

October 2023

What's News...

World's More Sensitive Radio Telescope

A team of researchers has developed a 'SMART box' to power the world's largest radio telescope, the Square Kilometer Array (SKA) low-frequency telescope, a network of radio dishes currently under construction in Western Australia. The Power and Signal Distribution (PaSD) SMART boxes (Small Modular Aggregation RFoF Trunk) provide electrical power to the SKA-Low telescope's 131,072 antennas. The team had to source special very-low-noise devices that emit minimal interference and are wrapped in a specially designed case to prevent stray radio waves from escaping. The SKA will be the world's largest and most sensitive radio telescope, capable of detecting faint signals from the universe.



Boston Launches First 5G Broadcast

The first 5G broadcast channel in the U.S. has begun operation in Boston, launched by low-power TV station

A Word from Sam Benzacar

The Resurgence of the Traveling-wave Tube

By Sam Benzacar



Readers of this column know what traveling wave tubes (TWTs) are and many assume that they're no match for semiconductor solutions, primarily GaN-on-SiC MMICs, that continue to permeate more applications yearly. But dig deeper, and you'll find that the market for TWTs is actually increasing, so why is a device conceived 80 years ago still viable today?

First, in 1986, President Reagan ordered NASA to focus on its core activities and hand off the rest to private industry, saying "NASA will keep America on the leading edge of change, and the private sector will take over from there." Now, the SpaceX Starlink constellation accounts for 5700 of the 7700 or so communications and other satellites around the Earth, all launched by the company itself. Others, like Amazon's Project Kuiper, will follow in the next few years. Although satellites in low Earth orbit (LEO) use solid-state (typically GaN) RF power amplifiers, those in geostationary orbit are much further away, and only TWTs can generate enough RF power to span the distance.

Another (unfortunate) factor driving TWT demand is Russia's war on Ukraine, which is depleting the resources of the U.S. and Europe that must be replaced as quickly as possible. This trickles down to TWTs and TWT amplifiers (TWTAs) that are extensively used in systems ranging from EW to radar and electronic countermeasures.

WVVO-LD. The broadcast is the result of efforts from LPTVBA and XGen Network and is being conducted under an experimental license from the FCC. 5G broadcast is a "one-to-many" solution that simultaneously sends content and data to many mobile devices. 5G broadcasting can also push alerts to mass targets in less than a second, which will be needed to rapidly send messages to the public when traditional uses overwhelm nearby transmitters.



Global EW Market Booming

A report from Fortune Business Insights values the global electronic warfare market at \$15 billion in 2022. It expects it to grow to \$16.65 billion this year and \$31 billion by 2030, an annual increase of 9.4%. The market's growth can be attributed to the increasing geopolitical tensions and regional conflicts. These factors have led to a greater need to adopt advanced warfare methods. In addition, the report says the cognitive EW market, valued at \$308 million last year in 2022, will reach \$1.7 billion this year and expand at a rate of 19.2% until 2032.



Microwaves are Helping Recycle Plastic

TWT technology development hasn't been stagnant, either, with their overall performance and efficiency increasing dramatically. Even small increases in efficiency have a positive impact on reducing the size, weight, and power required by a platform. While satellites are the most obvious platforms to benefit, almost every commercial or defense platform also stands to gain. Fifteen years ago, TWT efficiency was about 20%, but today it's twice that and increasing.

The Department of Defense and satellite broadband providers are also interested in using higher frequencies. DoD needs to develop EW and electronic countermeasures systems to address new threats high in the millimeter-wave region, and satellite companies need the massive bandwidth available there when current bands as high as Ka-band are no longer enough to provide greater capacity.

As a result, an enormous amount of R&D is being conducted to advance the TWT state of the art to meet the requirements of systems operating at much higher frequencies, even up to W-band and E-band. Several start-up companies, such as Teraphysics, are developing fabrication techniques like those of semiconductor processes to make TWT components at scale. That's a complete departure from the labor-intensive ways TWTs have always been made.

In short, despite the incursion of GaN technology, TWTs are likely to continue their development for many years to come.

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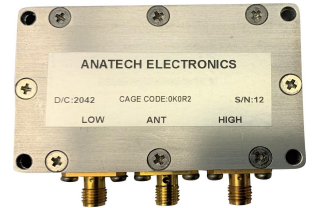
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Mitsui Chemicals and Microwave Chemical are continuing a project designed to commercialize microwave technology for plastic waste chemical recycling. The project aims to directly produce raw monomers from traditionally difficult-to-recycle plastics, such as automotive polypropylene and molding compounds used in bathtubs. The firms use Microwave Chemical's "PlaWave " microwave-based plastic degradation technology to break down the plastics into raw monomers. They say it is more efficient than the conventional approach that first converts the waste into oil.



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