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AID and Innovation

Tom Perkins
Sr. Technical Editor



By the time you read this another IEEE International Microwave Symposium will be history. If you attended in Seattle, I hope your visit was rewarding. Thanks to all those who helped make this great event worthwhile. I'll be summarizing the event in the July Editorial.

In April I wrote an article on Microwave Engineering Education. I have received several in-depth, complimentary, and insightful comments from readers that indicate that this is certainly a timely and important topic. I am attempting to reply to readers, as time permits.

AID

Wondering about the above Editorial title? It refers to Antennas, Integrated Circuits and Defense Electronics. The IEEE Wireless and Microwave Technology Conference (WAMICON) in Orlando, Florida, revealed a very interesting project that in some ways embraces all of these topics. A talk by the DARPA Microsystems Technology Office described their sponsorship of a program called *Arrays at Commercial Timescales* (ACT). Some liken this effort to creating a RF Field Programmable Gate Array (FPGA). Broadly described, the goal is to save time and money in the development of phased arrays for radar, communications, and electronic warfare by creating common building blocks to assist designers to avoid starting from scratch each time a new array is designed. The idea is to create a shared hardware foundation for future military phased array development programs. It has three tiers of technology that together form a reconfigurable system that would serve as a starting point or foundation for any new array program. Objectives include: a common building block for RF arrays, a reconfigurable means for the antenna to interact with radio waves, and over-the-air coherent array aggregation. The first two thrusts endeavor to reduce the time and money required to develop phased arrays. The final thrust seeks to reduce the size of phased arrays by developing distributed arrays that can communicate with each other and function as one large array.

Operationally, taking this concept a bit further, the idea of reconfigurable arrays and electronics that can perform multiple tasks upon command with one basic suite of hardware has been a longtime goal that may be finally achievable. The advantages related to reduced size, weight and power (SWAP) and also cost are certainly significant, particularly in these times of constrained budgets.

MIMO and More

What comes to mind when pondering these general topics (AID) in today's emerging technologies? Under antennas: multiple-input and

multiple-output (MIMO), use of metamaterials, fractals, active solid-state arrays, advancing synthetic aperture array (SAR) technology, and inflatable arrays. Thinking about integrated circuits: a plethora of mixed signal devices performing numerous functions with significant growth in digital circuitry, things that may emerge from the aforementioned DARPA ACT program, atom sized graphene FET based circuitry, and other nanoscale devices. Finally with defense, there tends to be a focus on preventing infiltration of counterfeit parts, development of low cost radar techniques, refurbishment and filling available shipboard and aircraft equipment volume with upgrades, robotic devices doing retrofit of retired space satellites, advances in GaN and SiC amplifiers, Terahertz technology, and Disruptive Technology, which is tending to be replaced by the more accurate term *Disruptive Innovation*.

There are numerous emerging examples of coalescence of antenna and integrated circuit technology. Obviously, wireless communication devices will continue to incorporate improved miniature circuitry. Another example with close proximity integration is diagnostic electronic *pills* that can be passed through very small infrastructure passageways and also the human digestive system. Obviously the critical challenge with human tissue and fluids is wide-band impedance matching in a less than ideal permittivity environment.

If you would like to submit an article on any of these topics, or another of interest, please contact Tim Burkhard or myself with a title and a short abstract we can review for consideration.

Finally, I know many of you are amateur (ham) radio operators. It's certainly a great hobby and has been a catalyst in developing my RF/microwave interests from my early

teen years. Some say hams were the first "social networkers." We should not let this year pass without mentioning that it's the 75th anniversary of the Hiram Percy Memorial Station, W1AW, in Newington, Conn. If you ever get a chance to visit, it's well worth a couple hours. Even better: if you are licensed, and have a

copy in your possession, you can operate the station as a guest. Next year is the 100th anniversary of the ARRL—another good reason to visit.

