

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 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.

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.

Bill Liles, NQ6Z, and Ward Silver, N0AX

Perspectives

This issue spans two axes of material; theory/practice and past/present. In the theory/practice arena, we'll start with W7SX's detailed theoretical treatment of radiation resistance. Where does it come from? How does it relate to feed point resistance? What does it really mean? To really understand antennas, there is hardly another more important concept.

On the side of practice, we find a very buildable WSPR beacon transmitter by VU3CER/WQ6W and K1TE/WB2TEV. Common and inexpensive MOSFETs, usually applied for switching low-frequency or dc current, with a high-speed gate driver IC to form a wideband RF amplifier. Several different types of low-cost microcontrollers can be used to control the single-chip RF signal generator to the tight tolerances of the WSPR protocol.

Examining past and present, we have a pair of articles featuring lab-quality test equipment. Back in the day, equipment of the type in DJ5FN's article on calibrating noise sources was expensive and rarely found on the amateur radio workbench. Today's equipment is typified by the pocket-sized Vector Network Analyzer (VNA) described in KL7AJ's monthly essay. Inexpensive and available world-wide, it's mind-boggling to see how much power is available to almost every ham.

In This Issue:

- Dhiru Kholia, VU3CER/WQ6W, and Bradshaw Lupton, Jr., K1TE/WB2TEV, describe an open-source, cost-effective, rugged, variable-power 5W WSPR beacon transmitter design for 160 through 6 meters.
- Heinz Schmiedel, DJ5FN, discusses how to calibrate ENR noise sources at home with modest ham equipment.
- Robert J. Zavrel, W7SX, develops an accurate definition and resulting equations to make accurate derivation possible to calculate antenna radiation resistance.
- In his essay series, Eric Nichols, KL7AJ, discusses how the affordable VNA has given many hams a new look at the radio universe.

Writing for QEX

QEX is a forum for the free exchange of ideas among communications experimenters. *QEX* is published bimonthly.

Please send full-length *QEX* manuscripts, or share a Technical Note of several hundred words in length plus a figure or two, to qex@arrl.org. We pay \$50 per published page for full articles and *QEX* Technical Notes. Get more information and an Author Guide at www.arrl.org/qex-author-guide. If you prefer postal mail, send a business-size self-addressed, stamped (US postage) envelope to: *QEX* Author Guide, c/o Maty Weinberg, ARRL, 225 Main St., Newington, CT 06111.