Engineering Sound for the Screen

Effective Deployment of

PHA-5125 and PHA-16

Compact Line Array Speakers in Video-Wall Applications

Corporate · Commercial · High-End Residential

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Executive Summary

Modern video walls — whether a 3 × 2 panel array in a corporate boardroom, a 4 × 2 hospitality wall in a hotel lobby, or a 3 × 3 cinema-style canvas in a private theater — share a common acoustic problem. They occupy the entire surface where a conventional loudspeaker would otherwise live. Hidden cavities are tight, clearance behind the panel face is measured in millimeters, and any audio system must integrate without breaking the visual silhouette of the wall. At the same time, the audience expects intelligibility and tonal consistency that match what they see on screen.

Pragmatic Audio's PHA-5125 and PHA-16 compact line array loudspeakers are purpose-built for this challenge. With a 2" × 2" (50 x 50 mm) footprint, neutral cosmetic finishes, and uniform driver arrays, both products deliver the predictable dispersion control, off-axis attenuation, and seat-to-seat consistency that make line arrays the technology of choice for screen-anchored applications.

This white paper presents three reference deployments — corporate, commercial, and high-end residential — and explains, with reference to dispersion behavior and the polar responses of the PHA-5125 and PHA-16, why the line-array form factor outperforms conventional point-source loudspeakers when the screen is the room.

Contents

1. Why Line Arrays Belong on Video Walls

A video wall is a hostile acoustic environment for conventional loudspeakers. The display surface is reflective at high frequencies, mounting depth is shallow, and the speaker has to fit alongside the panel array without visually fragmenting it. Most importantly, the audience is rarely seated directly in front of a single sweet-spot — listeners are spread across rows, lounge clusters, or boardroom tables, and the system has to deliver consistent intelligibility to all of them.

A line array solves these problems at a physical level. By stacking many small full-range drivers on a tight vertical pitch, the array's combined wavefront behaves as a single line source. In the plane perpendicular to the line of drivers (typically horizontal), dispersion remains very wide — a uniform broad fan-out of energy that covers the room. In the plane parallel to the drivers (typically vertical), dispersion narrows dramatically. The acoustic energy stays focused on the listening plane and away from the floor and ceiling, thus avoiding ceiling reflections and floor bounce. Thus minimizing the need for special acoustical treatment of the ceilings and heavy carpets on the floor.

For a video-wall installation that translates into four concrete advantages:

- **Visual integration.** At 2" × 2", both PHA-5125 and PHA-16 disappear into the bezel of a typical video wall. They flank the panels rather than perching above them, preserving the architectural intent.
- **Off-axis intelligibility.** Because vertical dispersion is tight, ceiling reflections and floor bounce are suppressed. Listeners hear direct sound, not a smear of early reflections, and speech intelligibility (STI) rises accordingly.
- **Seat-to-seat consistency.** Wide horizontal dispersion delivers near-equal SPL across all listening positions; the front-row / back-row level difference of conventional point sources is greatly reduced.
- **Scalable channel design.** Because PHA-5125 and PHA-16 share the same 4 Ω impedance, 89 dB sensitivity, and full-range driver topology, they can be used interchangeably as main speakers (mains), center channel speaker (centers), fills, and surrounds without timbral mismatch.

Key takeaway

A correctly oriented line array on a video wall behaves as a directed sound projector. The mounting orientation — vertical column or horizontal soundbar — chooses which plane gets the wide pattern and which gets the narrow one. That single decision drives almost every other design choice in this paper.

2. Product Reference: PHA-16 and PHA-5125

Both products are full-range, line-array loudspeakers in a 2" × 2" cross-section extruded aluminum enclosure. They differ primarily in length (and therefore driver count, throw distance, and low-frequency extension). A short summary follows; the table below presents the side-by-side specifications.

PHA-16 — Compact Line Array

The PHA-16 is a 25-inch, 16-driver compact array intended as a soundbar-class device or as a tonally matched fill / surround element. Its short length makes it ideal as a center channel above or below a video wall, as a perimeter fill speaker for outlying lounge zones in a commercial space, or as a surround / rear in a residential home theater. Because the PHA-16 shares the driver complement and tuning of the PHA-5125, it timbre-matches across a multi-channel design.

Power handling is rated at 128 W peak maximum, with a frequency response of 120 Hz – 20 kHz. The unit is offered in black, white, or silver finishes for direct decor blending and is CE compliant. An external HideAway™ amplifier, a mono-block amplifier MBA-148, stereo amplifier SAA-248 or PADS / TPA receiver options with appropriate amplifier, complete the signal chain.

PHA-5125 — High-Performance Line Array

The PHA-5125 is a 51-inch, 25-driver line array. With 200 W peak maximum power handling and frequency response down to 90 Hz, it is the workhorse main loudspeaker for video-wall integration. Because each enclosure is the full height of a typical 50" – 65" video panel, the PHA-5125 mounts naturally as a vertical column flanking the video wall — visually disappearing into the wall's left and right edges while delivering line-array dispersion behavior across the full screen height.

The PHA-5125 is weather-proof for outdoor installation, and its perforated aluminum grille is robust for high-traffic public environments. Custom finishes (white, silver, and others) are available in addition to standard black.

Side-by-side specifications

Specification	PHA-16	PHA-5125
Form factor	16 patent-pending full-range drivers in compact 25" array	25 full-range drivers in 51" line array
Power Handling	128 W peak maximum	200 W peak maximum
Frequency Response	120 Hz – 20 kHz	90 Hz – 20 kHz
Sensitivity	89 dB @ 1 W / 1 m	89 dB @ 1 W / 1 m
Impedance	4 Ω	4 Ω
Dimensions (H × W × D)	25"×2"×2" (636 x 50 x 50 mm)	51"×2"×2" (1296 x 50 × 50 mm)

Specification	PHA-16	PHA-5125
Weight	2.25 lbs	7.5 lbs
Finish	Black, white, or silver	Black; white/silver custom
Outdoor rated	Yes (weather-proof)	Yes (weather-proof)
Ideal placement	Center channel, fill, surrounds, near-screen pairing	L/R mains, flanking columns for video walls, long-throw

Table 1. PHA-16 and PHA-5125 specifications, summarized from product data sheets.

3. Dispersion, Directivity, and Sound Uniformity

The single most important behavior of any line array is the way its dispersion changes with frequency and orientation. The polar response measurement on the PHA-5125 data sheet (taken at 6 m, mirrored about the on-axis line) shows two things clearly: the array forms a narrow, well-controlled main lobe in the plane parallel to the drivers, and that main lobe maintains directionality from the lower midrange (around 300 Hz) all the way through 10 kHz and above. There are no sidelobe explosions, no broadband nulls, and only very minor artifacts above the upper midrange — exactly the behaviour that makes line arrays predictable in real rooms.

What changes when you rotate the array

A line array is anisotropic. The pattern shown on the polar plot in the data sheets of the PHA line arrays is the pattern in the plane parallel to the drivers. When you rotate the loudspeaker 90°, you move that pattern with it. In practical video-wall terms:

- **Mounted vertically (column).** The narrow pattern lies in the vertical plane. Energy stays in the listening plane; ceilings and floors are off-axis. The horizontal plane sees an approximately 140°-wide disperson fan-out — wide enough to cover an entire conference table or seating area from a single column.
- **Mounted horizontally (soundbar).** The narrow pattern lies in the horizontal plane. The array becomes directional left–right, and dispersion fans wide in the vertical plane. This orientation is appropriate for a center channel beneath a screen, where horizontal directivity is desirable and vertical wash is acceptable.

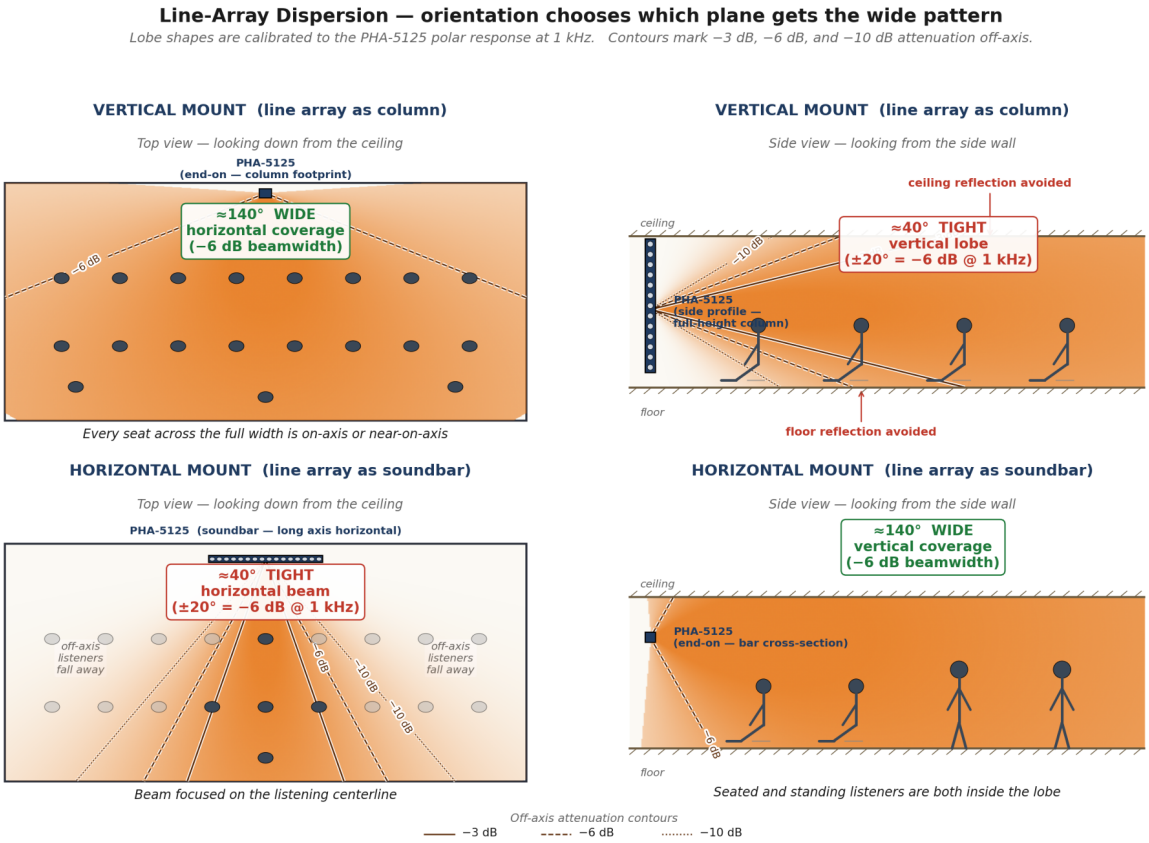

Figure 1.

Line-array dispersion shown in both views for both mounting orientations. The lobe shapes are calibrated to the PHA-5125 polar response at 1 kHz; dB contours mark the −3 dB, −6 dB, and −10 dB attenuation levels. The data-sheet polar plot corresponds to the narrow-plane behavior shown in the top-right and bottom-left panels — the same response, rotated 90° by the choice of mounting orientation.

Why this produces sound uniformity across the audience

Conventional point-source speakers obey the inverse-square law: every doubling of distance loses 6 dB. With a long line source, the geometry near the array approximates a cylindrical wave rather than a spherical one — energy spreads out in two dimensions, not three — and the SPL falls more slowly with distance, every doubling of distance loses only 3 dB. Far enough away the array eventually transitions to point-source behavior, but in the practical 2 m – 12 m listening range typical of corporate, commercial, and home theater video walls, the front-to-back SPL difference can be reduced to only 1 – 2 dB compared to 10 – 12 dB for a conventional bookshelf-class, on-wall, in-wall or in-ceiling speaker.

The audible result is an audience that hears the same balance, the same intelligibility, and the same dialog level whether they are sitting closest to the screen or the furthest reasonable seat. In rooms where listeners cannot all be in the sweet spot — boardrooms, lobbies, and multi-row theaters — that uniformity is more valuable than raw on-axis SPL.

Practical design note — dispersion control

In every layout that follows, vertical mounting of the PHA-5125 is the default for the main left/right

channels, because the wide horizontal pattern matches the way audiences are distributed in front of a video wall, and because the narrow vertical pattern protects against the ceiling and floor reflections that dominate small-to-medium room acoustics.

4. Scenario 1 — Corporate Boardroom Video Wall

A modern executive boardroom typically combines a 3 × 2 or 4 × 2 video wall on one short wall, a long conference table down the room's centerline, and twelve to sixteen seats — six or more per side, plus the head and far-end positions. The system must support clear speech reinforcement for in-room presentations, conferenced participants delivered over Microsoft Teams or Zoom, and program audio for media playback. Background HVAC noise is moderate. Ceilings are typically 9 – 11 ft, often with acoustic tile that helps tame reflections.

Recommended deployment

- **Two PHA-5125 columns mounted vertically, one flush to each side of the video wall.** Each column runs essentially the full height of the panel array. Because the column's narrow vertical lobe stays out of the ceiling tile and table surface, reflected energy is minimized and intelligibility is maximized.
- **Optional PHA-16 fill at the rear wall** for very long boardrooms (over 25 ft) where the back row sits beyond the comfortable throw of the mains. Configure as a delayed (electronically time-aligned) fill, not a separate channel.

Why this works

- The vertical PHA-5125 columns project a wide horizontal sound field that envelops every chair around the table — including the head and far-end seats — without aiming through the conference camera or the table itself.
- Vertical pattern control protects the system from the worst-offending early reflections in a boardroom: the reflective ceiling tile, reflective marble, tile or hardwood floors and the polished tabletop. They all lie outside the array's main lobe.
- With the speakers placed at the screen edges and not above or below it, no element of the visual canvas is interrupted. Camera framing of executive faces is unaffected.

Scenario 1 — Corporate Boardroom Video Wall

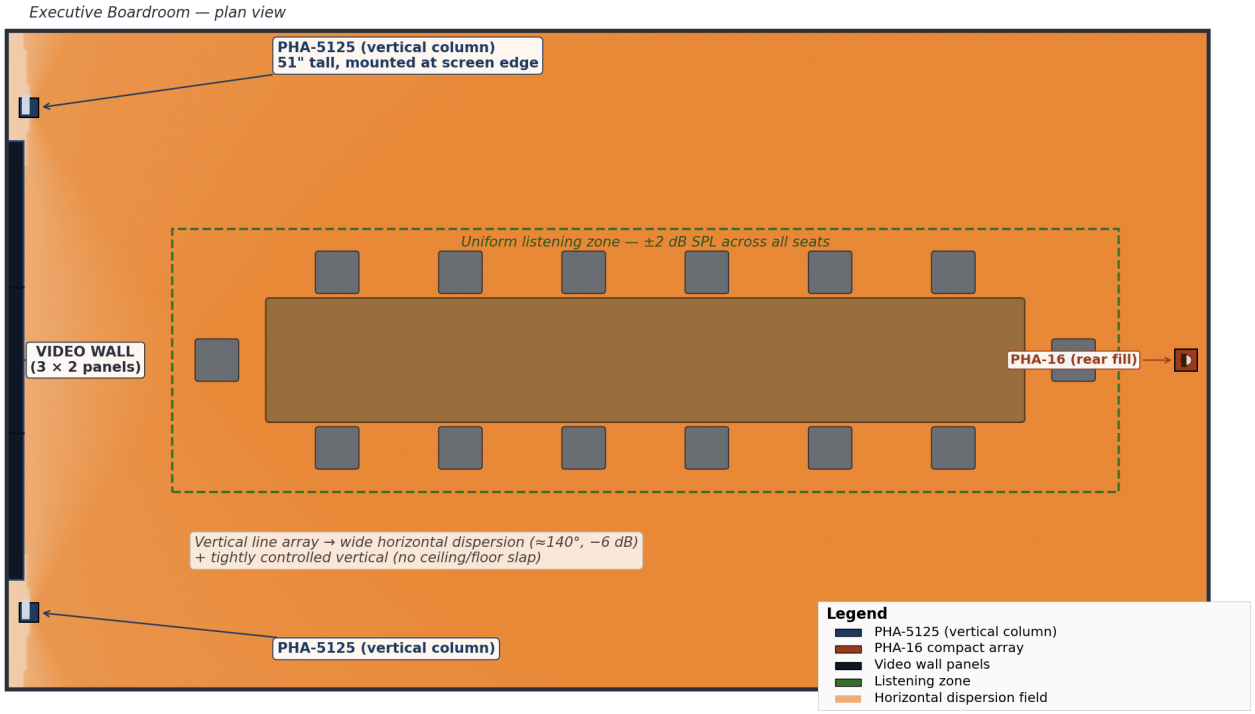

Figure 2.

Corporate boardroom plan view. Vertical PHA-5125 columns flank the 3 × 2 video wall; their wide horizontal dispersion (orange fans) envelops every seat at the table. An optional PHA-16 at the rear wall serves as a delayed fill in long rooms.

Tuning notes

- Set a low-frequency roll-off below 90 Hz; the room's mode structure rather than the loudspeaker's response is the limiting factor down low.
- In Microsoft Teams Rooms, Zoom Rooms, and similar UC environments, the conferencing mic array often sits on the table. Aim the PHA-5125 columns slightly above tabletop height so direct loudspeaker energy is not picked up by the mic; the wide horizontal lobe still covers seated heads.
- Treat the back wall behind listeners with absorption when possible — the line array reduces the rate of decay of direct sound, but back-wall reflections still arrive late enough to color speech.

5. Scenario 2 — Commercial Lobby & Hospitality

Hotels, corporate lobbies, retail flagships, and digital-signage installations present the toughest acoustical environment for a video-wall audio system. Volumes are large (often 4,000 – 10,000 ft³), surfaces are reflective (glass, polished stone, hard floors), HVAC noise is constant, and listeners are not seated — they are standing, walking, congregating around lounge clusters, or queuing at a reception desk. The audio system must remain intelligible across that whole footprint without blasting nearby listeners or drowning out conversations.

Recommended deployment

- **Two PHA-5125 columns mounted vertically as the main flanking array.** The 51" vertical column is essential here — its long line source produces the cylindrical near-field behavior that delivers consistent SPL out to 9 – 12 m from the wall, which is exactly the depth of a typical hospitality lobby's primary listening zone.
- **Four PHA-16 perimeter fills** placed near outlying lounge clusters and entry zones. Run the PHA-16 fills at lower level than the mains; their job is to raise the local direct-to-reverberant ratio for listeners who are too far off-axis from the mains, not to provide a second main system.

Why this works

- Long, narrow vertical dispersion limits energy splash into reflective ceiling tiles, glass curtain walls, and stone, marble or hardwood floors. The same wattage produces noticeably higher intelligibility than would the same power into a conventional point source — because more of it actually reaches the listener.
- The wide horizontal fan-out from each PHA-5125 reaches both the central queue area and the perimeter seating, eliminating dead zones beside the wall.
- PHA-16 perimeter units extend the coverage envelope to far-corner lounge clusters without requiring a center cluster (which would be visually out-of-place in a luxury lobby) or a distributed ceiling system (which would not maintain the same image as the on-screen content).
- Both products are visually neutral. With black, white or silver finishes specified, the speakers vanish into modern lobby architecture.

Scenario 2 — Commercial Lobby / Hospitality Video Wall

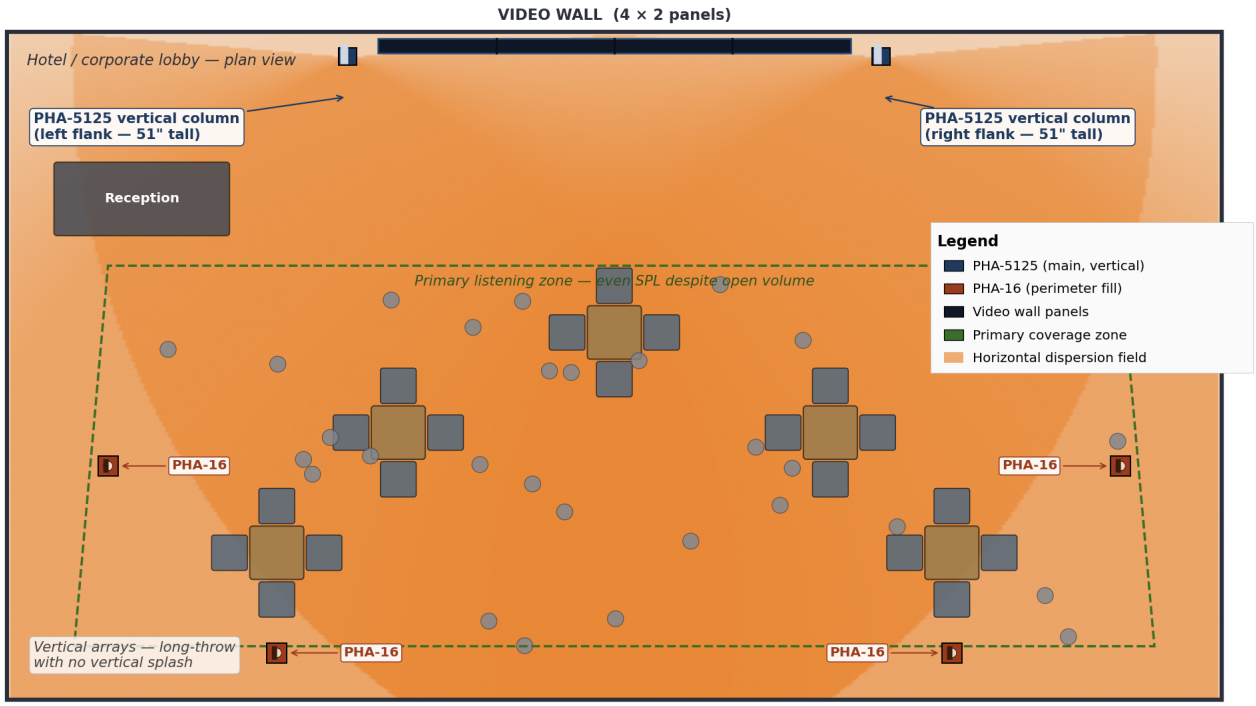

Figure 3.

Hospitality / corporate lobby plan view. Vertical PHA-5125 columns at the wall produce a long-throw horizontal field; PHA-16 perimeter fills extend coverage to outlying lounge clusters. Listeners are mixed standing-and-seated.

Tuning notes

- In a lobby, target an A-weighted ambient + 6 to + 10 dB program level — loud enough to be heard over conversation and HVAC, but not so loud that it intrudes on transactional speech at the reception desk. The wide-coverage line array makes this much easier than spot-cluster designs.
- If the lobby has more than 12 ft of ceiling height with no acoustic treatment, consider mounting the PHA-5125 columns slightly higher and aiming them down a few degrees. The narrow vertical pattern means that small tilts produce significant changes to the listening-plane SPL slope.
- The PHA-5125's weather-proof rating allows the same product to follow program audio outdoors to a covered pool deck, plaza, or patio — useful for resort properties and corporate campuses with indoor/outdoor video-wall continuity.

6. Scenario 3 — High-End Residential Home Theater

Custom residential home theaters have evolved well beyond a single front projector and three identical bookshelves or in-wall / in-ceiling speakers. Direct-view LED video walls are increasingly common as the central display, often configured as a 3 × 3 panel array on the front wall. In these dedicated rooms, the audio bar is set by a discerning client: tonal accuracy, spatial coherence between front and surround channels, and a listening experience that matches the visual fidelity of the video wall.

Recommended deployment

- **Two PHA-5125 columns as the L / R main channels,** vertically mounted at the screen edges. The full-height column places the acoustic center on the same axis as the visual center of the screen — there is no dialog-from-below or imaging-shift-with-row-position.
- **One PHA-16 as the dedicated center channel,** mounted horizontally directly above (or, where the wall geometry permits, directly below) the video wall. Because the PHA-16 uses the same drivers and tuning as the PHA-5125, dialog tonality matches the L / R mains seamlessly.
- **Two PHA-16 surrounds** mounted on the side walls at row 2 height, plus two PHA-16 rears at the back wall. All surround positions use the same product, providing identical timbre across the surround space.

Why this works

- Tonal match is the single most-important property of a multi-channel system. Pans, ambiance, and effects move continuously between channels; a timbral mismatch between mains and surrounds is immediately audible as a 'shift' in the soundstage. Because PHA-5125 and PHA-16 are sonic siblings, no amount of surround / main level offset is required to mask a tonal disagreement.
- Vertical dispersion of the PHA-5125 mains is tightly controlled. Row 1, Row 2, and Row 3 sit within the same lobe; row-to-row tonal balance and perceived dialog level remain consistent. This is normally achievable only with much larger and more expensive arrays.
- With L / R mains as 51" full-height columns, the soundstage extends the full height of the video wall. Visual events at the top of the screen (sky, vertical pans, helicopter shots) anchor acoustically at the same height as their image — a property that bookshelf or in-wall L / R speakers can never deliver.
- Because every speaker in the system is a 4 Ω, 89 dB, 2" × 2" extrusion, amplification, wiring runs, and wall integration are all standardized. There is no cabinet variation between channels.

Scenario 3 — High-End Residential Home Theater

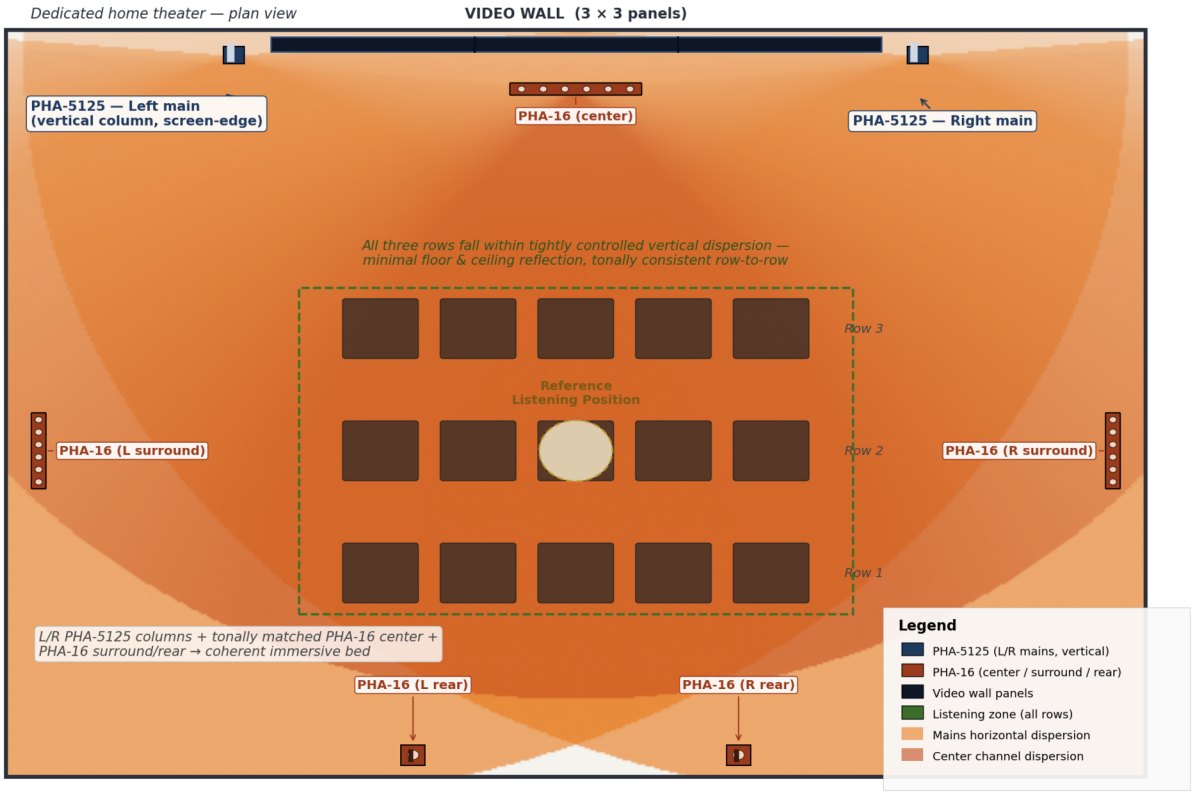

Figure 4.

High-end home theater plan view. PHA-5125 vertical columns serve as the L / R mains framing the 3 × 3 video wall; a PHA-16 above the wall is the timbre-matched center channel; PHA-16 surrounds at row 2 and PHA-16 rears at the back wall complete a fully driver-matched Dolby 7.2 setup. A couple of subwoofers add to performance of the low-end bass of the system. This can be further expanded to a full Dolby Atmos® implementation with additional PHA-16 speakers.

Tuning notes

- A subwoofer is essential for content below approximately 80 – 90 Hz. Cross over the PHA-5125 mains at the THX-recommended 80 Hz; the array's 90 Hz lower limit gives plenty of overlap and clean integration with most quality sub-woofers.
- Calibrate using the reference listening position (typically the center of row 2). Because vertical dispersion is tight, EQ adjustments made at the reference position will hold for all rows — unlike conventional bookshelf, on-wall, in-wall or in-ceiling speaker systems, where front-row and rear-row EQ are essentially incompatible.
- If the room is treated for first-reflection points on the side walls, the PHA-5125's narrow vertical dispersion already removes the most destructive ceiling and floor reflections; you may find that less broadband absorption is required than with conventional dome-tweeter mains.

7. Cross-Scenario Best Practices

Across the three application classes covered above, a number of design rules apply universally. They are summarized in the matrix below and then expanded.

Scenario	Primary array	Secondary array	Why this works
Corporate boardroom	Vertical PHA-5125 columns flanking the wall	Optional rear PHA-16 fill for long rooms	Wide horizontal coverage of seated audience; no ceiling slap in soft-acoustic spaces
Commercial / hospitality	Vertical PHA-5125 mains flanking the wall	PHA-16 perimeter fill at lounges & side seating	Long-throw coverage in open volumes; rejection of HVAC ducts and reflective glass
High-end home theater	Vertical PHA-5125 as L / R mains	PHA-16 horizontal as center, surrounds, rears	Tonal match across all channels; identical drivers throughout the bed layer

Table 2.

Quick-reference matrix of speaker roles by scenario.

Five rules that apply to every video-wall PHA install

- **Choose orientation to match the audience's geometry.** Vertical when listeners are spread left-to-right (most cases). Horizontal only when the speaker is acting as a soundbar above or below the screen for a narrow listening window.
- **Mount the array at the screen edge, not on top of the screen.** A PHA-5125 column flush to the side of the panel array preserves both the visual line and the acoustic line. A speaker placed above the screen always shifts the acoustic image upward.
- **Match products across channels.** The PHA-16 and PHA-5125 are deliberately driver-matched. Use that. A center, surround, or fill from a different family will be audible as a timbral seam.
- **Drive both products with the same amplifier topology.** Use the HideAway™ amplifier, a mono-block amplifier MBA-148, stereo amplifier SAA-248 or compatible PADS / TPA receivers across the system. Mixing class-D and class-AB amplifiers between channels can introduce subtle tonal differences that the line arrays themselves are too revealing to hide.
- **Time-align rear and side fills.** Whenever a PHA-16 fill is added behind or to the side of the listening zone (Scenarios 1 and 2), apply electronic delay equal to the additional distance from the mains. Otherwise the fill becomes its own apparent sound source rather than a level extension.

8. Specifying & Commissioning Checklist

Use the following checklist when scoping or commissioning a PHA-5125 / PHA-16 video-wall installation.

During design

- Confirm video-wall dimensions and bezel widths. The PHA-5125 column's 2" width plus mounting hardware must clear adjacent panels and any peripheral trim.
- Establish ceiling height, floor finish, and back-wall treatment. These determine whether vertical dispersion control alone is sufficient or whether additional broadband absorption is required.
- Specify finish (black, white, or silver) to match the architectural intent. White is typically preferred for hospitality lobbies; black for boardrooms and home theaters.
- Provision amplifier power: minimum 48 W per PHA-5125 channel for corporate / home theater duty; minimum 60 W per PHA-5125 channel for commercial duty with elevated ambient.
- Provision low-voltage cable runs (16 AWG minimum, 14 AWG preferred for commercial runs over 50 ft).

During commissioning

- Verify polarity at every speaker terminal before applying full-range pink noise.
- Measure on-axis SPL at the reference position with pink noise; verify within ± 2 dB of design target.
- Walk the room with a sound-level meter (or a calibrated tablet RTA) along the listening plane. Document SPL at each seat / standing position; uniformity should fall within ± 3 dB across the design coverage zone.
- Verify intelligibility with a STIPA test source where speech is the primary content. Target STIPA ≥ 0.60 in corporate boardrooms and home theaters; ≥ 0.50 in commercial lobbies.
- Apply parametric EQ only after coverage is verified. Do not EQ around a coverage problem.
- Document final settings and provide the client with a one-page commissioning record.

> **Engineering shortcut**
>
> If you are simulating the deployment in an EASE, CATT, or ODEON model, treat the PHA-5125 as a 51" line source with the published polar response and the PHA-16 as a 25" line source. Do not model either as a point source — the inverse-square fall-off rule does not apply at the working distances typical of these scenarios, and your SPL predictions will be 4 – 6 dB pessimistic at the back row.

9. Conclusion

Video-wall installations have become the default visual element of corporate, commercial, and high-end residential spaces. The audio system that accompanies them must do four things at once: integrate visually with the panel array, project intelligible sound across listener zones that are larger than a traditional sweet-spot, deliver tonally consistent multi-channel audio, and resist the early-reflection problems endemic to small-to-medium reflective rooms.

The Pragmatic PHA-5125 and PHA-16 line arrays answer all four requirements directly. Their compact 2" × 2" footprint disappears into the bezel of a modern video wall. Their line-source dispersion produces wide horizontal coverage with controlled vertical pattern, delivering uniform SPL and high intelligibility across audience footprints from a 12-seat boardroom to a 1,200 ft² hospitality lobby. Their shared driver topology supports tonally matched multi-channel design from the L / R mains to the center, surrounds, and rears of a private home theater.

When the screen is the room, the PHA line array is the loudspeaker. The three reference designs presented here — corporate, commercial, and high-end residential — show how the same two products, oriented and arrayed correctly, deliver world-class results across radically different application classes.

For project consultation, demonstration, or detailed specification support:

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