Two Compression Drivers and a Horn from FaitalPRO

By Vance Dickason

Editor's note: Before talking about FaitalPRO's new compression drivers, I have a correction and an announcement. First the correction: Two reports on the Tang Band drivers (both the March and the May issues) incorrectly listed the website. Tang Band's correct website is www.tb-speaker.com.

Now the announcement: As of this issue, Voice Coil *is using the new AmpConnect ISC (ISC for integrated soundcard) combination analyzer and measurement amplifier along with SoundCheck 12.0, which were provided courtesy of Listen. You can see the new AmpConnect ISC in* ***Photo 1****. This is truly an outstanding piece of equipment and pleasure to operate, plus it looks like vintage B&K or maybe a piece of Joemeek studio gear.*

Photo 1: Test Bench now uses Listen's new AmpConnect ISC combination analyzer and measurement amplifier. The analyzer's front (a) and back (b) are shown here.

For this month's Test Bench column, *Voice Coil* received two new compression drivers from FaitalPRO, the HF106 and the HF107, along with a FaitalPRO STH100 Elliptical Tractrix horn. Both the HF106 and the HF107 are new editions to a series of 1" diameter compression drivers, using Ketone polymer diaphragms.

This series includes the HF100, the HF102, the HF104 (see *Voice Coil* March 2012), and the HF105 (see *Voice Coil* December 2012). The entire series is designed to be used with the STH100 horn. These compression drivers represent different power-handling ratings and recommended crossover frequencies. The HF100 and the HF102 are rated at 30 W, while the HF104 and the HF105 are rated at 40 W. This month's new FH106 is rated at 60 W. The HF107 is rated at 70 W.

The FaitalPRO HF106

The first Faital driver I examined was the HF106 compression driver, coupled with Faital's STH100 horn (see **Photo 2**). The HF106, like the entire series, is an interesting compression driver that shares several unique features with the other models. Its features include a Ketone polymer annular-shaped diaphragm and an annular-shaped phase plug (note the HF100, the HF104, and the HF105 use radial-shaped phase plugs). The driver's throat diameter is 25.4 mm (1") with the diaphragm coupled to a 44 mm (1.73") diameter voice

Photo 2: FaitalPRO'S HF106 compression driver is shown coupled with the STH100 horn.

Photo 3: FaitalPRO's STH100 horn

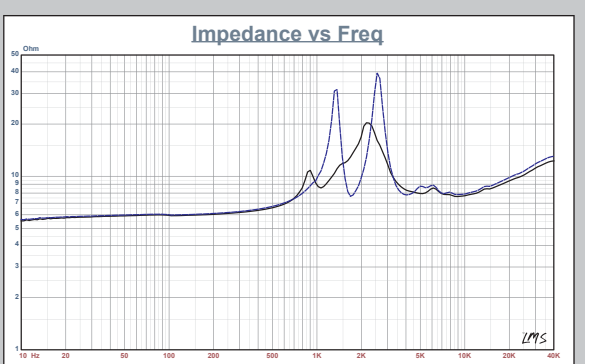

Figure 1: Faital HF106/STH100 free-air impedance plot

coil wound on a Kapton former with aluminum wire. Other features include a neodymium ring magnet, a cast aluminum body, 60-W AES-rated power handling (120-W maximum), and solderable aircraft terminals. The STH100 horn supplied with the HF106 driver has a 1" diameter throat with 80° horizontal × 70° vertical short elliptical tractrix flare (see **Photo 3**).

I used the LinearX LMS analyzer to produce the 200-point stepped sine wave impedance plot shown in **Figure 1**. The solid black curve shows the HF106 mounted on the STH100 horn and the dashed blue curve represents the compression driver without the horn. With a measured 5.4-Ω Re, the HF106/STH100's minimum impedance was 7.65 Ω at 8.9 kHz.

For the next test sequence, I mounted the HF106/STH100 combination in an enclosure with a 10" × 15" baffle and used a 100-point gated sine wave sweep to measure the horizontal and vertical on- and off-axis at 2.83 V/1 m. **Figure 2** displays the compression driver/horn combination's on-axis frequency response. With a 110-dB, 1-W/1-m rated sensitivity, it has a 111.3-dB, 2.83-V/1-m peak output at 4.1 kHz. The sound pressure level (SPL) profile measures ±4.5 dB from 1 to 10 kHz. (The HF106's recommended crossover frequency is a 1.3-kHz minimum with a second-order network.) Since this horn's coverage is 80° horizontal × 70° vertical, you wouldn't expect much difference in the horizontal and vertical off-axis plots. **Figure 3** shows the horizontal orientation. **Figure 4** shows the vertical orientation.

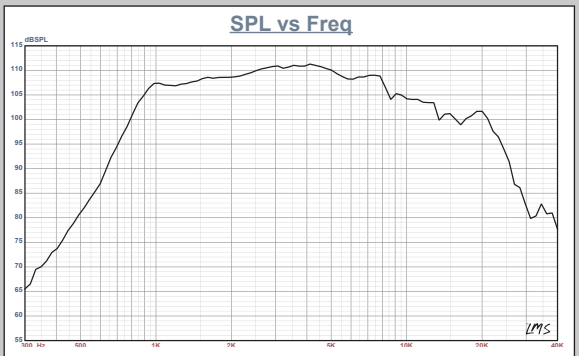

Figure 2: Faital HF106/STH100 on-axis frequency response

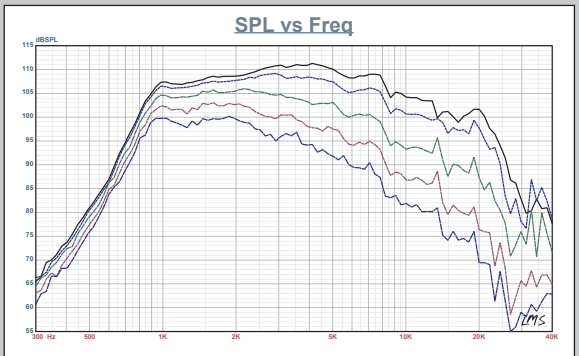

Figure 3: Faital HF106/STH100 horizontal on- and off-axis frequency response (0 = solid; 15° = dot; 30° = dash; 45° = dash/dot; 60° = dash)

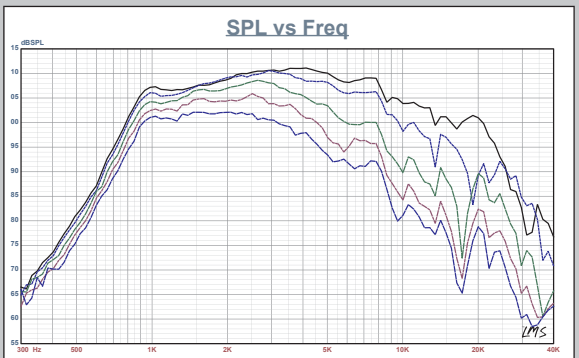

Figure 4: Faital HF106/STH100 vertical on- and off-axis frequency response (0° = solid; 15° = dot; 30° = dash; 45° = dash/dot; 60° = dash)

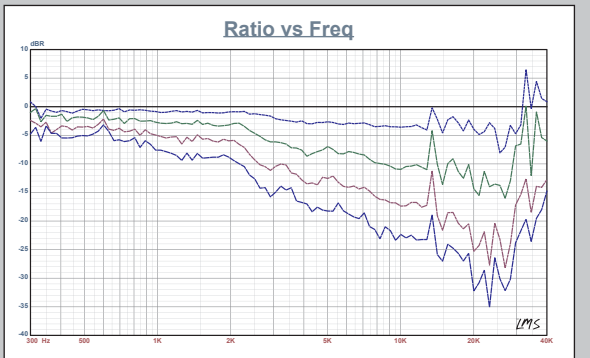

Figure 5: Faital HF106/STH100 normalized horizontal on- and off-axis frequency response (0° = solid; 15° = dot; 30° = dash; 45° = dash/dot; 60° = dash)

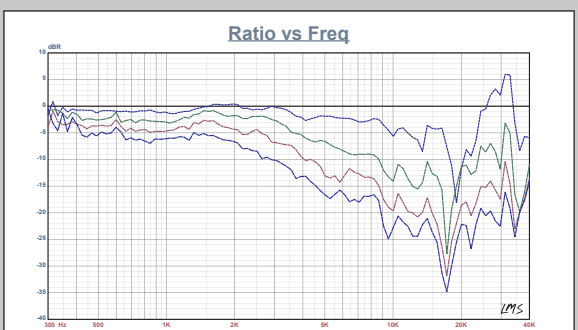

Figure 6: Faital HF106/STH100 normalized vertical on- and off-axis frequency response (0° = solid; 15° = dot; 30° = dash; 45° = dash/dot; 60° = dash)

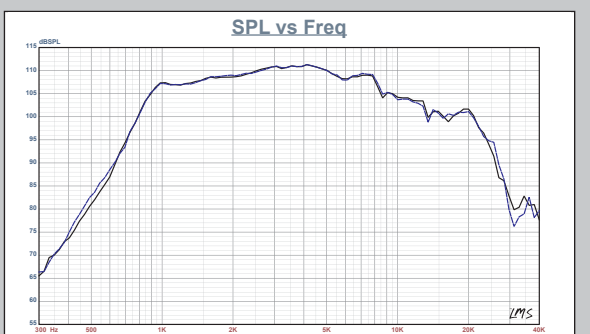

Figure 7: Faital HF106/STH100 two-sample SPL comparison

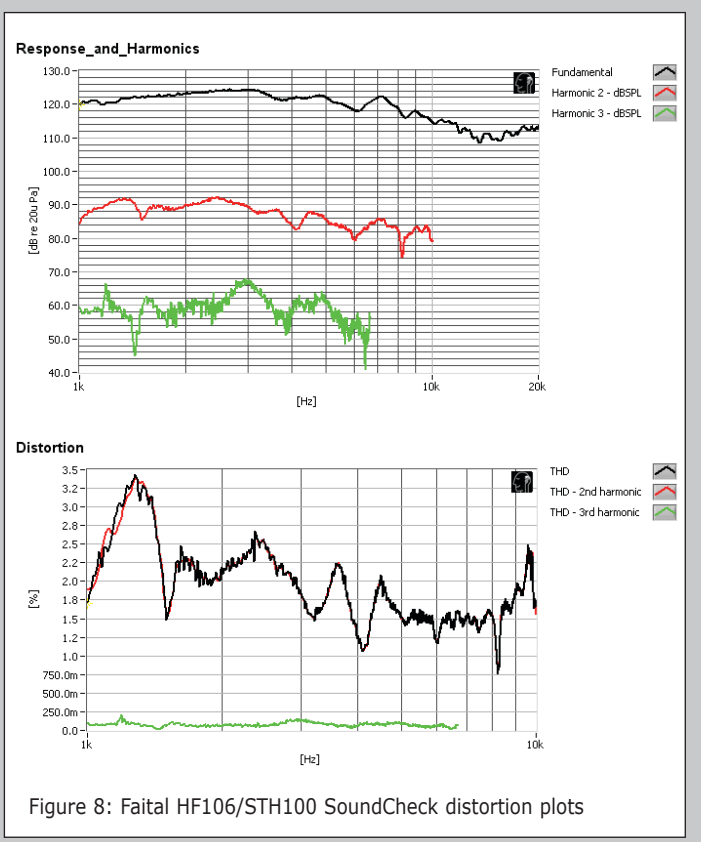

Figure 8: Faital HF106/STH100 SoundCheck distortion plots

Figure 3's plot with the off-axis normalized to the on-axis response is shown in **Figure 5**. **Figure 4**'s plot with the off-axis normalized to the on-axis response is shown in **Figure 6**. **Figure 7** shows the two-sample SPL comparison, and both samples are closely matched.

For the remaining tests, I used the Listen SoundCheck software, the AmpConnect ISC analyzer, a 0.25" SCM microphone, and a power supply to measure the distortion and generate time frequency plots. For the distortion measurement, I mounted the HF106/STH100 combination with the same baffle I used for the frequency response measurements. I used a pink noise stimulus to set the SPL to 104 dB at 1 m (1.73 V) and placed the Listen microphone 10 cm from the horn's mouth to measure the distortion. This produced the distortion curves shown in **Figure 8**.

I used SoundCheck to get a 2.83-V/1-m impulse response for this driver and imported the data into Listen's SoundMap time-frequency software. The resulting cumulative spectral decay (CSD) waterfall plot is shown in **Figure 9.** The short-time Fourier transform (STFT) plot is shown in **Figure 10**. The SoundMap software, supplied with SoundCheck 12.0, no longer

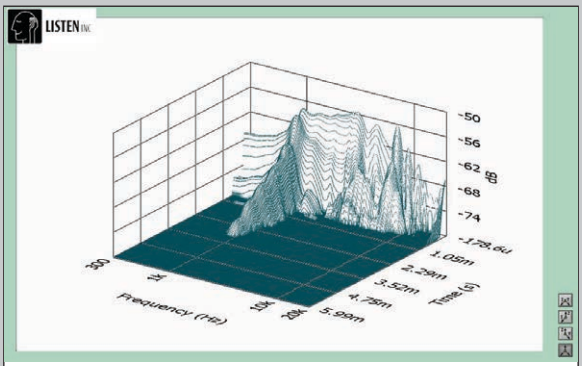

Figure 9: Faital HF106/STH100 SoundCheck CSD waterfall plot

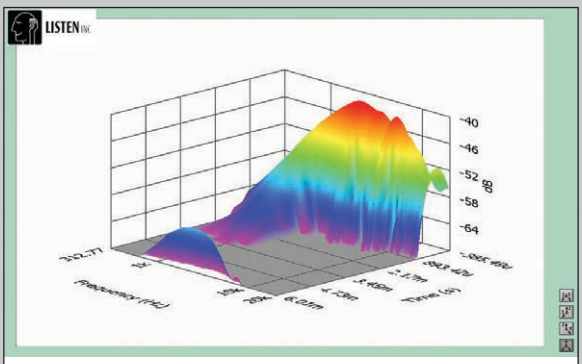

Figure 10: Faital HF106/STH100 SoundCheck short-time Fourier transform (STFT) plot

supports the classic "MLSSA" waterfall curve orientation. I used the default orientation for both SoundMap plots, and I will continue to do so in the future.

I have been told that the Ketone polymer diaphragm yields a smooth subjective performance. However, from the above data, the HF106/STH100 looks like a nice addition to FaitalPro's lineup of pro sound compression drivers.

The FaitalPRO HF107

I also examined the Faital's HF107 compression driver, again coupled with Faital's STH100 horn (see **Photo 4**). The HF107 has a 140-W power-handling capacity ferrite

Photo 4: FaitalPRO's HF107 compression driver

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:

Vance Dickason Consulting
333 South State Street, #152
Lake Oswego, OR 97034
(503-557-0427)
vdconsult@comcast.net

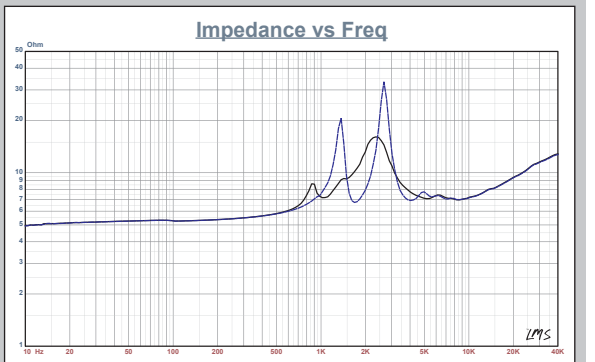

Figure 11: Faital HF107/STH100 free-air impedance plot

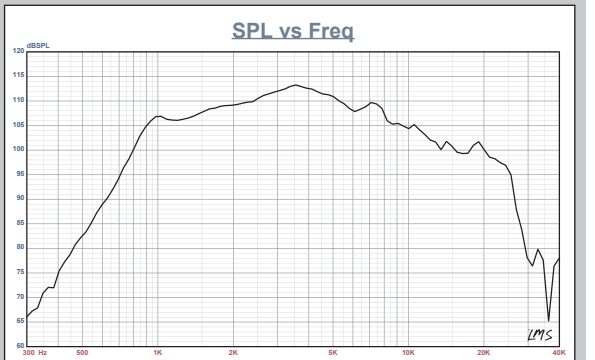

Figure 12: Faital HF107/STH100 on-axis frequency response

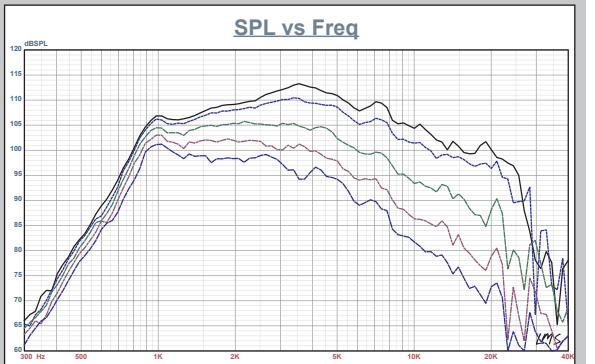

Figure 13: Faital HF107/STH100 horizontal on- and off-axis frequency response (0° = solid; 15° = dot; 30° = dash; 45° = dash/dot; 60° = dash)

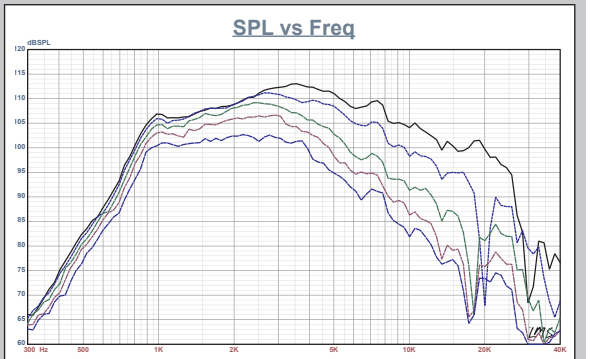

Figure 14: Faital HF107/STH100 vertical on- and off-axis frequency response (0° = solid; 15° = dot; 30° = dash; 45° = dash/dot; 60° = dash)

motor, and it is substantially more heavy and physically larger than the HF106 (the HF106 uses a neodymium ring magnet). Like the HF106, the HF107 is an interesting compression driver and it shares several unique features with the rest of this series. The HF107's features include a Ketone polymer annular-shaped diaphragm and an annular-shaped phase plug. Its throat diameter is 25.4 mm (1") and it is coupled to a 44-mm (1.73") diameter voice coil wound on a Kapton former with aluminum wire. Other features include a cast aluminum body, a 70-W AES-rated power handling (140-W maximum), and solderable terminals. The horn supplied for the HF107 is the same one used with the HF106. The STH100 has

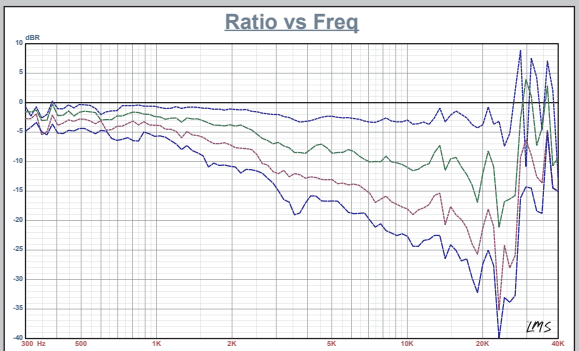

Figure 15: Faital HF107/STH100 normalized horizontal on- and off-axis frequency response (0° = solid; 15° = dot; 30° = dash; 45° = dash/dot; 60° = dash.

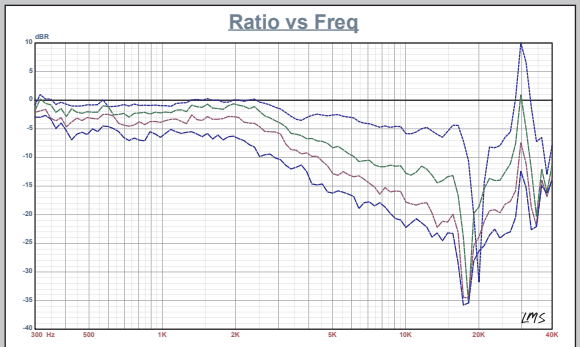

Figure 16: Faital HF107/STH100 normalized vertical on- and off-axis frequency response (0° = solid; 15° = dot; 30° = dash; 45° = dash/dot; 60° = dash)

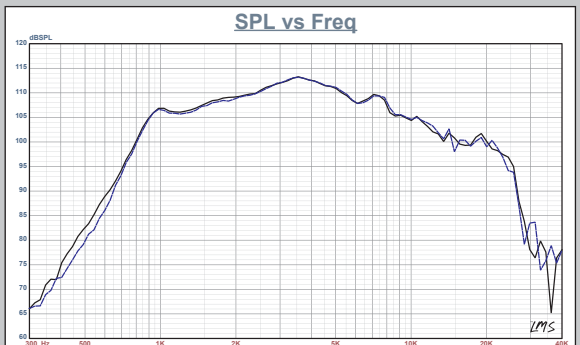

Figure 17: Faital HF107/STH100 two-sample SPL comparison

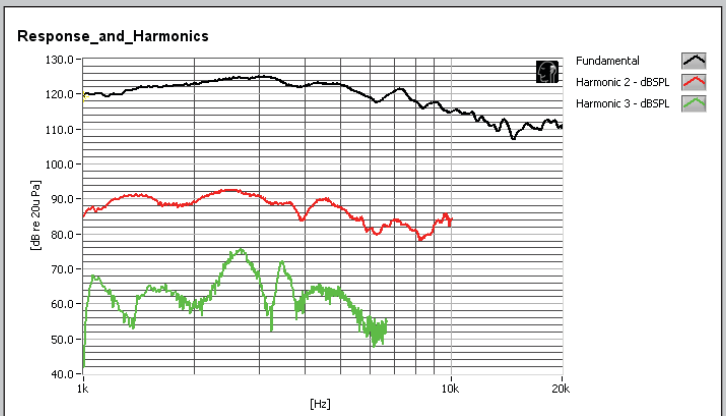

Figure 18: Faital HF107/STH100 SoundCheck distortion plots

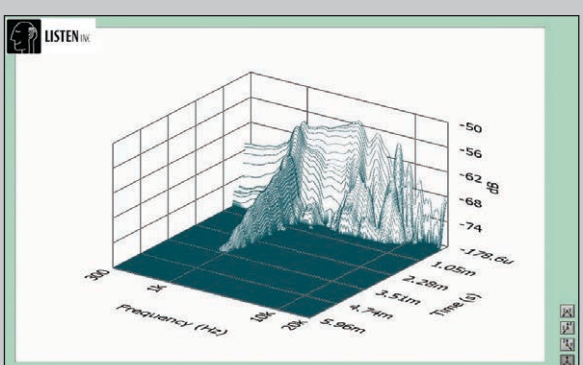

Figure 19: Faital HF107/STH100 SoundCheck CSD waterfall plot

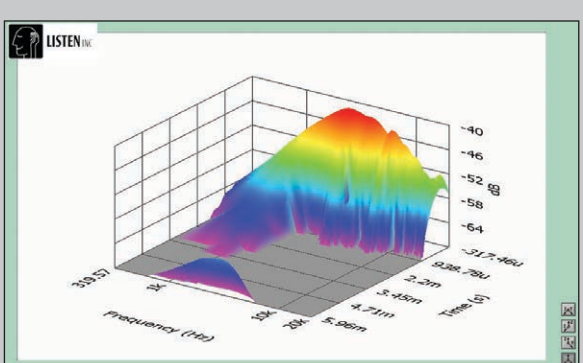

Figure 20: Faital HF107/STH100 SoundCheck STFT plot

a 1" diameter throat with 80° horizontal × 70° vertical short elliptical tractrix flare.

I used the LinearX LMS analyzer to produce the 200-point stepped sine wave impedance plot shown in **Figure 11**. The solid black curve was taken with the HF107 mounted on the STH100 horn and the dashed blue curve represents the compression driver without the horn. With a 5.4-Ω DCR, the HF107/STH100's minimum impedance was 6.97 Ω at 8.55 kHz.

For the next frequency response tests, I recess mounted the Faital HF107/STH100 in an enclosure with a 10" × 15" baffle. Then, I used a 100-point gated sine wave sweep to measure the horizontal and vertical on- and off-axis at 2.83 V/1 m. **Figure 12** shows the on-axis of the compression driver/horn combination. The SPL profile measures ±4.48 dB from 1 kHz to 10 kHz. (The HF107's recommended crossover frequency is a minimum of 1.3 kHz with a second-order network.) As with the HF106's off-axis test, this horn's coverage was 80° horizontal × 70° vertical. You wouldn't expect much difference in the horizontal and vertical off-axis plots, which confirmed in **Figure 13** for the horizontal orientation and **Figure 14** for the vertical orientation. **Figure 13**'s plot with the off-axis normalized to the on-axis response is shown in **Figure 15**. **Figure 14**'s plot with the off-axis normalized to the on-axis response is shown in **Figure 16**. **Figure 17** shows the two-sample SPL comparison, confirming that both samples are closely matched.

For the remaining tests, I used the Listen AmpConnect ISC analyzer and 0.25" SCM microphone to measure distortion and generate time frequency plots. For the distortion measurement, I mounted the HF107/STH100 combination with the same baffle I used for the frequency response measurements. I used a pink noise stimulus to set the SPL set to 104 dB at 1 m (1.7 V) and placed the Listen microphone 10 cm from the horn's mouth to measure the distortion. This produced the distortion curves shown in **Figure 18**. I then used SoundCheck to get a 2.83-V/1-m impulse response for this driver and imported the data into Listen SoundMap Time/Frequency software (now integrated with SoundCheck 12.0). The resulting CSD waterfall plot is shown in **Figure 19**. The STFT plot is shown in **Figure 20**.

Comparing the HF107/STH100 data to that of the HF106/STH100, the performance of both devices is quite good. For more information, visit www.faitalpro.com, or in the US, contact Faital USA, Keith Gronsbell, 220 West Parkway, Unit 13, Pompton Plains, NJ 07444, Phone (516) 779-0649, Fax (973) 835-5055, and e-mail kgronsbell@faital.com. ***VC***