

# Equipment Report

## Graham LS5/9 Loudspeaker

### A Superior Small Speaker

Robert E. Greene

**T**he heyday of the BBC loudspeaker research program was drawing to a close in 1983 when the original LS5/9 was developed. The LS5/9 and its larger brother the LS5/8 were really the last of the products one might think of as BBC monitors in the traditional sense. (The later LS5/12 was a different sort of transducer, and not really a creation of the Kingswood Warren group.) Things were changing at the BBC. Thatcher-esque austerity would soon shut down its speaker research program, and, in another direction, the BBC was having to deal with the monitoring of rock music—rather reluctantly, one supposes. The LS5/8 was explicitly intended, it seems, to meet the need for a monitor speaker that would play loudly. The LS5/9 is a much smaller unit—only a one-cubic-foot cabinet—but it too was expected to produce considerable sound pressure levels. But despite the additional requirement of playing louder, the LS5/9 remained true to the classic BBC principles of damped thin-wall cabinet construction and crossover circuitry that controlled the frequency response very carefully.

The LS5/9 was not quite the commercial success that earlier BBC-related models like the Spendor BC1 (which was the moral equivalent of the BBC's LS3/6) or the LS3/5a had been. For one thing, the BBC's ideas had become quite widespread, and accurate, flat, two-way “monitor” speakers from other sources had become widely available. There was more competition than the BC1 had seen in 1968, when it was practically the only low-coloration box monitor available.

Spendor and Harbeth kept the BBC tradition alive (at one remove) after the closing of the BBC research department. And though the BBC continued, and continues to this day, to issue licenses for manufacturers who wish to bring out BBC designs, they were almost all LS3/5a clones.

Recently, this has changed. Stirling Broadcast and now Graham Audio have taken up the manufacturing of licensed models other than the LS3/5a. Stirling has the LS3/6 (as well as its own version of the LS3/5a), and Graham has undertaken to reintroduce the LS5/8 and the LS5/9 (and I suppose almost inevitably its own version of the LS3/5a). These are all BBC-licensed models, meeting the original specifications, although in most cases with different drivers than those in the originals. We are now enjoying an embarrassment of BBC riches! This is a delightful thing, no doubt, for people like me, who admire the BBC tradition



enormously, but it does present a bit of a conundrum to the potential purchaser. Which BBC speaker should he buy?

The Graham Audio LS5/9 is BBC-licensed—certified to meet the specifications of the original design from decades ago. Moreover, it is engineered by Derek Hughes, a distinguished designer in his own right and also son of the founder (with his wife, Derek's mother) of Spendor and a member of the original BBC research team. We have here not only an officially licensed BBC monitor designed by a true expert, but a design with a family connection to the early days of BBC research.

### What the BBC Was Trying to Do

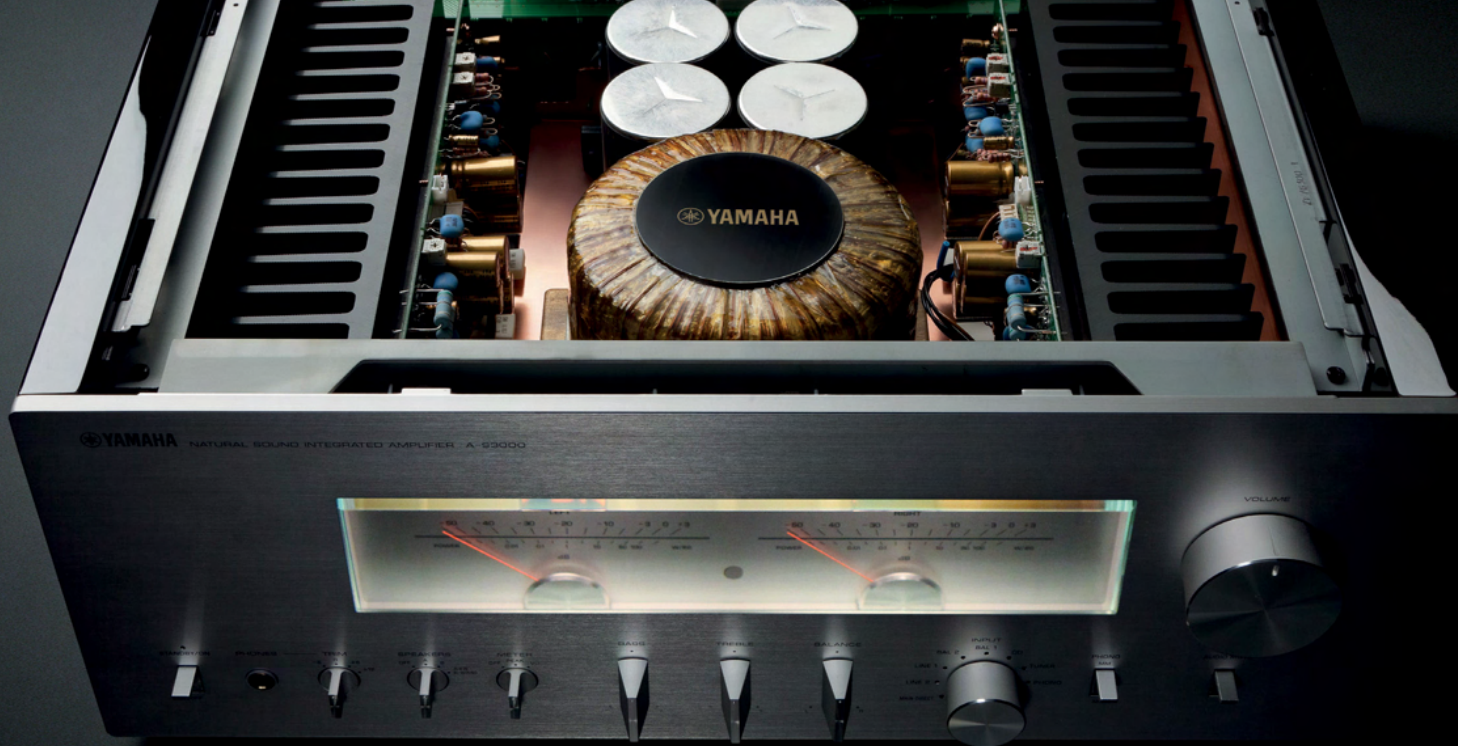
The BBC speaker research program had a number of unique features. One was the vastness of the resources on offer. In pre-austerity days, government money generated an environment where investigations could be carried out almost without financial restraint. The number of talented and dedicated people involved and the facilities they had on tap were unparalleled before or afterward.

A second feature of the situation was the unique opportunity to judge the sound of loudspeakers against the sound of actual music. No vague feelings about how a speaker compared to some indefinite memory of music were to be taken seriously. Live music was constantly available for direct comparison—control room versus the actual sound. In this context, colorations of great subtlety could be and were detected.

The BBC speaker research team wanted to develop speakers that would tell them the real and exact truth about what was being recorded, about what the microphone feed really sounded like. With good recording technique, this was expected to be the sound of live music itself. The absolute sound, indeed, was the goal.

Rather curiously, while this was very much the same goal declared by *The Absolute Sound* at its founding, TAS in fact emphasized another aspect of the sound—not so much exactly what the music sounded like but more how it was arranged in space. Nominally, of course, TAS was interested in both—in “the sound of real music in real space”—but in practice it was the second half of the equation (the “real space” part) that came to the fore. And audiophiles in those heady early days tended to embrace openness and “soundstage” at the expense of ignoring colorations—American audiophiles, anyway (the British continued to be interested in minimal coloration for a long time).

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## Specs & Pricing

**Type:** Two-way, bass-reflex stand-mounted loudspeaker

**Enclosure:** Damped thin-wall construction, birch plywood

**Drivers:** Diaphnaton polypropylene (developed and manufactured by Volt) mid/woofer, Son Audax HD13D34H tweeter

**Frequency response:** 50Hz–16kHz, +/-3dB

**Nominal impedance:** 8 ohms

**Sensitivity:** 87dB/2.83V/1m

**Maximum output:** >100dB at 2m

**Recommended amplifier**

**power:** 50–200 watts

**Dimensions:** 11" x 18" x 10.75"

**Weight:** 14 kg (31 lbs.)

**Price:** \$6799 (cherry finish), \$7199 (rosewood)

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the 1970s and early 1980s. This was in fact a really bad speaker for sounding like actual music. In the early 80s I was carrying around a record of myself playing a G major scale starting on the bottom note of the violin and going up three octaves. I had pauses between the notes of the same length as the notes themselves, which were held for a good bit so I could play the record back and fill in the pauses with the same notes played live. Differences would stick out like sore thumbs. Failure to reproduce the characteristic timbres of each note (each note was different, of course, violins being as they are) was really obvious.

On the Spendor BC1, with its BBC connection (effectively the same design as the BBC LS3/6), the match of each pair of notes was very good. One heard not just characteristic timbres correctly but the specific timbre of the violin involved, note for note. It was quite startling how well this worked. But with the Dahlquists—disaster! One could hardly recognize the violin timbre at all, even in the generic sense. The results were downright embarrassing.

How could this have been, when the Dahlquists were reviewers' darlings and the speakers of choice of a large portion of the American audiophile community? I think the answer is mostly that people either did not know or simply did not care. It is easy not to know—if one does not compare to live sound directly, colorations are much much less obvious than they are if one does compare.

The point here is that the BBC designers compared all the time. They worked with this type of thing on a daily basis. Commercial speaker designers seldom did this, and indeed really could not do it to the same extent. Most commercial speaker designers did not have orchestras in residence! And they still don't.

The ghost of this variability continues to haunt audio. Go around a show with a single recording. How it sounds will vary all over the place as one travels from exhibit to exhibit. Basically,

most of the presentations are quite wrong.

BBC speakers were pre-checked to ensure they were close to right (or not very much wrong). No one can make a speaker that is exactly right. (The threshold for detecting differences is extremely low—a 0.1dB change in frequency response is audible, not to mention various other things that can affect the sound.) But the BBC speakers were carefully checked against live sound to come as close to it as could be arranged, due allowance being made for the microphone technique and so on. Indeed, the whole point of a monitor speaker is to allow one to check on the accuracy of the recording process—to check on the microphones and the rest of the chain. The speakers are supposed to be leaving all that alone. This sounds a bit negative as a goal but in fact it is a worthy and important one. Moreover, many speakers are in fact quite bad in a comparison to live music and in providing information about the behavior of the chain up to the speakers. This was true then, and it remains true now, albeit to a lesser extent. (Improvements in driver technology have brought things to a better state, although nothing like perfection.) The high-end woods are still full of speakers that do peculiar and outrageous things to the sound.

Does this matter? It is surely audible. Do you care? Apparently quite a few people do not. In fact, it is relatively rare nowadays to read a review that talks about how a speaker actually sounds. As long as the balance is not totally outrageous—and often enough even when it is—the reviewer soon starts to talk

**If one does not compare to live sound directly, colorations are much less obvious.**

about space, and detail, and hearing this that or the other micro-thing. The way the speaker actually sounds in the sense I am discussing is seldom mentioned. People say that the speaker is “neutral” and move on. But of course hardly any of them are anywhere close to neutral in this compared-to-live sense.

I do not know if you care. But if you do—well, you are probably already a BBC heritage enthusiast. If so, read on. If not, I hope you will read on anyway—maybe I can convert you.

### The LS5/9 Itself

The LS5/9 is a small speaker—the enclosure is just over one cubic foot (that of the LS3/6 is two cubic feet). The BBC brief for the LS5/9 was to get as close as possible to the sound of the really large LS5/8, but in a much smaller box. I have not heard the LS5/8, but according to reports at the time, the LS5/9 filled the bill, except, of course, for less bass extension.

As such, the LS5/9 was and is a true monitor in the BBC sense—the LS5 category being the designation, as I understand the system, for monitors suitable for all types of program material and under the most demanding circumstances. (The numbers after the slash are chronological—later designs have higher numbers.)

As monitor speakers are supposed to, the LS5/9 was

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specified to have flat response in its original version. In the present “reissue,” this remains true. As it happens, the original mid/bass driver is no longer available so a new custom design is used, produced by Volt under the supervision of designer Derek Hughes. The Audax tweeter of the original survives to this day, in revised form. The tweeter, with a diameter of 34mm, is somewhat larger than is customary today. This has the virtue of reducing the “tweeter flare” effect and bouncing less sound off sidewalls compared to a smaller tweeter with the same crossover—and a most convincing virtue it is. Among other things, this speaker images exceptionally well, with startling focus.

The limitation of the larger tweeter is that the top end extension is slightly reduced. Since extension at the very top is mostly a matter of air and texture, this is perhaps a reasonable trade. (If one wants the top end to go way on out beyond 20kHz, one can of course add a super-tweeter, those being quite abundant nowadays.)

The LS5/9s have a rise in the bass, with the 50-to-100Hz octave up a few dB, and a gradual slope down to level above 100Hz, the down-slope ending around 300Hz. From 300Hz to 900Hz the speaker is essentially flat but slightly down in level compared to the overall lower treble level. (This is presumably a “monitor balance,” with the slight recession backing the sound away a bit since nearfield listening was anticipated, while the slight lift in the lower treble would give insight into problems in the material in this crucial region.) At around 1.25kHz there is a fairly narrow bump up in response, then a touch of the traditional 3kHz BBC dip. From 4kHz on up, the treble maintains level response up to around 10kHz, above which there is a small amount of droop. These response deviations above 100Hz are all small as speakers go. The speaker really is quite flat. (The rise in the 50 to 100Hz octave is actually useful, giving the speaker a sense of weight, which keeps it from sounding “small” even though its output drops quite rapidly below 50Hz.)

One of the advantages of a small stand-mounted speaker of this type is that it will actually deliver in a listening room its essentially neutral response. Visual fashion has made the high-end audio industry move into floorstanders. But the real truth is that very few floorstanders come out anywhere close to as flat in room as they are anechoically (or as one hopes they are, anyway). Stand-mounted speakers offer greater flexibility in position relative to room boundaries, and it is thus easier to get the in-room response to be reasonable. I suppose everyone has looked at the in-room response of typical floorstanders that are published around and about. The typical one has a boom at around 70Hz (from the floor to ceiling mode) followed by a hole between 100 and 300Hz, a midrange prominence, and a roll-off above. This last is actually something that ought to happen—in-room response needs to relax a bit in the upper frequencies. But the results below that hardly qualify as high fidelity. (When one works with room-correction systems one soon finds out how much that big floor-dip hole matters—it matters a lot.)

By contrast, even my initial, relatively casual placement of the LS5/9s produced a quite smooth in-room response, with only a rather narrow dip around 125Hz. Tweaking the position smoothed things out even more. (BBC-style stand-mounted

speakers make possible really neutral in-room behavior. This is aided by the slight rise of the speaker in the range between 100 and 300Hz, where, with floorstanders, a hole typically develops. And if you get into room correction, it is of course much more desirable to have a bit too much energy in the sub-300Hz area, where room effects are most prominent, than too little, since cutting is always a much better thing to do than boosting with EQ.)

So far, so good on general balance questions. But as one might expect, among the BBC-oriented group, which if not a cult in any negative sense is surely a dedicated bunch of Luddites with shared interests, there is a difference of view on the question of such small differences as exist among the various BBC heritage speakers. In particular, the Harbeth speakers, themselves outstanding examples of the survival of BBC ideas, tend to have a bit of extra energy in the 400 to 800Hz region, even the ones that are officially monitors, like the M30.1s and M40.1s. (The original M40s are an exception, being flat in this region.) You can see this for example on the (all but infallible) NRC measurements of the Harbeth M30, published on soundstage.com.

Enthusiasts of Harbeth have expressed dismay at any sign of midrange recession. This kind of controversy over things that seem small to the outside world is what happens when one gets really interested in some specialized matter and is severely anal-retentive. (Ask people who really care about pitch or temperament of scales!) Personally, I am somewhere

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in the middle—I liked to push up the 400 to 800Hz octave of the LS5/9 very slightly and push down 1.25kHz a bit. But on the Harbeth M30.1, I liked to pull down the 400 to 800Hz region. I am not at all fond of midrange projection. Recession of the mids can be a problem too, but the effect with the LS5/9s is small and mostly just moves the image back a bit.

I also reduced the 4-to-8kHz octave of the LS5/9 slightly. With these small adjustments, the LS5/9 could be brought into what I perceived as an almost completely neutral tonal balance. On its own, it is already fairly flat and neutral sounding, but as John Dunlavy used to remark, once you are flat within a dB or two, getting even flatter and more neutral becomes of really great interest.

## **Musical Experience**

After this digression, let me turn now to what the LS5/9 actually sounds like on music.

First of all, it really does sound quite close to truly neutral, even if one skips the EQ tweaking. But it sounds neutral in a way that perhaps might come as a bit of a surprise to those who think of the BBC sound as being a bit slow and heavy and recessed. Now it is, indeed, a little heavy in the bass as indicated (before it rolls off below 50Hz). But the sound overall is very precise and

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abundantly present. The BBC dip is only a hint here compared to some other designs, and the kind of droop from 4kHz to 8kHz, say, that some speakers use to make female vocals sound “nice” or “beautiful” is not really in the picture. In fact, rather the other way around. As one of my friends who knows music, but reacts to audio only intuitively, said, “It sounds as if the musicians are right there in front of you.” And so it does.

This is what a monitor is supposed to do—if that is the way the recording is—and that is what the LS5/9 does, especially with the small adjustments indicated. This is not shorthand for super-aggressiveness. Rather, it is just a matter of telling the truth about the recordings. But the truth here is not tempering the wind to the shorn lamb, and without the EQ touchup the LS5/9 is doing something of a monitor thing in the lower treble (except for the BBC dip). For reasons that are unclear to me technically, the effect seemed smaller with the Quad Artera stereo amplifier than with the Benchmark AHB2.

Incidentally, a couple of practical notes: Best sound is on an axis just below the tweeter. Avoid sitting above the tweeter axis; this means either a low seat or high stands! Second, leave the grilles on. They are part of the design—or so it seemed to me. There is a tweeter control on the front panel, via a jumper. This was part of the design, too, to accommodate variations among the tweeters. On my samples, it was set in the middle, which means you could cut the tweeter by a dB if you wanted to. (I doubt you would want to raise it, if you are a real accuracy person.) I left it where it was for review purposes. I did experiment briefly with a jumper from 0dB to -1dB position, which cuts the tweeter level a bit more than 1dB. While this was nominally a little flatter in the 4-to-8kHz range, I actually preferred the setting the manufacturer provided.

It is interesting to note that so habituated is everyone to absurdly aggressive treble nowadays, that reviews elsewhere have emphasized how smooth and non-toppy the speaker is, in spite of the 4-8kHz elevation noted above. We live in an odd world nowadays, where the overabundance of top-end energy of so many speakers can make a speaker that is only very slightly hot still seem a blessed relief.

### Music Itself: Examples

Listening to the LS5/9 gives the immediate and lasting impression of honesty. There is a sense that, yes, this is what the recording really sounds like, quite exactly. How pleasing this is, of course, varies with the recording but, as I've stated, truth to the recording is the idea here. The LS5/9s remind one rather persistently that most speakers today are not designed, or at least seem not to be designed, to sound exactly truthful so much as to sound like what the customers will think is good. This honesty was there with the speaker as it arrived, but my small EQ tweaks improved it enough that I am going to talk mostly about how it sounded that way.

A certain type of purist might object. But everyone who is really interested in exact tonal character must have noticed by now that essentially every speaker can be improved by a little judicious adjustment, especially for room effects but also further up where the room is having less influence.

Back to the sound. Let us consider the Bach/Sitkovetsky

*Goldberg* Variations arranged for string orchestra that I have discussed so often. This recording was made using ultra-neutral B&K (now Danish Pro Audio) omni microphones. There is not a lot of stereo precision, but there should be a very accurate representation of the tone of string instruments heard relatively close but not super-close. On the LS5/9s, the bass was perhaps a little loose though there was enough of it for proper fullness, even though the extreme bottom of the music is missing. But the tone above, where the music really is in this case, and in particular the violin sound were very realistic. A keen-eared violin appreciator would notice the effect of the narrow band lift around 1.5kHz, which made the violins sound a bit more nasal than should happen without the EQ. But this was a relatively small error, and moreover it was easily EQ'd out. And whether it was EQ'd out or not, one had a real sense of the tonal identity of the instrument, much more so than with most speakers, where something like a generic violin sound is all one can expect.

Moreover, the music had a remarkable coherence. There is no crossover like no crossover, and the LS5/9 reaps the benefit of no crossover at all until the one at 2.8kHz to the tweeter (third-order slopes). The sound is all of a piece, with no sense of division anywhere. The instruments speak with their unique and undivided voices.

Detail was superb. In the magical nineteenth variation, when the harpsichord plays in the background, the harpsichord sound was clearly ev-

ident and correctly presented, with no blurring over from the more prominent instrumental parts. The sonic picture was highly resolved in musical terms—one could hear the individual parts separately, but without losing the sound of the whole.

This was, in short, really good and really realistic—those two things being largely the same on a recording like this. It is not easy to explain this truth-to-source in words, since it is really a matter one needs to hear. But above the bass, one really feels one is hearing through to the mike feeds—to the immediate real sound—without any hype of high treble to fake transparency. This is a truly well-behaved speaker, with minimal resonant coloration and (above the bass) a clean decay.

Turning now to another one of my standbys, Freddy Kempf playing Rachmaninoff's transcriptions of Kreisler's *Liebesleid*, the piano sounded very piano-like. But there was a little less “glow” to the sound than sometimes happens. Since “glow” is usually a kind of resonant behavior, this seems likely to be associated with non-resonant, low-coloration sound. An ideal speaker rings less than all others!

Similarly, Janne Mertanen's extraordinary Chopin recital recording was very realistic—and very attractive. The LS5/9 is really impressive in the “compactness” of its presentation, in the sense that it is not ringing or producing resonant colorations. And on both these recordings, as well as all the other piano recordings I listened to, there was unusually good reproduction of the micro-structure of the piano's sound—of its attack



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and complex decay. This is presumably part of the pay-off of the BBC damped-wall enclosure, with its reduction of narrow-band (“high Q”) resonances.

Familiar orchestral material was also convincingly done, surprisingly so for such a small speaker. The LS5/9 goes loud without strain to an impressive extent. Its dynamic capacity is quite remarkable. And the strong bass down to 50Hz gives a sense of bottom-end support, even though the real bottom octaves are missing. This is one small speaker that does not sound like a toy. And, of course, one was constantly gratified by the correct balance and tonal character of the overall sound.

On Christopher Tin’s “Waloyo Yamoni” (from *Music from the Left Coast*, a recording on which I am playing), the voices were superbly clear and articulate and at the same time very attractive—as they should be. The multi-miking was obvious but not thrown in one’s face. Altogether, this is the recording almost exactly as I think it, in fact, sounds. And the amazingly realistic recording of the opening title song of *High Noon* on Unicorn’s *Western Film World of Dimitri Tiomkin* sounded even more startlingly real than usual.

The Dvorák *Legends*, with Fischer and the Budapest Festival Orchestra, sounded very convincingly like an orchestra. What HP used to call the orchestral *gestalt* was captured surprisingly well for a small speaker. One might in one’s audiophile inner self note that the tweeter was slightly rougher than some of the exotic items around nowadays, but one could well imagine that in a direct comparison with live, the LS5/9 would score well indeed.

## Space

The LS5/9 is intended for relatively close-up listening with the speakers aimed at the listener. It is intended, in effect, to reproduce the stereo imaging that was actually recorded. The image focus of in-polarity mono signals is superb and the out-of-polarity version—two channels in opposite polarity—is perfectly directionless. This test worked about as well with the LS5/9s as with any speaker design that I have encountered. This means that the speakers are going to image correctly. And in the intended setup, they vanish absolutely as sources on centered material.

The speakers seem to have minimal diffraction. One of the things that people do not always know about the BBC school is that the engineers worried about diffraction. Actually even in the AR, et al. days of the 1950s, people knew about diffraction (diffraction is nineteenth-century physics and even earlier). The Spendor BC1 for example had foam around the edges under the grille to avoid high-frequency scattering by the edges.

Another thing that people seem not to know about the general situation of imaging is that in recent decades designers have been using diffraction, perhaps unintentionally, to create a “soundstage.” This is the primary reason that narrow front speakers have a “good soundstage”—diffraction off the narrowly spaced edges.

The truth is that real spatial information, information that actually exists on the recording, is reproduced as a collection of images. A real “soundstage” is made up of a lot of individually imaged small events, which fit together to create an overall sense of space. Anything else is just sound off the walls or early

diffraction effects. A speaker like the LS5/9 is reproducing what is really there on the recording, not just tonally but also spatially when listened to as intended. The LS5/9 operates very much as a true point source; it is quite flat; and it has minimal resonant colorations and minimal diffraction. Just exactly how could it fail to image correctly? There is no way it could not work, and it does work.

This is not to say it will not produce images outside the speakers. Like any correctly working speaker on a phasey recording from widely spaced microphones, it can produce images that are not between the speakers on account of energy that is out of phase between the channels—a sort of junior version of the reverse-polarity test. This is somewhat hokey—correctly made stereo is supposed to be between the speakers—but people seem to like this, and there are quite a few recordings around of this sort. The LS5/9 will reproduce them as they are.

## The Overall Picture

The Graham Audio LS5/9 is an unusual and impressive speaker. It does a startlingly good job of transcending its

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small size to present large-scale music convincingly. It has a balance very close to neutral and surprising dynamic capacity. And its emphasis on the 50 to 100Hz region (just before its final roll-off) does a good job of providing a full sound, in spite of the near absence of the bottom octaves. Its imaging is simply correct, and its basic sound very much like actual music, with suitable sources.

The BBC had use for a smaller speaker that had dynamic power, a full sound, and an essentially neutral balance. Within the small deviations from absolutely smooth and flat response noted above, these goals are attained here. It may be that you have a need for a small speaker; if so, the Graham Audio LS5/9 is surely an item of extraordinary interest. Few other speakers of its size offer anything like a comparable musical truth. Comes to that, rather few of any size do. As Spencer Hughes once said (according to legend), “Big speakers have big problems.” This little box sounds to me more like music than many a monster high-priced floorstander. **tas**

