ANATECH ELECTRONICS INC

AT THE CENTER FREQUENCY

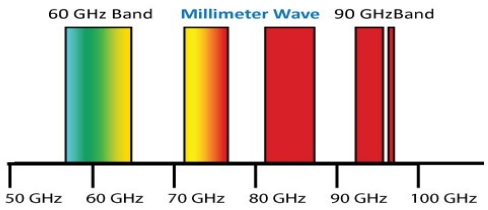
An e-Newsletter from Anatech Electronics

March 2019

What's News....

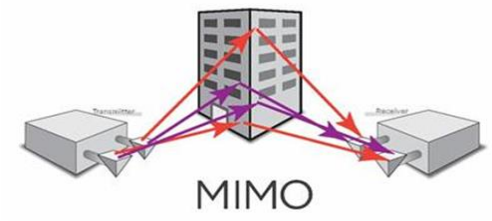
FCC Suggests Licensing 21 GHz of Bandwidth at 95 GHz

The FCC is considering a First Report and Order that would adopt rules to make 21.2 GHz of spectrum above 95 GHz available for unlicensed (and possibly licensed) operations. It would also create a new class of experimental licenses for the 95 GHz to 3 THz spectrum range. The technology to achieve operation at such frequencies is embryonic at best, which makes the FCC's attention to it somewhat surprising at such an early stage. Applications considered for 95 GHz include backhaul and point-to-point, and possibly mobility. The commission was supposed to have addressed the use of these frequencies at a meeting on March 15.



Xilinx, Samsung Develop 64 x 64 MIMO Solution

Xilinx and Samsung Electronics are working on a 5G New Radio deployment in South Korea, the result of a collaboration of the two companies to deploy 5G massive MIMO and millimeter-wave solutions using Xilinx's UltraScale+ platform. Xilinx says it has a massive MIMO device with 64 transmitters and 64 receivers and that it has created a way to bridge the digital and analog domains to miniaturize the overall structure. Direct RF sampling is used to digitize signals at very high frequencies and simultaneously process the signals on multiple bands within its SoC.



NHK Delivers First 9K Broadcasts

A Word from Sam Benzacar

AESA Is Coming to the Cellular Industry

It's pretty obvious to everyone who follows or is involved in the cellular industry that achieving everything promised by 5G will require every bit of technological wizardry that can be mustered, and the Active Electronically-Scanned Array (AESA) architecture will be one the most important contributors. You won't find this acronym in media coverage about 5G, as massive MIMO with "dozens of antennas" gets the attention.

Many readers of this column know AESA well, as it's the latest iteration of the active phased array that makes possible the exceptional performance of next-generation military radar and electronic warfare systems. There haven't been any commercial uses of the AESA for several reasons, primarily that the relatively-low frequencies currently used by the cellular industry don't require it, and that they would be too large and expensive. However, as carriers hold their noses and use the millimeter-wave spectrum, we'll all be hearing about AESA, or should be. At 28 GHz and 39 GHz and above, this advanced technology provides enormous benefits, and the size of the antenna is much smaller and potentially far less expensive.

At the moment, AESA radars cost millions of dollars because they're designed for defense applications that require a massive array of capabilities as well as the need to operate in fighter aircraft under hostile conditions. They're also produced by the "military- industrial complex" rather than commercial and consumer products manufacturers. Nevertheless, a millimeter-wave AESA would now still be prohibitively expensive, but that may change as the cellular industry begins to face the realities of delivering mobility at frequencies 10 times higher than today.

In fact, some companies already are. At least one (Anokiwave) has produced ICs for 5G phased arrays such as the AWMF-0108 that supports four transmit and receive antennas and includes gain control, phase shifters, beam steering, and other features in a 6x6-mm QFM package. Other companies have been working to reduce the manufacturing cost of AESA phased-array antennas for 5G.

MACOM, for example, has been collaborating with MIT's Lincoln Laboratory to realize low-cost manufacturing techniques for massive MIMO and software-defined beamforming for antenna systems with 64 T/R modules or more. The approach uses high-level functional integration as well as commercial manufacturing processes and will require direct RF sampling at the antenna port.

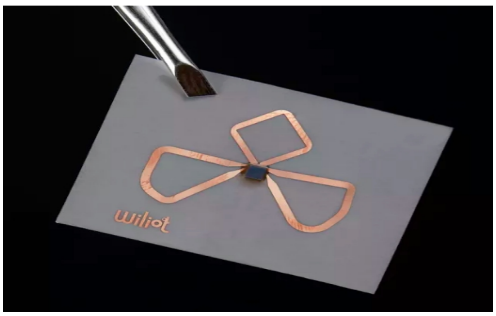
Direct RF sampling is currently being achieved in next-generation defense radars and EW systems, all of which presumably operate at lower frequencies than the highest ones conceived for 5G. These will require high-speed-sampling ADCs with high resolution and dynamic range, which in addition to defense systems are used in millimeter-wave test equipment, are extremely expensive, and are proprietary to their creators and a smattering of defense contractors. A few of these ADCs can, according to what can be gleaned from various sources, sample at 60 Gsamples/s and even higher performance can be achieved when interleaving is used.

The task of reducing the cost of such systems is far from trivial but the benefits for 5G are significant and will probably be mandatory for millimeter-wave applications in which a hundred or more antennas and accompanying beamforming capabilities are required to deliver truly massive MIMO. However, I suspect that by the time they're needed, commercial-grade AESA architectures will have decreased in cost enough to make them viable for cellular use, at least in some applications. If that proves true, it will benefit not just the cellular industry but defense systems as well.

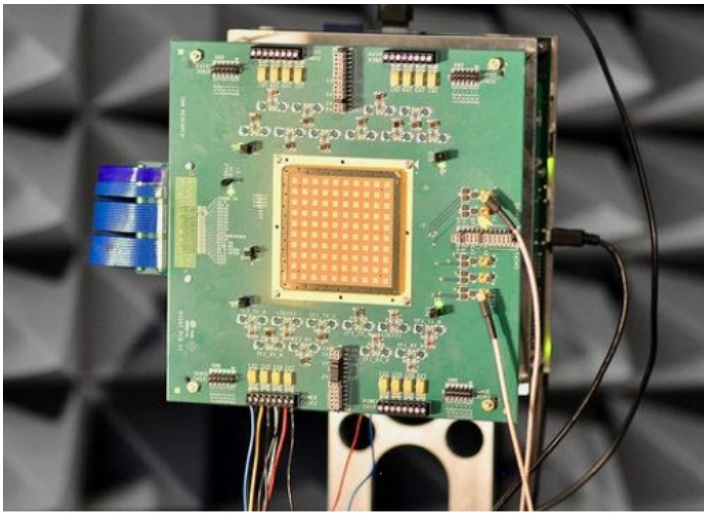
Japan's NHK has initiated the world's first 8K broadcasting after more than 20 years of development. A test color-bar pattern on the 8K TV screen was replaced at 10 a.m. with new 8K (7680 × 4320-pixel) images along with immersive 22.2 multichannel sound. The 8K channel, "NHK BS8K," is broadcast for about 12 hours daily. Programs include entertainment, art, nature, and sports, and the 8K satellite broadcasts are delivered in the ISDB-S3 transmission format with a transponder bandwidth of 34.5 MHz at 100 Mb/s. This provides for home delivery of one 8K channel or three 4K channels per transponder.

Bluetooth Device Powered by Ambient RF Energy

A new paper-thin, postage-stamp-size Bluetooth chip has been designed that operates without a battery. The device, from start-up Wiliot, can harvest energy from ambient RF energy from Wi-Fi, Bluetooth, and cellular signals, and use them to power a Bluetooth-equipped ARM processor that can be connected to a variety of sensors. Wiliot says that the size of the Bluetooth chip, combined with the lack of any battery, means it can be produced cheaply and mounted on almost anything.



1. A 28-GHz phased array nodule developed by IBM Research and Ericsson.



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