Test Bench

Tang Band's Full-Range Passive Radiator Module and Scan-Speak's New Subwoofer

By Vance Dickason

Tang Band's transducers have been featured in *Voice Coil* for many years. The company was founded in 1996 in Taiwan with the goal of manufacturing innovative, high-quality drivers. The transducer Tang Band sent to *Voice Coil* to review certainly lives up to that goal. The T1-1942S is a seriously creative new transducer, and it immediately caught my eye when I saw it on Tang Band's website. I mean, when was the last time you saw a 1" dome in its own cabinet with a passive radiator? Me neither.

The T1-1942S

The T1-1942S is an augmented full-range system based on Tang Band's W1-1942S 1" full-range dome device. Basically, the W1-1942S is a wide santoprene surround 1" polypropylene dome with a cloverleaf elastomeric damping material that overlays the dome (see **Photo 1**). Other features include a 28-mm voice coil diameter, X_{MAX} = 1.3 mm, 82 dB 1 W/1-m sensitivity, F_0 = 120 Hz, Q_{TS} = 0.24, and an operating range specified at 120 Hz to 20 kHz. The T1-1942S is the same driver designed into its own 154-mm × 54-mm × 30.1-mm composite enclosure with a built in 44-mm × 18-mm wide surround passive radiator, such that the system range is now specified at 78 Hz to 20 kHz. Suggested applications include portable audio, soundbars, and multimedia. Both devices have patented technology, although exactly what is patented is not specified in the literature on either product.

I tested the Tang Band T1-1942S by generating a stepped sine wave impedance plot using the LinearX LMS analyzer. The result of the LMS 300-point impedance sine wave sweep is shown in **Figure 1**. The 1" full-range passive radiator system exhibits the typical vented-type

Photo 1: Tang Band's T1-1942S 1" full-range transducer

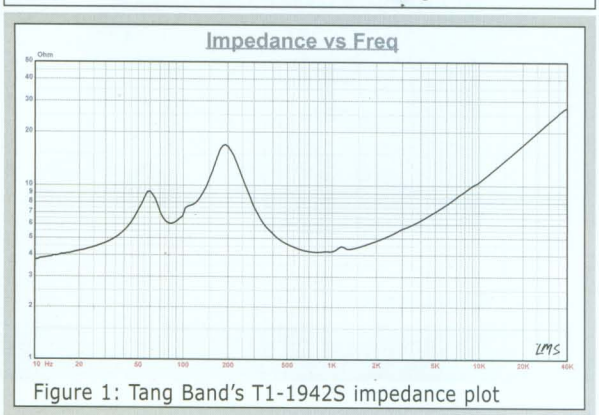

Figure 1: Tang Band's T1-1942S impedance plot

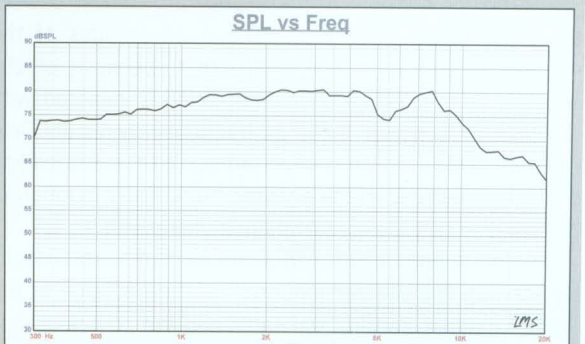

Figure 2: T1-1942S on-axis frequency response

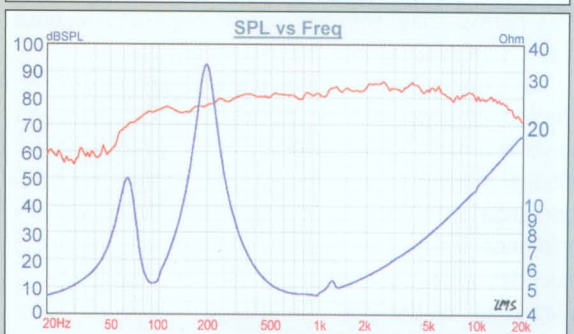

Figure 3: T1-1942S factory on-axis frequency response

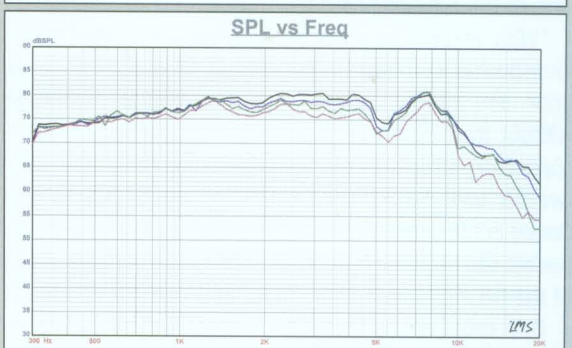

Figure 4: T1-1942S on- and off-axis frequency response

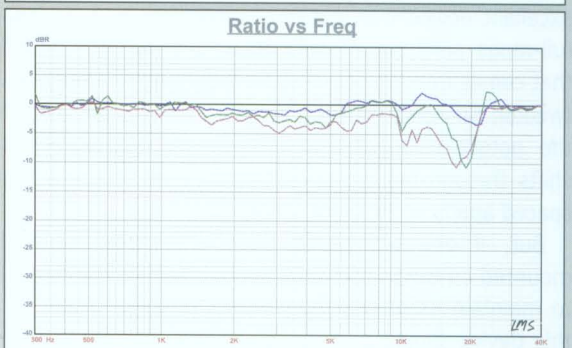

Figure 5: T1-1942S normalized on- and off-axis vertical frequency response

twin-peak impedance profile that has a 83.8-Hz tuning frequency. Minimum impedance for this device is 4.2 Ω at 795 Hz with a measured R_E = 3.7 Ω. The factory TS specification for the W1-1942S motor Q_{MS} = 1.79, Q_{ES} = 0.27, Q_{TS} = 0.24, L_{EVC} = 0.046 mH, and the V_{AS} = 0.16 ltr.

After completing the impedance measurements, I placed the small enclosure that has a baffle area of about 2" × 8" on the measurement stand and measured the on- and off-axis frequency response at 2.83 V/1 m.

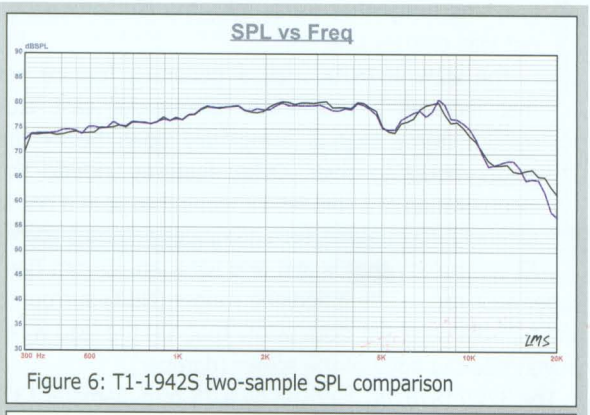

Figure 6: T1-1942S two-sample SPL comparison

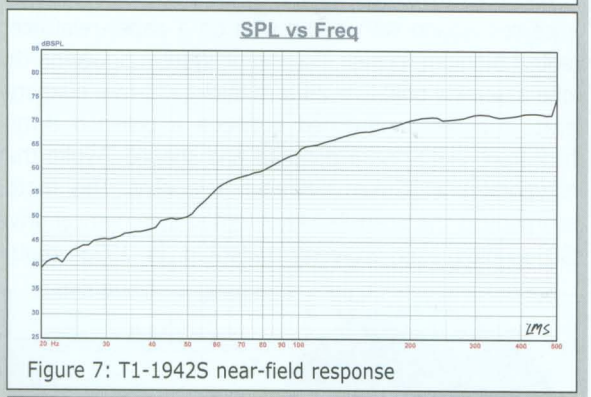

Figure 7: T1-1942S near-field response

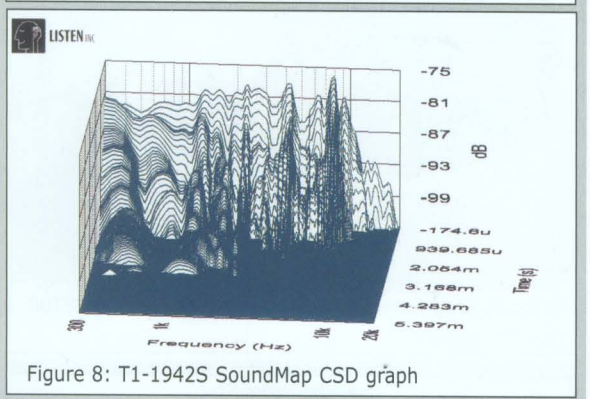

Figure 8: T1-1942S SoundMap CSD graph

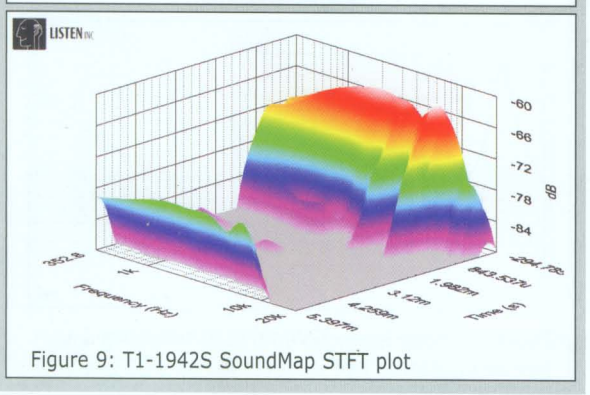

Figure 9: T1-1942S SoundMap STFT plot

Figure 2 shows the on-axis response. The frequency response for the T1-1942S is smooth, rising out close to 10 kHz. Obviously, this will be very baffle dependent, with a more flat response on a larger baffle, such as the factory response (see **Figure 3**). **Figure 4** provides the T1-1942S module's on- and off-axis response. Off-axis, the device is substantially better than most 1" domes. **Figure 5** shows the normalized version of **Figure 4**. In terms of production consistency, the two-sample SPL comparison is depicted in **Figure 6**, indicating the two samples were well matched with some minor variation in the 6-to-10-kHz region. The last SPL measurement I performed was a near-field measurement with the microphone placed between the dome and passive radiator (see **Figure 7**). The F3 is about 140 Hz, but if measured far-field with a larger baffle or in- or on-wall, it would likely be closer to the Tang Band factory measurement shown in **Figure 3**. Tang Band suggests a high-pass filter be used at between 80 to 100 Hz for this device.

Next, I recess mounted the tweeter and used the Listen SoundCheck analyzer and 0.25" SCM microphone to measure the impulse response. Importing this data into the Listen SoundMap software produced the cumulative spectral decay (CSD) or waterfall plot shown in **Figure 8**. **Figure 9** shows the short-time Fourier transform (STFT) as a surface plot. Last, I used the SoundCheck noise generator and SLM utilities to set the 1-m SPL to 94 dB (3.5 V) and the sweep range to 2 to 20 kHz. I measured the second- and third-harmonic distortion at 10 cm (see

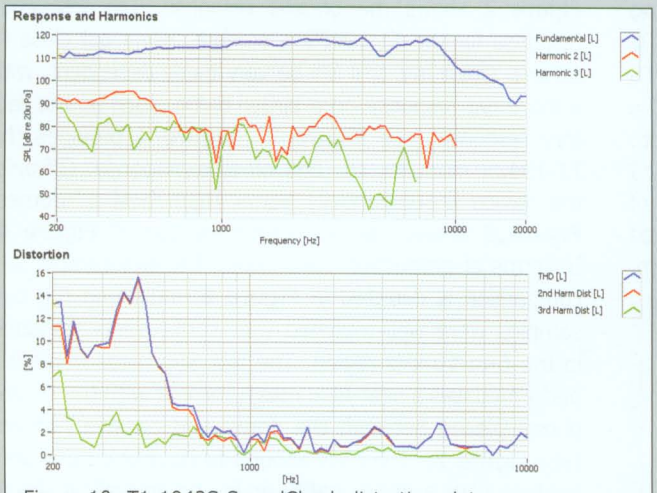

Figure 10: T1-1942S SoundCheck distortion plot

Figure 10). This test revealed the relationship between second- and third-harmonic distortion; however, the correlation to subjective preference based on THD is not well established. For more information on this transducer, visit www.tbspeaker.com.

The 32W/4878T00

This month, I also examined the 32W/4878T00, a new 12" subwoofer from high-end driver manufacturer Scan-Speak (see **Photo 2**). Over the years, Scan-Speak has become known for its midwoofers and tweeters, which is to say that its products can be found in a large percentage of the high-end loudspeakers on the market in the last 40 years. Having used Scan-Speak's drivers in designs for some of my consulting business customers, I found it also makes some excellent subwoofers. Currently, Scan-Speak has two Discovery line subwoofers, the 10" 26W/4558T00 and the 12" 30W/4558T00, plus a 10" Revelator subwoofer, the 23W/4557T00/02. The new 32W/4558T00 represents its second addition to the Revelator subwoofer line, and from what I was told, the first production run was entirely sold out!

The 32W/4878T00 has a generous feature set that includes a proprietary nine-spoke cast aluminum frame that is completely open below the spider-mounting shelf. Other features include the incorporation of a stiff flat 12" cone that uses a paper sandwich formulation with a unique, patented foam-fill technology that is stiff and light, an 85-mm hard paper dust cap, nitrile butadiene rubber (NBR) surround, and a 7"-diameter flat cloth spider that has the lead wires woven into the body of the spider (damper).

The 32W/4878T00 is driven by a 75-mm diameter (3") voice coil wound with round wire on a paper-reinforced vented titanium former. The motor system powering the cone assembly utilizes a 25-mm thick, 175-mm diameter ferrite magnet sandwiched between a polished 8-mm thick front plate and a polished and shaped T-yoke that incorporates a 36-mm diameter pole vent. This motor incorporates the Scan-Speak patented symmetrical drive (SD)—which was originally patented in 1973—motor


Photo 2: Scan-Speak recently released the 32W/4878T00, a new 12" subwoofer.

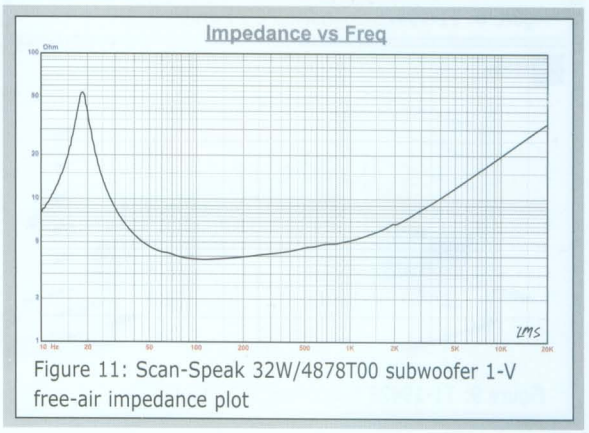

Figure 11: Scan-Speak 32W/4878T00 subwoofer 1-V free-air impedance plot