The Bands in 2022, p.105

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COMMUNICATIONS & TECHNOLOGY

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On the cover:
The Summits on the Air program is quite a challenge in Chile! Here, SOTA enthusiast and mountainclimber Mauricio Farias, CE3TDM, leads a team of hams up 10,000-foot San Gabriel Hill outside Santiago. Story on page 8.

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FEATURES

HAPPY NEW YEAR: CQ ushers in 2022 with a plethora of stories that touch on all aspects of the radio hobby to get the new year started right. First up is the results of the CQWW VHF Contest on pages 20 and 108. Then we head south to Chile, where SOTA is taking grip in the Andes on page 8. Next, there are two stories on being prepared for EmComm on page 47 and 70. Plus see how the HF bands will treat us in 2022 as Solar Cycle 25 gears up on page 105. All that and more in this issue.

COLUMNS

DEPARTMENTS

Figure 1. A vision of SSB utopia (Credit: Verlenne Monroe, XYL of Gary White)

Many of us devote a lot of time, money, and energy to ensuring that we have top-quality transceivers and antennas, but the importance of our microphone and resulting audio quality are often lower on the priority list. W5GW and K5PA say that's a mistake, and are here to help you sound as good as you can!

Microphones and Audio Speech Processing for SSB

Part 1 Microphone Types, Use, and Selection

BY GARY WHITE,* W5GW AND GENE HINKLE,# K5PA

A misunderstood application in amateur SSB is how to select, adjust, and use microphone (mic) and audio processing with a modern transceiver / transmitter that has a nominal bandwidth of about 3 kHz. Extended or enhanced SSB (eSSB) that goes beyond this bandwidth is not discussed.

Different operating modes (ragchew vs. DXing, low SNR vs high SNR, etc.), speaker characteristics, language, accents, and reception at different received signal-to-noise levels are all important factors in obtaining a received signal with clarity and intelligibility. These are all important to consider when using your microphone, yet are characteristics that are normally not considered when operating SSB.

Part 1 of this article discusses amateur radio mics in general and will arm you with information for how to select and use a microphone properly. Part 2 addresses more operating tips including general adjustments of your transmitter or transceiver and the use of an equalizer, noise gate, and a compressor.

* *Email: <white512@austin.rr.com>*
 # Email: <k5pa@arrl.net>

Basic Mic Operation

SSB audio is a subjective quantity (*Figure 1*) and what constitutes good audio, clarity and pleasing audio, varies from

person to person. The best practices and ideas presented here may not fit your voice or even what some of your on-the-air buddies think is good audio. But there is value in understanding the factors that define a high-quality communication channel that is well suited to its intended purpose, which is making voice communication possible.

Good audio from an SSB transmitter is not high fidelity (e.g., hi-fi) audio. Rather, it is communications-grade audio that is frequency bandwidth limited. The goals are to maximize both your intelligibility and overall pleasing sound. Depending on operations (rag chewing or DX), you likely will have different audio settings.

A mic is a transducer that converts audio frequency sound pressure waves into a varying electrical voltage. This voltage has both frequency and amplitude components. The voltage is usually represented on a decibel (dB) scale and many mic manufacturers will provide a frequency response curve like the one shown in *Figure 2*. Inspection of this curve indicates it has a low frequency cutoff below 400 Hz and a peak at about 3,000 Hz (3 kHz). The response is designed to provide articulation or a pleasing sound for the human voice.

Generally, amateur radio uses English as its common language. The English language is defined as being non-tonal. That is, the pitch of syllables does not define or provide a characteristic of the word. However, the frequency response of the human voice and ear contribute greatly to the intelligibility of the language and the characteristic sound of the speaker. A plot of the importance of frequency to intelligibility is shown in *Figure 3* (reformatted from Mic University, DPA Microphones).

Other languages, especially tonal languages (Chinese, Thai, Zulu, Navajo, etc.), have different emphasis and their importance of frequencies in bandwidth-limited SSB spectrum will differ. Likewise, different speakers may have higher or lower pitch in their voice characteristics.

Because we normally limit our SSB transmission bandwidth to 3 kHz, we lose upwards of 25% of intelligibility in our transmissions. This is especially true in the frequency range of 2-5 kHz, where most of the consonants are centered.

Closely tied with intelligibility are *articulation* and *enunciation*. Articulation is loosely defined as the physical process of speaking and enunciation is defined as pronouncing words clearly and correctly, so the meaning is correctly received. The best mic and sound system cannot compensate for poor enunciation; however, the opposite is true. A bad or poorly adjusted mic or sound system can introduce distortion, resulting in a loss of intelligibility.

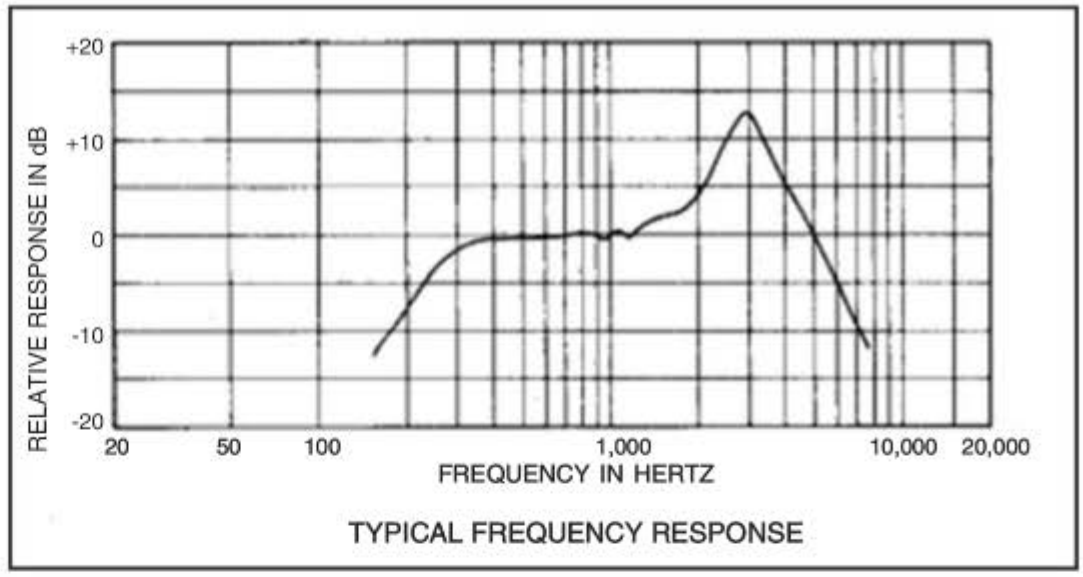


Figure 2. Shure 444 Frequency Response (Courtesy of Shure, Inc., used by permission)

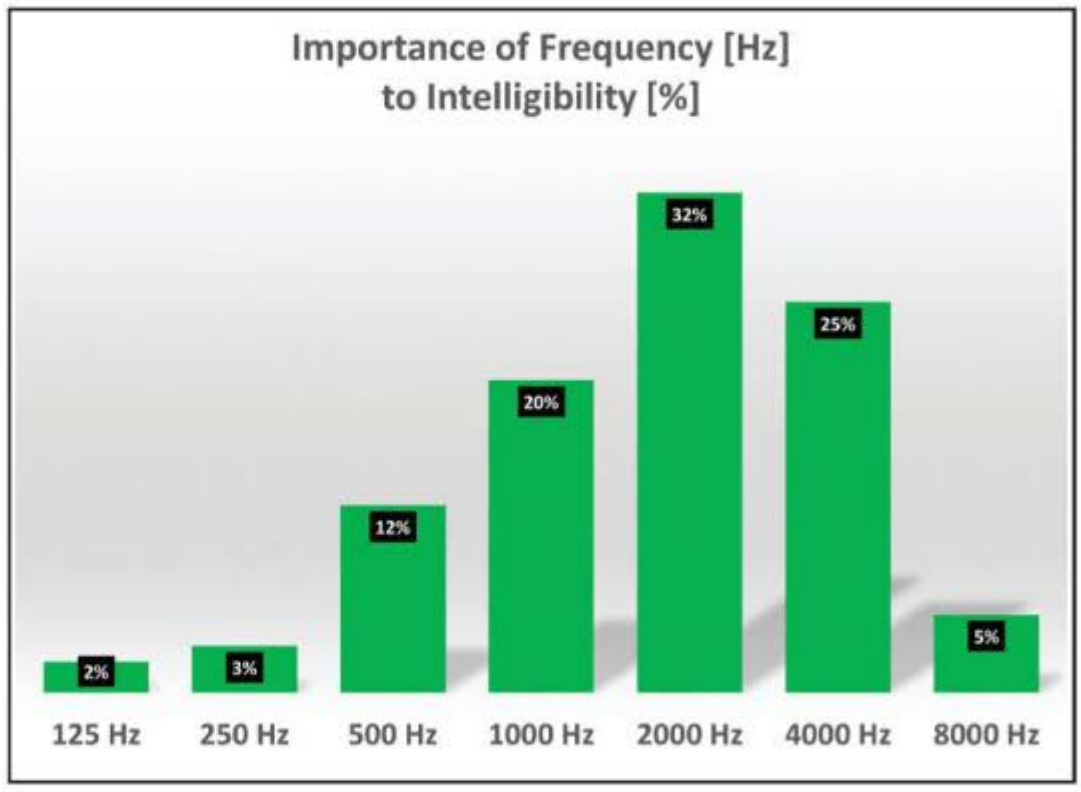


Figure 3. Frequency importance to intelligibility (Credit: DPA Microphones Data)

Figure 4 describes the importance frequency plays in articulation. Each dot on the plot represents a 5% cumulative growth in articulation as we go up in frequency. As an example, as we go from 250 Hz to 3 kHz, we achieve about 75% articulation. To obtain the full range of articulation for a normal voice, we would need to include the frequencies between 3 and 6.3 kHz. The band-limiting characteristics of SSB (red shaded area) reduce articulation by 25% in the frequency range where consonant sounds are developed. The purple shaded area (a conceptual overlay — none of the percentage units apply here) illustrates that the volume of our voice is not constant. Lower frequencies are stronger, yet they contribute a small amount to overall intelligibility until about 500 Hz.

An example of poor enunciation, articulation, and intelligibility is if you say, "I have a pine tree in my backyard," but the listener hears you say, "I have a fine bee in my backyard." A good exercise is to record yourself reading a page or two of random text from a book and then play back the recording. You may be surprised at how poor pronunciation

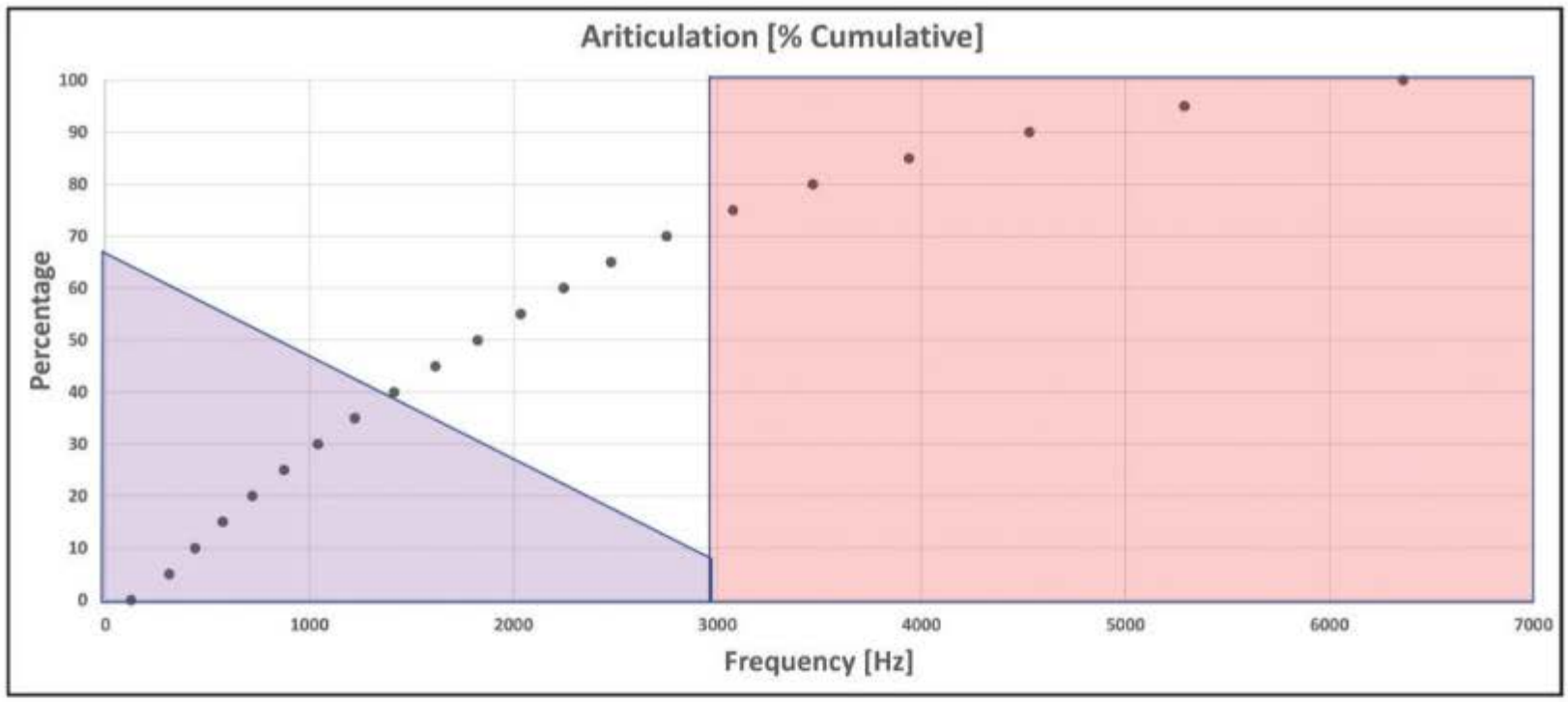


Figure 4. Articulation importance to intelligibility (Credit: Gary White)

has crept into your normal speaking voice. As we age, we tend to develop a lazy voice by which we mumble, slur our words, or otherwise poorly enunciate.

Another factor reducing intelligibility is yelling or shouting into the mic (a common occurrence) or less likely, whispering into the mic. Speak in a normal voice just as you would with someone at the dinner table. Keep the mic close to your mouth, no more than 2-3 inches away. That way, you can keep the mic gain down and still obtain sufficient drive to the transmitter. The lower drive will help reduce background noise.

There are a lot of hams who advocate holding the mic so you are talking at a 45° or even 90° angle to its front to improve clarity by limiting the sound of heavy breathing or noise pops on short duration consonants. From our experiences, this does nothing to improve clarity. A better solution might be the addition of a wind screen made of foam or cloth to your mic. Headset and many hand mics usually come with a foam noise screen (sometimes called a pop screen or a wind screen).

Another big factor in intelligibility is the signal-to-noise ratio (SNR) of the desired audio versus undesired audio noise. Background noise, echoes, television, equipment fans, etc., will be picked up by most mics. While we can't all afford a sound-proof studio, we can strive to keep background noises to a minimum. To differentiate ambient audio SNR from the received SNR, we will denote it as acoustic SNR (ASNR).

Selecting a mic designed for communications is generally good advice. Many hams select a sensitive broadcast microphone which allows them to speak in a normal voice some 1-3 feet away and fully modulate the transmitter. The problem comes in with the higher degree of sensitivity and dynamic range of a broadcast quality mic. Low ambient acoustic noise can be detected by the broadcast mic and negatively impact the desired voice signal. Plus, a broadcast mic typically costs more. While a broadcast mic can be used with good results for SSB, it will likely involve some careful attention to limiting background noises, and adjustment of controls. Also, many broadcast micro-

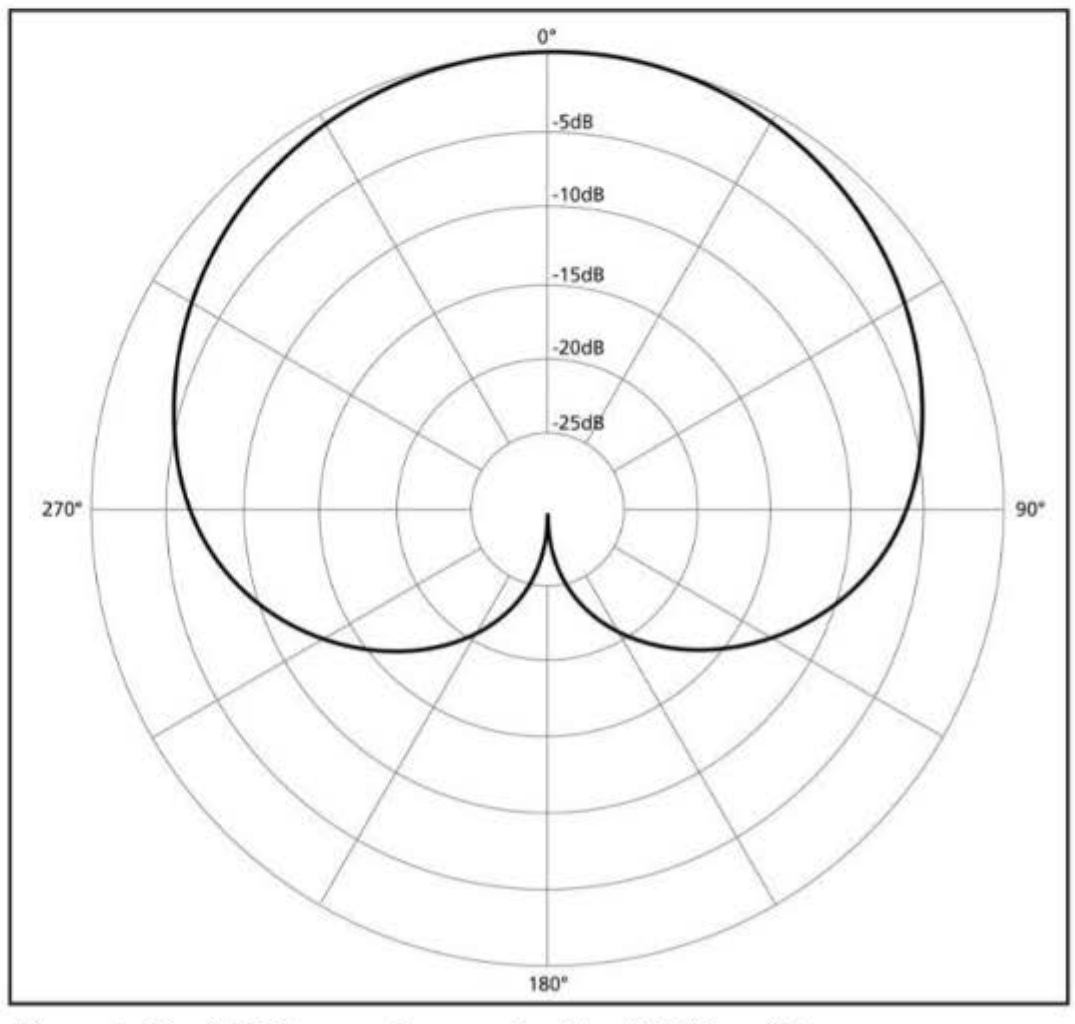


Figure 5. Cardioid shape reduces noise (Credit: Wikipedia)

phones of the condenser type require a phantom voltage of 48-volts DC to work.

A big factor in mic selection and improving ASNR is the shape of the microphone's reception pattern. A cardioid shaped sensitivity pattern, shown in *Figure 5*, is best for reducing a portion of the ambient noise. As indicated, the microphone is most sensitive to acoustic waves at the 12 o'clock position. As the acoustic wave arrives at the microphone from a different angle the microphone is less sensitive.

Microphone Selection and Types

When selecting an amateur communications microphone, there are primarily two types: Electret and dynamic. Other types of mic technology, such as crystal, carbon, ribbon, condenser, etc., will not be discussed. But this is not to say those mics cannot be used for SSB.

Electret technology has become common in recent amateur use and is usually the least expensive. The electret responds to the sound wave and is then amplified by a built-in field-effect transistor (FET) or a junction-gate FET (JFET). A characteristic of the electret mic is that it requires between 1.5- to 8-volts DC to power the FET / JFET (*Figure 6*). The mic element itself is very small, sometimes less than 1/2-inch in diameter and perhaps only 3/8-inch thick (*Figure 7*).

The electret element has a characteristic roll-off in frequency, but this is not significant for amateur use as this typ-

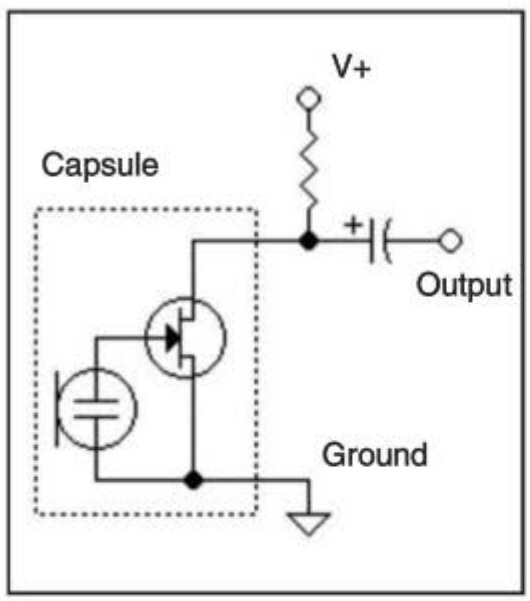


Figure 6. Electret mic element (Credit: Wikipedia)

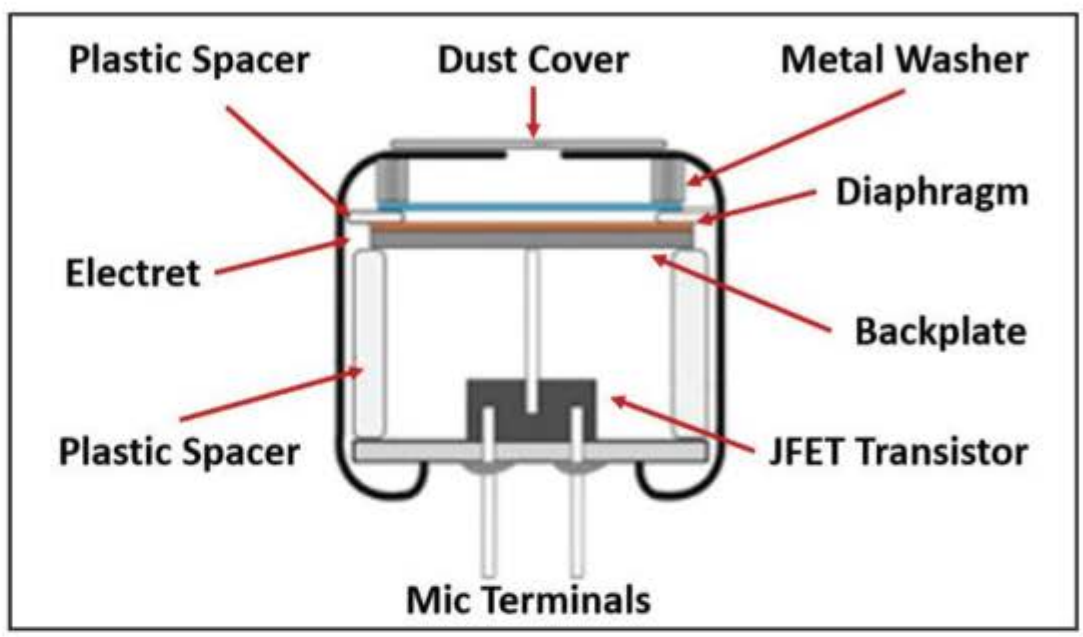


Figure 7. Physical attributes of electret mic (Credit: Wikipedia / Gene Hinkle)

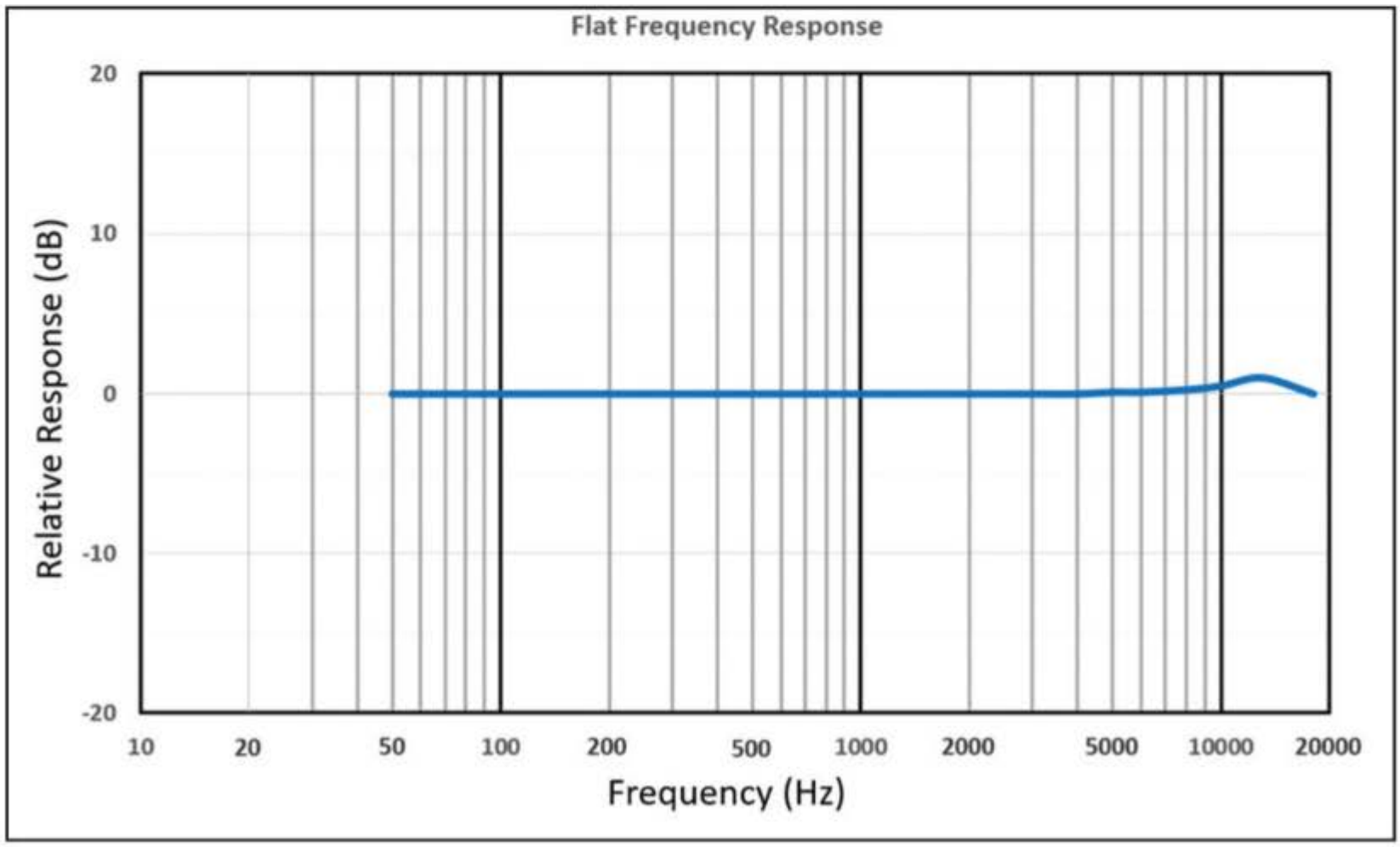


Figure 8. Typical flat response electret mic (Credit: Gene Hinkle)

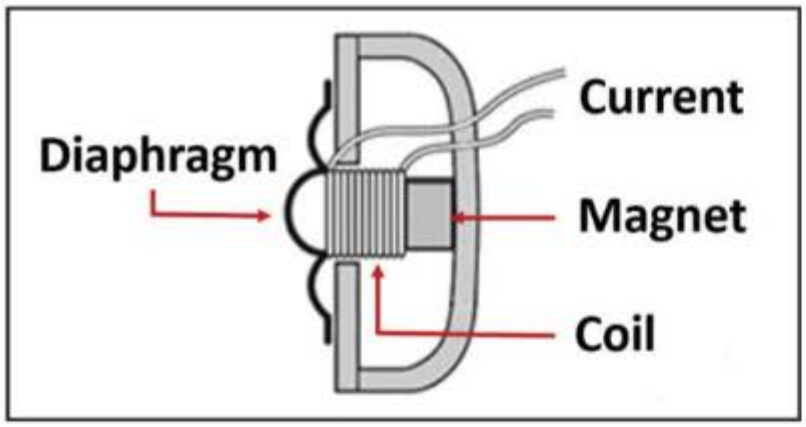


Figure 9. Dynamic mic (Credit: Wikipedia)

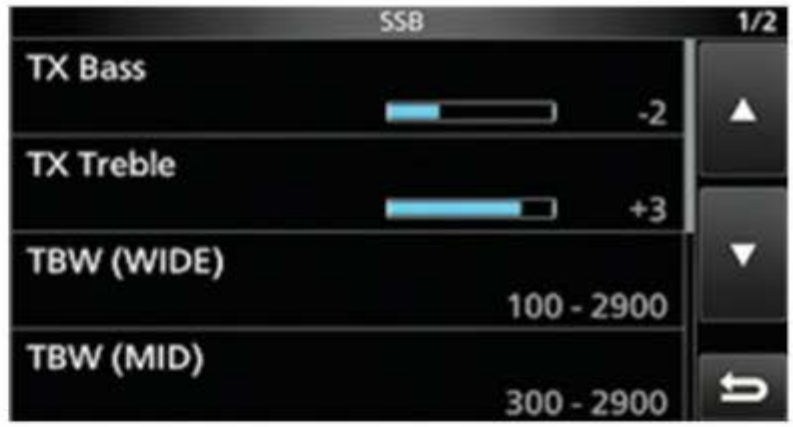


Photo A. Audio Adjustment Menu for Icom 7300 (Credit: Gary White)

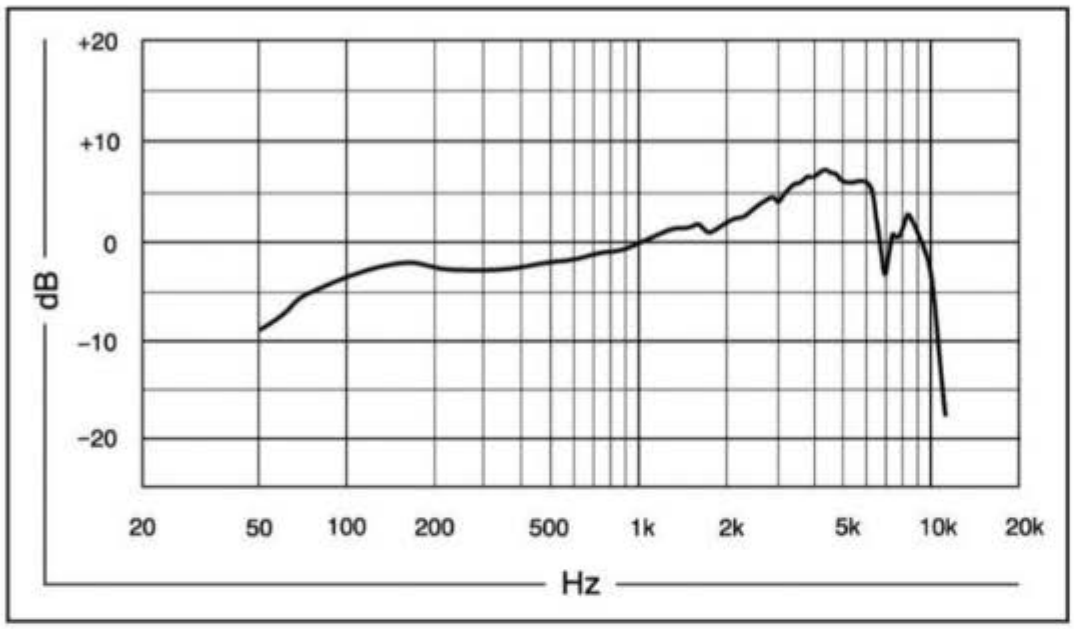


Figure 10. Shure 522 frequency response (Courtesy of Shure, Inc., used by permission)

ically occurs well above 3 kHz, typically about 10-20 kHz. More disconcerting is that the frequency response from 30-60 Hz to 3 kHz is usually flat (*Figure 8*). Because our voice is much stronger in the 20- to 750-Hz range, this can cause the SSB transmitter to devote most of the transmitted power to this band when using a microphone with a flat frequency response.

For bandwidth-limited communications, such as amateur SSB, a non-flat response can be designed by the manufacturer and modified by the mic enclosure itself. But beware, most condenser / electret elements or mics purchased at random are likely to be designed for higher fidelity than bandwidth-limited communications and some compensation will be necessary for amateur SSB use.

A dynamic mic element has a diaphragm that is attached to a coil that is free to move back and forth over a magnet as the diaphragm moves with the sound pressure wave. The varying physical movement creates a varying current which is applied to the first audio stage of the transmitter (*Figure 9*).

The frequency response of a communications dynamic mic is defined at the time of manufacture. Most dynamic mics for communication use elements that have a cardioid shape response. While they are very popular, dynamic mics are somewhat costlier than electrets. Dynamic microphones are noted for a somewhat mellower sound than electret elements, but in an SSB application this distinction is usually lost. Most modern transceivers provide a bias voltage on the microphone line to power an electret microphone that is sold with the transceiver. A dynamic mic requires a capacitor in-line to block this voltage.

Many dynamic mics being marketed for amateur use may have a frequency response that is better suited for broadcast or recording applications. That is, they are flat in the frequency range that we need to enhance for intelligibility. This is not always the case so be sure to carefully look at the microphone's specification sheet.

Figure 10 is a frequency response of a popular amateur dynamic mic, the Shure 522. Note the lower frequency roll-off below 100 Hz and the increase above 1 kHz peaking to nearly 10 dB at 3 kHz.

Recalling the previous *Figure 3*, we can see that this mic is accentuating an important consonant-carrying band between 1-3 kHz (or as stated in the audio world, this band of frequencies is emphasized or has presence). In addition, it is reducing its output below 100 Hz to reduce a nasal, or bass rumble effect to the voice that is annoying in communications.

Figure 10 represents a typical bandwidth-limited response curve for audio presented to the input of the first audio stage of a transmitter or transceiver. After filtering is applied in the audio and / or RF stages we find that signals much lower than 50 Hz and higher than 3 kHz are severely attenuated to be practically negligible. Remember, we only care about the mic's frequency response from about 50 Hz to 3 kHz when selecting or using it for amateur SSB.

Not all speakers' voices are the same. Just as a child's voice is higher in pitch than a woman's or a man's voice, there are wide ranges of voice pitches, articulations, and enunciations. Careful matching of the individual's voice to the microphone and audio system is necessary.

Two General Operating Modes

In normal rag-chew communications, we strive for use of the full spectrum of available audio. That is, we would typically select (if selectable) a wide transmitter bandwidth over that of a narrower bandwidth. We are willing to give up a small amount of received SNR for a more pleasing and robust audio sound.

For the most part, we would either eschew the use of compression or add it sparingly.

In DXing, crowded bands, or low received SNR situations, the opposite is true. We are willing to sacrifice the audio pleasantness factor to establish and maintain communications. We sacrifice bandwidth, especially the bass frequency band, to gain a higher effective SNR and increase the emphasis or presence of the treble frequencies. We likely add compression to raise our average power.

To achieve these different SSB operating modes, we apply speech processing using equalizers, compression, and noise gates. These will be discussed fully in Part 2.

Let us summarize what we know so far:

- SSB limits the intelligibility and articulation of the spoken voice
- A cardioid directional mic reduces some background noise
- A flat frequency response reduces the intelligibility of a bandwidth-limited communications microphone by devoting most of the power to the bass frequencies
- Shouting or talking loudly into a mic may exceed its dynamic range and reduce intelligibility; hence, speak closely and in a normal voice
- Too much presence in low or bass frequencies can be unpleasant, contribute to poor received SNR in the treble range, and reduce intelligibility
- A lack of emphasis in the higher frequencies (1-3 kHz) can impact overall intelligibility
- Because speaker voices are different, different frequency band emphasis or de-emphasis should be made to account for them (also known as, one size does not fit all!)
- Rag-chewing or casual operations are different than DX or low received SNR situations, and
- Transmitted audio and RF bandwidths and associated frequency responses should be adjusted to optimize for different operating conditions, equipment, and most importantly, your voice

Microphone Selection / Recommendations

#1. There are many microphone types available. Handheld, headset, table, boom mounted, floor mounted, etc. For the authors' preferred operating modes, generally either a handheld or headset mic is used. However, mic types should be selected for your own personal preference and operating conditions subject to the technology and specifications of the mic element itself.

#2. Start with the mic that came with your transceiver. The mics that come with almost all modern transceivers today are good communications mics with a cardioid pattern. Where they get a bad reputation is that sometimes the transceiver comes with limited information on how to adjust the drive and equalization. Or, more likely, the operator didn't set the controls properly.

#3. Learn the settings in your transceiver, including mic gain, compression, transmitter bandwidth, etc. As an example, consider the Icom 7300, a popular transceiver. The handheld electret microphone that is supplied with the transceiver has limited bass roll-off characteristics and almost no emphasis in the upper frequency band from 1-3 kHz.

Despite this nominally flat response, the Icom 7300 sounds fair for most normal speakers on SSB out-of-the-box. However, by providing a de-emphasis of bass and an emphasis of treble it will sound much better and have a greater punch for DX (*Photo A*).

#4. Buy a mic designed for communication service. There are many fine microphone manufacturers today. Unfortunately, many of their product descriptions lack frequency response charts and instead rely on subjective wording that can be difficult to interpret. For example, consider this excerpt regarding the Heil PR10 from the company's website [Reference 2]:

"The PR10 is Heil's newest communication microphone designed for articulate communication with most of today's transceivers. Although compact in size this microphone is built around a full 1-1/8-inch diameter dynamic element, just as our other PR series microphones used in commercial broadcast applications around the world. Producing full articulate sound from 85 Hz to 16 kHz you will be sure to be heard with every transmission…"

As stated, the PR10 is primarily a commercial broadcast microphone with a frequency response from 85 Hz to 16 kHz, suggesting the frequency range of 1-3 kHz will not be enhanced and some processing of the microphone signal could improve its performance. And come on, will we always be heard with every transmission?

This is not to imply the PR10 is not a good microphone. It certainly is, and their owners strongly agree, given the positive reviews it has on eham.net [Reference 3]. But it is one example of the difficulty we have in sorting through marketing hype and understanding the underlying technical specifications of what we might be purchasing.

#5. Read reviews and ask around. Eham.net contains reviews of many amateur microphones and we would highly recommend that as a good source for reviews. There are two opinions as to whether you should ask for advice from your buddies on the air. One opinion is sure, maybe your buddies have some valid recommendations and can help steer you in the right direction. Another opinion is that microphone selection is a very personal and somewhat emotional topic for many hams. Maybe they bought a nice mic but didn't know how to mate it with their transmitter or transceiver. The bottom line is this: The roses and onions you get from your fellow hams regarding your microphone selection should be taken with a grain of salt.

#6. Don't buy a microphone based on its cost when the application is amateur SSB. There are lots of very good mics that are affordable (as of this writing, less than $200). Sure, you could purchase a studio-quality condenser microphone that may cost several thousand dollars. But a $5-10 electret mic with some modest level of equalization can sound just as good or perhaps even better for SSB use. Cost of a communications microphone is not a significant indicator of quality.

In Summary

The aim of Part 1 was to channel and guide your expectations regarding microphone use as it applies to bandwidth-limited SSB for amateur radio. Hopefully you have a better appreciation of the challenging job your microphone does for you. You have the basics now to cut through the marketing hype and make an educated decision in purchasing a new microphone if that is your desire.

Part 2 will continue with a discussion of general mic adjustments, their interactions and how to use signal processing, including equalization, compression, and noise gates, to achieve even better audio for SSB.

References:

1 Factors Governing the Intelligibility of Speech Sounds, N. R. FRENCH AND J. C. STEINBERG, Bell Telephone Laboratories, New York, New York (Nov. 22, 1946)

2 <https://heilhamradio.com/products/pr-10-set/>

3 <www.eham.net/reviews>

ANNOUNCEMENTS *(from page 2)*

TULLAHOMA, TENNESSEE — The Middle Tennessee Amateur Radio Society will hold the **2022 Tullahoma Hamfest** from 8 a.m. to 2 p.m., Saturday, March 12 at the First United Methodist Church, 208 West Lauderdale Street. Contact: Michael Glennon, KB4JHU, (931) 588-0302. Email: <kb4jhu@arrl.net>. Website: <www.mtars-ham.org>. Talk-in 146.700- (PL 114.8). VE exams.

ELRYIA, OHIO — The Northern Ohio Amateur Radio Society will hold its **NOARS Winter Hamfest 2022** from 9 a.m. to 1 p.m., Sunday, March 13 at the Loraine County Community Center-John A. Spitzer Conference Center, 1005 N. Abbe Road. Contact: Carl Rimmer, W8KRF, (216) 256-9624 (before 9 p.m.). Email: <winterhamfest@noars.net>. Website: <http://noars.net>. Talk-in 146.70- (PL 110.9).

FORT WALTON BEACH, FLORIDA — The Playground Amateur Radio Club will hold the **52nd Annual PARC Hamfest** from 4-8 p.m., Friday, March 18 and from 8 a.m. to 2 p.m., Saturday, March 19 at the NWF Fairgrounds, 1958 Lewis Turner Boulevard. Phone: (850) 359-9186. Website: <www.w4zbb.org>.

KALAMAZOO TOWNSHIP, MICHIGAN — The Southern Michigan Amateur Radio Society will hold the **60th Almost Annual Michigan Crossroads Hamfest & Radio Swap** from 8 a.m. to noon, Saturday, March 19 at the Wings Event Center, 3600 Vanrick Drive. Phone: (269) 815-8007. Email: <smarshamfest@gmail.com>. Website: <www.w8df.com>. Talk-in 147.000+ (PL 94.8). VE exams.

LOOMIS, CALIFORNIA — The Sierra Foothills Amateur Radio Club will hold the **Loomis Hamfest 2022** beginning 8 a.m., Saturday, March 19 at the Loomis Historic Train Depot, 5775 Horseshoe Bar Road. Website: <www.w6ek.org>.

STUART, FLORIDA — The Martin County Amateur Radio Association will hold the **47th Annual Stuart Hamfest** from 8 a.m. to 2 p.m., Saturday, March 19 at the Martin County Fairgrounds, 2616 SE Dixie Highway (A1A). Contact: Hamfest Chairman (561) 309-8138. Email: <hamfest@mcaraweb.com>. Website: <www.stuarthamfest.com>. Talk-in 145.150- (PL 107.2). VE exams.

BOONVILLE, MISSOURI — The Boonville Amateur Radio Club will hold its Hamfest from 8 a.m. to 1 p.m., Saturday, March 26 at the Cooper County Youth Fairgrounds, 16899 Dunkles Drive. Contact: Dwight (660) 621-1265 or Tom (660) 841-5287. Email: <wa0e@arrl.net>. Website: <www.w0brc.org>. Talk-in 147.360+ (PL 127.3).

ANNANDALE, VIRGINIA — The Vienna Wireless Society will hold **WINTERFEST!** and the **2022 ARRL Virginia Section Convention** from 6 a.m. to 2 p.m., Sunday, March 27 at the Northern Virginia Community College Annandale Campus, 8333 Little River Turnpike. Contact: Mike, WA8AHZ, (703) 870-1730. Email: <tablesales2022@viennawireless.net>. Website: <www.viennawireless.net>. Talk-in 146.685 (PL 110.9). VE exams, WAS / DXCC / VUCC card checking.

APRIL

CORINTH, MISSISSIPPI — The Alcorn County ARES will hold the **April Fool Jess Ables Memorial Hamfest** from 9 a.m. to 5 p.m., Saturday, April 2 and from 8 a.m. to noon, Sunday, April 3 at the Crossroads Arena, 2800 South Harper Road. Website: <http://acares.reiseit.com>, Talk-in 146.925. VE exams

BRANSON, MISSOURI — The Four State QRP Group will hold **OZARKCON** from Friday, April 8 through Saturday, April 9 at the Stone Castle Hotel and Conference Center, 3050 Green Mountain Drive. Website: <http://ocon.rleepotter.com>.

CLAREMORE, OKLAHOMA — The Green Country Hamfest Inc. will hold the **Green Country Hamfest 2002** from 4-9 p.m., Friday, April 8 and from 8 a.m. to 3 p.m., Saturday, April 9 at the Claremore Expo Center, 400 Veterans Parkway. Email: <info@greencountryhamfest.org>. Website: <www.greencountryhamfest.org>. Talk-in 147.09+ (PL 88.5). VE exams, DXCC / WAC / WAS / VUCC card checking.

BELLEVUE, NEBRASKA — The Bellevue Amateur Radio Club will hold the **Bellevue ARC Spring Cleanup Hamfest** from 9 a.m. to 3 p.m., Saturday, April 9 at the Reed Community Center, 1200 Lord Boulevard. Contact: Dennis Mitchell, KCØYKN, (402) 690-2587. Email: <kc0ykn@cox.net>. Website: <www.bellevuearc.org>. Talk-in 147.39+ (PL 131.8). VE exams.

CUYAHOGA FALLS, OHIO — The Cuyahoga Falls Amateur Radio Club will hold the **66th Annual Hamfest Electronics and Computer Show** from 8 a.m. to 1 p.m., Saturday, April 9 at the Emidio and Sons Party Center, 48 E. Bath Road. Phone: (330) 790-1680. Email: <hamfest2022@cfarc.org>. Website: <www.cfarc.org>. Talk-in 147.270+ (PL 110.9) or 444.850+ (PL 110.9). Free VE exams.

GEORGETOWN, DELAWARE — The Sussex Amateur Radio Association will hold the **Georgetown Hamfest and Delmarva Radio Electronics Expo** and the **2022 ARRL Delaware State Convention** from 7:30 a.m. to 2 p.m., Saturday, April 23 at the Cheer Community Center, 20520 Sand Hill Road. Contact: Jamie, W3UC, (410) 202-7690. Email: <hamfestdelware@gmail.com>. Wesbite: <www.radioelectronicsexpo.com>. VE exams.

MOBILE, ALABAMA — The Mobile Amateur Radio Club will hold the **Mobile Hamfest** from 8 a.m. to 1 p.m., Saturday, April 23 at the Abba Shrine Temple, 7701 Hitt Road. Contact: David Huber, KK4JJM, <davidhuber@bellsouth.net>. Talk-in 146.94.

BEHIND THE BYLINES...

... a little bit about some of this month's authors

Aldo Aste Sambuceti, CE2NFT ("Summits on the Air [SOTA] Comes to Chile," p. 8), is a professional photographer and videographer in Chile. This is his first article for *CQ*.

Adrian Ciuperca, KO8SCA (DX column: "The OJØC 6-Meter DXpedition to Market Reef," p. 13), is a DXer and DXpeditioner who has participated in many of the major DXpeditions of recent years and is part of the 2022 3YØJ Bouvet expedition team. He received the YASME Excellence Award in 2020.

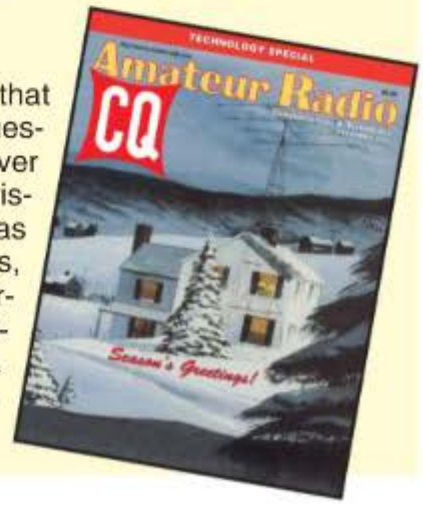
Dr. Sam Green, WØPCE ("A Fully Automated Sweep Generator Measurement System – Take 4," p. 36), is a retired aerospace engineer living in St. Louis, Missouri. He specialized in free space optical and fiber optical data communications and photonics, and now designs targets for guns with laser bullets. Sam is listed as inventor on 18 patents. He has been a ham since 1957 and held a Technician class license for 36 years before upgrading to Amateur Extra class in 1993.

Neil Foster, N4FN ("Putting the 'Spit' Key on the Radio," p. 52), is a "Yank" who also holds an "A" license in the UK, having taken the old RAE in England years ago. The "A" license is now known as a "FULL License" similar to our Extra Class license but without the CW requirement.

Gary White, W5GW (co-author, "Microphones and Audio Speech Processing for SSB – Part 1," p. 56), is a Registered Professional Engineer (retired). His interests are amateur radio, photography, astronomy, and fictional writing. He has published a novel and won awards for his short stories. His webpage is <https://w5gw.com>.

Co-author **Gene Hinkle, K5PA**, is a Registered Professional Engineer (retired) and Life Senior Member of the I.E.E.E. He has authored numerous amateur radio articles covering antennas, remote radio operations, and advanced technologies. His interests can be found on his webpage, <www.k5pa.com>.

Holiday Reprise: CQ Classic Cover



Last month's holiday cover description noted that "this month's cover comes with a hidden trivia question. Does it bring back any memories?" The cover was actually our "CQ Classic" for the month, reprising the December 1980 cover (see photo). It was the first of four holiday covers by John Rogers, W2ADC (SK), who was a very well-known watercolor artist in the last century. His "CQville" paintings graced our December covers from 1980-83. We're pleased to bring back John's work for a new generation of *CQ* readers. – *W2VU*