

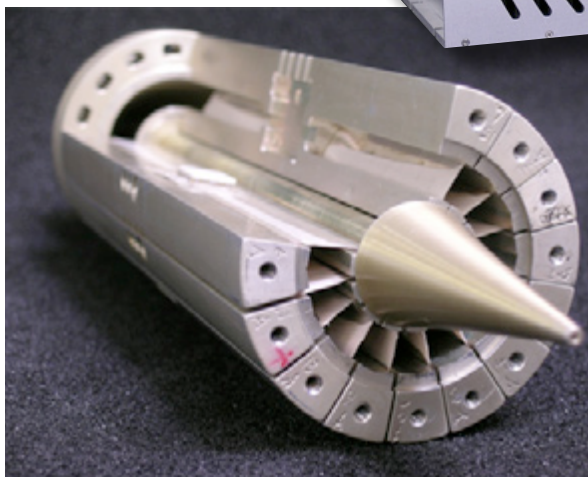
JACK BROWNE / TECHNICAL DIRECTOR

## SPATIAL-COMBINING METHOD ARMS 6-TO-18-GHz AMP

**B**roadband power drives many applications in military electronics, including in electronic countermeasures (ECM) systems and test-and-measurement setups. For high levels of microwave power, traveling-wave-tube amplifiers (TWTAs) have generally been the output stage of choice. But with the availability of solid-state amplifiers from CAP Wireless ([www.capwireless.com](http://www.capwireless.com)), based on the firm's patented Spatium™ technology, long-lifetime power transistors can be swapped for power tubes in many systems. The company's latest amplifier utilizing the technology is the model CHPA0618-G45, with a conservatively rated bandwidth of 6 to 18 GHz.

In a Spatium™ amplifier, the output contributions of multiple gallium arsenide (GaAs) monolithic microwave integrated circuit (MMIC) amplifiers are coherently combined within a guided-wave structure, using free space as the combining medium. The guided-wave structure (*Fig. 1*) actually resembles a group of antennas receiving output signals from the individual MMIC amplifiers, combining those contributions coherently along a finline structure. In contrast to traditional, planar dielectric-circuit-board combining approaches, combining losses are minimized and bandwidth is not limited by the dielectric properties of the circuit materials. In fact, the Spatium™ power combining approach, which is classically known as quasi-optical combining, is largely frequency independent, and limited in power and frequency mainly by

**1. Patented broadband Spatium™ power combining technology employs a guided-wave structure to combine the output contributions of individual MMIC amplifiers in free space.**



the performance characteristics of the individual MMIC amplifying devices.

The model CHPA0618-G45 solid-state amplifier (*Fig. 2*) makes use of the patented Spatium™ broadband spatial combining technology to cover a minimum bandwidth of 6 to 18 GHz and a typical bandwidth of 5.85 to 18.40 GHz with 30 W output power at 1-dB compression. The saturated output power is typically 35 W. The broadband power amplifier, which exhibits input and output VSWR of typically 2.0:1, provides minimum gain of 45 dB and typical gain of 48 dB across the full frequency range. Model CHPA0618-G45 provides flat gain without equalization,



**2. Model CHPA0618-G45 (above) is a solid-state power amplifier capable of 30 W output power at 1-dB compression from a minimum bandwidth of 6 to 18 GHz.**

controlling variations in gain to typically  $\pm 4$  dB over the full frequency range. This new Spatium™ power amplifier is designed for low-voltage systems, typically drawing 21 A current from a +9-VDC supply.

Although it is well suited for broadband applications such as ECM platforms and test and measurement systems, model CHPA-618-G45 can also be used in more narrow-band applications, such as radar, microwave imaging, and satellite communications systems. Its multiple-element architecture is insurance against single-point failures, exhibiting graceful performance degradation in the event of a single device failure. The solid-state amplifier does not suffer the warmup time or turn-on delays compared to TWTAs, and can be used at altitudes to 50,000 ft. It employs fan-forced convection cooling and

is designed for operating temperatures from 0 to +50°C. The model CHPA-618-G45 amplifier measures just 17.08 x 9.93 x 5.81 in. with SMA female input and output connectors and incorporates a DA15 DC connector with male pins. CAP Wireless, Inc., 3235 Grande Vista Dr., Newbury Park, CA 91320; (805) 499-1818, FAX: (805) 499-6649, Internet: [www.capwireless.com](http://www.capwireless.com).