

QEX

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 236

Harold Kramer, WJ1B
Publisher

Doug Smith, KF6DX
Editor

Larry Wolfgang, WR1B
Managing Editor

Lori Weinberg, KB1EIB
Assistant Editor

L. B. Cebik, W4RNL
Zack Lau, W1VT
Ray Mack, WD5IFS
Contributing Editors

Production Department

Steve Ford, WB8IMY
Publications Manager

Michelle Bloom, WB1ENT
Production Supervisor

Sue Fagan
Graphic Design Supervisor

Devon Neal
Technical Illustrator

Joe Shea
Production Assistant

Advertising Information Contact:

Janet L. Rocco, W1JLR
Business Services Manager
860-594-0203 direct
860-594-0200 ARRL
860-594-0303 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

Subscription rate for 6 issues:

In the US: ARRL Member \$24,
nonmember \$36;

US by First Class Mail:
ARRL member \$37, nonmember \$49;

Elsewhere by Surface Mail (4-8 week delivery):
ARRL member \$31, nonmember \$43;

Canada by Airmail: ARRL member \$40,
nonmember \$52;

Elsewhere by Airmail: ARRL member \$59,
nonmember \$71.

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 ©2006 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)



About the Cover

Craig Johnson, AA0ZZ, describes a high-performance direct digital synthesized VFO. His project uses dual PICs and a two-line LCD. Dual VFO operation supports split-frequency operation.



Features

3 CW Shaping in DSP Software

By Alex Shovkoplyas, VE3NEA

8 The IQPro: A High-Performance Quadrature DDS VFO

By Craig Johnson, AA0ZZ

23 Dual Directional Wattmeters

By Eric von Valtier, K8LV

34 Low-Profile Helix Feed for Phase 3E Satellites: System Simulation and Measurements

By Paolo Antoniazzi, IW2ACD and Marco Arecco, IK2WAQ

40 A Talking Logbook with Rig Control

By Steve Gradijan, WB5KIA

45 Uniform Current Loop Radiators

By Robert K. Zimmerman, Jr, NP4B

Columns

49 Tech Notes

By William Rynone, PhD, PE

60 Letters

62 Next Issue in QEX

53 Upcoming Conferences

54 Antenna Options

By L. B. Cebik W4RNL

May/June 2006 QEX Advertising Index

American Radio Relay League: Cov II,
62, Cov III, Cov IV
ARA West: 63
Atomic Time: 48
Down East Microwave, Inc.: 33
Elkins Marine Training International: 63
Expanded Spectrum Systems: 63

jwm Engineering: 7
National RF: 64
Nemal Electronics International, Inc.: 64
RF Parts: 63
Teri Software: 64
Timewave Tech: 64
Tucson Amateur Packet Radio Corp.: 22