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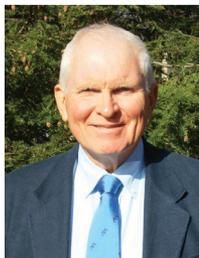
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Thinking Digitally?

Tom Perkins
Sr. Technical Editor



While I recently sat in my dentist's chair during a long procedure, he mentioned that his grandchildren "think digitally." Unfortunately, when your mouth is propped open, communication tends to be one-way, so I don't know exactly where he was going with his thought. By the time I could speak coherently, he was ready for his next patient and I could only offer, "see you in two weeks." By the time you read this, I might get an explanation about digital grandchildren

and then report back in a future issue. My dentist's comment reminded me of the reality that our communications techniques and almost everything associated with RF and microwaves are becoming digital.

This gives pause to consider where our technology will be in, say, 10 years. Communications has for the most part benefitted from the introduction of techniques such as Project 25 (P25), Terrestrial Trunked Radio (TETRA), Digital Mobile Radio (DMR), NXDN, etc. The benefits of HDTV digital television are obvious. Do any of you radio amateurs miss having analog TV signals on channel 2 (was 54 to 60 MHz) that could be used to indicate a sporadic-E six meter band (50-54 MHz) opening? I do, but I'm in a very small minority—and I digress.

Software-defined radios (SDRs) have robustly emerged in the last decade with constant improvements. The FCC has defined SDR technology for its commercial certification process in the following manner: "a radio that includes a transmitter in which the operating parameters of frequency range, modulation type or maximum output power (either radiated or conducted), or the circumstances under which the transmitter operates in accordance with Commission rules, can be altered by making a change in software without making any changes to hardware components that affect the radio frequency emissions."

Advances in Hardware

Hardware advances will certainly continue in areas such as adaptive and finite impulse response (FIR) filters that may exceed those imagined by George Matthaei, Leo Young and E.M.T. Jones when they published the 1,096-page book, *Microwave Filters, Impedance Matching Networks and Coupling Structures*, almost 50 years ago. I have had the past pleasure of meeting both Drs. Matthaei and Young. Jones seemed to disappear—but I digress again.

Digital Signal Processing (DSP) techniques will undoubtedly continue to improve as greater demand is placed on our finite spectrum. I/Q modulation schemes will be improved, as well as frequency stability and phase noise. The clever use of computers will relegate most technology of

the past century to collectors and museums. Occasional dichotomies or conundrums seem to exist, however. For example, aircraft continue to employ amplitude modulation (AM) for voice communications with air-control facilities. This is apparently to avoid “capture effect” which is common with frequency modulation (FM). Whereas two AM stations on the same frequency can be copied simultaneously, e.g., in an emergency situation. The use of traditional modes persists for various reasons, not least of which is the ability to interpolate or extrapolate information from a weak analog signal by the human ear/brain which can be a negative factor for digital communications, particularly when used in line-of-sight communications bands. The digital signal is either robust or present, or completely absent.

By now you have probably figured out that my editorial style seems to speak of exciting future technology, framed by my rich and exciting 40-plus years’ experience as a microwave engineer. This year I reached 55 years in ham radio, so I’ve consumed a steady diet of RLC and everything associated for a long time. It’s kind of interesting that nowadays almost everyone carries around some form of microwave radio.

In the New Year

January 2013 brings two events worth mentioning: the IEEE Radio and Wireless Symposium (RWS), January 20 – 23, in Austin, Tex., and DesignCon, January 29 – 30, in Santa Clara, Calif. Notable shows following include Microwave & RF, April 10 – 11 in Paris; and, of course, IMS 2013, set for June 2 - 7 in Seattle, Wash.

The year 2013 represents the 100th anniversary of the filing of two significant patents: *Wireless Receiving System* (regeneration) by

Edwin H. Armstrong; and *Selective Tuning System* (a form of push-button tuning) by E. F. W. Alexanderson—I guess digital isn’t really new!

Finally, on behalf of the *HFE* staff, I would like to wish all our readers, technical contributors,

Editorial Advisors, and advertisers a healthy and prosperous New Year.

Thank you for your continued readership and support.

HFE