



THE AERO AERIAL

THE NEWSLETTER OF THE AERO AMATEUR RADIO CLUB

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Photos in this issue by Harry Rundall, AC3EK

Ham News

Aero Club Holiday Party

On January 7, the Aero Club held its annual holiday party at Pizza John's in Essex, MD. See pages 5 and 6 for photos from the event, courtesy of Harry Rundall, AC3EK.

Did you pay your annual club dues yet?

If you haven't paid your annual club dues yet for 2026, please contact Joe Miko, WB3FMT.

The amount is \$24 for one person, \$2 for each additional person living in the same household.

Meetings

FEBRUARY
4 AND 18

Events

Winterfest 2026

Date: 3/15/2026

Location: Vienna, VA

Sponsor: Vienna Wireless Society

FredFest 2026

Date: 3/21/2026

Location: Frederick, MD

Sponsor: Frederick ARC

Delmarva Amateur Radio & Electronics Expo, ARRL DE State Convention

Date: 4/18/2026

Location: Georgetown, DE

Sponsor: Sussex Amateur Radio Association

York Hamfest

Date: 4/25/2026

Location: Glen Rock, PA

Sponsor: Penn-Mar ARC & Hilltop Transmitting Assoc

Odenton Spring Hamfest

Date: 4/26/2026

Location: Odenton, MD

Sponsor: Maryland Mobile's Amateur Radio Club

More Ham News

New 60-Meter Frequencies Available as of February 13

From ARRL

The new 60-meter frequencies approved by the FCC in December will become available to amateurs as of February 13, 2026, along with new power restrictions on those frequencies. [Read more](#)

FCC Poised to Exempt Amateurs From Foreign Adversary Reporting Requirements

From ARRL

At the urging of ARRL, the FCC is expected to exempt radio amateurs from foreign adversary reporting requirements. [Read more](#)

52-Week Ham Radio Challenge - 2026

From Fabian Kurz, DJ5CW and Phillip Kessels, DL9PK

This is meant to inspire you to extend your horizon in Amateur Radio. [Accept the challenge](#)

Hamvention 2026 Theme and Logo

From 2026 Hamvention Team

theme for Hamvention 2026 is "Radio Adventure!" because great adventures often lead to astonishing stories. [Take a look](#)

Helpful Links

From Harry Rundall, AC3EK

The leading page for DX news and special activities around the globe. <https://www.dx-world.net>

News and information about the Sun-Earth environment that can impact ham radio. <https://spaceweather.com>

More Events

Baltimore Amateur Radio Club Father's Day Hamfest/Expo

Date: 6/21/2026

Location: Upper, MD

Sponsor: Baltimore Amateur Radio Club BARC

CARA Fest 2026

Date: 10/3/2026

Location: West Friendship, MD

Sponsor: Columbia Amateur Radio Association

SKYWARN, ARES, RACES

SKYWARN® is a national network of volunteer severe weather spotters. The spotters are trained by local National Weather Service Forecast Offices on how to spot severe thunderstorms, tornadoes, hail and flooding. In some parts of the country, spotters also report snowfall and ice accumulation.

To learn more about SKYWARN® and how to become a spotter, [click here](#).

Harford County ARES/RACES Group meets at the Harford County Emergency Operations Center in Forest Hill, MD, the first Thursday of each month, 7:00-9:00 p.m. Let them know in advance if you would like to attend, via email to Steven Fook (K2EJ), Harford County Emergency Coordinator.

To learn more about Amateur Radio Emergency Service (ARES) and Radio Amateur Civil Emergency Service (RACES), [click here](#).

Training

SKYWARN® Classes

Basics, February 12, 6-8 pm, [Fairfax, VA](#)

Basics, February 17, 6-8 pm, [Marriottsville, MD](#)

Flood, February 17, 6-8 pm, [Harrisonburg, VA](#)

Basics, February 24, 7-9 pm, [Stafford, VA](#)

Basics, March 4, 6-8 pm, [Lovingson, VA](#)

Basics, March 18, 6-8 pm, [Charles Town, WV](#)

Basics, May 6, 6-8 pm, [Alexandria, VA](#)

In case you missed it,



check out the January issue.



Radio License Exams

The Aero Amateur Radio Club sponsors Amateur Radio License Exams with the ARRL VEC. Examination sessions are offered throughout the year (dates TBD). Visit our new licensing page to prepare:

<https://w3pga.net/getting-your-license/>

W3PGA Exam Location

TBD

Contact

Patricia Stone, AC3F
 email: ac3f@juno.com
 landline: 410-687-7209

VE Corner

Pat Stone, AC3F

Next testing for Aero Club TBD.

ExamTools ExamTools Portal

Volunteer examiners (VEs), please register at the the ExamTools website. Click "Assist with or Manage Exams" and follow the prompts. In addition to a valid email, you will need to upload a PDF copy, stamped "official", of your license to their site for verification. Website:

<https://exam.tools/>

Other Maryland Test Sites

Confirm in Advance

2/3/26, 5:45 pm: [Severna Park](#), register or call ahead

2/7/26, 2:30 pm: [Catonsville](#), walk-ins allowed

2/21/26, 9:00 am: [Laurel](#), walk-ins allowed

2/28/26, 8:45 am: [Forest Hill](#), walk-ins allowed

3/3/26, 5:45 pm: [Severna Park](#), register or call ahead

3/7/26, 2:30 pm: [Catonsville](#), walk-ins allowed

3/21/26, 9:00 am: [Laurel](#), walk-ins allowed

4/4/26, 8:45 am: [Forest Hill](#), walk-ins allowed

4/11/26, 2:30 pm: [Catonsville](#), walk-ins allowed

4/18/26, 9:00 am: [Laurel](#), walk-ins allowed

5/2/26, 2:30 pm: [Catonsville](#), walk-ins allowed

5/16/26, 9:00 am: [Laurel](#), walk-ins allowed

6/6/26, 2:30 pm: [Catonsville](#), walk-ins allowed

The Aero Club's Annual Holiday Party at Pizza John's 1/7/26





Thanks, Harry Rundall, AC3EK, for capturing the memories!



Margie Bourgoin, W1MRG, events@arrl.org; www.arrl.org/special-event-stations

Special Event Stations

Working special event stations is an enjoyable way to help commemorate history. Many provide a special QSL card or certificate!

Feb. 14, 1700Z – 2300Z, AB5ER, Romance, AR. North Central Arkansas Amateur Radio Service. **Valentine's Day Special Event**. 14.260. Certificate. Roger Gray, North Central Arkansas Amateur Radio Service, P.O. Box 166, Searcy, AR 72145-0166. www.ncaars.org

Feb. 14 – Feb. 16, 1600Z – 2300Z, W0JH, Stillwater, MN. Stillwater (MN) Amateur Radio Association (SARA). **Ice Station W0JH — Frozen Minnesota Lake Portable**. 3.860 7.260 14.260 21.360. Certificate. Shel Mann, 1618 Pine St. W., Stillwater, MN 55082. www.radioham.org

Feb. 14 – Feb. 22, 0000Z – 2359Z, W7P, Flagstaff, AZ. Northern Arizona DX Association. **6th Annual Pluto Discovery Anniversary S.E.** 7.266 14.266 21.366 28.366. Certificate & QSL. W7P — Pluto Special Event, 6315 Townsend Winona Rd., Flagstaff, AZ 86004. www.nadxa.com

Feb. 21, 1300Z – 2100Z, K3S, Odenton, MD. Nuclear Ship *Savannah* Amateur Radio Club. **War Shipping Administration Created 1942**. 7, 14, 21, 28. QSL. Ullis Fleming, 980 Patuxent Rd., Odenton, MD 21113. www.qrz.com/db/k3s

Feb. 23 – Apr. 21, 0000Z – 2359Z, WA5DTK, Montgomery, TX. Republic of Texas SES History Operators Club. **Republic of Texas SES**. 7.030 7.230 14.040 14.260. QSL. Barry Brewer, 10519 Bilsing Ct., Montgomery, TX 77356.

Feb. 25, 1500Z – 2359Z, W7ASL, Mesa, AZ. Sunlife Amateur Radio Club. **Annual Snowbird Field Day**. 14.329 21.329 28.329 50.329. QSL. Tom Goforth, 4324 E. Dagoon Cir., Mesa, AZ 85206. www.sunlifearc.org

Feb. 28, 0000Z – 2359Z, N4R, Sparta, TN. KR4EE. **2026 Rare Disease Day Special Event**. 14.070 14.080 21.074 28.074. QSL. Jill Dybka, 7737 Sparta Hwy., Sparta, TN 38583. KR4EE@arrl.net

Feb. 28, 1400Z – 2200Z, W0EBB, Leavenworth, KS. Kickapoo QRP Amateur Radio Club. **Freeze Your Keys — 22nd Winter Operating Event**. CW: 7.035 14.058; SSB: 7.240 14.325. QSL. Gary Auchard, 34058 167th St., Leavenworth, KS 66048. *Please send a SASE with your QSL card. Other bands will be used also if open.* w0mna74@gmail.com

Certificates and QSL cards: To obtain a certificate from any of the special event stations offering them, send your QSO information along with a 9 × 12-inch self-addressed, stamped envelope (3 units of postage) to the address listed in the announcement. To receive a special event QSL card (when offered), be sure to include a self-addressed, stamped business envelope along with your QSL card and QSO information.

Special Events Announcements: For items to be listed in this column, use the ARRL Special Events Listing Form at www.arrl.org/special-events-application, or email information to events@arrl.org.

Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; a special event listing for **May QST** would have to be received by **March 1**. In addition to being listed in *QST*, your event will be listed on the ARRL Web Special Event page. Note: All received events are acknowledged. If you do not receive an acknowledgment within a few days, please contact us. ARRL reserves the right to exclude events of a commercial or political nature.

You can view all received Special Events at www.arrl.org/special-event-stations.



ARRL Year of the Club

We're celebrating the 100th anniversary of ARRL's Field Organization by focusing on clubs throughout 2026.



Mike Walters, W8ZY ARRL Field Services Manager

It's been 100 years since ARRL's Field Organization was developed. This is a major milestone for the volunteer-based administrative and operational structure of the League, which allows ARRL programs and activities to be managed at local levels throughout the US and its territories. One of the major contributors to this local-level management is the ham radio club. That's why we're celebrating this landmark year by declaring it the Year of the Club.

Honoring Community Contributions

ARRL Affiliated Clubs (www.arrl.org/affiliated-club-resources) have been a major part of the growth and development of ARRL and its Field Organization over the years, with the oldest Affiliated Club — Dallas Amateur Radio Club, W5FC — being affiliated since 1919. It leads the list of more than 2,800 ARRL Affiliated Clubs across the country, with more joining each month.

Local clubs are holding licensing classes, performing Volunteer Examiner sessions, supporting community events like races and fairs, and providing emergency communications on a regular basis. They also frequently work with schools to give young students the opportunity to talk with astronauts aboard the International Space Station or to launch a pico balloon that can be tracked across the country or around the globe. Radio clubs are often the first introduction to the hobby



Members of the Providence Radio Association, W1OP, visited W1AW on December 9, 2021, to celebrate 100 years of ARRL affiliation. [Mike Walters, W8ZY, photo]

that a new ham receives, and they're the face of ham radio for the public, community officials, and emergency agencies.

In addition to recognizing community contributions, the Year of the Club honors club diversity — contest clubs get together and operate on-air contests, repeater clubs operate and maintain local repeaters, some clubs are formed to bring together DX operators as they strive to get elusive contacts, EmComm clubs work with local emergency services in times of need, school clubs allow students and teachers to learn about the many aspects of STEM through wireless communication, and general interest clubs may represent many aspects of the hobby.

It's important to note that clubs, like the rest of the ARRL Field Organization, are made up of volunteers who give their time, experience, and often money to make a club successful. These clubs and the many ham radio volunteers (without whom we would not have the diverse hobby that we have today) deserve to be celebrated. No matter their size, all clubs share the same vital fundamentals — they care about ham radio and their communities, and they want to see the hobby continue to grow.

Ongoing Celebrations

As a part of the Year of the Club festivities, we've initiated contests for club newsletters (www.arrl.org/news/arrl-year-of-the-club-newsletter-contest-call-for-submissions) and club websites (www.arrl.org/news/arrl-year-of-the-club-website-contest-call-for-submissions) and will be holding on-air club-focused events. Also, a new Worked All States award is available for 2026 — W1AW will travel to all 50 United States, and you'll be able to hear "W1AW/" from a different location on the air nearly every week of the year!

Follow the activities on the Year of the Club website at www.arrl.org/year-of-the-club. As more information and activities are announced, links will be posted there. Be on the lookout for related stories in *ARRL Club News* (www.arrl.org/club-news) and *The ARRL Letter* (www.arrl.org/arrlletter), as well as on the ARRL website at www.arrl.org.



Club Spotlight

W4GR



Gwinnett Amateur Radio Society

Founded: 1973	ARRL Affiliation Date: Sept. 11, 1982
Voting Licensed Amateur Members: 292	Meetings: Monthly
Members: 357	Website: www.gars.org/gars
Section: Georgia	Focus: Education, Public Svc., Community

A History of Service and Recognition

For more than half a century, the Gwinnett Amateur Radio Society (GARS) has been a pillar of amateur radio activity in Georgia. With a mission built on education, public service, and community, GARS has grown into one of the largest and most active clubs in the state — welcoming new hams, supporting schools, advancing emergency communications, and continuing to expand what a modern amateur radio club should be.

GARS became an ARRL Special Service Club in 1992, passed the 100-member mark the following year, and established regular VE sessions in 1994. By 2014, the group received national recognition as Dayton Hamvention Club of the Year, and membership topped 300 by 2018. GARS received the honor of Georgia Club of the Year at the 2022 Atlanta Hamfest and, in 2023, celebrated its 50th anniversary.

Growth, Innovation, and Education

Community involvement remains

a defining trait for this club. One of its earliest achievements was the construction of a homebrew repeater installed at Buford Hospital, a project that set the tone for GARS's collaborative and technically inventive nature.

GARS also supports the annual Memorial Day parade held in Dacula, Georgia; provides communications for a local dog show; and assists ARES and local agencies with emergency readiness and infrastructure. Members volunteer for the Stone Mountain Hamfest, and one of the club's most anticipated events each year is GARS TechFest, which is a free, hands-on exposition now entering its 27th year. TechFest features demonstrations, forums, vendor booths, exams, a chili cook-off, and groups ranging from AUXCOMM to digital mode enthusiasts. The event embodies what GARS does best: creating an atmosphere where learning, experimenting, and welcoming new people happens naturally.

The GARS licensing and education program is impressive. The club

hosts 12 monthly exam sessions, HamCram weekends, TechFest examinations, on-demand test sessions, and VE teams that bring testing directly into local schools. Anyone age 21 or under is granted free membership as part of GARS's commitment to youth outreach and STEM engagement. GARS also gives all newly licensed hams their first year of GARS membership for free, regardless of age.

They also actively collaborate with schools to establish amateur radio clubs, support ARISS student contacts with the ISS, and organize mini Field Days and foxhunts. Monthly meetings feature dual-track programming geared toward both newcomers and experienced hams. Mentorship also happens informally through weekly Friday lunches, Saturday breakfasts, and active online communities on groups.io, Discord, Facebook, and YouTube. The club newsletter, "GARzette," helps everyone stay connected.

The Future of GARS

The club continues to innovate. GARS is developing a topic-based net to encourage repeater activity, planning more social outings, hosting local contests, improving repeaters, and working toward an ambitious long-term goal: interconnecting its entire repeater network for expanded coverage and more operating flexibility.

When asked what keeps GARS thriving after 50 years, members point to one core idea — the club listens. Surveys, feedback, and open communication shape club development, creating a culture where members feel valued and involved. It's a model built not just on radios, but on people.

Ask Dave

Get more information from the “QST: Ask Dave” YouTube playlist at <https://bit.ly/3z2MBMI>.

Cables, Fading Signals, and Great Circles

Pushing Window Line Through Walls

Q Mark Ihde, K7SFA, asks: I want to switch from a coax-fed resonant HF wire antenna to a non-resonant parallel feed-line wire antenna. I would like to use the same $\frac{3}{4}$ -inch entry hole in the side of the house that my RG-213 cable uses. A $300\ \Omega$ twinlead will fit in the hole, but $450\ \Omega$ window line will not. Can I run a roughly 8-inch section of $300\ \Omega$ twinlead feed line through the hole and connect it to $450\ \Omega$ window line on each side of the wall? Obviously, this is physically possible, but will it work? What will it do to the overall characteristic impedance of the feed line?

A The best answer would be to forego the twinlead and run the RG-213 coax you already have through the wall, connect it to the low-impedance side of a 9:1 balun, and then use window line from the balun to your antenna. This has three virtues. First, it avoids an impedance bump in the feed line, which can cause minor issues with your standing wave ratio. Second, it keeps the window line out of your shack, where it can cause interference (ask me how I know). Third, you can run the coax to a lightning arrestor, then put the 9:1 balun in place and run the window line to your antenna.

Alternatively, if your tuner has the requisite balanced feed-line output, you can squeeze the window line through the hole, or you can slightly enlarge the hole to allow the window line through — again, not bothering with the $300\ \Omega$ twinlead. The window line’s impedance is slightly affected by stucco, because stucco is typically held to the wall by a net of metal lath. If you have wood siding, like me, then you shouldn’t have a problem.

And, if neither of these appeals to you, then you can instead do as you originally suggested and bridge the window line using the $300\ \Omega$ twinlead. This approach will create an impedance bump, but it will likely still tune.

You can experiment with different methods and decide which way you want to go. I’m a big fan of proper lightning mitigation, so I recommend running the RG-213 to a lightning arrestor properly attached to a ground rod, then running a short piece of coax to the 9:1 balun and using the window line from there to your antenna.

Ionospheric Fading

Q Doug Yarnold, N4CQD, asks: I do lots of HF operating from my truck with my Yaesu FT-891 and my mobile antenna, a Yaesu ATAS. I’ve found DXing difficult lately due to signals fading in and out. What causes this?

A The upper regions of the atmosphere are subject to intense bombardment by the sun’s radiation. Ultraviolet and X-rays cause the atoms in the high upper atmosphere to shed electrons, creating a plasma we call the ionosphere. Eventually, the free electrons recombine with the positively charged ions; however, while they are free, the charged particles — the negatively charged electrons and the positively charged ions left behind — will interact strongly with the Earth’s magnetic field. The charged particles take strange paths, creating huge currents. This further interacts back and forth with the magnetic field. When radio waves pass through these regions, some power is refracted back toward the Earth. This is what gives us a radio “path” to and from DX stations.

Further, the ionosphere is not uniform. The bottom undulates like waves on a pond. This means that your signal could be refracted in such a way as to fade in and out, or, more likely, the non-uniform ionosphere refracts the signal multiple ways, creating multiple paths that converge at the listening antenna, sometimes constructively (the multiple signals are in phase and thus add to each other) and sometimes destructively (the signals are out of phase and thus cancel each other).

If you watch your S-meter while listening to a DX station, you may see that the signal strength goes up and down. Normally this doesn’t affect the audio quality, because the radio’s automatic gain control keeps what you hear at a constant level. In many cases, the signal is strong for the entire exchange with the DX station; however, if the signal is weak to begin with, the signal strength can vary such that it descends below your receiver’s noise floor at times, causing dropouts.

Also, sometimes a strong signal at the start of a contact will be affected by the sun’s movement over

time. Under certain conditions, the signal will start dropping out and then rapidly coming back, sometimes causing every other word to drop out. This is a sure sign the band is closing and it's time to wrap up the contact and look for other stations with better signals.

Numerous factors affect the signal-carrying capacity of the ionosphere; these nether regions of the atmosphere are the subject of continuing research. Sometimes a signal that's fading at your location is strong at a location several hundred feet away at the same instant. It is possible to have receiving antennas at several locations and electronically look for the best signal, a technique known as *diversity reception*.

Normally, signals refracted by the ionosphere are circularly polarized, but this can be "squashed" as they reach Earth, giving way to another possible diversity mode: *polarization diversity*. You see this when a horizontal antenna and a vertical antenna fade out differently from each other. If your rig has the capability to receive two signals at once, or if you have another receiver handy, you can connect a horizontal antenna to one and a vertical to the other. As the signal fades on one antenna, it might strengthen in the other. It's worth a try!

DX and Great Circles

Q Walt Grosch, KZ9F, asks: This has perplexed me for a long time. I live in Wisconsin and just worked a station in the Central African Republic. According to QRZ and my Heathkit rotor control, I have to aim my beam antenna 75 degrees east of north. Why do I have to beam northeast for a station that is southeast of me?

A All of us are used to looking at flat world maps, but in reality, Earth is a sphere (technically an oblate spheroid). The shortest distance between any two points on Earth lies on a "great circle" wrapped around the globe that includes those two points. Figure 1A demonstrates the shortest distance between Wisconsin and the Central African Republic on a globe; Figure 1B zooms in on Wisconsin and shows that, in order to hit the Central African Republic, your signal should leave your location traveling about 15 degrees north of east, or 75 degrees east of north.

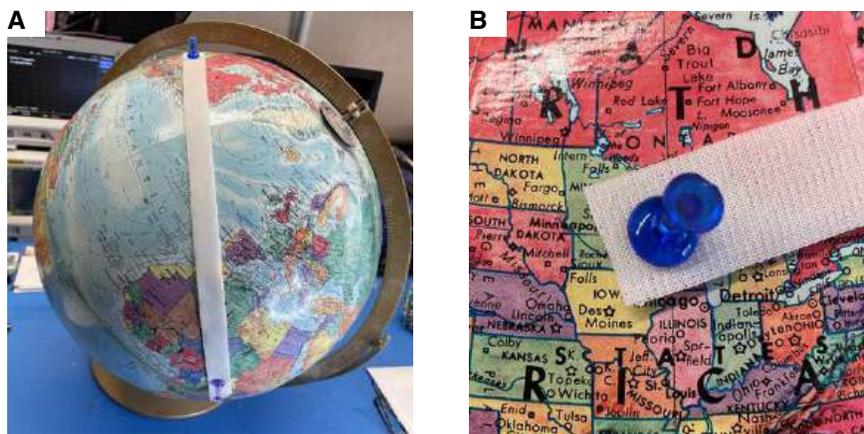


Figure 1 — The white tape (A) shows the shortest route between Wisconsin and the Central African Republic on a globe. The route is part of a great circle. Zooming in on Wisconsin (B), the great circle route to the Central African Republic takes off toward the northeast. This is the direction you should point your beam antenna. [Dave Casler, KEØOG, photos]

Tom Epperly, NS6T, operates a free website (<https://ns6t.net>) that will draw an azimuthal projection map centered on your location that you can download and print. It shows the great circle direction from you to any location on Earth. I've used one for years and highly recommend it.

Note that the radio signal leaving Wisconsin and traveling to the Central African Republic may not follow a perfectly straight line, as the ionosphere is not perfectly smooth. Despite this, a great circle is still the best estimate of where to point your beam.

Send your questions to askdave@arrl.org. I answer some questions here, and some via videos on my YouTube channel (www.youtube.com/davecasler), or during my weekly livestream on Thursdays at 6:45 to 8:15 PM Mountain Time on my channel.

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Understanding the FCC Exposure Rules for Handheld Radios

By extrapolating from the SAR exposure limits of commercial radios, hams can adjust their operations to keep RF exposure in line with regulations.

Gregory Lapin, PhD, PE, N9GL

Much effort has gone into helping amateurs determine safe exposure distances for HF radios. Along with myriad tools and information, an easy-to-use calculator is available on the ARRL website (www.arrl.org/rf-exposure-calculator). However, determining RF exposure from handheld radios presents a different challenge that is less easily addressed.

Under FCC regulations, any exposure from a source between 100 kHz and 6 GHz that is less than 20 centimeters — about 8 inches — from any part of the body must comply with localized specific absorption rate (SAR) limits (see Figure 1). SAR is the truest measure of RF exposure, corresponding to the rate of energy absorption in human tissue. Other methods of determining exposure are estimates and are usually expressed as incident RF power density or, for lower frequencies, as incident electric and magnetic field strengths. Although determining human internal exposure from incident fields is less accurate, it is a more practical prediction method, as field strength is relatively easy to measure and more easily modeled. SAR, by contrast, is extremely difficult to measure or model.



Figure 1 — Most amateur radio operators hold their handheld transceivers about 2 – 4 inches in front of their mouths for best transmission clarity; however, per FCC regulations, any RF exposure from a source between 100 kHz and 6 GHz that is less than approximately 8 inches from any part of the body must comply with localized SAR limits.

How Is SAR Tested?

The most common method for measuring SAR involves a probe making measurements in every 1 gram of tissue (a cube that is approximately 1 centimeter on each side). Of course, inserting probes into human beings is not practical, so SAR measurements are typically made in “phantoms” made of materials that mimic the electromagnetic properties of tissue. Computer modeling of SAR is possible but highly complex, as the model must account for the electromagnetic properties and spatial distribution of all types of tissue found in the body. Manufacturers whose products require FCC certification spend a lot of money testing SAR, and given the expense and complexity, this testing is not feasible for the radio amateur.

In the US, cell phones and commercial handheld radios are tested for SAR, but amateur radio transmitters, with the exception of certain commercially manufactured external power amplifiers, are not included in these requirements. Testing is intended to confirm that the transmitter conforms with FCC regulations for power output, spurious emissions, and human exposure; however, amateur radio operators have the right to use modified equipment, which would annul any certification. For instance, when you buy an amateur handheld radio, you can easily change the antenna, which is likely to change the parameters of exposure. As a result, the FCC determined that transmitters intended for radio amateurs do not need certification, but they are still required to comply with all FCC regulations, including RF exposure to the licensed operators and the people around them.

So, if amateur handheld radios aren’t being tested for SAR, how is an amateur supposed to conform with the exposure regulations? Ric Tell, K5UJU, had the idea to compare commercial handheld radios, for which SAR testing is required, with similar amateur radio handhelds. This is a reasonable approximation — manufacturers are unlikely to design entirely new radios for amateurs but rather make small modifications to their designs for use in the commercial space and in the amateur radio spectrum. In a study of the FCC certification database, Ric characterized commercial radios

for their SAR exposure levels at or near the amateur 2-meter (144 – 148 MHz), 1.25-meter (222 – 225 MHz), 70-centimeter (420 – 450 MHz), and 33-centimeter (902 – 928 MHz) bands. Tell outlined his findings in his July/August 2021 *QEX* article, “Amateur Portable Radios (Handheld Transceivers): Exposure Considerations Based on SAR.”

Duty Cycle

Human RF exposure is assessed as a time-averaged value. The FCC limits for amateurs are based on the time average of the instantaneous exposures over a 6-minute period. Thus, if a radio’s instantaneous exposure is double the FCC limit but transmission occurs for less than 3 minutes over any 6-minute period, the time-averaged exposure complies with the FCC limits.

SAR measurements of handheld radios for FCC certification are typically based on a 50% transmit cycle, with the expectation that a person using a handheld radio generally talks for half the time and listens for half the time. However, if the amount of time talking is decreased appropriately, virtually any transmitter can be used in compliance with FCC exposure regulations.

FCC exposure regulations give licensed radio amateurs a lot of control over their own exposure. Even if a given handheld radio exceeds the SAR limits extrapolated from commercial radios, the knowledgeable amateur operator can tailor the times that transmissions take place so that the 6-minute time-averaged SAR is less than the FCC limit.

Determining Handheld RF Exposure

You can make reasonable estimates of SAR exposure by extrapolating from tested commercial handheld radios to the exposure of untested amateur handheld radios. The test results for many commercial handhelds are summarized in Tell’s *QEX* article. If you know the SAR exposure from a commercial handheld radio that is similar to your amateur handheld, then that value can be used. For instance, if the FCC database contains exposure results for a commercial radio made by a given corporation, there is a good chance that the results would be proportional for that corporation’s amateur handheld operated at a nearby frequency.

If the results for a comparable commercial radio aren’t known, the safest calculation is based on the worst case in the database. In Figure 2 of Tell, SAR results from several radios are plotted as normalized values, with units of W/kg/W (see Figure 2). SAR is measured in W/kg and the normalization is for 1 W of transmitted power at a 50% duty cycle. These values can then be extrapolated to the wattage produced by a particular

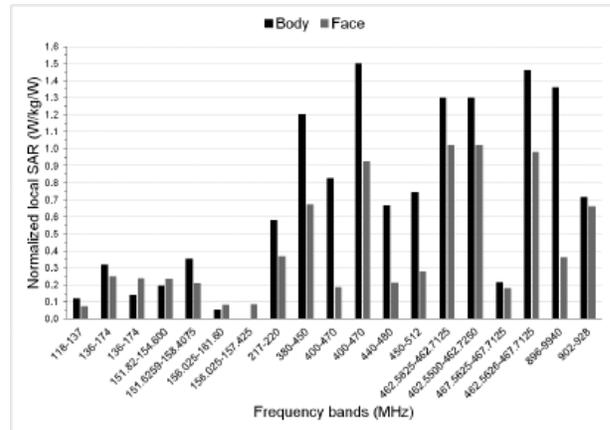


Figure 2 — This graph, from Figure 2 in Ric Tell’s, K5UJU, July/August 2021 *QEX* article, “Amateur Portable Radios (Handheld Transceivers): Exposure Considerations Based on SAR,” depicts the local 1-gram averaged SAR produced by commercial handheld radios in the FCC’s equipment authorization database that operate near or within amateur radio bands. The SAR estimates assume a 50% duty cycle at 1 W.

radio. Table 1 summarizes the reference values that can be used for each band.

The most common value to use, which may be conservative but ensures that you do not exceed FCC limits, is the high SAR. If you have a radio from a manufacturer that does not have entries in the FCC database, you can use the normalized high SAR values of 0.35 W/kg/W on 2 meters; 0.59 W/kg/W on 1.25 meters; 1.50 W/kg/W on 70 centimeters, and 1.35 W/kg/W on 33 centimeters. If, for example, your radio transmits 10 W on these bands, your extrapolated SAR exposure would be 3.5 W/kg on 2 meters; 5.9 W/kg on 1.25 meters; 15.0 W/kg on 70 centimeters, and 13.5 W/kg on 33 centimeters. Because the FCC local SAR exposure limit for a licensed amateur radio operator is 8 W/kg, operating with a 50% duty cycle would conform to that limit on 2 meters and 1.25 meters, but it would exceed the exposure limit on 70 centimeters and 33 centimeters.

Controlling Your Exposure

There are three general actions that you can take to ensure that you’re keeping exposure levels below the FCC limit:

- 1. Lower your power.** Most handheld radios can be programmed to transmit different power levels. Some give a choice of two power levels (Hi and Lo) or three levels (Hi, Med, and Lo). The power outputs associated with those levels vary by manufacturer and radio model, but using the handheld radio at lower power levels is one way to operate within the exposure limits.

Table 1 — SAR Reference Values

Amateur Band	Number of Reference Radios	Low SAR (W/kg/W)	High SAR (W/kg/W)	Mean SAR (W/kg/W)	Median SAR (W/kg/W)
2 m	6	0.05	0.35	0.19	0.17
1.25 m	1	0.59	0.59	0.59	0.59
70 cm	9	0.21	1.50	1.02	1.20
33 cm	2	0.71	1.35	1.03	1.03

2. Move away from the transmitter. You can also use your handheld radio farther away from you. One way is to place the radio more than 20 centimeters, or 8 inches, from any part of your body, holding it farther away or placing it on a nearby table; you can operate it from even farther away with a remote speaker-mic. Another way of distancing yourself from the source of exposure is to replace the handheld's antenna with a transmission line to a stand-alone antenna more than 20 centimeters away. You can still hold the radio in your hand, but your exposure will be from the antenna, which is now farther away. In both cases, you can calculate exposures using incident fields, such as what is done by the ARRL Exposure Calculator.

3. Limit your talking time. You can limit your exposure by reducing the duty cycle of your transmission. The SAR values listed in the FCC database are based on a 50% duty cycle, or 3 minutes of talking over a 6-minute period. Your talking time does not have to be consecutive — it is the sum of all the time that you talk during any 6-minute period.

To calculate the maximum amount of time that you can talk over 6 minutes, start with the tested SAR limit that you are using — either from Table 1 or from the values reported to the FCC from a similar radio — multiplied by the power you will be transmitting and multiplied by 2 to account for the 50% duty cycle used to obtain that tested SAR value. Divide that value into the local SAR limit (8 W/kg) and multiply that fraction by 6 to give you the maximum number of minutes that you can transmit in a 6-minute period.

$$M = \frac{8}{S \times P \times 2} \times 6$$

where

M = Maximum transmit time (minutes)

S = Tested SAR (W/kg/W)

P = Power (W)

Table 2 — Maximum Talk Time per 6-Minute Period

Band	5 W	10 W	15 W	20 W
2 m	Unlimited	Unlimited	4.6 minutes	3.4 minutes
1.25 m	Unlimited	4.0 minutes	2.7 minutes	2.0 minutes
70 cm	3.2 minutes	1.6 minutes	1.1 minutes	0.8 minutes
33 cm	3.6 minutes	1.8 minutes	1.2 minutes	0.9 minutes

Using a 10 W radio as an example, you could talk on 2 meters for the entire 6 minutes without exceeding the exposure limit; on 1.25 meters, you could talk 68% of the time, or for 4 minutes out of every 6 minutes; on 70 centimeters, you could talk no more than 27% of the time, or 1.6 minutes out of every 6 minutes, and on 33 centimeters, you could talk no more than 30% of the time, or 1.8 minutes out of every 6 minutes. Time limits for 5, 10, 15, and 20 W for each of these bands are shown in Table 2.

With the recent availability of low-cost amateur handheld radios with increased power output levels, the question of excessive exposure has been raised. But by using the existing SAR test results for similar commercial radios, a reasonable estimate can be made about the resulting exposure from these radios. Even for radios that exceed FCC SAR limits, modifications to operating procedures can keep your exposure levels within acceptable limits.

I would like to thank Phil Dolbow, WG5D, for initiating investigation into this topic; Kevin Graf, of the FCC Office of Engineering and Technology, for reviewing this article, and the members of the ARRL RF Safety Committee for discussing this topic and reviewing this article.

Gregory Lapin, N9GL, has been a radio amateur for 56 years, earning his license as a Boy Scout. He received his PhD in electrical engineering, specializing in biomedical imaging techniques, from Northwestern University. Greg studied drug delivery methods for brain tumors before becoming involved with RF exposure effects. He is a Life Senior Member of IEEE, serves on the IEEE Committee on Man and Radiation, and co-chairs the subcommittee that develops the C95.1 EMF safety standard for the IEEE International Committee on Electromagnetic Safety. Greg has been the Chairman of the ARRL RF Safety Committee since 1998 and represents ARRL on the FCC Technological Advisory Council. He is currently the editor of *The ARRL Handbook*. His other radio interests include propagation effects, software defined radio, and hiking through parks to operate POTA® and SOTA. Greg can be reached at n9gl@comcast.net.

For updates to this article, see the **QST Feedback page** at www.arrl.org/feedback.





Club Nets

Second Wednesday Net

70 Centimeters (449.575 MHz Repeater) @ 8 p.m. Local Time

Fourth Wednesday Net

2 Meters (147.24 MHz Repeater) @ 8 p.m. Local Time

Fifth Wednesday Net

10 Meters (28.445 MHz) @ 8 p.m. Local Time

CW Sunday Net

2 Meters (146.550 MHz simplex) @ 8 p.m. Local Time

Net Reports

440 Net Report, From Richard Hoerner, KB3VAE

The Aero ARC attempted to have a 440 net on 1/14/26. There were two participants Don K3DON and Richard KB3VAE. The Net was canceled due to no NCS and a lack of participants.

2-Meter Net Report, From Joe Miko, WB3FMT

The Aero Arc had its two meter net on 1/28/26. The net ran from 20:00 to 20:26 local. There were six participants:

W3PGA NCS	Joe	Essex
K3DON	Don	Joppatowne
KD3BOJ	Brian	Dundalk
KB3VAE	Rich	Essex
KB3QWC	Larry	Middle River
KC3YVY	Mike	Dundalk

Local Area Nets

Day	Time	Freq. (MHz)	Net Name
Daily	9 - 10 am	146.670	Oriole Net
Daily	6 pm	3.820	Maryland Emergency Phone Net
Daily	6:30 - 7 pm	146.670 PL 107.2	Baltimore Traffic Net
Daily	7 pm & 10 pm	3.557 CW	MD/DC/DE Traffic Net
2nd Tue	7:30 pm	146.670	Baltimore County RACES Net
2nd & 4th Tue	7 pm	146.775, (-) PL 146.2	Harford County, MD, ARES
3rd Fri	8 pm	WASH_DC Node 6154	MDC Section EchoLink
When activated by NOAA		147.030	SkyWarn (primary)

From the Skies Over Mt. Essex

SKY Events for February 2026

Date	EST (h:m)	Event
Feb 01	17:09	FULL Snow ☾ MOON
02	21:48	Regulus 0.4°S of Moon
03	14:18	Moon at Descending Node
07	03:26	Spica 1.8°N of Moon
09	07:43	LAST QUARTER MOON
10	11:52	Moon at Apogee: 404577 km
10	22:19	Antares 0.7°N of Moon
17	07:01	NEW MOON
17	07:12	Annular Solar Eclipse; mag = 0.963 visible in Antarctica.
18	01:19	Moon at Ascending Node 1 ././
18	18:03	Mercury 0.1°N of Moon:Occn.
19	06	Mercury at Perihelion
19	13	Mercury at Greatest Elong: 18.1°E
19	18:54	Saturn 4.6°S of Moon
23	21:43	Pleiades 1.2°S of Moon
24	07:28	FIRST QUARTER MOON
24	18:18	Moon at Perigee: 370132 km
27	01:26	Jupiter 4.0°S of Moon
27	16:34	Pollux 3.0°N of Moon

Planet Lookout at Mid-Month

Sunrise 06:56 EST and Sunset 17:44 EST

Mercury Morning Rise 07:40 Set 18:29; Mag -3.8 Size 6.4 arc seconds

Venus Evening Rise 07:29, Sets 17:13, Mag -3.9 size 9.8 arc seconds

Mars Evening Rise 06:38 Sets 16:54, Mag +1.0 size 4.0 arc seconds. Hidden By the Sun

Jupiter Evening, Rise 14:03, Sets 04:53, Mag-2.6 size 44.9 arc seconds.

Saturn Evening, Rise 08:27, Sets 20:19, Mag+1.1 size 16.2 arc seconds.

Uranus Evening Rise 10:49 Sets 01:12, Mag +5.7 size 3.6 arc seconds.

Neptune Evening Rises 08:24 Sets 22:27, Mag +7.9 size 2.2 arc seconds.

2026 Full Moon schedule and names of each

(All times Eastern; * denotes a Super Moon.)

- Saturday, Jan. 3 – 5:03 a.m. – Wolf Moon*
- **Sunday, Feb. 1 – 5:09 p.m. – Snow Moon**
- Tuesday, March 3 – 6:38 a.m. – Worm Moon
| **Total lunar eclipse**
- Wednesday, April 1 – 10:12 p.m. – Pink Moon
- Friday, May 1 – 1:23 p.m. – Flower Moon
- Sunday, May 31 – 4:45 a.m. – Blue Moon
- Monday, June 29 – 7:57 p.m. – Strawberry Moon
- Wednesday, July 29 – 10:36 a.m. – Buck Moon
- Friday, Aug. 28 – 12:19 a.m. – Sturgeon Moon | **Partial lunar eclipse**
- Saturday, Sept. 26 – 12:49 p.m. – Corn Moon
- Monday, Oct. 26 – 12:12 a.m. – Hunter's Moon
- Tuesday, Nov. 24– 9:54 a.m. – Beaver Moon*
- Wednesday, Dec. 23 – 8:28 p.m. – Cold Moon*

From Astronomy Magazine web page.

About the Aero Amateur Radio Club

Officers		Committees	
<i>President</i>	Joe Miko, WB3FMT	<i>Repeater</i>	Phil Hock, W3VRD Ken Erisman, NE3A Dave Brunner, AC3EO
<i>Vice President</i>	Rob Ballou, AE3B	<i>VE Testing</i>	Pat Stone, AC3F
<i>Recording Secretary</i>	Larry Hill, KB3QWC	<i>Public Service</i>	Bob Landis, WA3SWA
<i>Corresponding Secretary</i>	Pat Stone, AC3F	<i>Webmaster, Facebook</i>	Rob Ballou, AE3B
<i>Treasurer</i>	Tom Hawkins, WA3QLY	<i>Trustee</i>	Dave Frederick, KB3KRV (W3PGA) Jim Marshall, KC3FBL (AE3RO)
<i>Resource Coordinator</i>	Ron Distler, W3JEH	<i>Club Nets</i>	Joe Miko, WB3FMT
		<i>Contests</i>	Harry Rundall, AC3EK

Newsletter Editor Cathy Feinman, W3CLF
 Aerial archives dating to 2004 are available at <https://w3pga.net/the-aerial-newsletter-library/>

Website: <http://w3pga.net>

Facebook: <https://www.facebook.com/W3PGAClub>

Email: w3pgaclub@gmail.com

Meetings

We meet via Zoom at 7:00 PM ET (channel will open around 6:00 PM).
 Check your email for the link or inquire at w3pgaclub@gmail.com.
 All are welcome to attend. Arrive early to socialize.

- W3PGA 2 M** INPUT: 147.84 MHz, OUTPUT: 147.24 MHz, PL 123.0
- W3PGA 70 Cm** INPUT: 444.575 MHz, OUTPUT: 449.575 MHz, PL123.0
- W3JEH 1.25 M** INPUT: 222.24 MHz, OUTPUT: 223.84 MHz