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DECEMBER 2017

Naim Audio Mu-so Qb Wireless Music System

A Case of Groundbreaking Design

Founded in 1973, Naim Audio is a hi-fi manufacturer based in Wiltshire, UK. With a history rooted in engineering and design excellence, Naim's first wireless music system, introduced in 2014, has won multiple awards for its ground-breaking design. Its compact "little sister," the Mu-so Qb, followed suit with its stunning design, glass-filled polymer casing, the same clever digital brain as the original Mu-so, 300 W of power, and bass radiators that help generate a beautiful sound.

By
Oliver A. Masciarotte
(United States)

Mu-so Qb
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Price: $899 MSRP

There once was a tale of two sisters—one sleek or, some would say, flat; and the other, imposing though some would say a bit blocky. They were cultured children, knowing just how to behave with all the better societal norms—AirPlay, Spotify Connect, TIDAL, Wi-Fi, Bluetooth, UPnP music servers, iOS, and Android. They accepted teachings from "radio" on the interwebs, a USB flash drive, wired 10/100 Ethernet plus analog, or digital audio spigots. They could read a variety of dialects (e.g., MP3, ALAC, AAC, FLAC, WMA, WAV, AIFF, and Ogg Vorbis). And, of course, they also played well with their other Naim streaming siblings.

The girls, named Mu-so and Qb or "Cube" due to her shape, grew up to be pretty rockin' kids, each with a two-year warranty. Their brushed aluminum casework, silver anodized heatsink, backlit 18 mm acrylic plinth, and curvy black livery assures that they're comfortable in almost any decor save Colonial Revival. For the fashionistas in the crowd, optional grills are available in three desaturated colors—a carnelian red, a dark teal, and a burnt orange. The fabric grill cloth (see **Photo 1**) on a sturdy plastic skeleton borrows its sinuous shape from Naim's towering NAP S1 Statement monoblock.

On top, Qb also has a similar large, silky knob as the NAP S1. When powered, the acrylic base lights white in a low-key way, illuminating the inscribed logo. The amount of illumination is, as with all other functions, accessible, and adjustable from an app, yet that giant rotary volume control also has enough real estate to contain the input selector and power switch (see **Photo 2**).

On the back, below the hefty heatsink, is a 3.5 mm analog TRS input jack, an F05 "TOSLINK" female for legacy AES-3 digital in up to 96 kHz, an RJ jack for 10/100 Ethernet connectivity, and a standard Type A USB for plugging in a thumb drive library. Also on the back is a tiny multicolored indicator to inform you of the Qb's current state, used in conjunction with the app's onboard function.

The 8" Cube comes equipped with a power cord

that mates to its C8 inlet and supplies the universal switched mode power supply. That PSU has two main outputs—one for the power amplifiers and another for the digital sections. The digital PSU is, in turn, sub-regulated for different processors running at different voltages. Actually, there are six main power supplies within the product, some of those being regulated for different subsections. Unlike Naim's more traditional products, the Mu-so sisters are almost entirely digital.

Atop the Qb, when you receive it in its carrying handle–equipped box, is a printed Quick Start guide and a "pin-tool" for hard reset, a manufactured version of the venerable bent paper clip. A chunky, substantial infrared remote is available as an option, but I didn't receive one during the review so I mostly relied on my iPad mini to drive the Qb around.

Once a Qb is presented with a wired or wireless connection, it steers you through a setup procedure that, for me, didn't initially "stick." I had to set it up several times before it settled down and performed further without a hitch. After setup, the Qb is accessible via AirPlay or its other wireless protocols, and it offers the world of Internet radio streaming via an embedded vTuner premium 5. If you have more than one Naim streaming product around your domicile, including the extended Uniti family, you can bind them together for whole-house audio.

The Qb is a very attractive product. If you take off the shapely grill, which I did rather quickly to hear what it was doing, you'll see a unique "…arrangement of five drivers, offset, and angled perfectly to create a left-right dispersion symmetry," as Naim would say. There's a single shared woofer, while each channel has a 64 mm midrange and a 25 mm tweeter in a unique, slightly asymmetrical arrangement. Each mid/tweeter pair is rotated 45° relative to the front face, providing more perceived separation of each channel. If Darth Vader had an entertainment robot, the Qb could well be its stand-in (see **Photo 3**). With its grill on, however, the Qb is all Mies van der Rohe, a rectilinear study in silver and subtle shadow lines.

Inside the Qb

I asked Steve Sells, Naim Audio's Electronics Design Director, what goes on inside that enigmatic cube. There are a total of 300 Watts "…worth of amplifiers inside. There's 100 W on the large (shared) 'obround' woofer and 50 W for each of the mids and tweeters," Sells said. The amplifiers are all off-the-shelf Class D, and they all have digital inputs, not analog. Sells mentioned that they carried out "…extensive auditioning of the Class-D amplifiers. During the development with Bentley motor cars, we found that Class D can be tuned to the speaker very

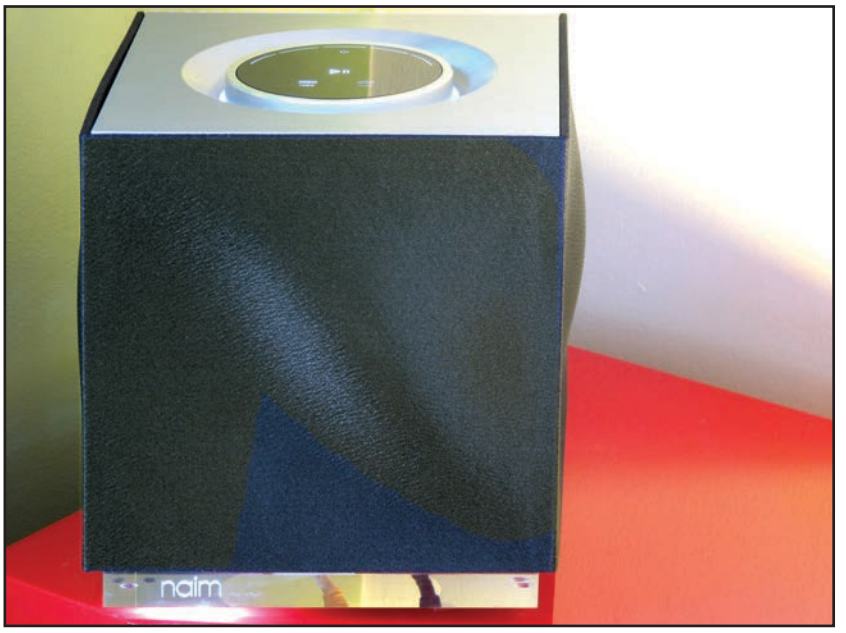

Photo 1: With its compact footprint, broad connectivity, and hi–fi sound, the Naim Qb is a winning entertainment appliance.

Photo 2: All controls are easy to decipher and operate.

Photo 3: A great deal of thought has gone into what's behind the grill.

successfully when the speaker and enclosure are (pre) defined. This carried over to Mu-so development." In 2008, Naim partnered with the respected Bentley Motors, a marque now almost 100 years old, in that "Naim for Bentley" project Sells mentioned. Their aim was to deliver an optional, high-performance sound system for the already luxe automobiles. Today, for a slight up-charge, you can purchase a higher styled Naim for Bentley Mu-so that debuted in October 2016, with a knurled volume knob and aluminum colored grills that match those in the Naim for Bentley cabin.

Design Challenges

When asked what was their most challenging design mandate and how it was addressed, Steve Sells, Electronics Design Director for Naim Audio, was quick to point out that it was all about two factors: sound quality and reliability. "To address the sound quality, we started with Mu-so and designed the speaker as if it were a high-end, active loudspeaker with DSP crossovers. We had just spent three years designing the Bentley DSP active car system. Bentley told us their customers may take the car to a desert, turn the system up to full volume and party. It must not stop and it must sound good irrespective of volume setting. Then Simon Matthews, our Group Design Director, made it look like clean modern art with joyful interaction. We built many prototypes and tuned them before closing in on the final design. Once we had (that), we worked again on cabinet interactions and drive unit performance. The speaker system was designed by (Technical Director) Roy George, who has designed many high-end speakers. We also used a DSP that would generally be considered too good for an all–in–one speaker. We wanted to maintain as much digital resolution of the original material as possible. The EQ tuning (alone) took 6 months."

"To address reliability we do all sorts (of tests). We have a lab specifically set up for safety and tests. Tests include humidity and life accelerated heat cycle testing. We also carried out HALT (Highly Accelerated Life Test)…, where we increase the stress until it fails and look at the weakest failure mechanisms. We carry out comprehensive FMEA (Failure Modes and Effects Analysis)…and drop tests. We shipped prototypes around the world and back again. However, in terms of man hours, the software is the largest effort. These small systems are complex. They are like a complete multi-room active hi-fi system in one box and connect to the Internet and have complementing iOS and Android apps. The end result is we made an all-in-one speaker that can be played all day for radio or streaming without fatigue and then genuinely fill a room with sound for a party in the evening. (Naim's top-of-the-line) Statement was being designed in the same lab simultaneously. Statement drove us to obsessive levels of detail in design, the whole lab was fanatical about quality. I remember how we applied the same design principles to our most affordable and expensive products at the same time. It was a very busy time and very rewarding as a team."

When testing and analysis fails and your beloved product goes down, it's nice to know that the rumor about Naim service is…almost true. Urban legend says that they service every product ever made, and Sells clarified this…"Some parts are now gone, for example, drive units for old speakers. Generally, all electronics we can service and repair. There's always some cool old vintage gear down there being re-capped and serviced."

Let's veer away from motor cars and drivers to another kind of driver, as in loudspeakers…Sells told me that all of the drive units and passive radiators are custom designed by Naim and not used in any other product. The 145 mm × 76 mm woofer employs a large, 72 mm ferrite magnet. Its basket is steel, with a stiff paper cone and a rubber surround. It has a 25.2 mm voice coil wound on a Kapton former. The high-temperature polymer former stops eddy current braking associated with metal versions. The 64 mm mids use neodymium magnets and also employ a steel basket, paper cone, and rubber surround. The former for those is aluminum, this time "…the excursion isn't as large so eddy currents are less important but heat dissipation is," according to Sells. The tweeters are 25 mm catenary silk domes, neodymium magnets and, like the mids, copper-capped pole pieces for lower distortion. Naim refers to the dual side-mounted, 148 × 86 mm oblong passive radiators that load the centrally located woofer as Auxiliary Bass Radiators (ABRs).

A dedicated 32-bit DSP does the heavy math. It calculates the digital volume control, plus boundary compensation, speaker protection, and bass compression when needed. Sells pointed out that, "The crossover is exclusively performed in the DSP and the Class D amplifiers are directly connected to the drive units. This gives incredible dynamics and headroom." The boundary compensation is carefully tuned to alleviate rear wall constructive interference.

Regarding bass compression, as in low-frequency dynamic range compression, Sells clarified that, "It's not to change the sound like a sound engineer would but to maximize the bass capability of the unit and provide protection to the drive units from being over driven. We use a mix of compression and limiters on all drive units. They don't come into play until they are needed to maximize transparency but make the unit party proof." Party proof indeed…I measured 105 dB SPL A weighted with slow averaging from 1 m while playing music. That didn't even come close to maximum output as, in the app, I'd already set a limit of 85% of maximum volume and, at 105 dBA, the volume control was at about 90%!

Mu-so vs. Qb

With Mu-so and Mu-so Qb being closely related, I wondered how they differ…They use the same streaming core, host controllers, and amplifiers. The PSU in the Qb is scaled for lower voltage to reduce the power output and physical size. Also, the bass

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Photo 4: The Qb is an exceptional product aimed at those of us for whom quality audio is fundamental.

amplifier in the Qb is mono and the two have entirely different EQ tuning. The Mu-so uses an MDF cabinet and the Qb uses reinforced ABS. When it comes to the more enthusiast–oriented Uniti family, things get a bit more fancy. Sells gave me the low down... "Uniti Atom is a completely different platform and does not share any parts with Mu-so. Atom has a very high-end, 384 kHz-capable streaming core (the cost is not justifiable on Mu-so) and a SHARC 40-bit floating point DSP. Again, the SHARC would be great in Mu-so but is complete overkill and as such would lower the value for money. Atom also uses a large toroidal transformer power supply, analog volume control and Class AB amplifiers. The commonality is that it is the same engineering and design teams designed both Mu-so and Atom."

I mentioned a USB input...From that flash memory library, the Qb can play WAV, FLAC, and AIFF up to 24-bit/192 kHz, MP3, OGG, WMA and AAC files up to 16-bit/48 kHz at 320 kbps. Both streaming and locally resident data passes through a 2 MB circular buffer in RAM so its usage is timed just right.

An obsession for detail can be seen in choices made regarding brain power inside Qb. Even though there's enough spare processing power in just the

Bluetooth chip alone to be a host controller, the design team used two micros plus a dedicated monolithic DSP. An ARM RISC microcontroller is the main host and master of all things digital. It tells all the other subsystems what to do, and runs a micro-kernel written in-house. On a sub-PCB, there's the streamer processor. It has the responsibility of looking after all thing streaming—the cloud and UPnP streams, Airplay, iRadio, Ethernet management, and so forth. It runs a variant of ThreadX (Express Logic's very popular real-time OS). Interestingly, Qb's RISC micro can only handle ALAC files up to 24-bit/96 kHz, due to the additional computational complexity required for decompression.

The Verdict

The Qb is definitely not your grandmother's table radio (see **Photo 4)**. In fact, the only radios it has is an 802.11b/g, 2.4 GHz Wi-Fi transceiver and SBC, AAC, and aptX Bluetooth. Nonetheless, the Qb serves as an extremely high-fidelity version of that compact appliance of yore—easy to use, able to deliver voice and music from around the globe as easily as your favorite playlist, and it even includes a convenient smart alarm function to wake you up or, in my case, remind me to meet the school bus.

Naim's marketing warns that, "listen and you'll be hooked," and I have to agree. I love my other wireless powered speakers, Soundmatters' brilliant and pocketable foxLv2; BenQ's electrostatic treVolo party animal; and Audioengine's capable and cost effective B2, as each has its own advantages and place in my musical menagerie. Yet the Mu-so Qb occupies a special place, one formerly held in granny's house by the likes of Tivoli or Bose.

Your family will love it, I know mine did. With its thrillingly hi-fi sound, broad coverage, wide variety of input choices, rock-solid construction and understated good looks, Qb is an exceptional product aimed at those of us for whom quality audio is fundamental to our everyday lives. In the sidebar, "Measurements and Listening Tests, Kent Peterson confirms my glowing opinion of Naim's Mu-so Qb.

About the Author

Oliver A. Masciarotte has spent more 30 years immersed in the tech space, working on facilitation, optimization, marketing, and product development for clients worldwide. As an author and speaker, he enjoys informing folks about technological best practices. More information is available at seneschal.net and othermunday.com.

Measurements and Listening Tests

By Kent Peterson

The Naim Mu-so Qb was measured at Warkwyn's facility using the Klippel Near Field Scanning (NFS) system delivering a 360° balloon, which allows for an examination of the radiation pattern and off-axis frequency response and at any frequency—important information when determining where to place this compact but substantial system in your home.

For measurement of the Mu-so Qb, we used 0.5 V as an input through the line-in and with the volume at full gain. A calibrated ACO Pacific (7052E capsule) free-field mic with the 4048 preamp was used as the measurement mic and all on-axis data is referenced at 1 m and between its two opposing tweeters.

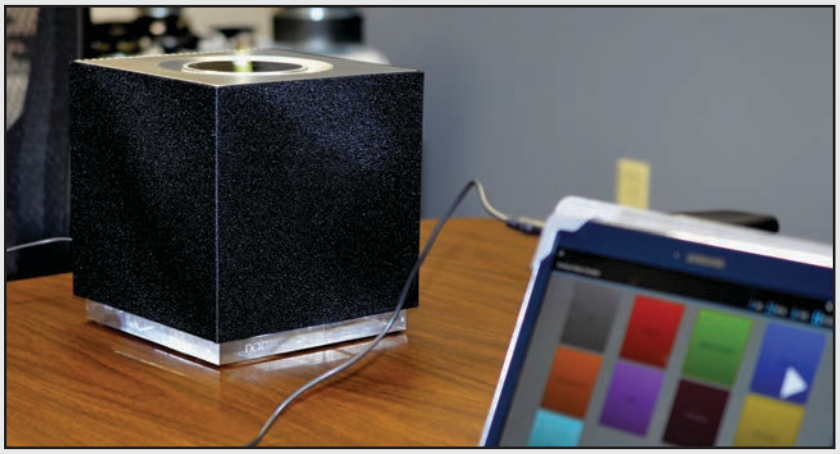

Photo 1: The Naim Mu-so Qb was set up in the Warkwyn conference room.

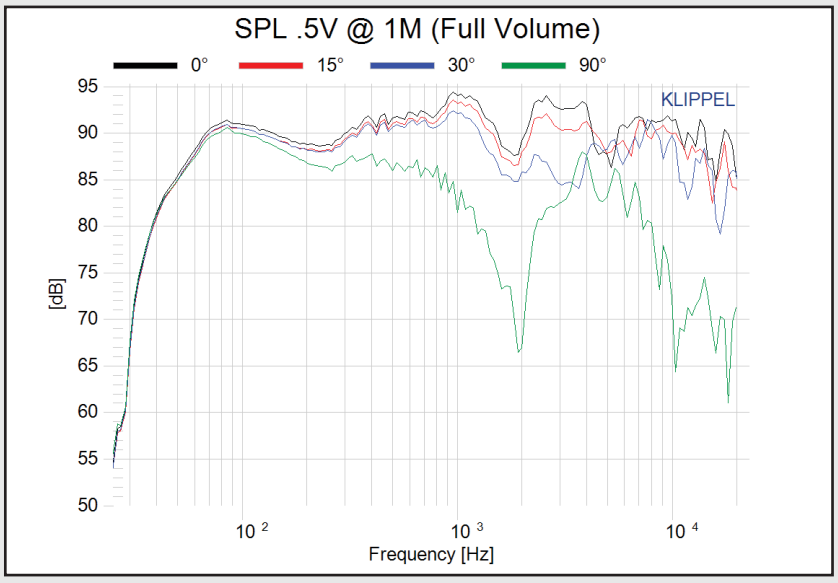

Figure 1: This is the horizontal sensitivity on-axis, 15°, 30°, and 90° (no smoothing).

Measurements points around the speaker totaled 2598 and were processed with a resolution of 0.73 Hz and from 20 Hz to 20 kHz. The length of the stimulus was 1.4 s.

Subjective listening was performed in a 12′ × 20′ carpeted conference room with padded seating and a small kitchenette in the corner- similar to what may be encountered in a typical living room (see **Photo 1**).

The Measurements

On- and off-axis measurements show the speakers impressive low-frequency response below 100 Hz with a slight bump at 80 Hz. It must be noted that in much the same way that measurements are performed in an anechoic chamber, the Mu-so Qb was measured mounted upon a pole in the center of a room with no boundary plane present. The low-frequency response was immediately noted post measurement with this in consideration and knowing that in general use, this system would be used with a boundary plane always present (e.g., a counter top, a coffee table, a bar, etc.), which will further emphasize the low frequency in any room. A look at the measured frequency response in the horizontal plane on-axis and at 15°, 30°, and 90° is shown in **Figure 1**.

As mentioned earlier, there is a good amount of low-frequency content from 60 Hz to 150 Hz with a gentle rolloff until rising at 280 Hz. This is consistent even at 90° off-axis and not surprising considering the opposing passive woofers on either side of the cabinet—the bass from this system can truly fill the room. A 10 dB rise then occurs from 300 Hz through 1 kHz.

In all the horizontal axis, the system then makes a substantial swing downward at 1.2 kHz until recovering at 2.5 kHz. It may be more accurate to say that there is a pronounced bump from 2.5 kHz to 4 kHz with another occurring from 6 kHz to 10 kHz before rolling off through 20 kHz with on-axis peaks at 15 kHz and 18 kHz. An unwrapped 360° pressure/f contour map shown in **Figure 2** provides a complete view of the horizontal radiation of the speaker through its rated frequency response.

The horizontal contour mapping affirms the on/off axis measurements but also reveals the high directivity of the Mu-so Qb above 1 kHz and also illustrates the considerable drop-off at 2 kHz. As anticipated the dual passive radiators provide omni-

directional low-frequency information from 200 Hz and below.

Vertical on/off axis measurements are similar to the horizontal curves and not surprising considering the symmetry and relatively small size of the cabinet (see **Figure 3**).

Interestingly the mid-band from 1 kHz through 2 kHz holds together much better 90° off-axis and in the vertical plane. This may be stretching a positive note of an extreme off-axis measurement, but it certainly appears that any party attendees laying on the carpet in front of the Mu-so Qb will enjoy the same presence response as those dancing on the surrounding balcony.

Examining the unwrapped vertical contour balloon shown in **Figure 4** offers no surprises, again considering the relative symmetry of the system and the cabinet.

Listening

A week of listening to the Mu-so Qb system was very enjoyable while we switched from classic R&B and rock to jazz and orchestral, to contemporary pop and dance music. All the selections were line-input utilizing full-resolution .wav files through a tablet.

A listening staple—*Aja* by Steely Dan (thanks for the music and enjoy that higher stage Walter Becker)—seemed even and smooth. However, we found a substantial improvement in the low end when we moved it from a single open plane to a corner kitchenette area, thereby improving the boundary conditions. This was the same for orchestral allowing a nice warm feel to the double bass and viola without feeling overbearing.

Vintage samba and bossa-nova recordings (there is always time for João Gilberto, Antônio Carlos Brasileiro de Almeida Jobim, and Stan Getz) seemed to play better in the corner as well. And not only in the low end—the addition of lateral and close supportive reflections made up for the lack of presence at 2 kHz filling the room with that gorgeous guitar, pleasant vocal delivery, and stark saxophone.

Considering the latest trends, we enthusiastically tapped our feet to the likes of Daft Punk, LCD Sound System, and yes, Taylor Swift. We're engineers but we're not dead—and we didn't say we danced.

Placement in the corner for these bass heavy mixes, however, seemed over the top (unless you're into that kind of thing). Moving the system back to the table in the middle of the room and out of the corner certainly tamed that effect. But that's the beauty of this system—it's easily movable and can quickly become part of the party. Though considering that a quick EQ of the system with Naim's app can correct for too much bass, you may want to keep it in the corner as we wouldn't want anyone spilling anything on this beautiful package.

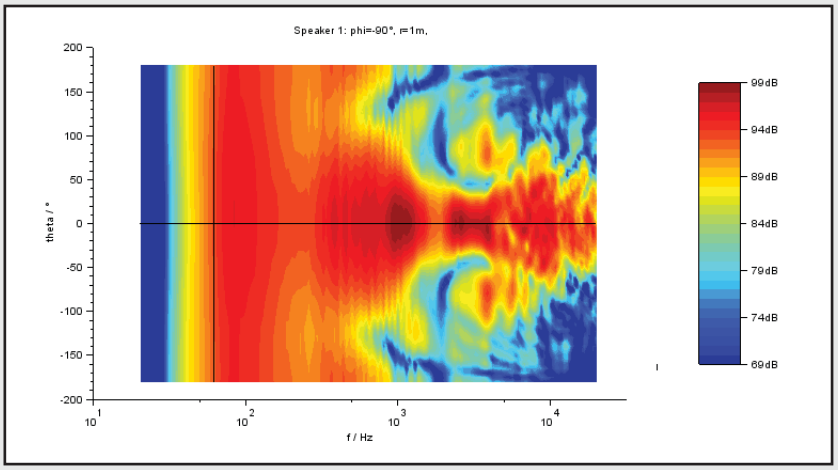

Figure 2: The unwrapped horizontal contour balloon provides a complete view of the speaker's horizontal radiation through its rated frequency response.

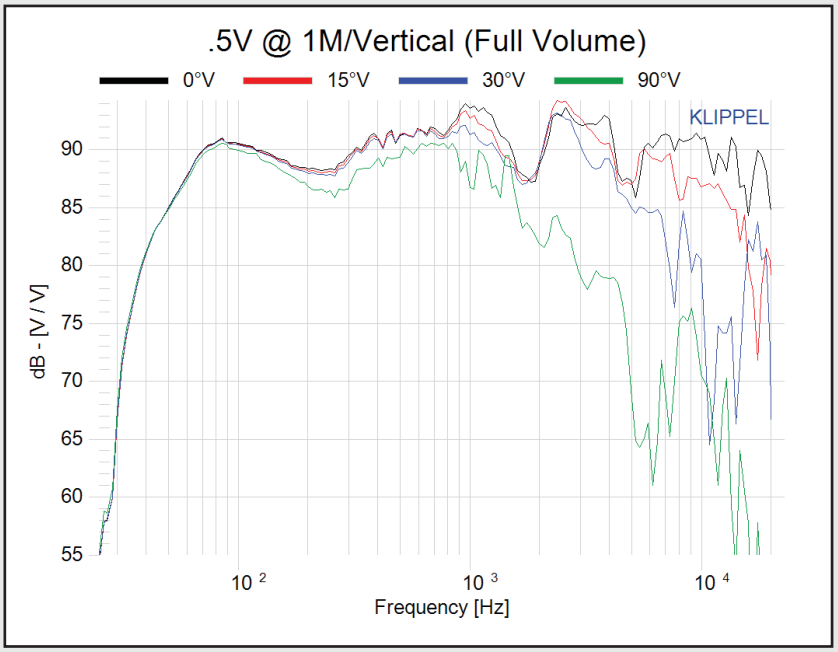

Figure 3: This is the vertical sensitivity on-axis, 15°, 30°, and 90° (no smoothing).

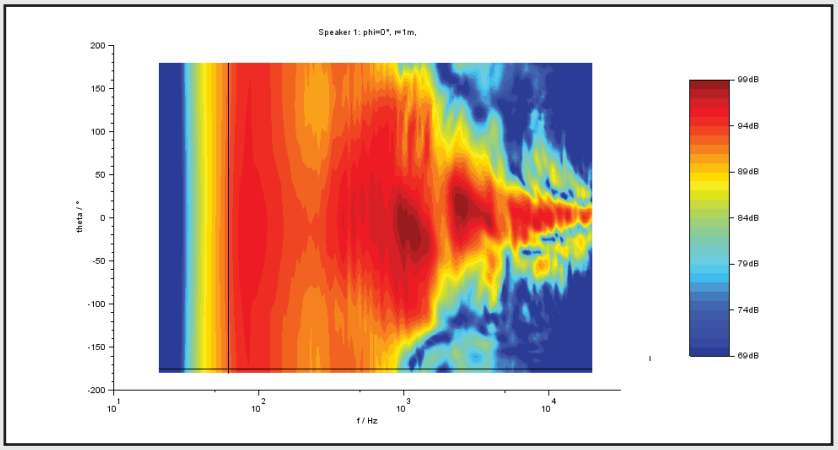

Figure 4: The unwrapped vertical contour balloon offers no surprises, considering the relative symmetry of the system and the cabinet.