

QEX (ISSN: 0886-8093) is published bimonthly in January, March, May, July, September, and November by the American Radio Relay League, 225 Main Street, Newington, CT 06111-1494. Periodicals postage paid at Hartford, CT and at additional mailing offices.

POSTMASTER: Send address changes to: QEX, 225 Main St, Newington, CT 06111-1494 Issue No 309

*Publisher*  
American Radio Relay League

Kazimierz "Kai" Siwiak, KE4PT  
*Editor*

Lori Weinberg, KB1EIB  
*Assistant Editor*

Zack Lau, W1VT  
Ray Mack, W5IFS  
*Contributing Editors*

**Production Department**

Steve Ford, WB8IMY  
*Publications Manager*  
Michelle Bloom, WB1ENT  
*Production Supervisor*  
Sue Fagan, KB1OKW  
*Graphic Design Supervisor*  
David Pingree, N1NAS  
*Senior Technical Illustrator*  
Brian Washing  
*Technical Illustrator*

**Advertising Information Contact:**

Janet L. Rocco, W1JLR  
*Business Services*  
860-594-0203 – Direct  
800-243-7768 – ARRL  
860-594-4285 – Fax

**Circulation Department**

Cathy Stepina, QEX Circulation

**Offices**

225 Main St, Newington, CT 06111-1494 USA  
Telephone: 860-594-0200  
Fax: 860-594-0259 (24 hour direct line)  
e-mail: [qex@arrl.org](mailto:qex@arrl.org)

**Subscription rate for 6 issues:**

In the US: \$29;  
US by First Class Mail: \$40;  
International and Canada by Airmail: \$35

Members are asked to include their membership control number or a label from their QST when applying.

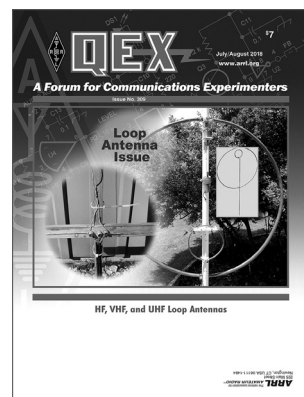
In order to ensure prompt delivery, we ask that you periodically check the address information on your mailing label. If you find any inaccuracies, please contact the Circulation Department immediately. Thank you for your assistance.



Copyright © 2018 by the American Radio Relay League Inc. For permission to quote or reprint material from QEX or any ARRL publication, send a written request including the issue date (or book title), article, page numbers and a description of where you intend to use the reprinted material. Send the request to the office of the Publications Manager ([permission@arrl.org](mailto:permission@arrl.org)).

**About the Cover**

This theme issue of QEX features loop antenna articles from several authors who investigate the patterns and efficiency of both the small HF gap-resonated loops, and full-wavelength loops for VHF and UHF. Authors explain the importance of the current variation and Q-factor of small loops; use of a Smith chart for easily matching and tuning; how coupling to earth ground affects the impedance, pattern, gain, and RF exposure compliance distance; and the effects of various loop shapes and stacks of loops having one-wavelength perimeter elements.



**In This Issue**

## Features

- 2 Perspectives**  
Kazimierz "Kai" Siwiak, KE4PT
- 3 Small Transmitting Loops: a Different Perspective on Tuning and Determining Q and Efficiency**  
Milton E. Cram, W8NUE
- 9 Effects Due to Ground For Small Transmitting Loop Antennas**  
Peter DeNeef, AE7PD
- 12 Small Gap-resonated HF Loop Antenna Fed by a Secondary Loop**  
Kai Siwiak, KE4PT and Richard Quick, W4RQ
- 18 Adapt Your Equipment to Operate at Millimeter Waves up to 32 GHz**  
Euclides Lourenço Chuma, PY2EAJ
- 22 An Arduino-based DDS for the Heathkit SB-104 Transceiver**  
Tom Sowden, W6KAN
- 26 Conductivity of Trees at HF**  
Rudy Severns, N6LF
- 28 Satellite Distance and Velocity**  
Andrzej (Andy) Przedpelski, KØABP
- 31 Some Additional Geometrics for Loop Antennas**  
John Stanley, K4ERO
- 37 PiGate Emergency E-mail System**  
Mark Griffith, KDØQYN
- 40 Tech Notes**
- 42 Letters**
- 43 Upcoming Conferences**

**Index of Advertisers**

ARRL.....44, Cover III  
DX Engineering: .....25  
Kenwood Communications: .....Cover II

SteppIR Communication Systems..... Cover IV  
Tucson Amateur Packet Radio: .....21