For most, the phrase “precise microwave measurements” brings to mind a lab bench in a comfortable office. These days, more and more technicians and engineers need to make accurate measurements in less hospitable conditions: in a BTS during a snowstorm, aboard a ship sailing through rough seas, or at a satellite trailer in a sandstorm.

Many of these scenarios take place far from the equipment pool. Only the best gear—rugged, dependable and flexible—makes it into the field kit. Measuring up and earning a spot is the driving idea behind Agilent’s FieldFox handheld microwave analyzers. Increasingly, high-performance handheld analyzers are needed to test the power and bandwidth of jamming systems, check the alignment of antennas in point-to-point microwave links, and validate antenna and cable systems in commercial and military aircraft.

Inside and out, the FieldFox family was designed with these applications—and end users—firmly in mind (Figure 1). To provide precision virtually everywhere, FieldFox delivers Agilent-quality microwave measurements in a compact, 6.6-lb package: cable and antenna analysis, vector network analysis, and spectrum analysis. Additional capabilities include a power meter, vector voltmeter, an independent signal source, a variable DC supply, a frequency counter, an interference analyzer, and built-in GPS receiver.

Figure 1: The FieldFox family is ideal for engineers and technicians who need to make precise measurements in tough environmental conditions.
Designing from the ground up

It’s one thing to assemble a luggable analyzer that includes multiple functions. It’s quite another to create a handheld instrument designed for the day-to-day workflows of technicians and engineers in the field. It’s still another to provide on-the-go microwave measurements that agree with those made with Agilent benchtop analyzers.

Rather than trying to repurpose an existing benchtop instrument, the industrial and electronic design of FieldFox started with a clean sheet of paper. That meant getting out of the office and tagging along with techs and engineers in the field. As they performed routine maintenance, in-depth troubleshooting, and everything in between, we were there—observing, interviewing and listening.

Creating a truly field-worthy industrial design

We traveled to a variety of sites in vans, pickups and trucks. The “good” instruments often rode up front with the crew; other gear was often tossed into the cargo area of a van or the bed of a pickup. In all cases, the people, vehicles and instruments had to be equipped for a wide range of conditions—above ground or underground, day or night, rain or shine.

In FieldFox, these experiences translated into attributes that make it ready for the toughest conditions. To ensure durability in harsh environments, the completely sealed enclosure is compliant with US MIL-PRF-28800F Class 2 requirements. The water-resistant chassis, keypad and case can withstand salty, humid environments and a temperature range of 10 to +55 °C (14 to 131 °F). Gasket-sealed doors protect the instrument interfaces from moisture, and the dust-free design—with no vents or fans in the case—helps extend instrument reliability. The case can also withstand shock and vibration. Finally, a specially designed connector bay protects the RF connectors from damage due to drops or other external impacts.

Defining field-ready ergonomics

First-hand observations of on-the-go personnel provided deeper insights into practical, meaningful decisions about ergonomics. For example, a nonslip rubber grip—built into the case—not only fits securely into the user’s hands, it also prevents the analyzer from sliding off the hood of a vehicle. The front-panel buttons are large enough to easily operate while wearing gloves (Figure 2).

The vertical or “portrait” orientation and 7.4-inch (188 mm) width makes FieldFox easy to hold. Coupling that with a carefully designed keypad layout makes it easy for a user to operate FieldFox with their thumbs. Also, a weight of just 6.6 pounds (3.0 kg) makes FieldFox easier to carry than similar analyzers.

Because FieldFox may be used day or night, inside or outside, we included a bright, low-reflective display and five display modes that optimize viewing under a wide range of lighting conditions. The keys are also backlit to enable operation in darkness.

Figure 2. FieldFox is a handheld instrument designed for the day-to-day workflows of technicians and engineers in the field.
Applying Agilent’s measurement science
The electronic design of FieldFox is a classic example of what Agilent can do. Before FieldFox, our technology portfolio included a host of high-performance chips that deliver best-in-class measurement performance. For FieldFox, our best measurement scientists extended those technologies to provide high performance with low power consumption. The result: FieldFox consumes about 15 W and lasts 3.5 hours on a single charge. And because it consumes just 15 W of power, the enclosure can be completely sealed.

Filling the gaps
There are other handheld analyzers on the market. Beyond our own technological assessments, we also asked end users about their opinions and experiences. They identified four key issues with handhelds they had tried or were using:

• Most are not designed to operate in real-world moisture, rain, humidity, dust or temperature changes.
• Most have a too-short battery life.
• Field measurements seldom agree with lab or production-line results.
• It’s difficult if not impossible to make accurate signal-power measurements when the ambient temperature is fluctuating.

FieldFox fills all these gaps.
Leveraging our microwave heritage

A FieldFox analyzer contains capabilities borrowed from Agilent’s benchtop analyzers—many of which are today’s best microwave instruments. By providing levels of precision not available in any other handheld instruments, FieldFox ensures greater confidence in results.

In network analysis, built-in calibration engines leverage extremely accurate algorithms from high-end VNAs—and this enables precise and repeatable measurements in the field. Our approach to calibration hardware is borrowed from benchtop VNAs. With an emphasis on portability, Agilent simplified calibration by adding built-in calibration standards, so measurements can be made in the field without carrying additional accessories. With any other instrument, when additional devices to the test port are added, such as jumper cables, recalibration is required using an external calibration kit. CalReady is another unique feature that saves time in the field -- turn it on and it’s already calibrated. This means it’s immediately ready to make accurate measurements such as S11, S22, and VSWR.

To enhance spectrum analysis, we leveraged the PowerSuite measurements from Agilent spectrum and signal analyzers to the FieldFox handheld spectrum analyzers. This enables users to make fast, accurate one-button power measurements of channelized communication systems with ease and confidence.

FieldFox microwave spectrum analyzers save time by improving accuracy with InstaAlign, an internal amplitude alignment that occurs automatically as the environmental conditions change, without user intervention. This provides an industry-leading amplitude accuracy of ± 0.5 dB at power-up, with no warm up required. FieldFox is the only 26.5 GHz handheld spectrum analyzer with a built-in full-band tracking generator.

Figure 3. Built calibration standards and alignment procedures enable precise measurements in the field.
Conclusion

Every piece of gear in a field kit has to prove its worth. Measuring up and earning a spot is the driving idea behind our FieldFox handheld microwave analyzers. They’re equipped to handle routine maintenance, in-depth troubleshooting and anything in between. Better yet, FieldFox delivers Agilent-quality microwave measurements virtually anywhere technicians and engineers need to go. When they add FieldFox to their kit, they literally carry precision with them.
Precision. Readiness. FieldFox.

Every piece of gear in your field kit had to prove its worth. Measuring up and earning a spot is the driving idea behind Agilent’s FieldFox analyzers. Carry the precision of our microwave models: they deliver Agilent-quality measurements wherever you need to go. Boost your readiness with an RF unit: every operating mode is flexible enough to meet the needs of novices and experts alike. And count on the durability of handheld analyzers designed to withstand your toughest working conditions. Add FieldFox to your kit—and see how it measures up.

Agilent Advantage Services is committed to your success throughout your equipment’s lifetime. To keep you competitive, we continually invest in tools and processes that speed up calibration and repair and reduce your cost of ownership. You can also use Infoline Web Services to manage equipment and services more effectively. By sharing our measurement and service expertise, we help you create the products that change our world.

Download application notes, watch videos, and learn more: www.agilent.com/find/FieldFox

Agilent Email Updates
www.agilent.com/find/emailupdates
Get the latest information on the products and applications you select.

Agilent Channel Partners
www.agilent.com/find/channelpartners
Get the best of both worlds: Agilent’s measurement expertise and product breadth, combined with channel partner convenience.

Related literature

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>FieldFox Handheld Analyzers, Brochure</td>
<td>5990-9779EN</td>
</tr>
<tr>
<td>FieldFox Combination Analyzers, Technical Overview</td>
<td>5990-9780EN</td>
</tr>
<tr>
<td>FieldFox Microwave Spectrum Analyzers, Technical Overview</td>
<td>5990-9782EN</td>
</tr>
<tr>
<td>FieldFox Microwave Vector Network Analyzers, Technical Overview</td>
<td>5990-9781EN</td>
</tr>
<tr>
<td>FieldFox Handheld Analyzers, Data Sheet</td>
<td>5990-9783EN</td>
</tr>
<tr>
<td>FieldFox Handheld Analyzer, Configuration Guide</td>
<td>5990-9836EN</td>
</tr>
<tr>
<td>FieldFox N9912A RF Analyzer, Technical Overview</td>
<td>5989-8618EN</td>
</tr>
<tr>
<td>FieldFox N9912A RF Analyzer, Data Sheet</td>
<td>N9912-90006</td>
</tr>
<tr>
<td>FieldFox N9923A RF Vector Network Analyzer, Technical Overview</td>
<td>5990-5087EN</td>
</tr>
<tr>
<td>FieldFox N9923A RF Vector Network Analyzer, Data Sheet</td>
<td>5990-5363EN</td>
</tr>
</tbody>
</table>

Download application notes, watch videos, and learn more: www.agilent.com/find/FieldFox