatures, one framework

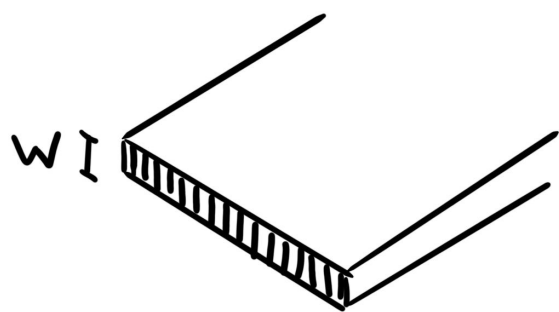
By controlling a defined set of design parameters, Stereotype establishes a framework for intentionally authoring that signature.

Geometry and Scale

Aspect ratio governs the **spatial distribution** of resonant modes across the panel surface. Panels with irrational, non-square proportions generate a denser and more uniformly spread modal field, producing a smoother and more diffuse acoustic output. Square or simple-ratio geometries, by contrast, yield coincident or clustered modes that can introduce tonal coloration or peaks. Overall dimension scales the fundamental resonant frequencies: larger panels shift the modal field toward lower frequencies, extending bass reproduction, while smaller panels concentrate energy in the mid and upper range. Together, aspect ratio and dimension set the foundational acoustic register of each panel.



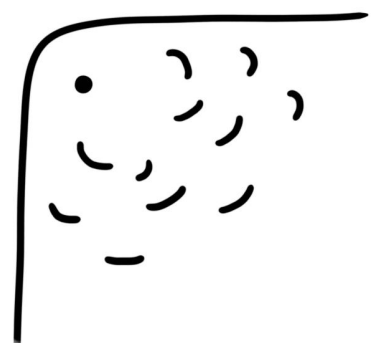
Material and Thickness



The panel material determines three interacting properties: bending **stiffness**, internal **damping**, and surface **mass**. High-stiffness materials such as carbon fiber or acrylic favor broad frequency extension and higher output efficiency, but are prone to narrow resonant spikes. Softer or composite materials introduce greater internal damping, producing a smoother but often attenuated high-frequency response. Thickness modulates both stiffness and mass simultaneously, a thicker panel increases rigidity, raising the frequency of its resonant modes, while a thinner panel allows more compliant bending and extends lower-frequency radiation. The stiffness-to-mass ratio is the defining acoustic lever within this parameter pair.

Surface and Edge Treatments

Corner fillets alter the boundary conditions at panel edges and corners, affecting how bending waves reflect and recombine across the surface. Sharp corners tend to reinforce high-Q localized modes; rounded geometries distribute wave energy more gradually, smoothing the modal density in the upper frequency range. Engravings introduce **local variations** in stiffness and mass, acting as targeted perturbations to the resonant field, selectively suppressing or displacing specific modes without altering the panel's global geometry. Coatings function as **distributed damping layers**: by absorbing bending wave energy at the surface, they reduce high-frequency ringing and broaden the effective bandwidth of the panel, at the cost of some sensitivity at the extremes. Together, these treatments operate as fine-tuning mechanisms applied over the foundation established by geometry and material.





| Parameter | Lower range | Upper range |
|--------------------|----------------------------------|---|
| Aspect ratio | Clustered modes, tonal character | Distributed modes, diffuse output |
| Dimension | Mid/high-focused response | Extended bass register |
| Material stiffness | Soft, damped, smooth | Stiff, efficient, dynamic |
| Thickness | Compliant, lower-frequency bias | Rigid, mid-range prominence |
| Corner fillets | Sharp, mode-dense edges | Rounded, smoothed high-frequency response |
| Engravings | None, full modal field | Targeted mode suppression |
| Coating | Uncoated, full resonance | Damped, reduced ringing |

Parametrization table.

Panels and signatures

Main properties

In a DML system the panel is not merely a diaphragm, but it's an instrument itself. Its acoustic output is directly shaped by three material properties:

Stiffness-to-mass ratio → Efficiency of wave propagation; high ratio thus extended frequency response

Internal damping → How quickly modes decay; high damping means smoother, less "ringy" response

Dimensions and geometry → Spacing of resonant modes; uniform distribution that means flat frequency response

Application

Stereotype exploits the material-dependency of DML acoustics as a design feature rather than an engineering problem to be solved. The electronic core amplifier, exciter, aluminum frame, remains fixed. The front panel is interchangeable. Swapping the panel is acoustically equivalent to changing the resonant body of an instrument: the same input signal becomes a different sound.

This is the concept of the sound signature, the characteristic spectral fingerprint a panel imposes on whatever audio passes through the system. Three signatures are available at launch based on three respective panel materials.

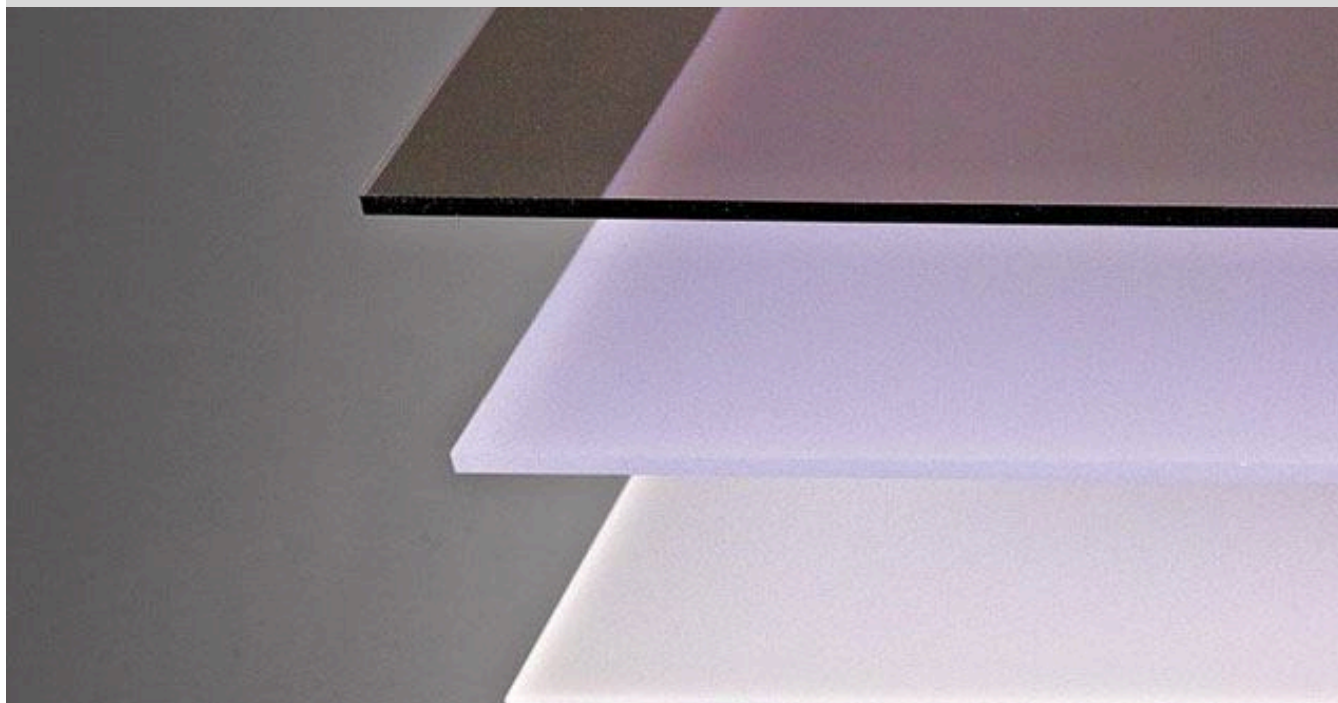
Materials

As a starting point, three panel versions are proposed. They're chosen for their representation of different acoustic properties, from warm tones to bright and detailed sound qualities. More panels signatures can be released in further developments.



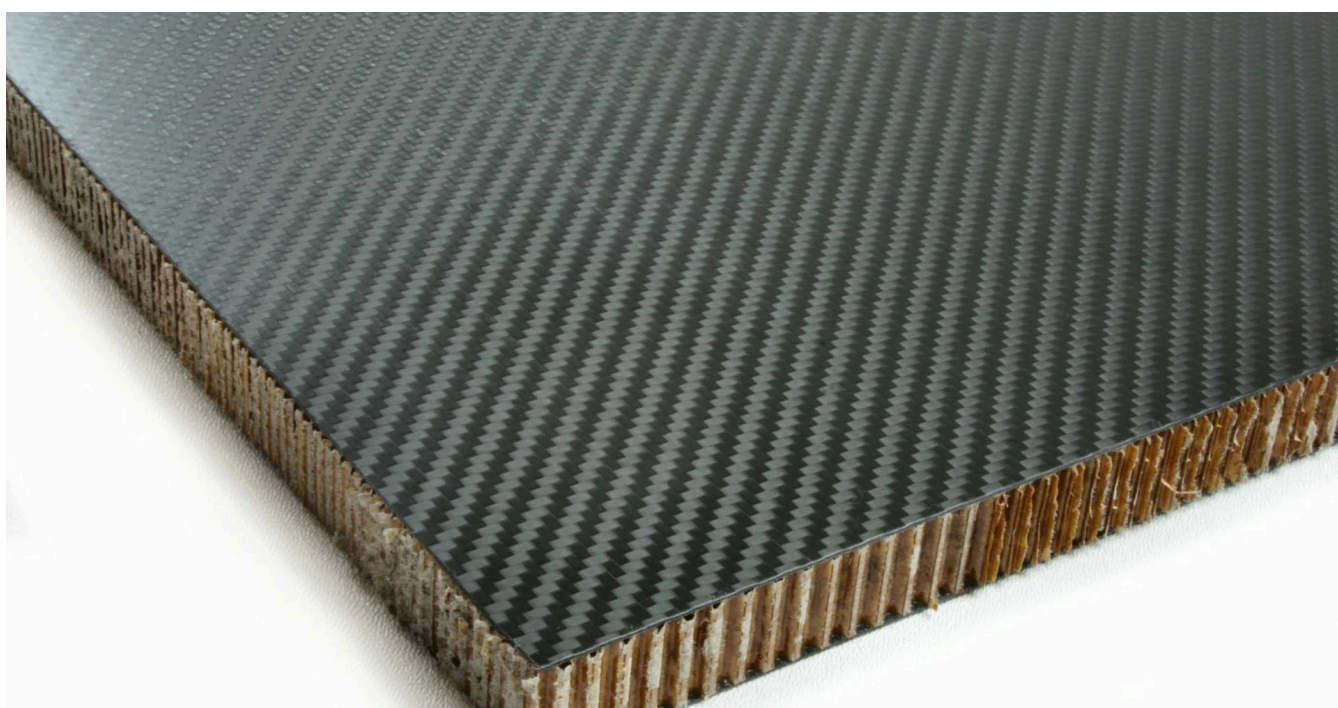
Poplar wood

Poplar at 5 mm is light and moderately **stiff**, with natural cellulose fibres that introduce gentle, frequency-selective damping across the midrange. A thin polyester resin coat adds a controlled layer of surface damping, suppressing the highest-frequency resonances while protecting against moisture warping. The result is a **warm**, present, and efficient character, elevated output across the upper midrange, strong vocal projection, and an energetic sense of presence. **Efficiency** is high; Poplar moves air readily.



Acrylic

Acrylic is denser than wood and highly **homogeneous**, its internal structure has no grain to scatter or absorb energy unevenly. Bending waves travel fast and far before attenuating, favouring the propagation of mid-to-high frequencies. The surface is non-porous and reflects rather than absorbs. The resulting character is **bright**, **detailed**, and transparent, precise transients, clean stereo imaging, and a dry, articulate quality well-suited to electronic and acoustic music that lives in the upper registers.



Carbon fibre + Nomex Honeycomb

This sandwich construction combines two materials chosen for opposing virtues. Carbon fibre skins offer an exceptional **stiffness-to-mass ratio**, they resist deformation even at very thin gauges, allowing bending waves to propagate efficiently down to low frequencies. The Nomex honeycomb core separates the skins to maximise flexural rigidity while keeping the overall panel light and introducing controlled internal damping between layers. The combination produces a flat, extended, and neutral response, bass reaching useably down toward 80 Hz, low coloration across the midrange, and the kind of measured objectivity associated with studio monitoring. This is Stereotype's reference-grade option.

Material performance and comparison



Observations

A dedicated frame was constructed to mount the selected panels and enable controlled observation. This setup allowed each panel to be tested under **consistent structural conditions**, although not perfect in terms of isolating all variables.

For acoustic measurements, a microphone was positioned on-axis at a distance of 1 meter from the panel. Recordings were then captured and imported into Room EQ Wizard (REW) for analysis, allowing the frequency response and overall behaviour of each configuration to be evaluated and compared.

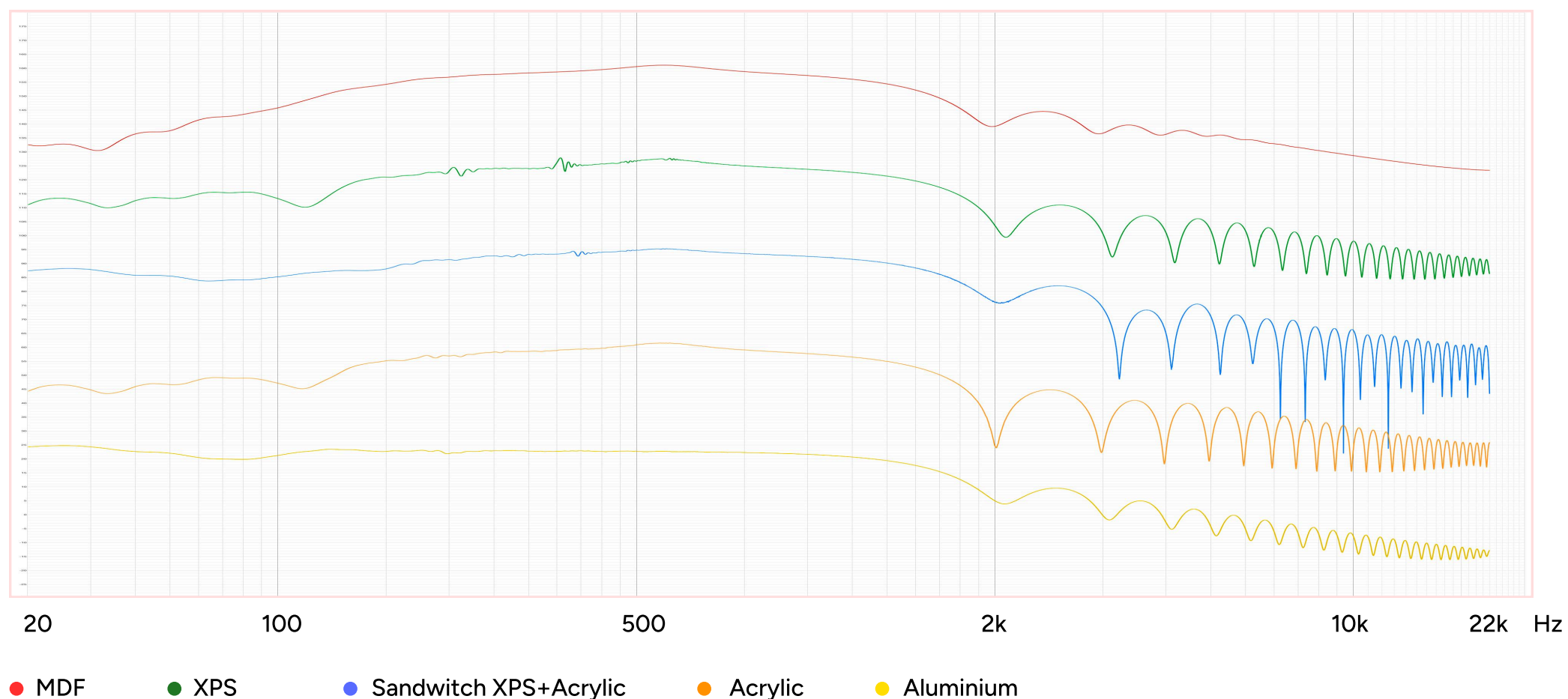


01. Making of the frame
02. Position of the microphone
03. Calibration
04. Testing at fixed distance



White noise was used, in a continuous pitch change from 2Hz to 25Hz

dB (curves displaced for comparison)



Results

This graph illustrates the frequency response of the analyzed materials. Measurements were conducted in a controlled environment with acoustic treatment to minimize unwanted reflections. The distance between the microphone and the panel was fixed at exactly 1 meter.

The MDF panel exhibits an "A-shaped" response curve, with a noticeable emphasis on mid frequencies followed by a relatively linear trend across the spectrum.

The subsequent panels show pronounced peaks, resulting in a sound that is more defined and punchy, but also characterized by frequency cancellations caused by resonance effects.

The sandwich structure performs the worst: the presence of layers with different densities leads to uneven frequency transmission. When certain frequencies are attenuated in the first layer, they are not effectively transferred to the next.

The acrylic panel demonstrates the most linear response, maintaining clarity without forming "A" or "V" shaped curves.

The aluminum panel delivers the strongest low-frequency performance but falls short in the high-frequency range.

Discussion

Differences in sound signatures were identified both through the analysis of frequency response graphs and through comparative listening tests using the same audio tracks across panels. Together, these observations confirmed that distinct acoustic behaviours are clearly perceptible, and that DML technology can achieve a level of sound quality suitable as the foundation for the Stereotype system. Among the materials tested, MDF, acrylic, and XPS foam proved to be the most promising, each offering a recognizable and consistent acoustic character.

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3

The product becomes a portfolio of sonic identities, both visually and acoustically

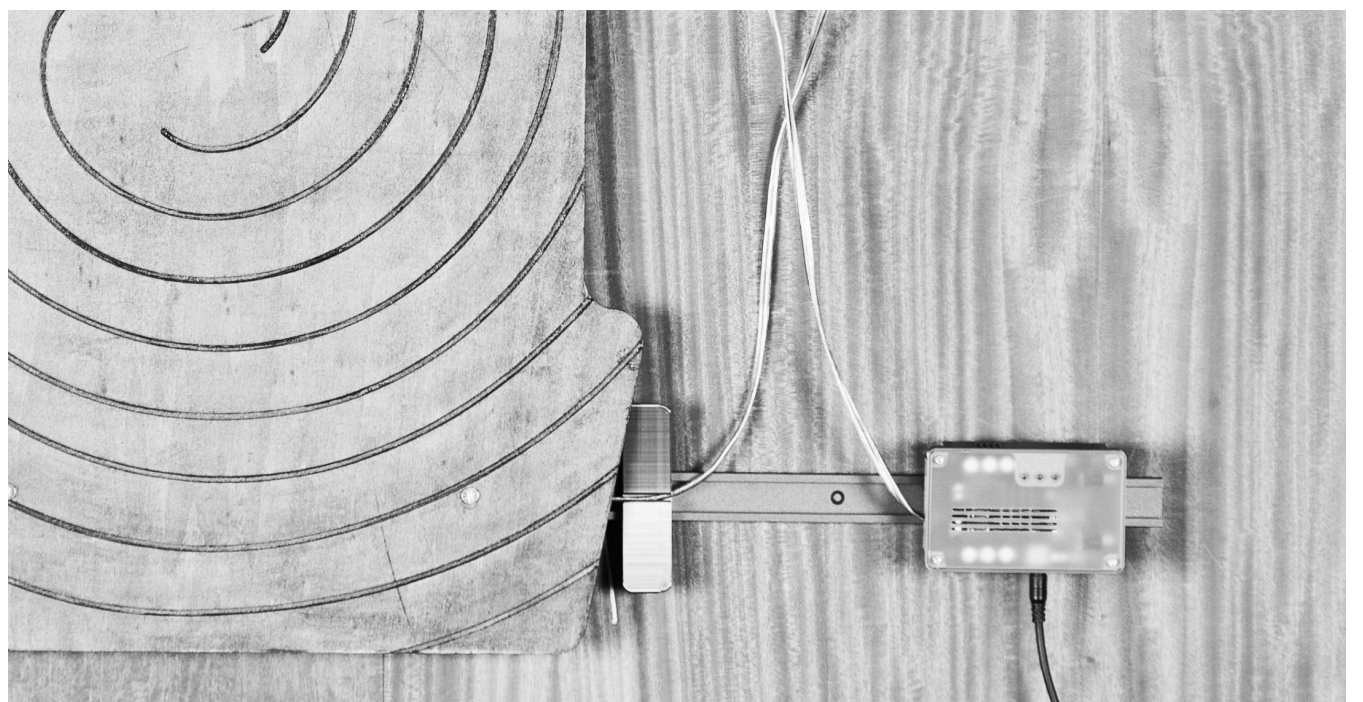


Stereotype

Starting from a reflection on the sound panel as an autonomous entity, Stereotype investigates how sound can be represented and encapsulated within its material form. In this context, sound is not only an auditory phenomenon, but also a visual one, and therefore blends a novel acoustic approach with an intuitive and clever design.

The project is conceived as a product system in which acoustic panels become both sound emitters and visual carriers of their own sonic identity. This dual condition enhances interaction, making the relationship between user and sound more direct and legible.

Stereotype is designed as a modular wall-mounted system, where panels are interchangeable and can be recomposed over time. The system allows for a gradual expansion from a mono configuration to a stereo setup, using two panels that can be arranged and updated according to spatial and acoustic needs.



Opportunity

Recent years have seen circular, modular and repairable audio products such as the “One Smart Speaker” by Frolic and the Small Transparent Speaker, which focus on modular components and visible construction.

However, exciter-based DML products largely remain in the niche of DIY and maker culture, rarely translated into clear, approachable consumer objects with a coherent brand language.

Stereotype targets this gap: it packages DML technology into a legible wall-mounted system with a clear narrative (“change the panel, change the sound”) and a limited set of curated material signatures, suitable for small-batch production by design studios or young companies with modest manufacturing capability.

Positioning

Category: Domestic wall-mounted audio system (mono to expandable multi-panel).

Price strategy: Accessible mid-range product, cheaper and lighter than most premium speakers with comparable sound dispersion, but more refined than DIY kits.

Brand promise: “Sound surfaces you can tune, reconfigure and grow over time.”

The company sells:

A base kit: rails, sliding toggles, standoffs, amplifier module with Bluetooth and wired input, cable holders, power supply and one panel.

Additional panels and possible exciter upgrades as accessories, forming a small product-system around the initial installation.

Key concept

Most consumer audio products present sound customization as a digital operation, usually through apps, equalizers, or presets. Stereotype shifts that logic into the physical domain. Rather than selecting a software profile, the user changes the sound by changing the material that vibrates. This move gives acoustic customization a more tangible meaning. It transforms listening from a passive act into an exploratory relationship between object, material, and space.

Product Philosophy

Stereotype is designed as an object that combines audio performance with material expression. It avoids the visual language of conventional loudspeakers and instead presents itself as a sound surface integrated within the architectural space of the room.

Its identity is based on three main values:

acoustic customization / spatial efficiency / direct relationship between user and sound.

Main features

Interaction principles

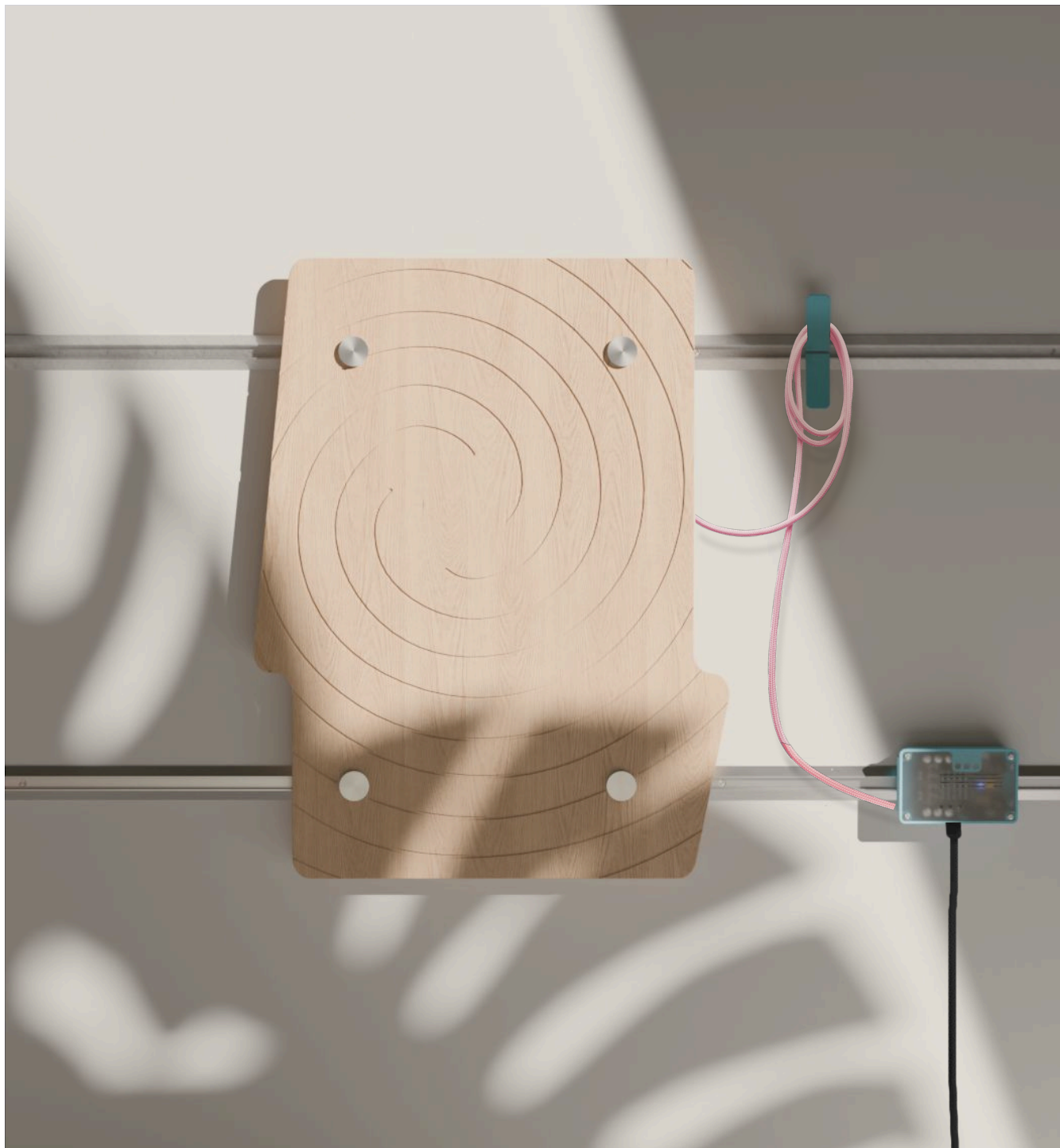
Stereotype is intended for living rooms, bedrooms, and small studios where sound quality, visual integration, and space efficiency all matter, which also oriented the choice of electrical components, starting from the typology of Bluetooth amplifier. It is suitable for daily listening through a smartphone or other Bluetooth source, while also supporting wired input. The interaction model is intentionally simple. Daily use happens mainly through the user's phone or connected source, while the product itself provides only essential power and volume control. The deeper interaction lies in the possibility of changing panels according to taste, room character, or listening intent.

Assembly and installation

Some of the parts are intended to be delivered preassembled, reducing complexity for the final user. Installation is limited to wall mounting and connection to power and audio source. This makes the product more accessible than a technical kit while keeping the architecture clear and serviceable, following the logic of making DML audio technology more accessible. Panel exchange is designed to be easy and direct. The exciter does not rely on adhesive bonding, but on a threaded mechanical attachment system developed by Dayton Audio, allowing the panel to be replaced without damaging components or compromising the product's modular logic.

Stereotype is designed around the possibility of swapping panels around, experimenting with different sound signatures or selecting it based on things like personal preferences and music genre





Engraving's role

The engraved Fermat spiral is inspired by aperiodic patterns used in acoustic gratings to distribute energy evenly and control lobes. This can spread out strong peaks in radiation patterns and avoid repetitive symmetries that can cause sharp resonances.

Translated to a bending panel:

- locally modifies stiffness and mass, subtly changing how bending waves propagate and where modes prefer to form.
- it helps break up regular standing-wave patterns, aiming for a more distributed set of modes rather than a few dominant ones.

In perceptual terms, the spiral aims to **smooth** the panel's response and dispersion: a character that feels less like a single tone and more like a textured surface of sound. At the same time, the spiral provides a strong visual identity that makes the acoustic function legible to users: you can literally see the path sound energy tends to follow.

Stereotype in the home context.

Spatial location

Unlike conventional speakers that occupy shelves, stands, or floor space, Stereotype is conceived as a fixed wall-based audio surface, highlighting the visual element of the project, almost like an abstract visualization of the sound it produces. This changes its presence inside the home. It becomes part of the room composition rather than an object placed temporarily within it.

The inherent spatial quality of the audio produced by DLM systems makes it a possible design choice, as it eliminates the need to direct the panel to the listener more precisely. This way, the system delivers room-filling sound without taking up floor area. Its form is therefore tied not only to aesthetics, but also to a clear spatial advantage, especially in tighter domestic spaces.



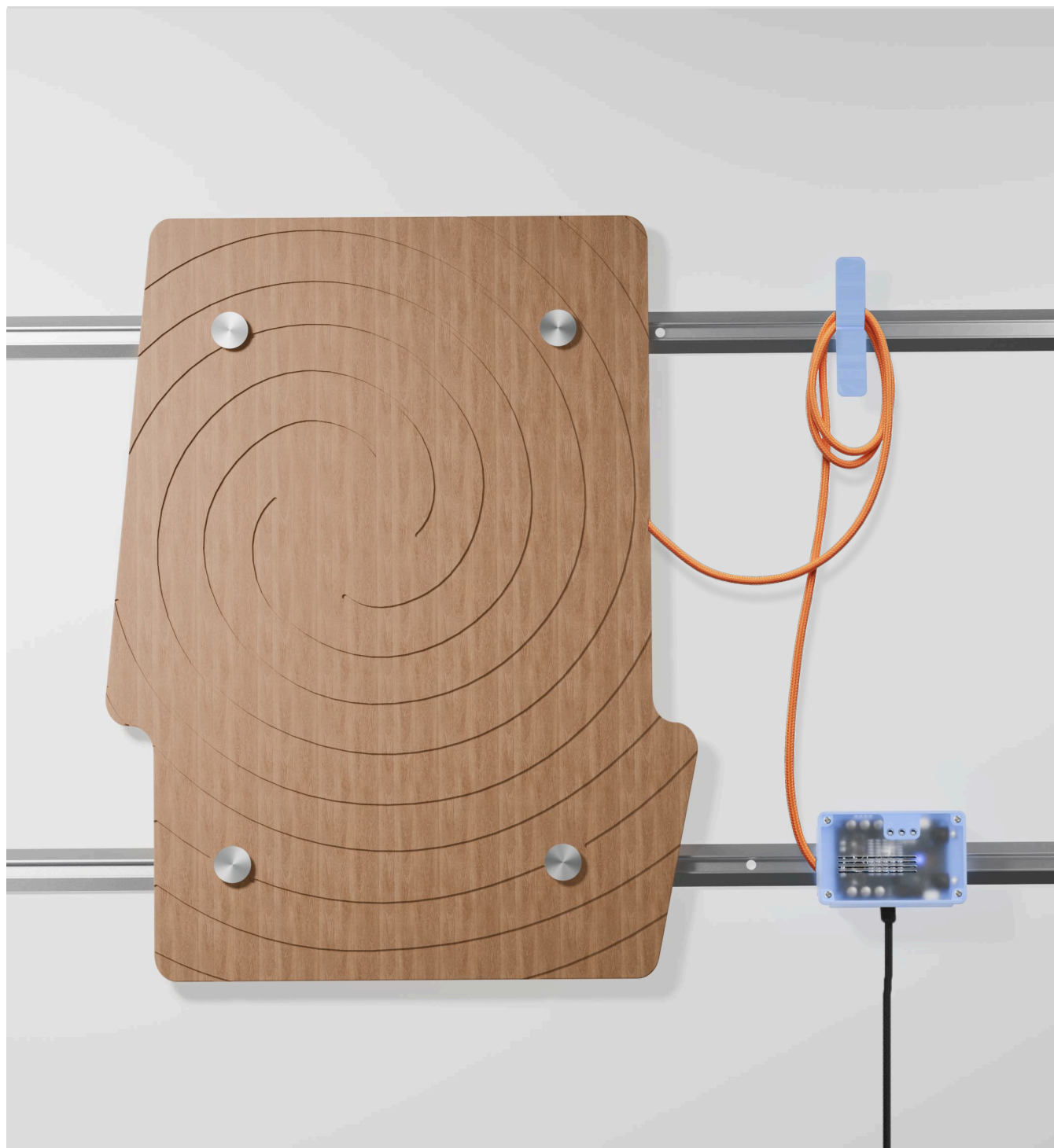
Basic module

Versatility

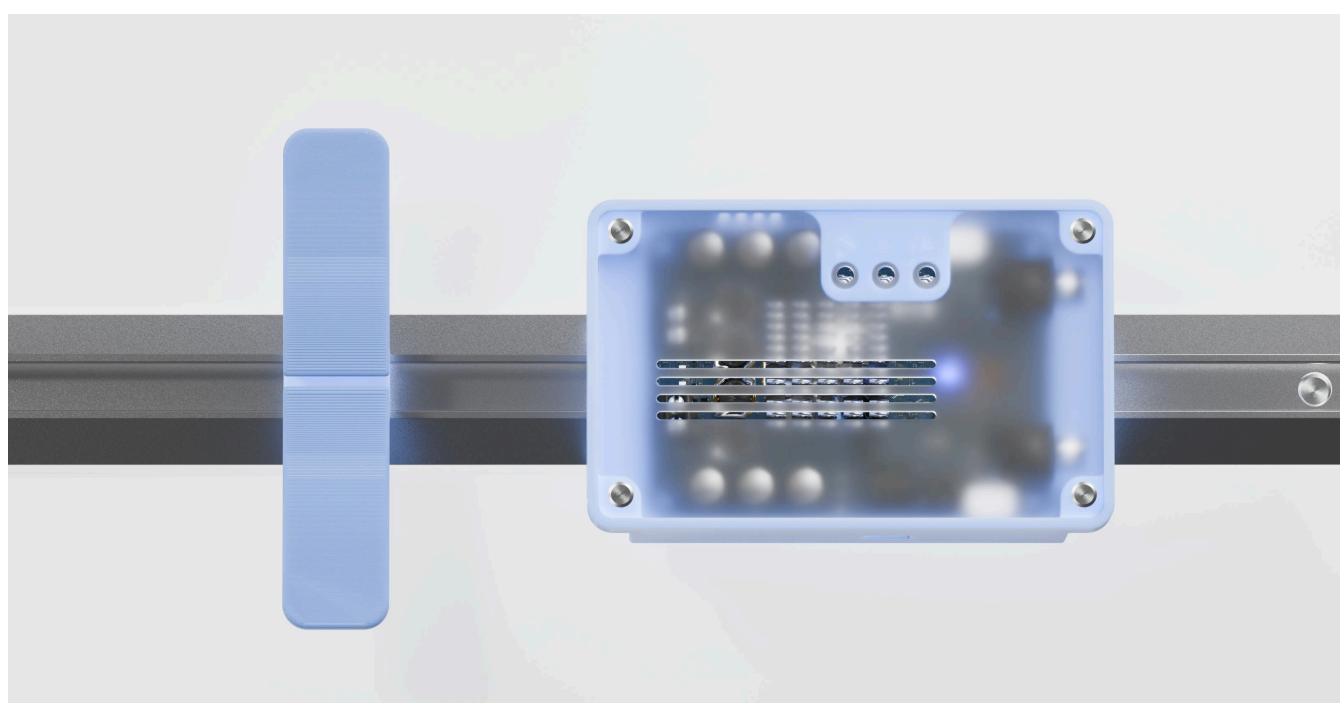
The basic model is designed for versatility. It is compact enough to fit comfortably in smaller rooms, yet substantial enough to create a strong presence upon entering a space.

The structure operates in mono using a single exciter, channeling the full range of frequencies into one panel. This ensures a complete listening experience at a more accessible price point, while leaving room for future expansion.

The Stereotype family is built around modularity, enabling forward compatibility. The system can evolve over time, allowing users to refine the sound or transform it into a spatial experience through the addition of further exciters. The base model therefore provides a fully functional starting point, while remaining open to integration with additional components as the system grows.



Amplifier and Cable stocker





Panel of the base module

Exciter model:
Dayton EX25PCDS-4 IMS™



Panels are conceived as distinct visual identities to communicate the qualities of the sound they produce. Their appearance acts as an interpretative layer, allowing users to anticipate and recognize different acoustic behaviours.

Three main categories structure this system: Raw, Glow, and Deep.

Configuration

Raw

Panels are made from birch plywood or fir wood as a premium alternative, cut to a thickness of 5 mm and engraved to achieve a balanced, relatively flat sound profile. The mass of the material supports the presence of lower frequencies, while the engraved pattern damps vibrations, helping to control resonance and reduce peaks. The surface is then treated with a water-based varnish.



Laser-cut shape and engravings



Glow

Panels are made from plexiglass, whose relatively low mass and high stiffness produce a brighter sound. The smooth surface and low internal damping favour the transmission of higher frequencies, resulting in an acoustic signature with extended high-end response.

Engraving is used to interrupt the continuity of the surface, it softening resonance peaks and reducing excessive sharpness.

Satin finish

Laser-cut shape and engravings

serigrafia
Pantone 317C

Deep

Differently, panels are constructed from carbon fiber honeycomb sandwiches. The cellular core absorbs part of the high-frequency energy while allowing lower frequencies to propagate, resulting in a warmer signature. The layered structure introduces distributed damping, reducing brightness and spreading resonance peaks. The surface is left unengraved, as additional patterning would offer limited functional benefit and could interfere with the material's inherent acoustic behaviour.



UV Print
Pantone 705C

Laser-cut shape

The structure

Structurally, the system is organized around 1.20 m aluminum rails onto which all components are fitted and slid. This solution emerged through an iterative process of simplification, both in structural terms and in relation to user interaction.

Alongside the panels, the amplifier within its casing and the cable reeler are integrated into the same rail system. This shared infrastructure allows elements to be positioned, added, or rearranged with ease, supporting a modular and adaptable configuration.

As a result, stereo setups can be assembled and customized intuitively, enabling users to define both the spatial arrangement and the overall listening experience.

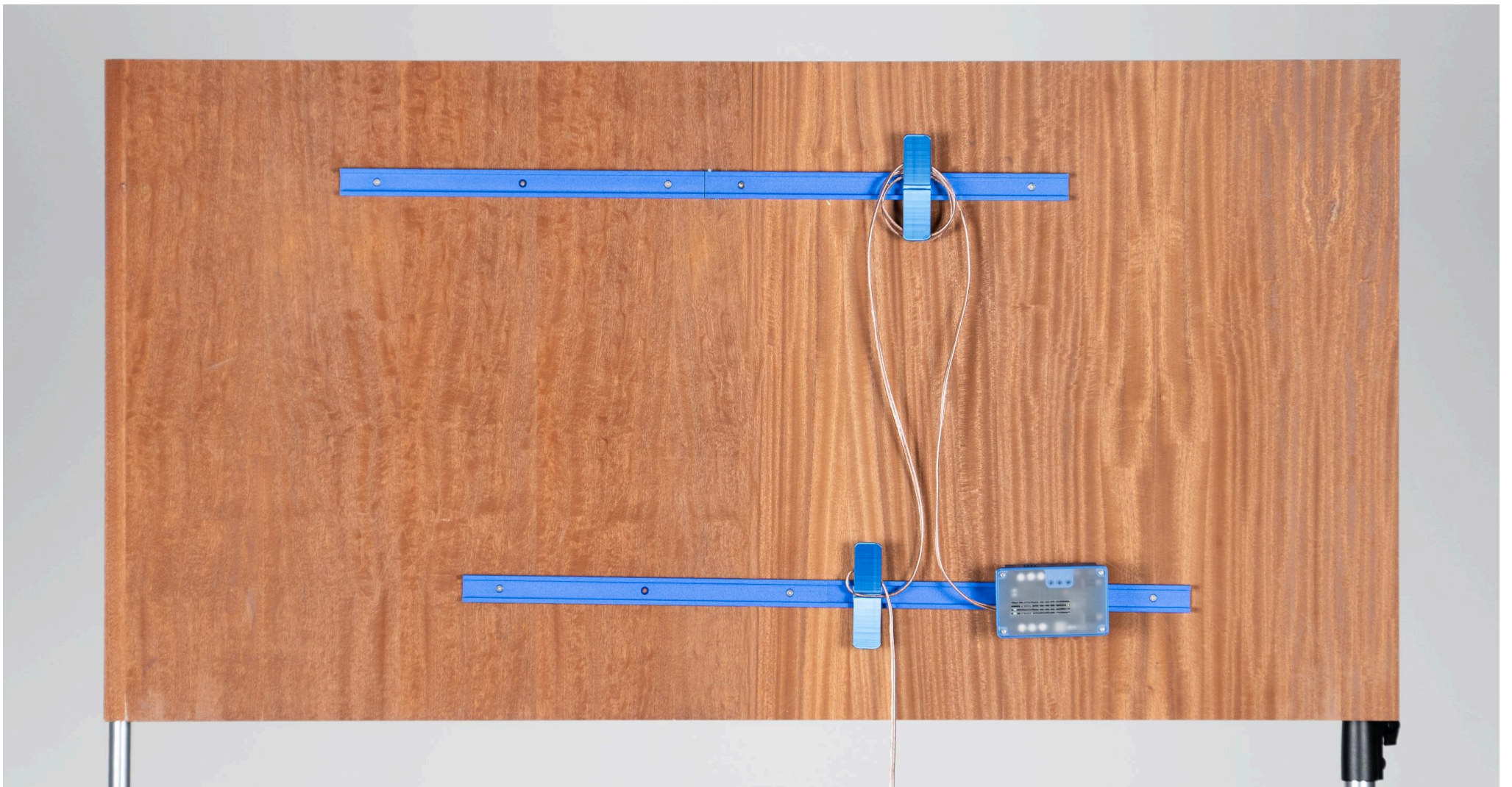
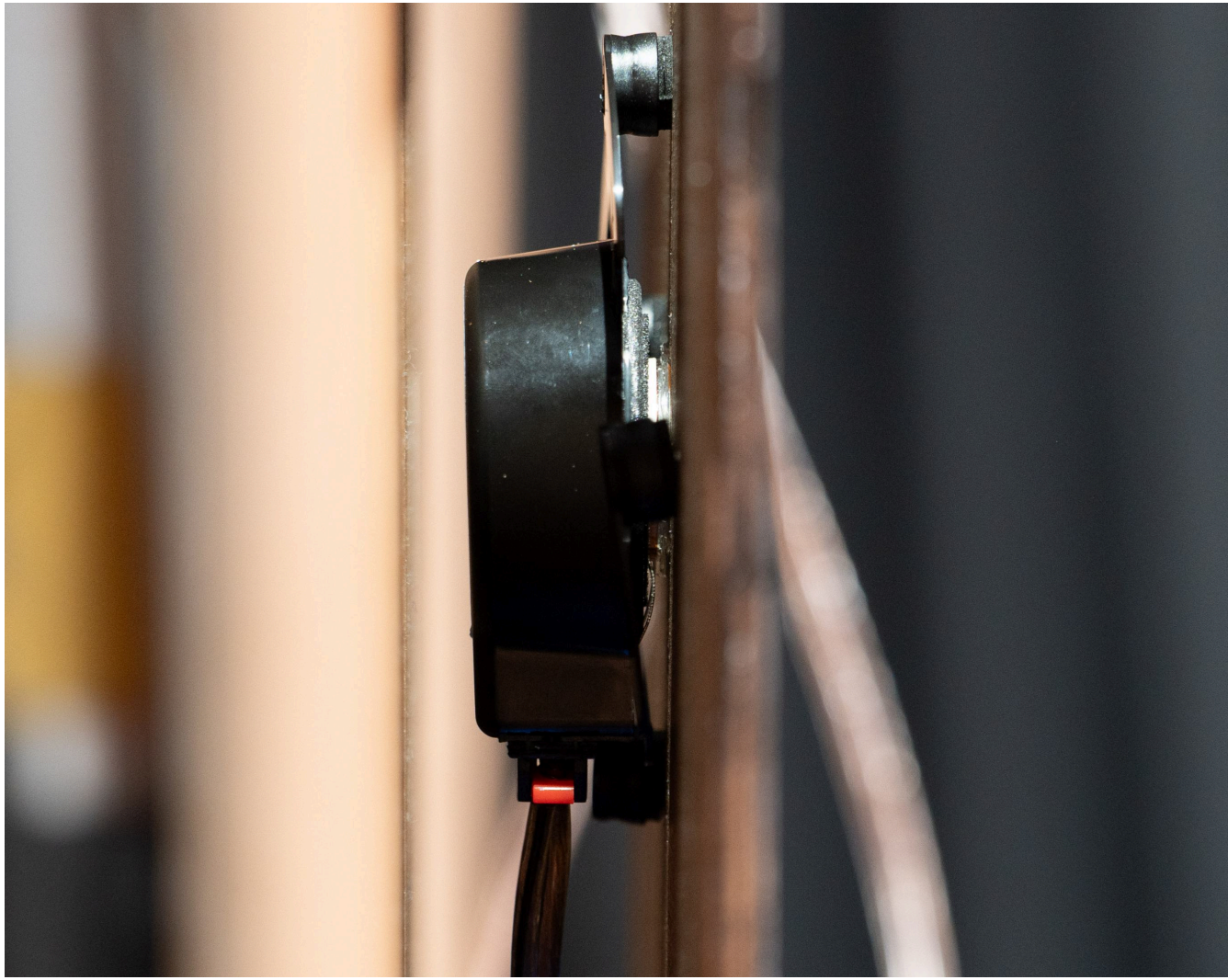


Photo of the prototype: rails, cable holder and amplifier module



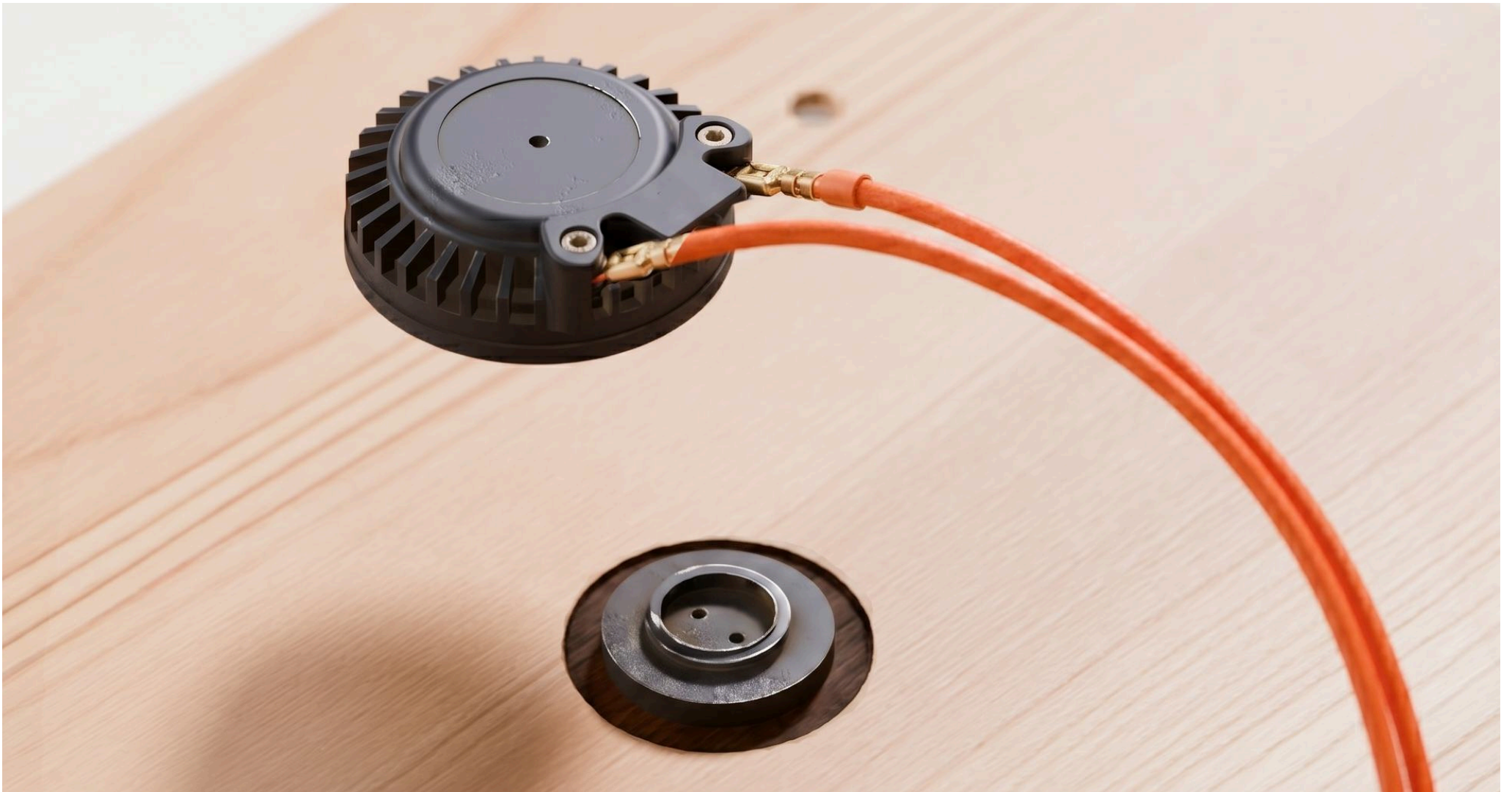
The exciter

Using the IMS (Interchangeable Mounting System) by Dayton Audio, the exciter doesn't have to be directly glued to the panel surface. This way, panels can be easily swapped without damaging the component.



Cable holder

To allow for different kinds of configurations across all of these elements, cable holders are incorporated as an accessory to manage the 2.5m long cable and keep everything visually tidy. it's 3D-printed in different finishes.



Dayton exciter being attached to the panel using Dayton's IMS, following an engraved guide on the back of the panel.

How it works

The Stereotype system radiates sound into space using an audio exciter, a type of transducer that transfers mechanical vibrations directly to a surface, rather than producing sound through a conventional speaker cone. The excited surface then vibrates across its entire area in multiple distributed modes, effectively becoming the sound source that emits audio into the surrounding environment.

Because the acoustic result depends strongly on the physical properties of the panel, changing the material also changes the sound character. In Stereotype, this principle becomes the foundation of the user experience: each panel is both a visible object and a form of physical tuning.



Aluminium profile with sliding toggles

Architecture

The system is divided into custom and standard elements. The only fully custom part is the front panel, which is designed to optimize visual quality and acoustic behavior. The rear structure and most hardware components are based on standard market parts in order to simplify sourcing, reduce development cost, and improve small-scale feasibility.

This hybrid logic is central to the project. It allows the product to maintain a distinctive identity, while remaining realistic for startup-level or crowdfunding-oriented production.

Different panels and panels materials



User interaction

Connecting

Stereotype is designed to be intuitive and accessible in its use. It connects to external devices via Bluetooth, while also supporting jack cable input for a more tactile and analog experience. Once connected, playback and volume can be controlled through a set of buttons integrated into the docking station, which houses the central processing unit of the system in the form of an amplifier. This element functions as the operational core, transmitting the audio signal to the exciter, conceived as the pulsating heart of the project, which converts the signal into vibrations that generate sound.



Connecting the power supply.

Sliding

The user is invited to actively engage with the configuration of the system. Components can be freely positioned along the two supporting profiles, allowing for a wide range of arrangements that encourage experimentation and personal expression. This configurational freedom extends to the visual domain, where cables and cable holders can be shaped and organized to create patterns and forms, further emphasizing the interplay between function and aesthetics.

Changing

The perception of sound can be easily altered by replacing the panel. Simply by twisting the screws the current surface can be removed and substituted with another, in a gesture reminiscent of handling a vinyl record. The exciter is then attached to the new panel, acting in a manner analogous to a stylus, enabling the surface to resonate and produce sound according to its material and structural properties.



Pausing and playing music, regulating volume, switching to the next or the previous track.



Photo of the prototype in use: the user is changing the panel by sliding it and adding cable holders to the rail structure.

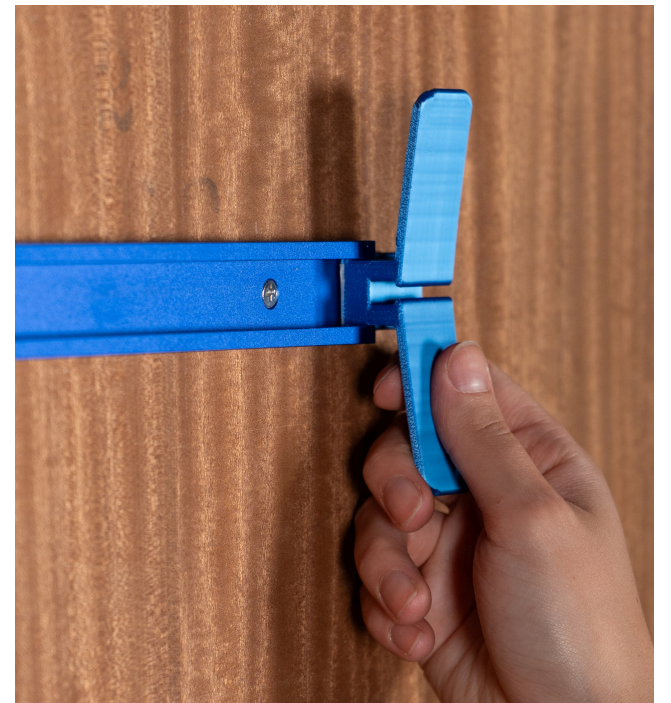
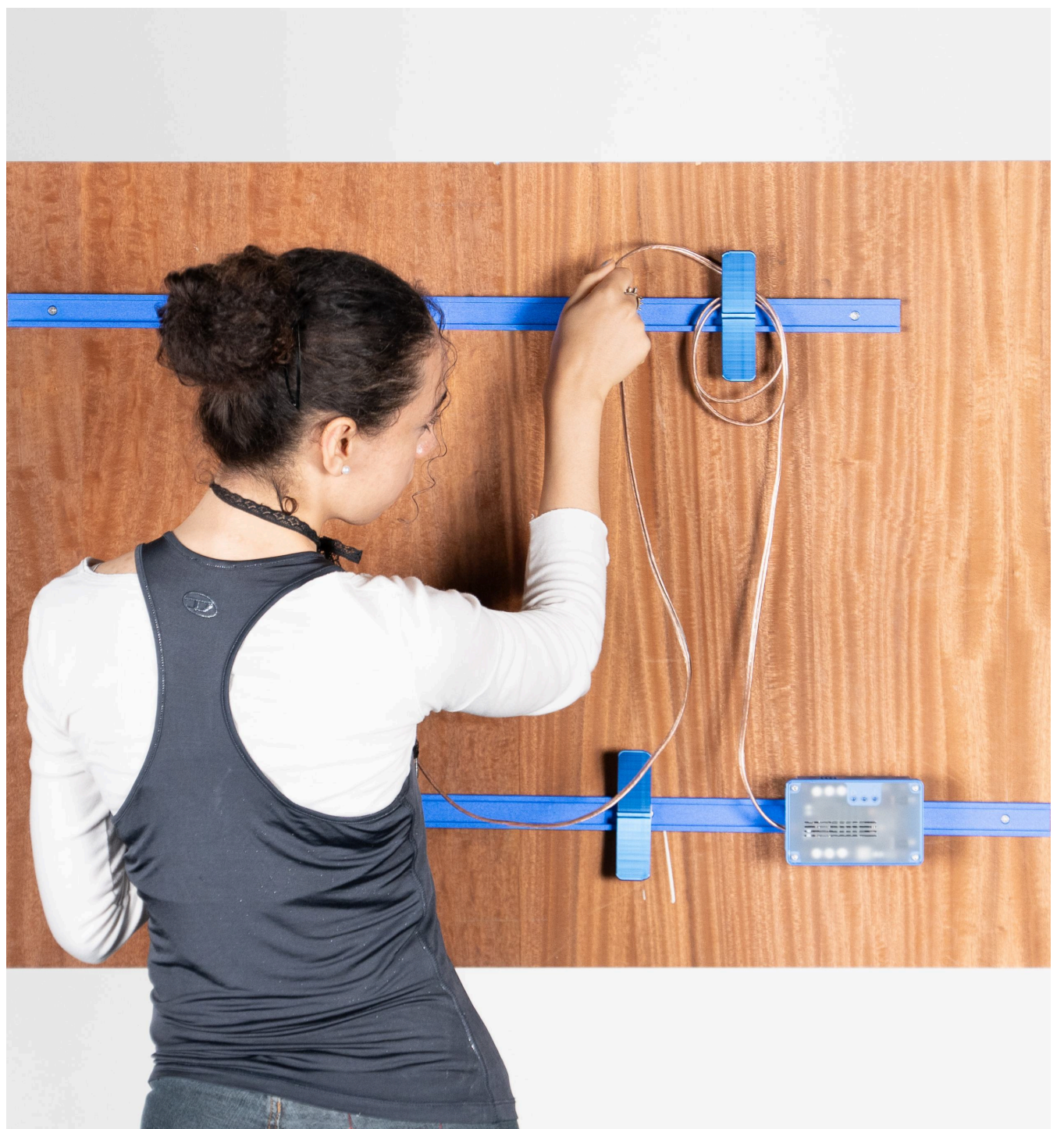


Photo of the prototype in use: the user is creating patterns with the cables.



Components

The amplifier module is designed as a compact, integrated unit that drives the exciter while remaining fully embedded within the rail system. It is based on a Class D amplification architecture, chosen for its high efficiency, low heat generation, and reduced form factor, making it suitable for a minimal and enclosed configuration.

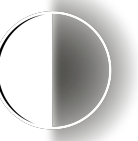
The module is pre-wired and calibrated to match the electrical characteristics of the exciter, ensuring stable impedance handling and consistent signal transfer. It supports Bluetooth connectivity for wireless audio input, alongside a standard analog input for wired sources, providing flexibility across different use scenarios.

Housed within a dedicated casing, the amplifier is mechanically coupled to the rail structure, allowing it to be easily positioned or replaced if needed.

Stereotype is primarily composed of pre-existing components, including aluminum profiles, screws, cables, a power supply, an amplifier, and an exciter. These elements are sourced from external suppliers, allowing the company to focus its efforts on the design and production of panels and 3D-printed parts, which constitute the customizable dimension of the system. The use of standardized components enables a modular structure that can be assembled and reconfigured repeatedly, adapting to a wide range of spatial conditions. In contrast, the custom-designed elements define the identity of the product, allowing it to reflect the aesthetic preferences and creative input of the user.

Amplifier module components.

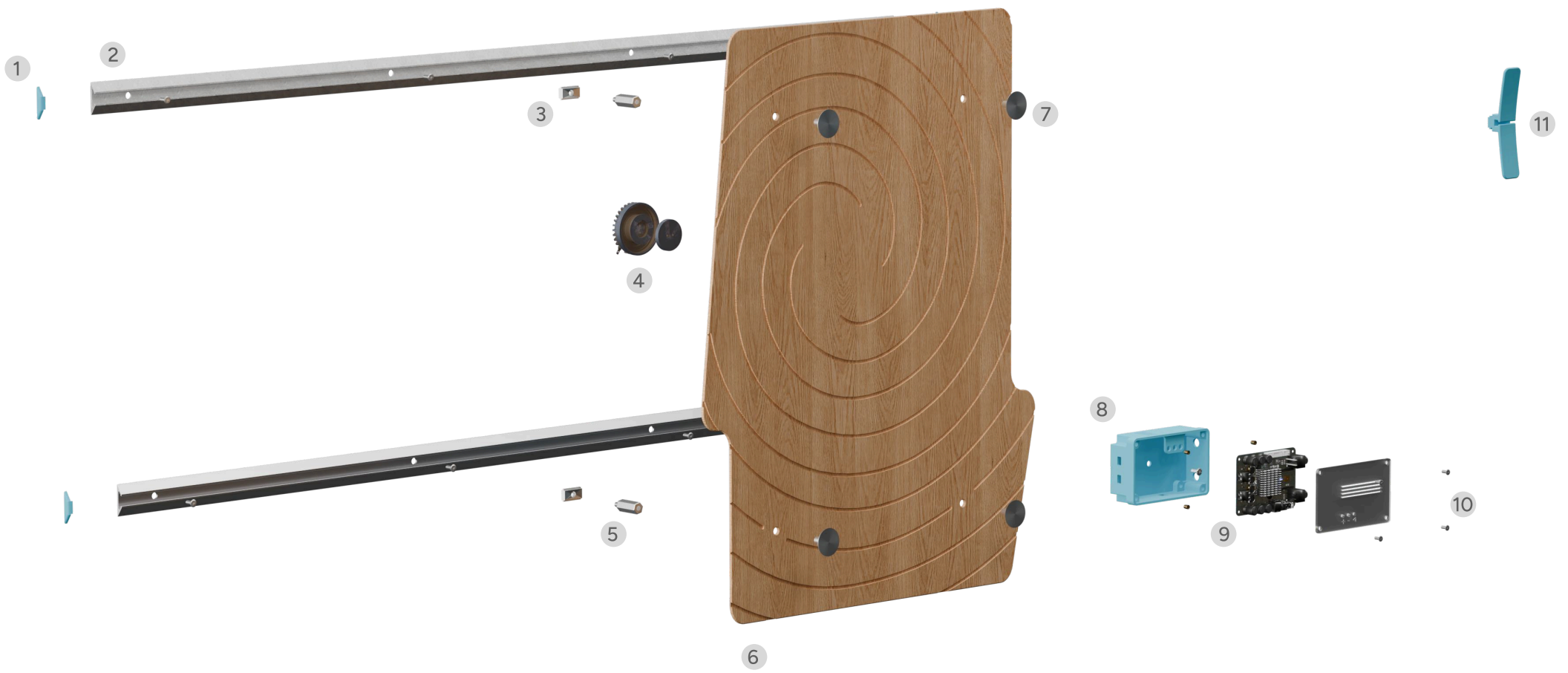




- 1. Track Profile Cover
- 2. Track Profile
- 3. Toggle
- 4. Exciter

- 5. Standoff
- 6. Panel System Subassembly
- 7. Knurled head screw
- 8. Amplifier Station Subassembly

- 9. Amplifier
- 10. Screws
- 11. Cable Organiser



Exploded view

The system includes the following components. Aluminum profiles form the structural framework. Screws are used to secure the profiles to the wall. Sliding toggles allow elements to be positioned along the profiles with flexibility. Spacers define the distance between the wall and the mounted elements. Additional screws connect the panels to the structure. The system is powered by an external power supply. The amplifier processes and transmits the audio signal, while the exciter, developed by Dayton Audio, converts it into mechanical vibrations.

The customizable components include a docking station that acts as a housing for the amplifier and is produced through three-dimensional printing. Cable holders, also three-dimensionally printed, enable the creation of expressive configurations through the arrangement of cables. The panels themselves are available in engraved poplar wood or resonant spruce, as well as in engraved acrylic. Additional options include carbon fiber and honeycomb panels, each offering distinct acoustic and visual qualities.

Positioning

Cost positioning

A realistic target retail price for Stereotype is between 300 and 450 euros. This range is consistent with a product that combines one CNC-machined panel, standard structural hardware, an audio exciter, amplifier electronics, power supply, and manual assembly, while remaining positioned below premium audiophile systems and above entry-level Bluetooth speakers. Low-cost Bluetooth amplifier modules and related audio hardware are already widely available on the market, which supports the feasibility of this target when combined with limited-batch production.

Stereotype is made to be a relatively low-cost product-system compared to other sound reproduction equipment on the market. The presence of a central brand provides a coherent visual and material language, making the product more legible, accessible and its performance more consistent and reliable.

Production

The panel is laser-cut because it determines both acoustic behavior and visual character. All other elements use existing components already in production or inventory. This approach reduces tooling requirements and makes small-batch manufacturing economically feasible.

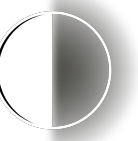
Stereotype is tailored to small design studios or micro-enterprises. The production strategy emphasises:

- High use of off-the-shelf components: standard aluminium profiles, commodity exciters, open-market amplifier boards, generic power supplies and fasteners.
- Low tooling investment: small custom pieces (toggles, cable reels, amplifier housing) produced via 3D printing or simple CNC machining, which suits low-volume batches and iterative refinement.
- Panel fabrication through CNC routing or laser cutting plus light finishing, processes widely accessible in fab labs and local woodworking shops.

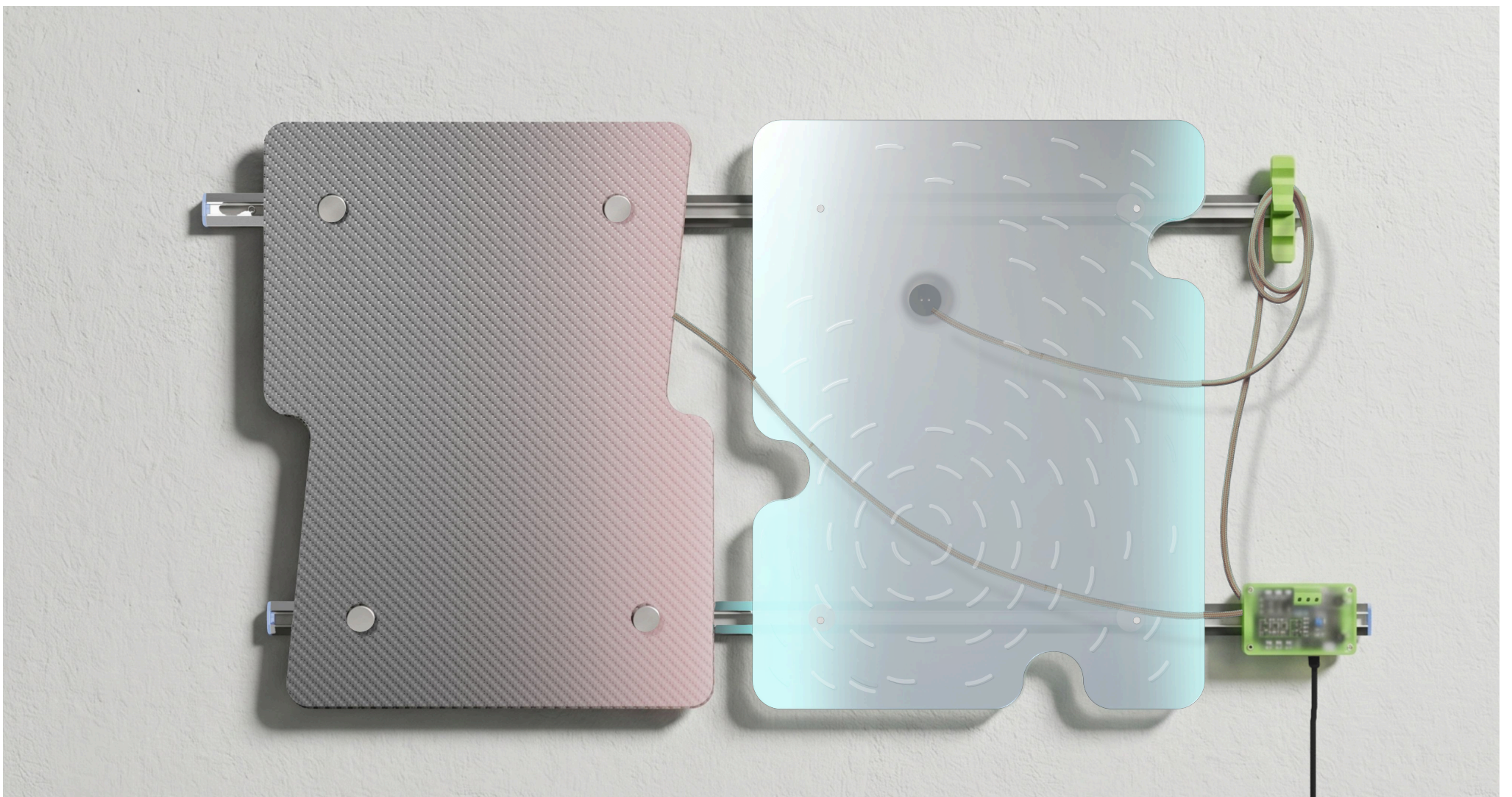
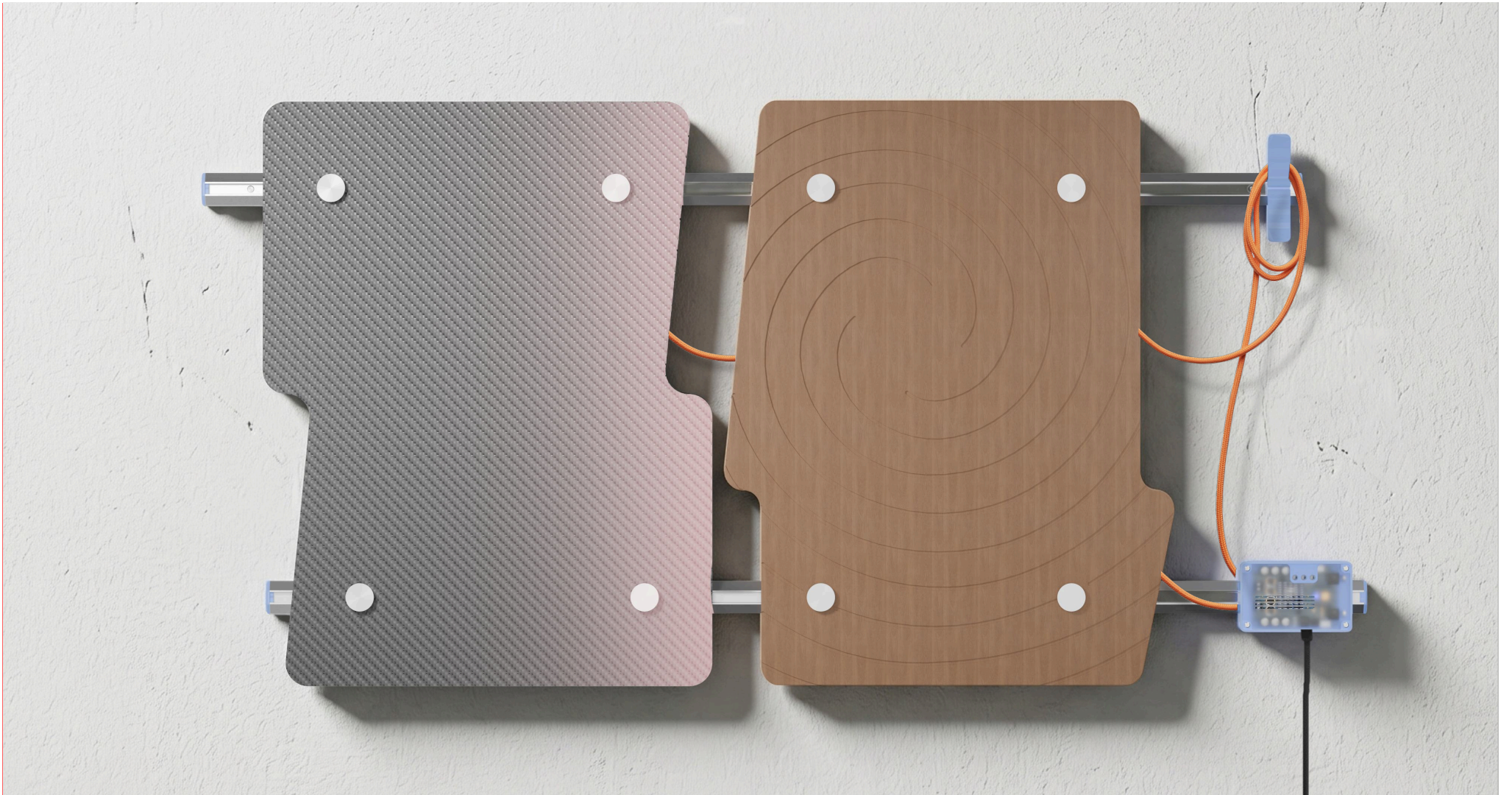
Commercial model

The base offering consists of one unit with a single panel. Additional panels sold separately form the growth path for the brand. Each new panel introduces functional variation rather than purely aesthetic change. Customers can thus modify system output without replacing the structural or electronic components.

This structure also enables iterative refinement. New panel designs can be tested in limited production runs and feedback cycles are shorter than with integrated product design. A startup operating within this constraint can introduce variants more rapidly than manufacturers dependent on injection molding or other fixed tooling.



Different configurations



Circular design principles

Repairability and material efficiency

The use of mechanical joints and non-adhesive assembly enables straightforward disassembly, repair, and component replacement. At the same time, the DML approach replaces conventional enclosed speakers with thin vibrating panels, reducing the need for heavy materials and complex internal structures. Together, these strategies minimize waste while maintaining performance and accessibility.

Distributed production

By combining off-the-shelf components with digitally fabricated parts, Stereotype supports localized and small-scale production. Panels can be manufactured using regionally available materials, while the open system encourages reuse, refurbishment, and redistribution of components. This creates a flexible product-service ecosystem in which value is maintained through continuous use, adaptation, and community-driven evolution rather than constant production of new goods.

Modularity and life cycle extension

Stereotype is structured as a modular system in which long-lasting components, rails, amplifier, and cabling are separated from interchangeable panels. This allows users to update sound characteristics and aesthetics without replacing the entire product, significantly extending its lifespan. The system evolves through partial upgrades rather than full substitution, reducing material turnover over time.



Development Roadmap

Possible evolution

Starting from its current state, Stereotype can be further developed along multiple directions, amplifying its effectiveness, circularity and community-engaging aspect.

Finally refine finely

Panels design can be furthered explored in order to increase more families of signatures and to improve component's CMF

Keep circularity circulating

Circularity never reach a plateau, its always evolving. Recycled plastics, reclaimed timber, bio-based composites, all compatible with the same rail and exciter platform

For makers to make

Partly open panel geometry files, allowing maker communities to experiment within defined acoustic constraints while reinforcing Stereotype as a platform rather than a single object, in line with the SCUO emphasis on open and distributed design.



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Stereotype is a modular wall-mounted audio system that allows users to customize their listening experience through interchangeable sound-radiating panels.

Instead of relying on a conventional speaker cone, the system uses distributed mode loudspeaker principles, where an exciter transfers vibration directly into a flat surface that becomes the source of sound.

The project is developed as an academic design proposal, but it is conceived and presented as a working prototype. Its ambition is to offer a clear product identity, strong spatial integration, and a unique form of physical sound customization through material choice.

