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## Diverse Applications Offer Balance for Wireless Convergence

Gary Breed  
Editorial Director



My recent comments on convergence generated considerable response. Like me, everyone in the industry has an opinion on the path of convergence. We all want to know which platform, what services and whose transmission formats and data protocols will be the winners.

I'll return to this subject later, but first I want to point out the importance of other parts of this industry that remain diverse and independent. A couple readers mistakenly interpreted my notes on convergence as presenting the whole story of high frequency technology—which is definitely not the case!

The discussion of convergence applies to the consolidation of mass communications features and services. That market segment is important, but is just one part of an extremely diverse high frequency industry. Commercial, military, medical and industrial applications have been growing—and changing—as fast as the more visible consumer wireless communications. For an engineer, these diverse applications represent a challenge that requires a broad range of knowledge rather than specialization. The “next project” is rarely just an evolution of the current one; more likely, it's something quite different.

Of course, there are the universal challenges of cost, time-to-market and manufacturability, to be achieved while meeting the required performance parameters. With typically smaller production runs and a wide range of performance requirements, the balance among these factors is much different than with mass-market devices. Fortunately, there are engineers who thrive in this dynamic environment, just as others prefer ongoing, in-depth involvement in their preferred technologies.

The range of applications is impressive—from kilohertz to terahertz, from microwatts to megawatts. Some are quite visible, like digital broadcast transmitters and receivers, military communications and navigation systems, or the huge variety of wireless devices. Others are not so well known, like industrial plasma systems, sensors and imaging systems, advanced radar, or subatomic particle physics research tools.

A very interesting application area is the development of components

that go into wireless and other high frequency products. Integrated circuits, filters, connectors, antennas and signal processing components have all played a big part in the successful implementation of high frequency technologies. Even packaging, housings, circuit substrates and other “non-electronic” materials have active development work underway to continue improvements in the high frequency performance of these materials.

One more group of applications that is out of public view is testing—test equipment, probes, fixtures, cables, detectors, and all the other pieces that make it possible to measure the high frequency environment and evaluate the performance of devices, circuits and systems. No scientific or engineering endeavor can succeed without accurate measurements, and with the complexity of today’s equip-

ment and systems, speed and flexibility are needed as well.

I could go on for pages, since there are many more applications that are part of the diverse high frequency realm. Some are as esoteric as microwave power transmission, while others are as basic as making an oscillator a little smaller or an amplifier a little quieter.

### **Back to Convergence...**

OK, now that we’ve reestablished the fact that there is a lot going on in this segment of industry, I’ll respond to some comments I received about convergence.

First, there were a few public relations style responses like, “It’s obvious that the wireless handset is where convergence is headed. Just look at all the features—camera, e-mail, Internet browsing, MP3 player...” My answer is, “Maybe.” Sure, these features are great, but

some don’t work well with today’s typical handset. Which is why there is so much research underway to define the ideal personal communications device.

The other prevailing comment is that there isn’t really any convergence. There is only the expected consolidation of functions where it is technically logical and economically feasible. I was tempted to agree, but decided that this was part of the definition of convergence—a lot of functions being “logically consolidated.” Eventually, I expect us to see a single highly-capable system of personal communications—but it won’t be the only game in town. There will still be alternatives to this “converged” system, and there will still be many other important activities in the high frequency industry.