

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:

ARRL
225 Main St.
Newington, CT 06111 USA
Telephone: 860-594-0200
FAX: 860-594-0259 (24-hour direct line)

Officers

President: Rick Roderick, K5UR
P.O. Box 1463, Little Rock, AR 72203

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.

Kazimierz "Kai" Siwiak, KE4PT

Perspectives

Progress in Technology

On a hot July day in the southwestern USA desert a mother ship launched a manned rocket plane that flew higher than 50 miles – the "edge of space." The year was 1962 when Robert M. White flew to a height of 59.6 miles in an X-15 rocket powered aircraft. The mother ship, a USAF B-52 aircraft, launched twelve flights that exceeded an altitude of 50-miles. This includes two missions that exceeded the 62-mile (100 km) high Kármán boundary between Earth's atmosphere and outer space. In July of 2021 the 50-mile altitude mark was breached by a commercial Virgin Galactic passenger-carrying rocket-powered aircraft launched from a purpose-built mother ship. This was followed on July 20 — the 52nd anniversary of the first manned Moon landing — by a passenger-carrying Blue Origin sub-orbital rocket flight, à la NASA's Alan B. Shepard flight, which exceeded the Kármán altitude boundary.

It took just six decades of technological progress to go from the X-15 rocket plane research project, and from NASA's first sub-orbital manned rocket flight, to the onset of space tourism by two different methods. *QEX* salutes and congratulates the technologists and visionaries involved.

In This Issue

- Tom Alldread, VA7TA, designs a small RF step attenuator that is accurate over a wide frequency range.
- Luiz Duarte Lopes, CT1EOJ, graphically solves a matching network using drafting implements.
- Eric Nichols, KL7AJ, in his Essay Series, organizes the use of Kirchhoff's laws.
- Steve Stearns, K6OIK, explains a paradox where the additional transmission line loss due to SWR can be negative in dB.
- Lynn Hansen, KU7Q, describes the CTR2 HMI for managing radios in your shack.
- Maynard Wright, W6PAP, shows that SWR can depend on amplifier output impedance.

Writing for *QEX*

Please continue to send in full-length *QEX* articles, or share a **Technical Note** of several hundred words in length plus a figure or two. *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. All members can access digital editions of all four ARRL magazines: *QST*, *On the Air*, *QEX*, and *NCJ* as a member benefit. The *QEX printed edition* is available at an annual subscription rate (6 issues per year) for members and non-members, see www.arrl.org/qex.

Would you like to write for *QEX*? 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.

Very kindest regards,
Kazimierz "Kai" Siwiak, KE4PT
QEX Editor