Photo 2: Tang Band's T1-1931S full-range passive radiator system features a small enclosure.

The T1-1931S

Voice Coil's March 2013 issue featured a report on the new Tang Band T1-1942S full-range passive radiator system, an enclosed version of Tang Band's W1-1942S 1" full-range dome device. This month I received the T1-1942S's "little brother," the T1-1931S. Like the T1-1942S, the T1-1931S is based on the 0.75" version of the W1-1942S, the W1-1931S. These are all described as full-range systems, but the T versions use a small enclosure with a passive radiator to extend the low-frequency response.

As with the W1-1942S, the W1-1931S has a wide santoprene surround and a 0.75" diameter polypropylene dome with a cloverleaf elastomeric damping material that overlays the dome (see **Photo 2**). Other features include a 20-mm voice coil diameter, X_{MAX} = 1.2-mm, 76-dB 1-W/1-m sensitivity, F_0 = 170 Hz, Q_{TS} = 0.46, and a 170-Hz-to-20-kHz operating range. The T1-1931S is the same driver designed in its own 14-mm × 35-mm × 87-mm composite enclosure with a built in 11-mm × 29-mm diaphragm wide surround passive radiator. With the enclosure and PR, the system

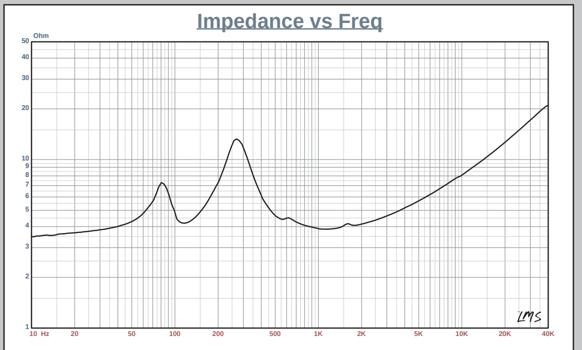

Figure 9: Tang Band T1-1931S impedance plot

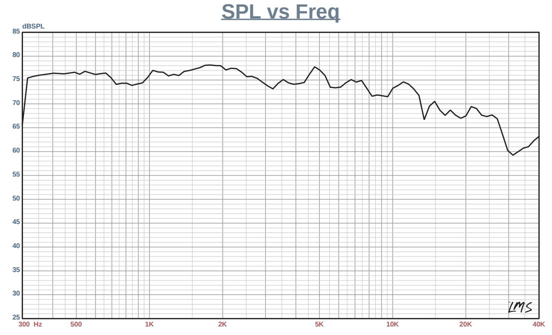

Figure 10: Tang Band T1-1931S on-axis frequency response

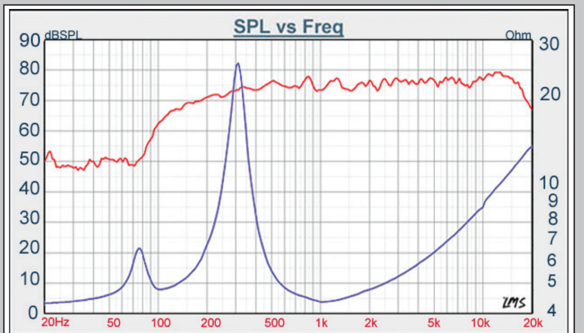

Figure 11: Tang Band T1-1931S factory on-axis frequency response

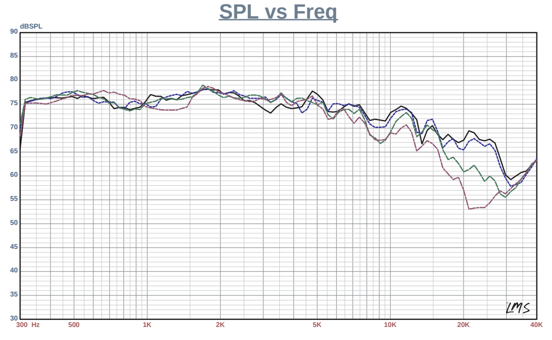

Figure 12: Tang Band T1-1931S on- and off-axis frequency response

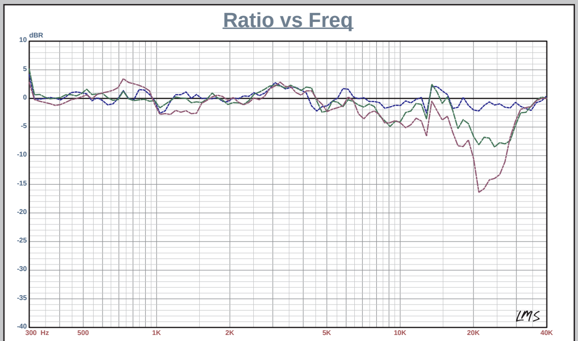

Figure 13: Tang Band T1-1931S normalized on- and off-axis vertical frequency response

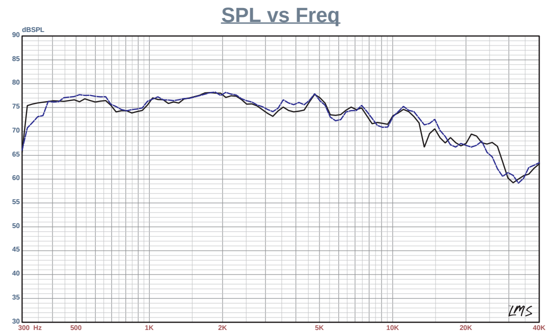

Figure 14: Tang Band T1-1931S two-sample SPL comparison

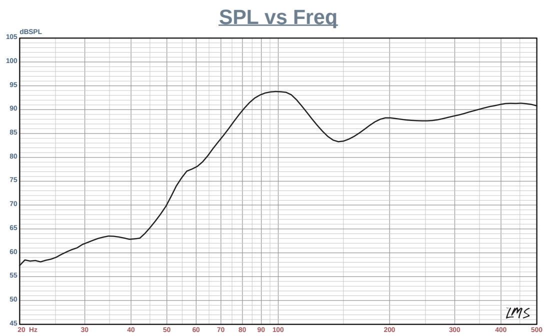

Figure 15: Tang Band T1-1931S near-field response

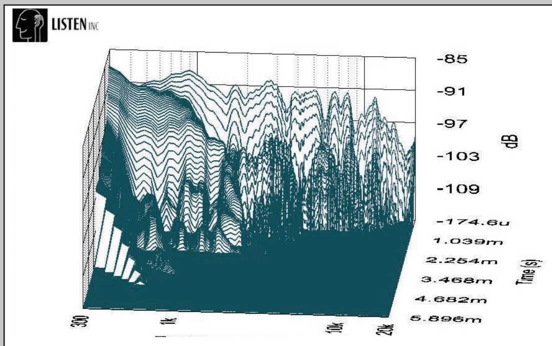

Figure 16: Tang Band T1-1931S SoundMap CSD graph

range is extended from 170 to 105 Hz (105 Hz to 20 kHz). Suggested applications include portable audio, soundbars, and multimedia. Both devices use patented technology, although exactly what is patented is not specified in either product's literature.

I commenced testing the Tang Band's T1-1931S by using the LinearX LMS analyzer to run a stepped sine wave impedance plot. **Figure 9** shows the LMS 300-point impedance sine wave sweep's result. The 0.75″ full-range passive radiator system exhibits the typical vented-type twin-peak impedance profile that has a 117-Hz tuning frequency. Minimum impedance for this device is 3.9 Ω at 1.1 kHz with a measured R_E = 3.74 Ω.

After completing the impedance measurements, I mounted the small enclosure on a large baffle that measured about 8″ × 12″, placed it on the measurement stand, and measured the on- and off-axis frequency response at 2.83 V/1 m. **Figure 10** shows the on-axis response. The frequency response for the T1-1931S is smooth and is ±2.4 dB out close to 10 kHz. Obviously, this will be baffle dependent, with a flatter response on a larger baffle (e.g., the factory response shown in **Figure 11**). Sensitivity is rated at 76 dB, which is about right for this transducer.

Figure 12 shows the TB T1-1931S module's on- and off-axis response. As with the T1-1942S, off axis the device is substantially better than most 0.75″ domes. **Figure 13** shows **Figure 12**'s normalized version. In terms of production consistency, the two-sample SPL comparison is shown in **Figure 14**, indicating the two samples were well matched within about 1 to 1.5 dB.

The last SPL measurement I performed was a near-field type with the measurement microphone placed between the dome and passive radiator (see **Figure 15**). F3 was about 83 Hz, hence Tang Band's published 105-Hz-to-20-kHz operating range. Tang Band suggests using a high-pass filter at 100 Hz for the T1-1931S.

Next, I used the Listen SoundConnect analyzer and 0.25″ SCM microphone to measure the impulse response with the tweeter recess mounted. Importing this data into the Listen SoundMap software produced the CSD (waterfall) plot in **Figure 16**. **Figure 17** shows the STFT displayed as a surface plot. Last, I used the SoundCheck noise generator and SLM utilities to set the 1-m SPL to 94 dB (7.6 V), and the sweep range to 200 Hz to 20 kHz. I measured the second- and third-harmonic distortion at 10 cm (see **Figure 18**). I performed the measurement to show the relationship between second- and third-harmonic distortion; however, correlation to subjective preference based on THD is not well established. For more information on this interesting new transducer, visit www.tb-speaker.com. ***VC***

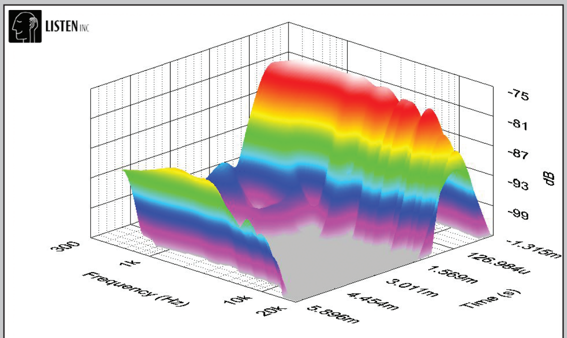

Figure 17: Tang Band T1-1931S SoundMap STFT plot

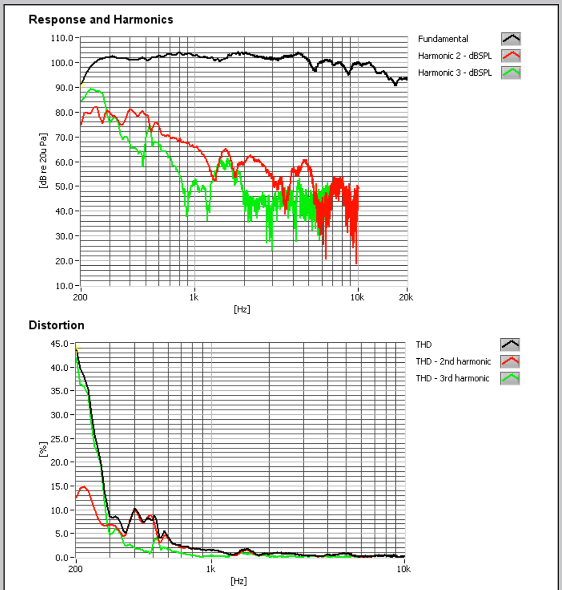

Figure 18: Tang Band T1-1931S SoundCheck distortion plot

Submit Samples to Test Bench

Test Bench is an open forum for OEM driver manufacturers in the industry. All OEMs are invited to submit samples to *Voice Coil* for inclusion in the Test Bench column.

Driver samples can include any sector of the loudspeaker market, including transducers for home audio, car audio, pro sound, multimedia, or musical instrument applications. Contact *Voice Coil* Editor Vance Dickason to discuss which drivers are being submitted.

All samples must include any published data on the product, patent information, or any special information to explain the functioning of the transducer. Include details on the materials used to construct the transducer (e.g., cone material, voice coil former material, and voice coil wire type). For woofers and midrange drivers, include the voice coil height, gap height, RMS power handling, and physically measured Mmd (complete cone assembly, including the cone, surround, spider, and voice coil with 50% of the spider, surround, and lead wires removed). Samples should be sent in pairs to:

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