

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.



ARRL is an incorporated association without capital stock chartered under the laws of the state of Connecticut, and is an exempt organization under Section 501(c)(3) of the Internal Revenue Code of 1986. Its affairs are governed by a Board of Directors, whose voting members are elected every three years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial, and no one who could gain financially from the shaping of its affairs is eligible for membership on its Board.

"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 Street, 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.

Any opinions expressed in *QEX* are those of the authors, not necessarily those of the Editor or the League. While we strive to ensure all material is technically correct, authors are expected to defend their own assertions. Products mentioned are included for your information only; no endorsement is implied. Readers are cautioned to verify the availability of products before sending money to vendors.

Kazimierz "Kai" Siwiak, KE4PT

Perspectives

Time and Leaps in Technology

Earth experienced another equinox in September marking the onset of spring south of the equator and fall north of the equator. With it comes the semi-annual assault on our body clocks known as local summer time or local winter time. When I phone my daughter Dai, KE4QXL, in New Zealand from Florida, USA, I must take into account the local summer/winter times and their mini-jetlag effects on our lives. The local time-change boundaries don't transition on the same dates across political boundaries, so her local time is either 16, 17, or 18 hours ahead of my local time depending on the date of the year — additionally, the transition dates vary from year to year. It's confusing and would be a potential mess for logging ham contacts. Ah, but we hams and the airlines have that problem licked! We use Coordinated Universal Time (UTC). Even the GPS satellites apply relativistic corrections to stay in sync with UTC. Everyone logs the same time UTC everywhere in the world, and everything works out, right?

Not necessarily! Ham technology has leapt to the limits of time accuracy where even one second matters. Some Amateur Radio modes — like several digital modes in *WSJT-X* — rely on fractional-second coordination and accuracy of UTC in our local computers. Since 1972, UTC has implemented 27 leap seconds to align Earth time with the clockwork of the Universe. The latest adjustment was on 2016 December 31 when the www.time.gov clock read 23:59:60. These occasional leap seconds have been branded a potential hazard to navigation, but rest assured, your computer clock is safe this year; no such micro-jetlag moment is planned for the end of 2017.

In This Issue

Our *QEX* authors touch upon a wide variety of Amateur Radio topics. These are at the top of the queue.

James L. Tonne, W4ENE, discusses asymmetrical audio waveforms, the problems this creates, and ways of minimizing the asymmetry.

Raymond F. Gurney, KDØFYF, measures the signal strength of digital mode transmissions and proposes that this might be a useful tool for acquiring propagation data.

Peter DeNeef, AE7PD, shows that unusual antennas near ground require careful treatment to assess RF exposure safety compliance.

Joseph M. Haas, KEØFF, shows how and why relays can be operated significantly below their nominal rated voltage.

Stefan Scholl, DC9ST, describes a software defined radio that captures up to 100 MHz bandwidth, as well as direct sampling of the 70-cm band.

John Flood, K4DLX, measures the characteristic impedance of transmission lines using an antenna analyzer.

Keep the full-length *QEX* articles flowing in, but if a full length article is not your aspiration, share a brief **Technical Note** that is perhaps several hundred words long plus a figure or two. Expand on another author's work and add to the Amateur Radio *institutional memory* with your technical observation. Let us know that your submission is intended as a **Note**.

QEX is edited by Kazimierz "Kai" Siwiak, KE4PT, (kswiak@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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73,

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