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Theory + Application elektroakustik Solitaire S 540 Loudspeaker

16 Pages of New Music Features and Reviews



Theory + Application

S 540

**A RADICALLY
DIFFERENT
APPROACH
TO** BY ROBERT HARLEY
**LOUDSPEAKER
DESIGN**



elektroakustik Solitaire

Loudspeaker

photos by Matt Wrightsteel

IN 1978,

a young man named Siegfried Amft was about to be graduated from technical university when one of his professors, Dr. Fritz Sennheiser (yes, *that* Sennheiser), encouraged the young man to start his own audio company. Immediately upon graduation Sigg, as he liked to be called, founded a company whose name reflected his engineering-driven approach to audio design—Theory and Application elektroakustik, or T+A for short.

T+A quickly established itself as one of Germany's premier loudspeaker manufacturers through a combination of technical innovation and high value. The company was extremely successful in Germany and throughout Europe, expanding its product line to include a full suite of electronics. In fact, T+A became Germany's largest high-end audio electronics manufacturer. Today, the company employs 80 people, including 14 engineers (all with engineering degrees), and its products are distributed in more than 50 countries.

T+A became so successful that Sigg spent most of his time managing the business rather than designing speakers, his overarching passion. But with Sigg's son Conradin recently installed at the business' helm (after earning a master's degree in entrepreneurship and gaining experience working in other industries), Sigg was freed to return to his first love—speaker design. Now, having the time to devote to invention as well as the resources of a successful company, Sigg could develop the speaker he'd long conceptualized—the \$54,900 Solitaire S 540 reviewed here.

The S 540 is the embodiment of several interesting ideas Sigg developed about how a loudspeaker should behave in real-world listening environments—a customer's living room. Consequently, the S 540 looks and behaves very differently than standard “cones-in-a-box” designs or dipole models.

Throughout his career, Sigg has been a champion of electrostatic and planar-magnetic drivers and has developed many electrostatic-based products. For example, he developed a hybrid dynamic/electrostatic speaker back in 1984. Sigg now favors planar-magnetic drivers for their greater reliability, particularly in humid climates where electrostatics are likely to arc and destroy the diaphragm. Clearly, his ambitious new speaker would incorporate his latest thinking on planar-magnetic-driver design.

THE S 540 LOOKS AND BEHAVES VERY DIFFERENTLY THAN STANDARD “CONES-IN-A-BOX” DESIGNS OR DIPOLE MODELS.

In a nutshell, the S 540's unusual driver complement produce a very different dispersion pattern than just about any other loudspeaker. Specifically, the S 540 has very narrow horizontal and vertical dispersion in the midrange and treble, meaning that the sound at the listening position (above about 200Hz) is nearly all direct sound from the speaker with very little room reflections. Unlike a full-range open-baffle planar that also has a narrow horizontal and vertical dispersion, the S 540 is a monopole, directing all its acoustic output directly in front of the speaker to the listening position.

The unusual driver array is the key to the S 540's behavior. The front panel houses a 33.5"-tall planar-magnetic tweeter (T+A calls it “magnetostatic”) coupled to seven tiny oval midrange drivers arranged in a vertical line alongside the tweeter. A vertically stacked array of drivers, called a “line array,” radiates sound in a cylindrical shape in front of the speaker rather than in a spherical shape as a single point-source driver does. The mid-range line array's cylindrical radiation pattern mimics the planar-magnetic tweeter's cylindrical radiation pattern. The tall and narrow tweeter naturally radiates in a cylindrical pattern because of its shape. T+A calls this approach “Cylinder Wave Technology.” The company didn't invent the concept (the physics have been known for decades), but there's been a newfound interest in the idea—line arrays have recently revolutionized the live-sound industry. There's an interesting video on YouTube called “Why Music Festivals Sound Better than Ever” explaining how line arrays work and why they have replaced point-source speakers for live sound reinforcement.

T+A asserts that room reflections are a significant source of sonic degradation; reducing those reflections through the S 540's design confers significant benefits, it asserts. In a traditional speaker, sidewall and ceiling reflections combine with the direct sound at the listening seat, creating a pattern of narrow cancellations and reinforcements (called “comb filtering”). It's called comb filtering because the frequency response looks like a comb—a series of very narrow, closely spaced peaks and dips in the response created by the constructive and destructive combination of two signals that occurs when one



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RESOLUTION IS MANIFESTED AS A WEALTH OF INNER DETAIL IN THE TREBLE, BOTH IN TIMBRE AND DYNAMICS.

is slightly delayed relative to the other. This phenomenon distorts music's timbres, introduces phase shifts, and destroys spatial cues encoded in the recording that degrade sound-staging, among other deleterious effects. In my own experience, absorbing or diffusing sidewall reflections is the single most important acoustic treatment you can deploy (with conventional loudspeakers).

It's interesting to note that this design is diametrically opposed to the omnidirectional approach favored by MBL, most notably in its 101 X-Treme MKII reviewed by Jonathan Valin two issues ago (October 2023). As you can read in Jonathan's comprehensive analysis, MBL believes that room reflections (if tonally identical to direct radiation) contribute to a more accurate representation of the original acoustic event. But as with many things in audio, opposing approaches can yield exceptional results from each school of thought—think of single-end triode amplifiers and dreadnought solid-state designs, for example. I address this larger question in this issue's From the Editor.

Bass is reproduced by four 8.6" side-firing woofers that are mutually braced inside the sealed cabinet. A smaller version of the S 540, called the S 530, employs the same midrange/tweeter driver complement, but with two woofers per speaker rather than four and a smaller cabinet. The entry level in the three-model Solitaire line, the Solitaire S, has a shorter version of the planar-magnetic tweeter, front-firing woofers, and a ported enclosure.

The S 540 is supplied in mirror-imaged pairs so that each speaker's planar-magnetic tweeter can be positioned on the outside edge.

The woofer-to-midrange transition occurs at 180Hz, a typical figure. But I was surprised to discover that the S 540's tweeter is crossed over to the midrange at a very low 1.8kHz. A more typical crossover frequency is 2.8kHz–3kHz. The S 540's low crossover point is made possible by the tweeter's sheer size and high power handling. This low crossover frequency means that much more of the midrange frequencies, particularly the range of the human voice and instrumental overtones, is reproduced by the planar-magnetic driver rather than by the cone midrange drivers. Moreover, the transition between drivers is

shifted lower, away from the frequency band where the ear is the most sensitive.

Two sets of binding posts are provided for bi-wiring or bi-amping. Just above the rear-panel input terminals are three three-way toggle switches that allow the user to adjust the speaker's tonal balance. Specifically, you can independently boost or cut the bass, midrange, or treble by ± 1.5 dB.

The enclosure is made from a combination of MDF side and rear panels, along with a baffle machined from aluminum billet. The enclosure volume is a large 120 liters. The S 540 is available in three finishes, black, silver, and macassar wood. Metal grilles attach magnetically, although I left them off for the review.

See the sidebar for technical details of the design, particularly that of the extraordinary in-house-developed planar-magnetic tweeter.

Listening

I unpacked and set up the S 540 myself, which turned out to be a bit of a challenge for one person. Each speaker weighs 176 pounds. The speaker is shipped with a machined aluminum plinth that bolts to the speaker bottom and provides outrigger supports into which four robust spikes are threaded. T+A has posted on YouTube a video showing the uncrating and assembly process. Note that the video is of two rather large gentlemen setting up the smaller S 530 model. One person setting up the larger S 540 is more challenging than the video depiction, as I learned. Setting up the S 540 is a two-person job.

About a week after I dialed-in the speakers, industry veterans James Shannon and Dave Nauber from T+A visited to hear the system. They proclaimed that everything sounded as it should without further tweaking. I shot a video of Jim explaining the company's history and design of the Solitaire S 540. You can find that video and many others (nearly 200 and counting) on *The Absolute Sound's* YouTube channel. There's also an extended video in which I describe my room's acoustic design and construction and a companion video in which I take you through all the components in my reference system.

I drove the S 540 with a single channel of the CH Precision M10 amplifier as well as in passive bi-amplification mode, with one channel of each M10 driving the woofer section and one channel of each amplifier driv-

ing the midrange-treble section. In addition to being configurable as a stereo, mono, or bi-ampable amplifier, the M10 allows you to adjust the amount of feedback in 1% increments to fine-tune the system.

The S 540 is especially sensitive to listening height, but that is only an issue with an unusually high or low listening seat. You can immediately hear the S 540's narrow vertical directivity simply by standing up and hearing an instant reduction in sound pressure. I found that a very small amount of toe-in, say 5–15°, was ideal. Any more than that and the sound became overly bright. Unlike many speakers, the S 540 didn't need much toe-in to realize a strong and stable central image. Many speakers with a conventional radiation pattern benefit from a lot of toe-in because increasing the toe-in reduces the amount of energy reflected from the sidewalls. After running the speakers at high volume at night and whenever I wasn't in the listening room/office to break them in, I did the final setup, which included experimenting with the three rear-panel tonal-balance switches. As mentioned, you can independently boost or cut the bass, midrange, and treble levels by ± 1.5 dB. After a lot of back-and-forth listening, I ended up with the controls set in the flat position, although some bottom-heavy music benefited from attenuating the S 540's generous low end.

Listening to music through S 540, it was immediately apparent that this is a planar design, not a conventional cone-based speaker. What gave it away? That unmistakable sense of immediacy, of lifelike presence, of resolution in the treble, and of transient speed that are the hallmarks of planars. I was surprised considering that the S 540 is essentially a dynamic-driver design with a planar-magnetic tweeter, but the S 540 sounded remarkably like a full-range planar.

Dynamic-driver speakers with a ribbon or planar-magnetic tweeter often sound like a dynamic-driver speaker with a planar-magnetic tweeter—the planar's characteristics are apparent only in the treble. But my strong impression of the S 540 as sounding planar-like through the midrange and treble is attributable, I think, to three factors. The first is that, unbeknownst to me at the time, the tweeter crosses over to the midrange at a very low 1.8kHz. Consequently, much more of the midrange is reproduced by the planar-magnetic driver than occurs with a dome tweeter crossed over at a typical 2.8–3kHz. Second, the seven midrange drivers are tiny and have ultra-light diaphragms, allowing them to match the planar-magnetic tweeter's exceptional speed more closely. Third, the arrangement of the midrange drivers in a line array creates a radiation pattern that emulates the line-source tweeter's cylindrical radiation pattern. This helps the two disparate drivers to sound more alike. As a result, the design produces a seamless blend that is often lacking in speakers with a small planar-magnetic tweeter coupled with a single cone midrange that creates a spherical rather than a cylindrical radiation pattern.

In addition to sounding like a full-range planar, the S 540 exhibited absolutely no discontinuity between the 33.5" planar-magnetic tweeter and the array of seven tiny oval dynamic drivers. It sounded "of a piece" from top to bottom, an extremely challenging hurdle for designers of hybrid loudspeakers. In fact, this transition has historically been the Achilles' Heel of hybrid designs.

**A SENSE OF RAZOR-SHARP SPEED,
EQUALLY FAST DECAY, AND A FEELING OF
WEIGHT BEHIND THE TRANSIENT.**

I'll say right up front that the S 540's 33.5" planar-magnetic driver, designed and built in-house by T+A, is a fabulous transducer. It is the foundation of the speaker's defining characteristics. That foundation is one of the high resolution, transient speed, and lifelike presence that come so naturally to planar drivers. That resolution is manifested as a wealth of inner detail in the treble, both in timbre and dynamics. Listening to familiar music, I heard newfound details in delicate cymbal and hi-hat. On the beautiful composition "My Way Home" from sax player Gary Meek's album *Good Friends*, during the gentle and lyrical melody the drummer plays a figure on the hi-hat that complements the phrasing. The hi-hat was infused with texture, micro-transients, and a sense of realism that eludes most speakers. Rather than sounding like undifferentiated bursts of high-frequency transient information, the hi-hat sounded as you hear it live, with all its delicate detail fully resolved. All throughout the listening, the S 540's resolution of treble information, particularly the inner detail of cymbals, was readily apparent. The S 540's finely filigreed top end, with its ability to portray very fine detail with alacrity, brought music to life. The resolution was enhanced by the S 540's transient speed—the ability to convey the steepness of attacks, from the micro level to the macro. Someone hearing the S 540 may not specifically identify this greater transient fidelity and resolution; rather, they may simply experience greater musical realism and, with it, deeper musical engagement.

Percussion was beautifully portrayed, with a sense of razor-sharp speed, equally fast decay, and lifelike weight behind the transient. Many electrostatic and planar-magnetic speakers exhibit this speed and resolution but lack a sense of body and weight. With many planars, transients are quick, but don't have much dynamic impact behind them, leading to the "skeletal" sound that sometimes characterizes the genre. The superbly recorded self-titled album by the band African Guitar Summit features layers and layers of extremely intricate and interwoven percussion patterns played on a wide range of instruments. The S 540's superb transient articulation allowed me to better appreciate this music's sophisticated rhythmic interplay. Accurately reproducing music's transient nature goes a long way toward musical realism.

The S 540 also had a palpable sense of top-octave air, that region not of pitches and notes but rather of the impression that a lid has been taken off the top of the soundstage and of a see-through transparency. Perhaps not coincidentally, the S 540's tweeter extends to 50kHz. In the past I've used electrostatic super-tweeters with my main speakers to extend the system's upper frequency limit and heard a similar expansion of the sense of space and apparently unlimited air and extension.

I must point out that the S 540 has a bit of extra sparkle and brilliance through the treble range. I wouldn't characterize the speaker as bright overall, but recordings with significant energy in a particular treble

band—vocal sibilance, the zills of a tambourine, or the upper harmonics of some instruments that are rich in upper-order harmonics such as a soprano saxophone—caused the speaker to highlight the treble. This character contributed to the S 540's sense of openness, life, and resolution, but sometimes at the expense of smoothness. The magnitude was slight; I tried attenuating the treble by 1.5dB with the S 540's rear-panel switch, but this was too much correction for most recordings. The fact that I heard a 1.5dB attenuation as an overcorrection demonstrates that the S 540's liveliness in the treble is minor. Nonetheless, the speaker favors liveliness and resolution over timbral warmth—which, incidentally, is typical of electrostatics and planar-magnetic designs.

Significantly—and surprisingly—the S 540's planar-like sound extended through the entire midband. The human voice was reproduced with startling realism—that impression of the speaker disappearing and the voice existing in space completely detached from the electro-mechanical contrivance creating it. A vocal entrance on a song's first verse after an instrumental opening produced a startling effect—a primal reaction to the brain's belief that another person has just appeared. That quality seems to come naturally to planars, even inexpensive ones like the Magnepan LRS+. It's interesting to note that a female vocal contains most of its energy between 160Hz and 2kHz, with harmonics extending beyond that frequency with decreasing amplitude. That frequency range is exactly the range covered by the seven oval midrange drivers, with the upper harmonics reproduced by the planar-magnetic tweeter. Midrange timbres were crystalline in their purity, liquidity, and freedom from grain. Piano had a bell-like clarity along with remarkable resolution of the instrument's dynamic structure of attack, sustain, and decay. Solo piano recordings captured in a hall also highlighted the S 540's resolution of low-level information as the speaker beautifully conveyed the harmonic structure of chords decaying all the way down to the hall's ambient floor.

The midrange presence and purity combined synergistically with the superb tran-

SPECS & PRICING

Type: Three-way floorstanding loudspeaker
Loading: Sealed
Driver complement: 4x 8.6" woofers, 7x 3.5" x 2.3" midrange drivers, 1x 33.5" "magnetostatic" planar-magnetic tweeter
Frequency range: 20Hz–50kHz
Impedance: 4 ohms
Sensitivity: 88dB
Crossover frequencies: 180Hz, 1800Hz
Nominal power rating: 240W
Music power rating: 300W
Finishes: Silver, black, macassar wood
Dimensions: 12.6" x 58" x 20.5"
Weight: 176 lbs. each
Price: \$54,900

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Associated Equipment

Analog source: Basis Audio A.J. Conti Transcendence turntable with SuperArm 12.5 tonearm; Air Tight Opus cartridge; CH Precision P1 phonostage with X1 power supply; DS Audio ST-50 stylus cleaner, DS Audio ES-001 Eccentricity Detection Stabilizer, Levin record brush, Degritter ultrasonic LP cleaner

Digital source: Wadax Reference DAC with Akasa DC cables, Wadax Reference Server with Reference PSU, UpTone Audio EtherREGEN Ethernet switch

Amplification: CH Precision L10 Dual Monaural linestage; CH Precision M10 Dual Monaural power amplifiers

AC Power: Shunyata Everest 8000 conditioner, Shunyata Omega and Sigma NR V2 power cords; Shunyata AC outlets, five dedicated 20A lines wired with identical length 10AWG

Support: Critical Mass Systems Olympus equipment racks and Olympus amplifier stands; Center Stage² isolation, Arya Audio RevOpods isolation

Cables: AudioQuest Dragon interconnects, AudioQuest Dragon Zero and Dragon Bass loudspeaker cables

Grounding: Shunyata Altaira grounding system

Accessories: The Chord Company GroundARRAY noise reduction

Acoustics: Acoustic Geometry Pro Room Pack 12, ASC 16" Round Tube Traps

Room: Purpose-built; Acoustic Sciences Corporation Iso-Wall System

sient fidelity to render stringed instruments with superb clarity and life. Acoustic guitar—Hans Theessink on *Jedermann Remixed*, Rodrigo y Gabriela, Al DiMeola on the acoustic trio album *The Rite of Strings* with Jean-Luc Ponty and Stanley Clarke, was particularly realistic because speakers rarely have adequate transient speed to capture the initial attack of plucked strings. The S 540 reproduced that sense of the harmonics ringing in the air after the initial transient. In fact, all stringed instruments benefited from the S 540's combination of attributes. Ruth Moody's *These Wilder Things* has some spirited interplay between acoustic guitar, banjo, dobro, and acoustic bass; the S 540 beautifully resolved each instrument without devolving into blur.

A benefit of the S 540's narrow radiation pattern and concomitant reduction in reflected energy is an extremely precise soundstage. By "precise" I mean that images are tightly focused and exactly positioned. In this regard, the S 540 doesn't sound like other speakers. I could hear precisely where every instrument was located with very fine resolution. A drum kit's tom-toms vividly reveal this spatial resolution. The drum kit's toms can be miked with one mike on each tom, a coincident stereo pair over a few toms, or a single overhead pair that captures the toms and cymbals in stereo. Whatever the miking method, tom fills were spread across the soundstage, with each drum having pinpoint location. Listen to the great drummer Simon Phillips on his album *Protocol II*—the huge kit was vividly portrayed with each of the many mounted toms precisely positioned. Recordings that capture the natural acoustics of the hall were particularly well-served by the S 540's spatial precision. Listen to "The Cowboys Overture" from *John Williams at the Movies* (ideally, as a 176.4kHz/24-bit download from Reference Recordings, but the 88.2kHz/24-bit Qobuz version is thrilling as well). The illusion of The Dallas Winds surrounded by the fabulous acoustic of Meyerson Symphony Center was palpable. Depth was also superbly ren-

IMAGES ARE TIGHTLY FOCUSED AND EXACTLY POSITIONED.



THE STAR OF THE SHOW IS THE FABULOUS PLANAR-MAGNETIC TWEETER, DESIGNED AND BUILT IN-HOUSE BY T+A.

dered, particularly low-level spatial cues such as reflections from the back of the hall.

My listening room's acoustic treatment was designed for the vast majority of loudspeakers that don't exhibit the S 540's unusual forward-focused radiation pattern. With the S 540, most of the reflected energy comes from the wall behind the listener, not the sidewalls and ceiling. It occurred to me that the S 540 would benefit from absorption behind the listening position. I have some acoustic absorbers and diffusers behind the listening seat, but the acoustics aren't optimized for a speaker with the S 540's radiation pattern. Out of curiosity, I temporarily added to the rear wall four 2' x 4' mid-treble absorbers from Acoustic Geometry. With the additional absorbers behind the listening seat, the soundstage was even more sharply focused, and the imaging precision mentioned earlier tighter.

Finally, the bass from the four 8.6" woofers in the large sealed enclosure was, as expected, extended and powerful. The stereotype of sealed-enclosure speakers as favoring speed and resolution at the expense of warmth and fullness didn't apply to the S 540. I would characterize the bass as a bit on the generous side—not boomy or thick, but full and warm. Pitches were well articulated, making it easy to follow complex bass lines. The S 540 didn't quite extend to organ

pedal tones, but the pair powerfully pressurized my room with a satisfying fullness when called upon. On some music, I preferred the S 540 with 1.5dB of bass attenuation engaged via the rear-panel switch. This amount of attenuation was perfect, bringing the bass into perfect balance. On most music, however, I preferred the flat setting. An interesting consequence of attenuating the bass with the switch was an increase in the S 540's wonderful sense of openness, transparency, clarity, and space. The inclusion of the three level adjustments is a wise move, making it much more likely that the S 540 will perform well in your room. In a room smaller than my 18' x 11' x 27' listening space, the Solitaire S 530, with its two woofers per speaker, may be an ideal match.

Conclusion

The T+A Solitaire S 540 isn't another minor variation on the three-way dynamic loudspeaker. Rather, it is a radically different approach with its 33.5" planar-magnetic tweeter and line array of seven tiny oval midrange drivers. The resulting cylindrical radiation pattern significantly reduces sidewall and ceiling reflections and their deleterious effects. The S 540's timbral purity and ultra-precise soundstaging are likely the result of this design approach.

The star of the show is the fabulous planar-magnetic tweeter, designed and built in-house by T+A. Its large size, extremely wide bandwidth (it is operated from 1.8kHz to 50kHz), high power handling, and superb transient fidelity are the foundation of the S 540's performance. The driver's speed, resolution, and precise articulation are exceptional. I enjoyed these qualities not for their own sake but rather because it is just this kind of resolution that contributes to the sense of realism—of hearing music rather than a recreation of it—that fosters deep musical engagement. There's no mistaking the S 540 for anything other than a planar; cone and dome drivers simply don't sound like this. Moreover, although only the tweeter is a planar design, T+A has somehow managed to pull off the near-impossible trick of making the S 540 sound like a full-range planar, largely

DESIGN

The S 540 is a three-way system employing four 8.6" side-firing woofers, seven oval midrange drivers measuring 3.5" x 2.3" arranged in a line array, and a 1" wide, 33.5" long planar-magnetic tweeter. Crossover frequencies are 180Hz and 1.8kHz. All the drivers are developed in-house. The woofers have an optimized cone profile along with a stiffening feature T+A calls the StarStabilizer system, a star-like shape embossed in the aluminum cone to raise the frequency at which the cone breaks up. A newly developed suspension system increases the woofer's linear excursion. The midrange driver diaphragms are also made

from aluminum for lightness and stiffness. The small midrange drivers and their ultra-light diaphragms better match the planar-magnetic tweeter's transient speed. Spreading the midrange energy over 7 drivers means that each driver is operated at a very low level, increasing dynamic headroom.

The Mag850 planar-magnetic tweeter, developed primarily by Project Director Max Kirschke, features a precise array of 64 specially shaped neodymium magnets spread out over the driver's length. The conductor bonded to the Kapton diaphragm is nearly 40' long, arranged in a back-and-forth pattern so that the diaphragm is driven uniformly over its entire surface area. The Mag850's diaphragm thickness is measured in micrometers—about the same thickness as kitchen stretch film. The conductor in a planar-magnetic driver that is bonded to the diaphragm is analogous to the voice coil in a dynamic driver but stretched out in straight-line segments. In both driver types, the audio signal flowing through the conductor creates a varying magnetic field that interacts with the fixed magnetic field provided by the magnets, causing the diaphragm to move back and forth to create sound. The advantages of a planar-magnetic driver include extremely low moving mass, which confers superior transient response (the diaphragm starts and stops faster) as well as providing a much larger radiating surface area than a dome tweeter. The Mag850's large size and robust construction allow it to be crossed over at a very low 1.8kHz.

The enclosure sides and rear are made from MDF, with the front baffle machined from a solid aluminum billet. The woofers are arranged opposite each other, and the cabinets are braced at the woofer locations, so that their energy cancels, reducing enclosure vibration. Each crossover section (low-pass, bandpass, high-pass) is mounted on its own board. Two pairs of input terminals are provided for bi-wiring or bi-amping. Three rear-panel switches allow the user to boost or cut the bass, midrange, or treble levels independently.

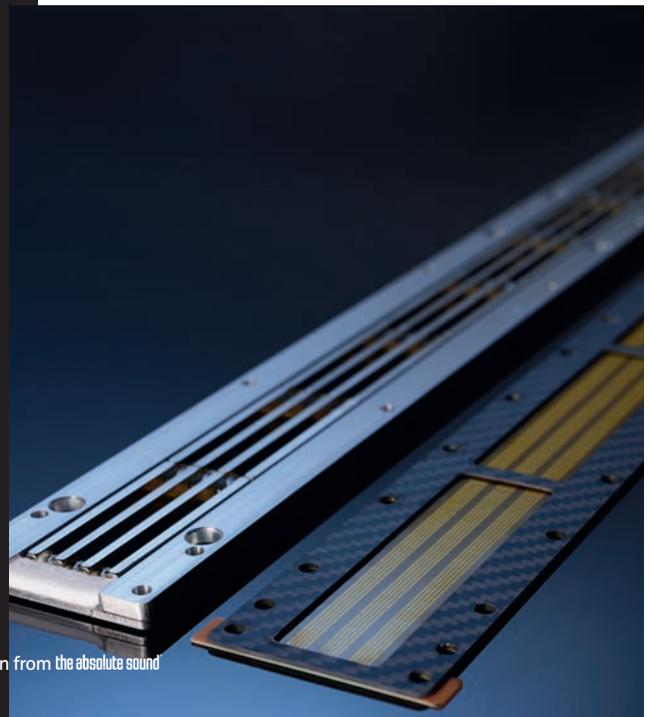
As described in the review, the wavefront generated by the S 540's forward-facing midrange line array and tweeter is concentrated in front of the speaker in a cylindrical shape. The amount of off-axis energy (horizontally and vertically) is very low, resulting in the listener hearing much more direct sound from the speaker and far less sound reflected from the sidewalls and ceiling. Another phenomenon that results from the line array's cylindrical radiation pattern is that sound intensity attenuates linearly as a function of distance ($1/d$) rather than with the square of the distance ($1/d^2$) as with traditional loudspeakers that produce a spherical radiation pattern. Though the cylindrical radiation patterns begin to transition to a spherical pattern above 12kHz, that is well beyond the range of much musical energy. The side-firing woofers, of course, produce a spherical radiation pattern, but that's not an issue for low frequencies radiating into an enclosed space such as a listening room.

T+A HAS SOMEHOW MANAGED TO PULL OFF THE NEAR-IMPOSSIBLE.

because the midrange-to-tweeter transition is utterly seamless.

I have two caveats. The first is that the S 540 has a lively tonal balance, with an emphasis on resolution and detail rather than tonal warmth. The second caveat is perhaps reflected in the S 540's full name—Solitaire S 540. Because of the narrow radiation pattern, the S 540 is best experienced sitting in front of the speakers. This isn't a party speaker, or one that works well if you want to listen to music in the kitchen while cooking, for example. Nonetheless, I spent plenty of time enjoying music sitting one seat away from the sweet spot (I always give the center seat to visitors) and found the S 540 to be wonderfully engaging musically from this position.

The T+A Solitaire S 540 injects some new ideas into the loudspeaker category, delivering a combination of virtues you simply don't hear in conventional box speakers. If you're in the market for a speaker in this price range, I encourage you to audition the S 540. You may find it as musically compelling as I did.



Theory + Application elektroakustik Solitaire S 540 Loudspeaker

Q&A

SIEGFRIED AMFT, FOUNDER OF T+A

How long had you been conceptualizing the Solitaire series?

The principle ideas and concepts for our Solitaire Cylindrical Wave transducers were developed 14 years ago. The new generation (S 430, S 530 and S 540) is based on those ideas, but the drivers are completely new developments, taking into account the knowledge we have gained over the years with the first cylindrical-wave loudspeakers. Instead of an electrostatic line source, we use a magnetostatic driver that is only half as wide as the oval shape of the new midrange drivers. That significantly improves the radiation behaviors of the line array. It took nearly one and a half years to develop the cabinets, drivers, and crossovers.

Describe the S 540's cylindrical radiation pattern and how that differs from that of a conventional loudspeaker.

Line arrays or line sources consist of multiple individual sound transducers, or a single long diaphragm, generating a cylindrical wave in a specific frequency range. The wave is strongly concentrated in the vertical direction and focuses the energy horizontally in the area in front of the loudspeaker. With a conventional loudspeaker, the sound radiation from the individual drivers is spherical in the lower frequency range and then bundled. As a result, there are very strong reflections from ceilings, floors, and sidewalls in certain frequency ranges.

Sound intensity from a conventional loudspeaker attenuates at a rate of $1/r^2$ (if the distance is doubled, intensity is reduced by four times), but with line-array systems the rate of decline is only $1/r$ (doubling the distance halves the intensity). The result is that the sound field extends much further, and reflections from ceilings, floors, and walls are either very low or virtually non-existent.

Tell us about Solitaire's fundamental design goal of reducing sidewall and ceiling reflections at the listening position and why that is important.

With a line array or a line source, the radiated waves are interfering in the soundfield to form a quasi-plane wave directly in front of the baffle. Above, below, and to the side, the sound is largely canceled out by interference. This concentrates the energy in the area directly in front of the loudspeakers. The amount of reflected (indirect) sound is very small. The listening experience is substantially more intensive, and the information is not affected by reflected (i.e., indirect) sound mixing with the direct sound and creating delays due to the phase differences.



IT TOOK NEARLY ONE AND A HALF YEARS TO DEVELOP THE CABINETS, DRIVERS, AND CROSSOVERS.

You've long been a proponent of planar drivers. Tell us about your history with planars and why you believe they are superior to dynamic drivers or other technologies.

I developed our first electrostatic tweeter in 1984 for our first Solitaire speakers. It was 5cm wide and 15cm high. Over the years we have developed a wide variety of models, with a curved membrane of 40cm or 90cm in length. We first developed our magnetostatic drivers for our headphones and then extended them to the tweeters of the new Solitaire loudspeakers.

Planar transducers are very complex and therefore expensive but have a decisive advantage: The membrane is driven homogeneously over the entire surface and consequently it does not break up and cannot compress. With the right construction, there is no distortion and enormous sound pressure levels can be generated. The mass of the diaphragm is nearly zero and therefore, the dynamic and transient behaviour is perfect and cannot be matched by any kind of dome tweeter. **tas**