The American Radio Relay League

The American Radio Relay League, Inc, is a noncommercial association of radio amateurs, organized for the promotion of interest in Amateur Radio communication and experimentation, for the establishment of networks to provide communications in the event of disasters or other emergencies, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

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"Of, by, and for the radio amateur," ARRL numbers within its ranks the vast majority of active amateurs in the nation and has a proud history of achievement as the standard-bearer in amateur affairs.

A *bona fide* interest in Amateur Radio is the only essential qualification of membership; an Amateur Radio license is not a prerequisite, although full voting membership is granted only to licensed amateurs in the US.

Membership inquiries and general correspondence should be addressed to the administrative headquarters:

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The purpose of *QEX* is to:

1) provide a medium for the exchange of ideas and information among Amateur Radio experimenters,

2) document advanced technical work in the Amateur Radio field, and

3) support efforts to advance the state of the Amateur Radio art.

All correspondence concerning *QEX* should be addressed to the American Radio Relay League, 225 Main St., Newington, CT 06111 USA. Envelopes containing manuscripts and letters for publication in *QEX* should be marked Editor, *QEX*.

Both theoretical and practical technical articles are welcomed. Manuscripts should be submitted in word-processor format, if possible. We can redraw any figures as long as their content is clear. Photos should be glossy, color or black-and-white prints of at least the size they are to appear in *QEX* or high-resolution digital images (300 dots per inch or higher at the printed size). Further information for authors can be found on the Web at **www.arrl.org/qex/** or by e-mail to **qex@arrl.org**.

Kazimierz "Kai" Siwiak, KE4PT

Perspectives

Another Mode for the Basic SDR System

The basic Software Defined Radio (SDR) System has been identified in *Wikipedia* and in this column as comprising some form of RF front end (a stable transceiver), followed by conversion between the analog and digital realms (such as by an audio sound card), along with a general purpose personal computer (PC). We emphasize that the *software defined* part of this basic radio system is the Amateur Radio communications software that operates on the PC, producing a wide range of communications protocols, or "waveforms" that are not native to the transceiver used as the RF front end. While modern SDR platform architectures do provide a transceiver function that continues to migrate the boundary between the analog and digital realms ever closer to the antenna — those SDR platforms still require, and benefit from, the PC-based waveforms and modes.

New modes or digital protocols continue to proliferate — now with the addition of FT4 (in beta testing as of this writing) to the *WSJT-X* suite. Your basic SDR System (or SDR platform plus PC) benefits once again, without the need of any additional piece of hardware. All of the magic happens in the software running on the PC. Our Amateur Radio communications capabilities have again grown without the need to change the basic hardware.

According to *WSJT-X* developers Joe Taylor, K1JT; Steve Franke, K9AN; and Bill Somerville, G4WJS; "FT4 is an experimental digital mode designed specifically for radio contesting... FT4 can work with signals 10 dB weaker than needed for RTTY, while using much less bandwidth." Watch these pages for additional modulation waveforms, and for further SDR System evolution.

In This Issue

We feature a range of topics in this issue of *QEX*.

John Westmoreland, AJ6BC, describes THEMIS, a GPS-disciplined oscillator.

Andy Przedpelski, KØABP, takes a different look at the phase locked loop.

Joseph Pingree, WB2TVB, shows how to design and print 3D components.

Tuck Choy, MØTCC, considers pi networks with and without inductor loss in this first of a two-part series.

Scott Roleson, KC7CJ, constructs a receiver step attenuator.

Writing for *QEX*

Keep the full-length *QEX* articles flowing in, or share a **Technical Note** of several hundred words in length plus a figure or two. Let us know that your submission is intended as a **Note**. *QEX* is edited by Kazimierz "Kai" Siwiak, KE4PT, (**ksiwiak@arrl.org**) and is published bimonthly. *QEX* is a forum for the free exchange of ideas among communications experimenters. The content is driven by you, the reader and prospective author. The subscription rate (6 issues per year) in the United States is $29. First Class delivery in the US is available at an annual rate of $40. For international subscribers, including those in Canada and Mexico, *QEX* can be delivered by airmail for $35 annually. Subscribe today at **www.arrl.org/qex**.

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Very best regards,

Kazimierz "Kai" Siwiak, KE4PT

Dr. Ulrich Rohde, N1UL, Wins 2019 IEEE CAS Industrial Pioneer Award

The Industrial Pioneer Award honors the individual(s) with exceptional and pioneering contributions in translating academic and industrial research results into improved industrial applications and/or commercial products. The award is given by IEEE Circuits and Systems Society and president Yong Lian extended his congratulations and looks forward to honoring Dr. Rohde at their flagship conference, ISCAS 2019.

The purpose of the annual IEEE Circuits & Systems Society Awards is to illuminate the accomplishments of CAS Society members and celebrate their dedication and contributions both within the field and to the CAS Society. Award recipients are nominated by their CASS peers in order to honor the service and contributions that further strengthen the CAS Society.