Test Bench

Wavecor's New Coaxial Cloth Dome/Ceramic Cone Tweeter

By Vance Dickason

The first device to be explicated this month is another interesting new tweeter from Wavecor—the China-based high-end OEM partnership that included former Vifa engineers Allan Isaksen and Per Madsen. Wavecor recently announced the release of a completely new line of high-end OEM drivers that include Kevlar/Carbon fiber cone woofers and midranges and a new coaxial tweeter, as shown in **Photo 1**. While I have received the entire new line-up from Wavecor, the first driver in this new series to be investigated for this segment of Test Bench is the new TW045WA01 dual-diaphragm tweeter.

The really stand-out feature for the TW045WA01 (**Photo 2** and **Photo 3**) is this unique dual-diaphragm assembly comprised of a 22mm diameter coated textile dome for high-frequency extension and a 45mm ceramic/aluminum cone, which adds low-frequency output and efficiency. While you could be tempted to consider this as a cone tweeter, it's really a whole new category of hybrid design that incorporates aspects of both dome and cone tweeter technology.

Photo 1: Wavecor's TW045WA01 tweeter is part of a completely new line of high-end OEM drivers that include Kevlar/Carbon fiber cone woofers and midranges and a new coaxial tweeter.

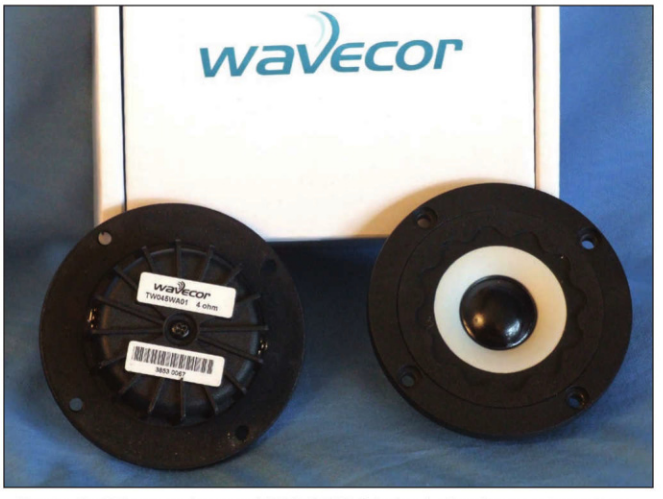

Photo 2: Wavecor's new TW045WA01 dual-diaphragm tweeter.

Other features include a dual neodymium magnet motor structure, a copper foil-clad pole shorting ring (Faraday shield) vented to an aluminum die cast damped rear chamber (with rear heatsink fins), a compact injection-molded 90mm (3.5") diameter 6.7mm thick aluminum faceplate, a 4Ω 22mm diameter voice coil with a vented aluminum former wound with copper-clad aluminum wire (CCAW), a foam mounting gasket, 95dB sensitivity (averaged 5kHz-20kHz) and gold-plated terminals. A sculpted foam damping ring is attached to the faceplate, along with an acoustic damping pad attached to the top of the pole piece, directly below the coated textile dome. It should also be noted that the thick black emissive coated aluminum faceplate and aluminum rear finned cavity provide substantial thermal cooling for this tweeter.

Testing commenced using the LinearX LMS analyzer to produce the 300-point impedance sweep illustrated in **Figure 1**. The tweeter resonance occurs at a moderately low 670Hz. With a 2.87Ω DCR (Re), the minimum impedance for this tweeter is 3.2Ω at 1.8 kHz.

Following the impedance test, I recess mounted the Wavecor tweeter in an enclosure with a baffle area of 12"×5" and measured the on- and off-axis frequency response again using the Loudsoft FINE R+D analyzer (provided to *Voice Coil* by Loudsoft) and the GRAS 46BE

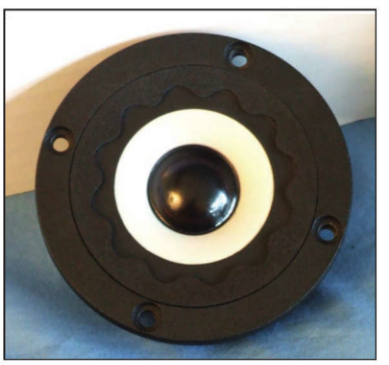

Photo 3: This unique dual-diaphragm assembly is comprised of a 22mm diameter coated textile dome for high-frequency extension and a 45mm ceramic/aluminum cone.

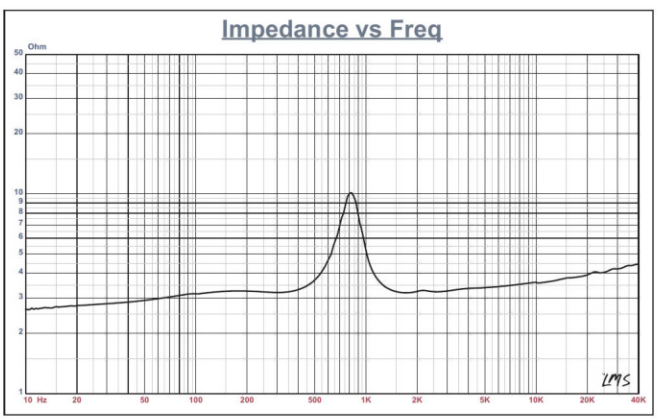

Figure 1: Wavecor TW045WA01 impedance plot

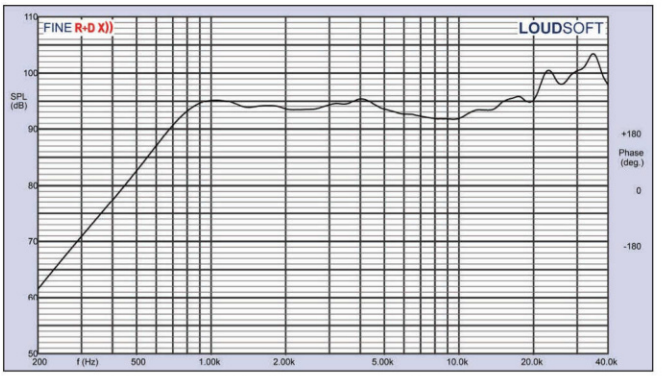

Figure 2: Wavecor TW045WA01 on-axis frequency response

¼" microphone (courtesy of GRAS Sound & Vibration), which were set up to measure from 200Hz to 40kHz (using a 192kHz sampling rate) at 2V/0.5m normalized to 2.83V/1m. Sweeps were performed at 0°, 15°, 30° and 45°. **Figure 2** shows the on-axis response of the TW045WA01, which measured ±2.0dB from 750Hz to 20.5kHz, with the response extending to 40kHz.

Figure 3 gives the 0° to 45° on- and off-axis response of the Wavecor tweeter, with the off-axis curves normalized to the on-axis response shown in **Figure 4**. **Figure 5** shows the CLIO 180° polar plot (measured in 10° increments with 1/3-octave smoothing). The two-sample SPL comparison of the Wavecor TW045WA01 is illustrated in **Figure 6**,

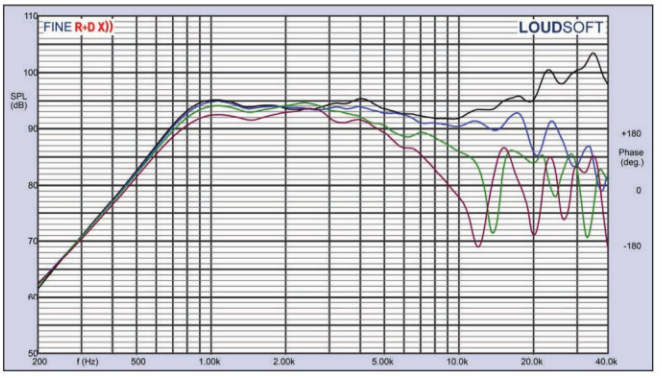

Figure 3: Wavecor TW045WA01 horizontal on- and off-axis frequency response (0°=black; 15°=blue; 30°=green; 45°=purple)

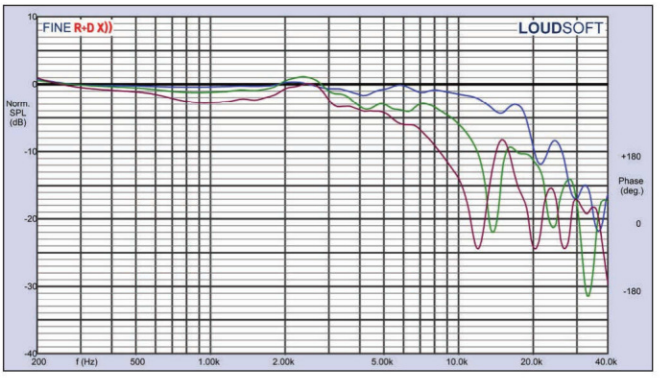

Figure 4: Wavecor TW045WA01 normalized on- and off-axis frequency response (0°=black; 15°=blue; 30°=green; 45°=purple)

indicating the two samples were closely matched to within ≤ 1dB throughout its operating range to 40kHz.

For the final test group of tests, I initialized Listen's SoundCheck analyzer along with the Listen SCM 2 ¼" microphone (provided courtesy of Listen, Inc.) and measured the impulse response with the tweeter recess mounted on the same 12" × 5" test baffle. Importing this data into the Listen SoundMap software produced the cumulative spectral decay (CSD) waterfall plot shown in **Figure 7**, and the Short Time Fourier Transform (STFT) displayed as a surface plot, which is shown in **Figure 8**.

For the last SoundCheck test procedure, I set the 1m SPL to 94dB (2.96V) using a noise stimulus, and measured the second and third harmonic distortion at 10cm, depicted in **Figure 9**. The third harmonic distortion is very low for this driver.

Wavecor's build quality is typical of the high-end two-channel/home theater OEM driver market, and has remained consistently so for several years. The TW045WA01 is decidedly a new original tweeter design, and they don't come along all that often. While I can't discuss the details, I did have the opportunity to subjectively review an earlier proprietary OEM version of this device. The OEM high-frequency device that I had available to me was not at all identical to the TW045WA01, although it did have a very similar diaphragm and motor structure. I did an informal subjective comparison of the proprietary version with several high-end tweeters ranging in retail price of $480 to $750 each, and I found the Wavecor OEM variation squarely in that category of tweeter. That means the new Wavecor tweeter is the kind of tweeter you would find incorporated into two-channel high-end loudspeakers in the $20,000 to $100,000/pair price range. While I have not performed the same kind of subjective listening test on the new TW045WA01 tweeter, I'm guessing it falls into this same category. For more information, visit www.wavecor.com. **VC**

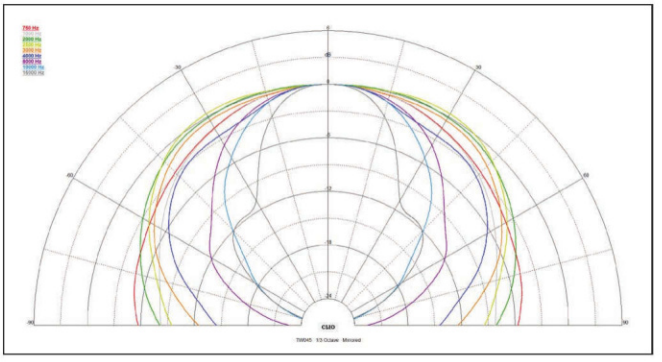

Figure 5: Wavecor TW045WA01 180° horizontal plane CLIO polar plot (in 10° increments)

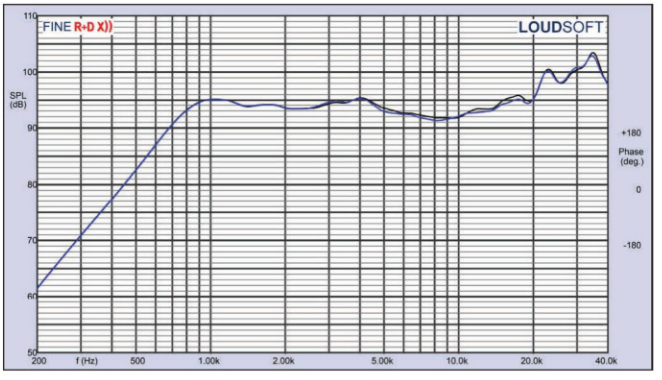

Figure 6: Wavecor TW045WA01 two-sample SPL comparison

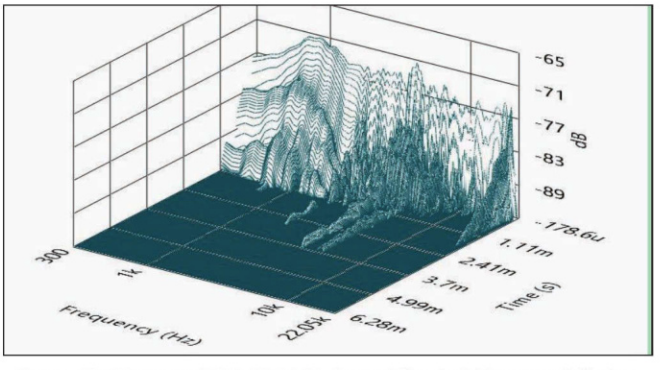

Figure 7: Wavecor TW045WA01 SoundCheck CSD waterfall plot

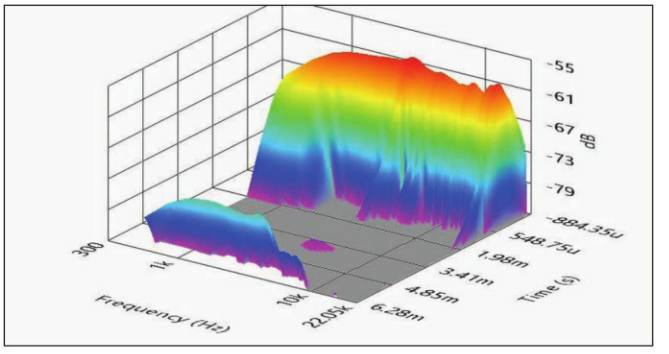

Figure 8: Wavecor TW045WA01 SoundCheck STFT surface intensity plot

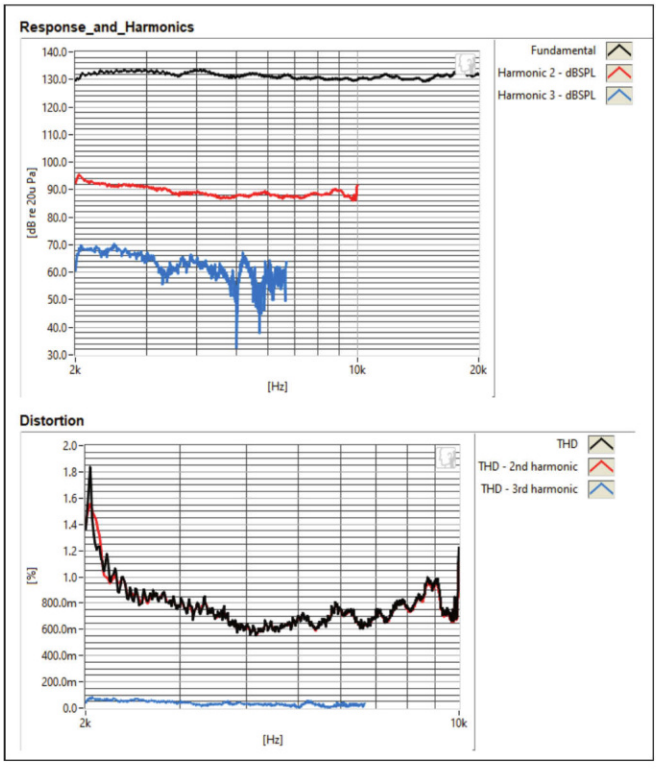

Figure 9: Wavecor TW045WA01 SoundCheck distortion plots