

## ▶ Portable Audio Analyzers

By Mike Klasco and Rob Baum

Speaker engineers typically have access to a laboratory test system for measuring frequency response and perhaps distortion. Yet these systems are not truly light and portable. There is room for something faster and more portable than even a laptop-based test system, yet more sophisticated than a digital multimeter or a cheap Radio Shack sound level meter.

It can be very handy to have a  $\frac{1}{3}$  octave or higher resolution analyzer while voicing prototype systems or checking out the competition in the listening room. The vast majority of Asian speaker production lines have a QC station at the end of the line, but only check with a sweep for buzz and rub. What about more subtle problems, such as top-end response if there was too much glue on the neck joint, or if one out of every three drivers were short-changed by the funky magnetizer or whatever?

### FEATURES

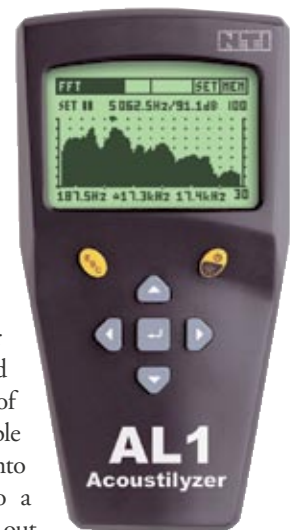
A handheld spectrum analyzer that could hang from your belt and be used for checking the response and sensitivity of speakers outside of the lab would be a handy tool for most speaker engineers. We have been playing with a “handful” of spectrum analyzers. These handheld units cover the full hearing bandwidth and most break it up into  $\frac{1}{3}$ -octave bands, which means you have about 30 bands covering 10 octaves. This bandwidth and resolution is fine enough for most adjustments you might make on a crossover network or just for determining which driver is messing up the balance.

NTI's Acoustilyzer (see review, Nov. '05 *VC*) and Sencore's SoundPro family offer FFT high-resolution response analysis. FFT has the resolution for tweaking parametric equalizers and crossover networks. All of the gear we surveyed interfaces to your computer for expanded functionality—such as recording response curves and enhanced printouts. A few models integrate a signal generator, which is very handy to have in the field. If a generator is not built-in, then test signals (pink noise and so on) are supplied on a CD. Others offer a separate signal generator. Impedance and polarity tester functions are also included on some units.

Laboratory analyzers are expensive, awkward, and hard to

justify for the listening room when there is already a full test system in the lab. For voicing and production line work, a handheld  $\frac{1}{3}$ -octave analyzer with integrated SPL meter would do nicely. Considerations are not just the ease of use of walking the production line and observing levels and tonal balance, but also the intuitive operation of most of these handhelds—even buyers and junior QC guys can handle this stuff. And the frosting on the cake is that most of the latest crop of handhelds is capable of much more, and some morph into decent lab gear when connected to a laptop. Of course, getting the most out of these power-packed handhelds requires an understanding of speakers and audio, and there is an opportunity here for “someone who really does not know what he is doing” to generate bad data.

All these handheld units come with a Type II mike, which has decent accuracy for field use over time and temperature, with less accuracy particularly at higher frequencies. If you are concerned about traceable lab measurements or if you become involved in expert witness court work on audio matters, you will need a Type I mike and meter system, and the calibration certificate for the system together (mike and electronics) to back it up. Most of the brands reviewed offer an optional Type I or recommend one, which will set you back another



NTI AL1 Acoustilyzer zoom  
FFT with resolution to 0.7Hz.



NTI offers complete sets with analyzer, measuring mike, and the MR1 analog generator.

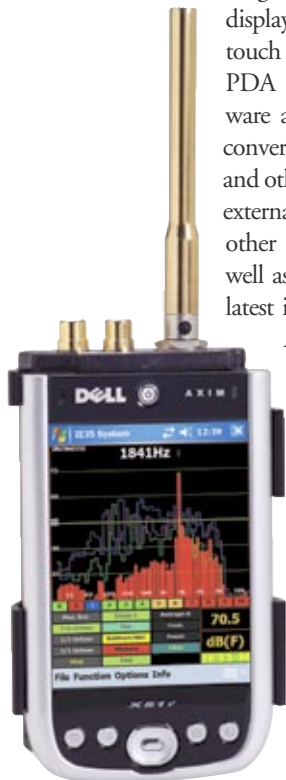
\$1000 or more.

Our focus is on self-contained handheld test gear from Ivie, Phonic, NTI, and Sencore.

## Ivie

Ivie Technologies has been providing acoustic test equipment electronics for about 30 years—their IE-10 and IE-30 handheld spectrum analyzers launched this category.

These compact units used rows of red LEDs for display. About three years ago Ivie launched the IE-33, which is the first miniature handheld calibrated measurement device delivering a broad range of acoustical measurements displayed on an (approximately) 3" × 4" color touch screen LCD. The IVIE analyzer is really a PDA handheld computer with the IVIE hardware and firmware (mike preamp, 20 bit A/D converters from audio to digital and back again, and other stuff) living in the handheld computer's external sleeve. Obviously users can use all the other functions of a Windows Mobile PDA as well as the acoustic instrument capabilities. The latest iteration is the IE-35, which uses the Dell



The Ivie IE-35.

Axim X51v hardware platform. It is now faster, more resistant to data loss, viewable using a VGA screen, and more—very nice. Pricing is \$1747, which includes the additional external 2200mAH battery. Software features are the same as the IE-33. Ivie will continue supporting its IE-33 user base with software updates and enhancements.

Loudspeaker test functions include real-time frequency response measurements ( $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{6}$ , or  $\frac{1}{24}$  octave resolution), sound level measurements, polarity checking, dual trace and XY oscilloscope measurements, built-in signal generator, and audio level voltmeter. The latest

Dell handheld computer host offers Wi-Fi and Bluetooth, which has some exciting applications for the IE-35 functions. A lot packed into 11 ounces.

If you already have a compatible handheld computer, then the sleeve, software, and calibrated mike cost about \$1199 total.

Delivering accurate measurement data, the Ivie is one of the most powerful instruments of this group.

## The Phonic PAA2 and PAA3

These handhelds consist of a self-contained unit that has an approximately 2.5" × 3" monochrome display and mike and is readily connected to your laptop computer. The PAA2 is a handheld audio analyzer that provides the tools needed to set up any sound environment. It features 31 band real-time spectrum analysis, SPL (sound level) and line meter, internal noise generator, EQ setting program, microphone calibration, and speaker phase (polarity) checking abilities.

For testing the response of a speaker, the noise generator

The Phonic PAA2.



The Phonic PAA3.

output is sent to the sound system and the output is shown on the PAA2's display. EQ, electronic crossover points, and other adjustments are then made. Alternatively, the included CD test disc can be used for the signal source that eliminates the umbilical cord to the amplifier.

The PAA2 has a central job dial from which all functions and menus can be accessed, leaving your other hand free to attend to other things. The PAA2 connects to any desktop or laptop. On a large screen, the output display is quite impressive. Cost of the PAA2 is \$360 retail (MAP \$300), and PAA3 is \$470 with a MAP of \$400.

## Sencore

Sencore has been around for 50 years and is known to old-timers as manufacturers of test gear for TV repairmen. Standard features on their SoundPro SP395 and SP495 include: dual phantom-powered high-gain/low-distortion microphone inputs, FFT processing, USB Preamp Audio Interface, and built-in generator. The response analyzer offers up to  $\frac{1}{12}$  octave resolution ( $\frac{1}{24}$  when connected with TerraLink software). Optional field-upgradeable firmware modules are available, including Speech Intelligibility, Time Delay Analysis (TEF functionality without the PC), Multi-band Decay, TechBench, and Noise Curves.

These modules add a wide range of capabilities including adjustments of speaker time adjustment and speaker frequency response equalization; they also test and document band-specific background noise and room reverberation. Other nice capabilities that you may eventually find useful include cable testing, speaker impedance test, polarity test, and signal generator functions. The SP495 SoundPro is also equipped with an SD memory card slot, high resolution color LCD display, digital audio outputs, stereo recorder, and impulse recorder functions.

The SoundPros are housed in aluminum cases and are portable (battery operated). Among the most sophisticated in the survey, the SP395 SoundPro is \$2795, and the SP495 is \$3295.

## NTI

NTI is a long-established brand of acoustic test equipment for lab and production line QC. Formerly the test equipment division of Neutrik, they have been an independent

company for over five years. A few years back, NTI launched the Ministruments product line with its Minirator MR1 for field use. The MR1 handheld (\$215) provides an analog audio generator setup for monitoring and troubleshooting analog audio systems.

For our survey, we reviewed NTI's newest compact acoustical analyzer, the AL1 (\$904), which includes a combination of acoustical and electrical features, although the existing ML1 products can be upgraded with firmware to AL1 capabilities. As with some of the other handhelds in this survey, the AL1's functionality is more than  $\frac{1}{3}$  octave response with the goal of an all-in-one tool for sound and systems contractors and installers.

The real-time spectrum analyzer (RTA) features selectable  $\frac{1}{4}$  and  $\frac{1}{3}$  octave bandwidth. The RTA simultaneously provides real-time single band SPL measurements.

The AL1's sound level meter, in addition to instantaneous and integrated sound pressure level (SPL) measurements, provides repeatable short-time Leq and sound exposure level (SEL) test capabilities for event monitoring requirements, including Lmin and Lmax as well. The AL1 displays RTA without interrupting other ongoing sound level measurements.

Stored spectra may be averaged or combined by using the available mathematical functions. The "Max-Min" display is particularly helpful for finding dominant room modes and characterization of listening areas. The Zoom FFT allows a detailed investigation of the frequency response of audio systems, such as comb effect or speaker interactions at crossover transitions.

The propagation delay time measurement for speaker setups is conducted between the electrical input of the AL1 and the built-in microphone. Automatic difference calculation simplifies the verification of correct delay arrangements for larger halls and auditoriums. Besides the polarity verification for speakers and systems, the AL1 includes basic electrical functions such as level RMS, frequency, distortion (THD+N) measurement, and cable testing.

Expanded functionality for the Acoustilyzer and the Minilyzer is provided by the MiniLINK (USB interface), which is included as standard with the Acoustilyzer. MiniLINK adds both remote control and the ability to transfer both screen data and data arrays to the PC, along with the capability for automatic instrument firmware and software updates from the NTI website. The MiniSPL calibrated mike (\$349) is for both the AL1 and ML1, as these analyzers use an external mike, which may also be extended with any standard XLR mike cable.

Most of the products in this survey are great values. For sure, even if you are not ready to spend a grand or two, the Phonic units are painless entries at a few hundred dollars, which is what you might expect to pay for just a decent sound level meter. There is also the customer wow factor.

One of us (Rob) was troubleshooting a pre-production run of speakers in China for one of our clients and pulled out his NTI Minirator MR1 while visiting a production line to run a quick test. Language gaps aside, there was no mistaking the

strong impression this product had on the factory engineers, who immediately wanted to know how much an MR1 cost. The MR1 was also quite helpful at troubleshooting some buzz in a headset speaker with poor glue joints at a different factory: just dial in a pure tone at the right frequency and ramp up the level until it is obvious for all to hear. Pure tones can make it easy for people to hear certain subtle distortions; certainly far easier than the usual sweep. So while these are all useful test instruments, perhaps an additional benefit is that they all are also marketing tools for your services.

The Ivie 35, NTI AL1, and Sencore SoundPros are sophisticated and comprehensive test systems in spite of their compactness. As the power of the tool increases, so does the learning curve and the knowledge required of the user. All of these products are insightful tools, will speed your work, and offer a great opportunity to continue your professional growth. **VC**