



Together, we can create more innovative medical devices so people get more out of life.



Username

Password

Remember me

[Forgot login?](#)

[Register](#)

[HOME](#) | [TECH BRIEFS](#) | [WHITEPAPERS](#) | [FEATURES](#) | [PRODUCTS](#) | [WEBCASTS](#)

AEROSPACE & DEFENSE

TECHNOLOGY

The Engineer's Guide to Design & Manufacturing Advances

Electronics & Computers

Semiconductors & ICs

Mechanical Components

Manufacturing & Prototyping

Software

Photonics

Machinery & Automation

Materials

Next-Generation Phased Radar Systems Lead to Hardware Improvements



Wednesday, 01 April 2015

More compact, lightweight, and efficient power dividers increase resolution and range for the next wave of fixed phased array systems.

Page 1 of 2

Meeting the performance needs of the next generation of radar systems that will be deployed by the military is spurring the development of more efficient and sensitive hardware components to go along with the rapid advances in signal processing techniques and bandwidth.

The military uses radar for many purposes, including guiding missiles to targets, directing the firing of weapon systems, and providing long-distance surveillance and navigation information. However, for the next generation of systems currently in development, the most critical requirement is the ability to successfully counter saturation attacks. Such attacks may include numerous aircraft and missiles converging from multiple directions at the same time.



[Calibrating the sights on a radar system in Iraq to constantly monitor the skies in search of indirect fire attacks. \(Pfc. J. Princeville Lawrence\)](#)

To meet this challenge, very high data rates are required to track a large number of simultaneous targets. Unfortunately, the level of data quality required is not achievable with the traditional rotating or fixed radar systems in use today.

Mechanical Rotation

Radar systems are often identified by type of scanning. The most common, mechanical scanning, involves the rotation of a parabolic dish or antenna through a 360-degree sweep of the horizon. As it rotates, pulses of radio waves or microwaves are transmitted and bounce off any object in its path. The object returns a tiny part of the wave's energy.

These systems are not without limitations. Such systems provided limited tracking capabilities. Upon detecting a potential target, the radar typically waits a second or two for an additional sweep return so that it can correlate the two echoes, extract course and speed information, and start a new tracking process. Depending on the sweep rate, this wastes valuable time against an incoming enemy aircraft or weapon.

Mechanical-scan radars are also susceptible to damage. If the servomotors that cause the antenna to rotate or stabilize it fail, or the antenna is damaged, the radar is rendered inoperable. As a result, later generations of radar moved away from mechanical scanning toward fixed, phased array radar systems in which all movement is eliminated.

Fixed Phased Arrays

Phased arrays are composed of evenly spaced antenna elements, each of which emits a signal that incorporates a phase shift to produce a phase gradient across the array. The amplitudes of the signals radiated by the individual antennas, and the constructive and destructive interference caused by objects, determine the effective radiation pattern of the array.



CLEO:2015

Laser Science to Photonic Applications
Tech Conference: 10-15 May | Expo: 12-14 May
San Jose, California, USA

Hear Six Nobel Laureates Speak

Subscribe today to receive the INSIDER, a FREE e-mail newsletter from *Defense Tech Briefs* featuring exclusive previews of upcoming articles, late breaking NASA and industry news, hot products and design ideas, links to online resources, and much more.

[Sign up now >>](#)

[Rocket Science May Improve Kidney Dialysis](#)

[Dry Drilling Composites Using Carbon Dioxide Cooling](#)

[Researcher Develops Autonomous UAV Refueling System](#)

[Are Airships the Future of Aviation?](#)

[Tracking WiFi Signals to Passively See Through Walls](#)

Powered by [AddThis](#)

SEMICON
China 2015
March 17-19, 2015
Shanghai, China

Free Webinar

Simulation of Microfluidic Devices Using COMSOL

Sponsored by



By digitally varying the signal phases and amplitude of the elements in an array – a process known as digital beamforming – the main beam can be “steered” to determine the direction of the signal source, even though the antenna does not physically move.

[By improving the performance of the receiver, next-generation products expect to improve the radar results in more complex, real-world scenarios such as tracking a suspicious vehicle moving through a densely populated area.](#)

Because of the rapidity at which the beam can be steered, phased array radars can perform search, track, and missile guidance functions simultaneously with a capability of over a hundred targets.

Phased array systems vary in size and complexity. For several decades, massive planar arrays have been used aboard Navy warships and are at the heart of the shipborne Aegis combat system and the Patriot Missile Systems. Smaller phased array antenna can be built to conform to specific shapes, like missiles, infantry support vehicles, ships, and aircraft.

Although there are several ways to accomplish electronic beam steering, one such technique involves varying the phasing between elements in a fixed, multi-element array. This is typically accomplished with power dividers that emit signals of varying phase and amplitude to the antennae.

As an example of the hardware improvements required in next-generation systems, power dividers serve as a prime example.

« Start Prev 1 2 Next End »

Publications: [NASA Tech Briefs](#) [Medical Design Briefs](#) [Lighting Technology](#)

[Legal](#) [Privacy](#) [Feedback](#) [Subscribe](#) [Advertise](#) [Contact](#) [About](#)

TB TECH BRIEFS
MEDIA GROUP
an SAE International Company

© 2009-2015

Username

Password

Remember me

[Forgot login?](#)

[Register](#)

- Electronics & Computers
- Semiconductors & ICs
- Mechanical Components
- Manufacturing & Prototyping
- Software
- Photonics
- Machinery & Automation
- Materials

Next-Generation Phased Radar Systems Lead to Hardware Improvements



Wednesday, 01 April 2015

Hardware Improvements – Power Dividers

Page 2 of 2

Power dividers are passive components that divide an input signal into two or more identical output signals. For phased array systems that require a range of signal amplitudes, the input signal is often altered using attenuators to vary the signals prior to output to deliver the desired signal level.

The traditional way of accomplishing this is to utilize a standard, multi-channel power divider with attenuators at each of the output ports. Attenuators, however, increase the overall size and weight of the unit while drawing additional precious watts of power. The size and weight of the power divider with attenuators made it difficult to deploy on jet planes that could benefit from more sophisticated radar.

There are power dividers that split power from 6.7 to 18.4 dB across the output ports and do not require attenuators. Operating between 1100 and 1500 MHz, the 8-way divider is optimized for space-constrained applications. The divider can handle 350W peak and 35 W CW.

The output signal is staggered in fixed amplitudes that begin at 18.4 dB at ports 1 and 8, 12.4 dB at 2 and 7, 8.6 dB at 3 and 6, and 6.7 dBs at ports 4 and 5. The 8-output ports are each connected to a fixed antenna. The power divider extends the coverage from one mile to several miles.

The next generation of phased array systems, along with advanced signal processing techniques, could have significant benefits for many branches of the military. For example, higher-resolution radar could be used to initiate a computer takeover in the event of a missile attack on a jet plane. Using sophisticated evaluation of the missile's speed and trajectory, millisecond-to-millisecond, computer-controlled micro-adjustments could be used to evade the threat.

In an intense battlefield application with numerous vehicles and personnel, advanced radar could be used to not just track high-speed targets, but also slowmoving targets like ground troops. Armed with this information, the command center could have complete, realtime visibility of all moving components of a battlefield.

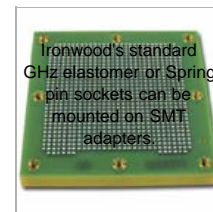
This article was written by Anuj Srivastava, President and CEO of Renaissance Electronics & Communications, Harvard, MA. For more information, visit <http://info.hotims.com/55588-541>.

« Start Prev 1 2 Next End »

CLEO:2015
Laser Science to Photonic Applications
Tech Conference: 10-15 May | Expo: 12-14 May
San Jose, California, USA

Hear Six Nobel Laureates Speak

more from Technology Leaders



Socket Accessories



27 GHz BGA Socket



Contact Ironwood Electronics

Ads Powered with

Subscribe today to receive the INSIDER, a FREE e-mail newsletter from *Defense Tech Briefs* featuring exclusive previews of upcoming articles, late breaking NASA and industry news, hot products and design ideas, links to online resources, and much more.

[Sign up now >>](#)



OPTICAL ENCODER
Inventors & Innovators

Encoders
Accelerometers
Scanners

For Military & Space Applications

Motion Control for the Most Sophisticated Military Platforms

View our Capabilities & 60 Year Heritage at:

BEIPRECISION.COM

