This Month's News: Happy New Year and the Club's 86th Year – DecemberFest was Great

The December 10th annual **DecemberFest** Dinner Party was enjoyed by twenty-nine members and their guests at La Dolce Vita in Oxnard's Heritage Square (where we celebrated our 2019 DecemberFest). All of the new and returning board members were announced, Richard WA6AEW (outgoing at-large board member) and Pedro K6MIL (secretary-elect; both not present) were thanked for their service to the club and Certificates of Appreciation were signed and displayed. Phil Cohen WA6BUZ was recognized for stepping forward to become our "temporary" secretary until we have a club special election in February, 2022. We especially acknowledged Denney N6HV, for his excellent quizmaster abilities, his managing all of the club's donated equipment, and his monthly trips to the TRW swap meet to sell (for donations) the club's items. Mark Leach KN6FWH donated several gifts and kindly volunteered and acted as Denney's helper, delivering gifts to the lucky winners. Also recognized and thanked were John Kitchens NS6S, our ARRL Santa Barbara Section Manager, for his donation of the Antenna and ARRL's Hands-On Radio Experiments Volume 1-2 books, Linda Shank for her gifts of embroidered snowflake ornaments to the ladies and Tim KN6JGB for his hand-crafted fragrant holiday-shaped soap to all partygoers.
The winners of the Monday Night Net Contest were announced. Our new Monday Night Net Contest will start again on Monday, January 3rd and the two remaining December Mondays will be our "normal" weekly check-ins. We would like to have volunteers for December 20th and 27th, 2021, and for all of the 2022 net contests, as well as alternate net control operators in case the net control operator has problems. I've placed a sign-up spreadsheet on our groups.io website under files, Monday Night Net. Thanks to Dave AI6VX for signing up for every first Monday of the month as net control operator.

Our next club meeting is January 14th at the Dudley House, where Tim Duffy K3LR from DX Engineering will present "Grounding and Bonding" via Zoom. Visitors are always welcome to attend our meetings. We will continue to update our members on any new Ventura County Health Department requirements.

The Inside Story

Message from the President

The Prez Sez,

Happy New Year 2022!

January, with the newly elected (and some re-elected) board members, will bring new beginnings as well as activities and actions passed forward for the club to address. Many thanks to all who have served and supported our club last year as well as everyone who is assisting in 2022.

Actions from Last Year:

Our Bylaws committee (led by Mark KD6ASL) has been collecting all of the recommendations from our members and has edited the bylaws document before sending it out for our member's review, subsequent to holding a vote for its acceptance.

Our Youth committee (Tim KN6JGB) has been working with the local scouting and school officials and is expected to offer several opportunities for our club to assist in the education of potential new hams.

We have several important club offices open and need members to step up and volunteer. The following positions are open: Program chairperson. We would like a member to review our member's topic requests (as listed in the membership application/renewal) and arrange to have a guest speaker (could be a Zoom-based presentation) to discuss the popular topics scheduled for our meetings. We have

(Continued on Next Page)

Club Offices	And Keyer	Contributors
President	Robert Shank	KM6RSS
Vice-President	Clem Alberts	KM6OKZ
Secretary	Phil Cohen	WA6BUZ
Treasurer	John Gartman	W6JPG
Board Member	Steve Noll	WA6EJO
Board Member	Dave Schmidt	AI6VX
Board Member	Mark Swaney	KD6ASL
Program Manager	Open	Please volunteer
Equipment Mgr.	Denney Pistole	N6HV
Refreshments	Linda Shank	
Facilities	Richard Abbey	WB6AEW
Keyer Editor	Robert Shank	KM6RSS
Webmaster	Robert Shank	KM6RSS
Domain	Phil Cohen	WA6BUZ
Membership	Open	Please volunteer
License Trustee	Dave Schmidt	AI6VX
Monday Night Net	Open	Please volunteer
QSL Manager	Ben Holmes	K6QV
Safety Officer	Mark Vodon	KI6PTE
PIO/Trivia	Dana Wentling	KG6WXE
Columnist	Reese West	KQ6TT
Columnist	Orv Beach	W6BI

The KEYER is published monthly by K6MEP, the Ventura County Amateur Radio Club, Inc. as a means of providing club members the minutes from K6MEP's monthly general membership meetings, the monthly board of directors' meetings, a calendar of events and articles of interest about amateur radio. Layout and logos are the property of The Ventura County Amateur Radio Club, K6MEP.

Submit material by email to KM6RSS@gmail.com. Our club mailing address is:
K6MEP
PO Box 2103
Oxnard, CA 93034-2103

K6MEP holds general membership meetings at 7:00 PM on the 2nd Friday of each month (except December). Dues are $20 per year.

Message from the President (Continued)

speakers scheduled for January and February.

Membership chairperson. This person works with our Secretary to contact area hams (sometimes using emails sent to our K6MEP website, our Monday Night Net, Facebook, MeWe or other methods) and invite them to our club meetings and other activities.

Monday Night Net Control Operator Scheduler. We've had great success with last year's Monday Night Net being run by members of the club as net control operators. By having volunteers as our net control operators, they have the opportunity to improve their "microphone skills" and learn more about our members and guests. I've created a schedule calendar on our groups.io website. The link is https://groups.io/g/K6MEP/files/2022%20Monday%20Night%20Net%20Contest .It would be very helpful to have a member volunteer to become our scheduler and encourage everyone to sign up to be a net control operator for a few Mondays in 2022. Dave AI6VX has volunteered to take the first Monday night of every month. We are also looking for someone to be a back-up operator in case the operator has problems with his/her rig. I've proactively prepared and sent the script out for every Monday night net that includes the next meeting's date and topic/presenter.

Picnics and Outings chairperson. We've held very successful picnics at the Dudley House and also had limited outings (due to health department regulations) at parks where we tested our rigs. It would be very helpful for a member to volunteer to help organize these activities.

Field Day chairperson. Field Day will be here before you realize and we need to start a committee to plan the event. We've been holding Field Day at Oxnard College and should also consider other locations if they offer better communications possibilities.

DecemberFest chairperson. The process of making a list of restaurants that meet our selection criteria, polling our members to select the best restaurant and making the reservation, as well as acting as a go between with the restaurant and the membership, is a very important club activity, even though it is done only once a year.

Thanks again for all that our members do to make our club meaningful and enjoyable!
73,
Robert Shank KM6RSS

Minutes of the November 28th, 2021 VCARC Board Meeting

MEETING LOCATION: Zoom

BOARD ATTENDEES:

OFFICE	LAST	FIRST	CALL SIGN	PRESENT
PRESIDENT	SHANK	ROBERT	KM6RSS	X
VP	ALBERTS	CLEMENT	KM6OKZ	X
SECRETARY	MORILLAS	PEDRO	K6MIL	
TREASURER	GARTMAN	JOHN	W6JPG	X
BOARD	ABBEY	RICHARD	WB6AEW	
BOARD-elect	NOLL	STEVE	WA6EJO	X
BOARD	SCHMIDT	DAVE	AI6VX	X
BOARD	SWANEY	MARK	KD6ASL	

GENERAL MEMBER ATTENDEES: Burt KA6BJA, Denney N6HV, Jeremy KN6JMD, Reese KQ6TT, Steve WA6EJO, Stewart KG6BOV and Tim KN6JGB.

CALL TO ORDER 19:09

Opened the meeting at 19:09 and there were 4 out of a possible 7 board members present.

Minutes:

- We now have 44 paid-up members.
- Referred to the minutes of the November board meeting and asked for motion to approve and vote to accept. Unanimous approval.
- Referred to the minutes of the November general meeting and asked for motion to approve and vote to accept. Unanimous approval.
- Discuss Monday Night Net Contest results and decide if it served its purpose. Board agreed that the contest has increased the number of participants and has helped introduce visitors to our club. The motion was presented and voted approval to start the 2022 contest on January 3rd but to continue the Monday Night Net from Monday, December 13, 20, and 27 without having these days in the contest. A new column on the net control volunteer sign-up sheet was to be added for an alternative net control in case of problems with the primary.
- Discussed the collection of 2022 dues status; a purging of the unpaid members will be done on February 1st (90 days as per our bylaws “Any member in arrears more than 90 days will be considered inactive and dropped from the membership rolls”). (Continued on next page)

Minutes of the November 28th, 2021, VCARC Board Meeting (continued)

Officers Report:

- Treasurer: The report wasn't completely detailed but the total was given (not including Denney's TRW sales) due to the time limits on tonight's meeting.

Committee Reports:

- Social Functions
  - Decemberfest restaurant costs vis-à-vis our September board meeting. When the board convened in September (09/05/21) it was decided that:
    - "All social functions will be included in the yearly budget.
    - Authorization by the Board is required, if not previously authorized in the yearly budget.
    - Members may be required to pay for their food, to defray costs of the function."
  - A discussion was initiated to determine if the board agrees that it is appropriate to defray some of the dinner cost as per our above board recommendations. The discussion covered all of the different points-of-view and a motion was made, seconded and carried to provide up to $1,000 from the club's treasury to equalize the per diner cost to approximately $30 (alcoholic beverages were to be paid directly to the wait staff by the diner). The $30.00 was the original amount provided as an estimate, based on the cost back in 2019. Current shortages of both wait staff and food doubled the cost of the dinner.
- Members Health and Safety
  - One of our officers had asked the president to request specific guidance from The County Health Dept. before the Board meeting (originally scheduled on December 5th), so the Board could make a decision on behalf of VCARC, Inc. The Board could request a member of the Dept. of Health to attend our Board meeting to decide on any changes to make for January's General Membership Meeting at the Dudley House. That item was read to the board for comments. The board determined that there was no interest in having someone from the health department attend our meeting; our Safety and Health chairman, Mark Vodon KI6PTE, reviewed the current regulations and determined that:

    "4. Face Coverings. In addition to any State orders, face coverings, to be worn over the nose and mouth, are required regardless of COVID-19 vaccination status **in all indoor public settings** and businesses, including but not limited to: offices, retail stores, restaurants and bars, theaters, family entertainment centers, **meetings**, and local government offices serving the public.

    6. Exemptions. Individuals are **not required to wear face coverings** in the following circumstances:

    d. **While actively eating and/or drinking**.

(Continued on next page)

- **Minutes of the November 28th, 2021, VCARC Board Meeting (continued)**

  g. Performers at indoor live events such as theater, opera, symphony, and professional sports and (at our club meetings) **persons speaking before a live audience may remove face coverings while actively performing or participating, though such individuals should practice physical distancing as much as practicable."**

  - First aid kits recommendations and costs (Mark Vodon KI6PTE) was tabled until Mark provides the comparison of kits and costs.

- By Laws
  - Update on member-recommended edits. Are they available to review and approve by the board tonight to be sent to the general membership within the required time to be presented at the general membership meeting in January for a vote? (Tabled until Mark Swaney is available to discuss the status).
- Special Orders:
  - Inventory
    - Reimbursement request from Club Equipment Manager (Denney N6HV) for last month's TRW expenses. (Denney to submit to John)
    - Report from Denney on items sold and amount collected (Denney to submit).
- Unfinished Business:
  - Accounting Process Discussion
    - Status report on review of VCCU categories and assignment of transactions to those categories
      - Income sources and fixed and variable expenses
  - Reports to determine amount of budgeted categories
    - There is $2,633.00 in the income category called "none" that needs to be assigned into an appropriate category.
- New Business:
  - Consider joining the ARRL Club Commission Program (tabled)
  - Consider establishing a Santa Barbara section chairperson to interface with John Kitchens, Section Manager (tabled until Mark Swaney is in attendance)
  - Discuss purchasing a club Zoom Account (motion was made to spend up to $150 per year to purchase a Zoom Pro account, approved and Robert followed-up on November 29th and bought a club Zoom account
- Announcements:
  - The December 10th K6MEP club DecemberFest is scheduled to be held at La Dolce Vita
  - Adjournment: Meeting adjourned at 20:18.

Notes from the K6MEP Annual DecemberFest Dinner Party – Robert KM6RSS

We had twenty-nine members and their guests at the December 10th DecemberFest dinner at La Dolce Vita. Everyone enjoyed the buffet; lots to choose from including several salads, four main courses, an abundance of vegetables, and iced tea and lemonade. The desserts included tiramisu and a fruit medley. We had four wait staff that made sure everyone had drinks, were served all of the delicious food, desserts and cleared the tables.

After dinner, President Robert announced all of the new and returning board members. Richard WA6AEW and Pedro K6MIL were thanked for their service to the club and Certificates of Appreciation were signed and displayed. We especially acknowledged Denney N6HV for his excellent quizmaster abilities, his managing all of the club's donated equipment, and his monthly trips to the TRW swap meet to sell (for donations) the club's items. Mark Leach KN6FWH donated several gifts and kindly volunteered and acted as Denney's helper, delivering gifts to the lucky winners. Phil Cohen WA6BUZ was recognized for stepping forward to become our secretary. Also recognized and thanked was John Kitchens NS6S, our ARRL Santa Barbara Section Manager, for the donation of the Antenna and ARRL's Hands-On Radio Experiments Volume 1-2 books. Linda Shank gifted snowflake ornaments to the ladies and Tim KN6JGB provided hand-crafted fragrant holiday-shaped soap to all partygoers.

The winners of the Monday Night Net Contest were announced: Dave AI6VX, Denney N6HV and Robert KM6RSS who checked-in to all 48 nets (3-way tie for first place and $33.33 to each winner). Rod KA6GSU and Clem KM6OKZ tied for 47 nets (two-way tie for second place and $25 to each winner), and Jeremy KN6JMD who finished in third place with 46 nets (and $25).
Our new Monday Night Net Contest will start Monday, January 3rd and the three remaining December Mondays will be our normal weekly check-ins. We would like to have volunteers for December 13, 20 and 27th and January 10th nets, as well as alternate net control operators in case the net control operator has problems. I've placed a sign-up spreadsheet on our groups.io website under files, Monday Night Net. Thanks to Dave AI6VX for signing up for every first Monday of the month as net control.

Our next club meeting is January 14th at the Dudley House, where the presentation topic is "Grounding and Bonding" with Tim Duffy K3LR from DX Engineering via Zoom.
Thanks to who attended and Happy Holidays and a Prosperous and Healthy New Year 2022 to all. Robert KM6RSS

K6MEP Monday Night Net Update Robert KM6RSS

Our 2021 Contest started on January 11 and ended on December 6th. We had a total of 820 check-ins including 136 visitors and an average of 17.08 check-ins (see weekly details on next page).

As stated during the DecemberFest dinner, the winners of the contest were Dave AI6VX, Denney N6HV and Robert KM6RSS who checked-in to all 48 nets (3-way tie for first place and $33.33 to each winner). Rod KA6GSU and Clem KM6OKZ tied for 47 nets (two-way tie for second place and $25 to each winner) and Jeremy KN6JMD finished in third place with 46 nets (and $25). Robert and Jeremy have asked that their awards be placed in the club's special fund for assisting the youth and other ham-related needs.

Our new Monday Night Net Contest will start Monday, January 3rd and end on December 5th. To give those who are interested in the experience of being part of our Monday Night Net Contest as Control Operators, I've placed a sign-up spreadsheet on our groups.io website under files, 2022 Monday Night Net. Dave AI6VX has kindly volunteered to be the primary net control operator for January 3rd; we also need a back-up net controller as well. Dave also signed up as primary net control for every first Monday of the month for the entire contest. If you would like to volunteer, please contact me with the date(s) you would like and whether you want to be the primary or the back-up net controller and I'll update the list, which is saved to our K6MEP.groups.io website https://groups.io/g/K6MEP/files/2022%20Monday%20Night%20Net%20Contest .

Our Net is held each Monday night at 20:00 hrs. local time (we won't hold the net on Christmas Eve/Day or New Year's Eve/Day if they fall on a Monday). We welcome all Ham operators so please check-in and join the roundtable discussion. The net is on Two Meters on the WD6EBY Repeater of Oxnard on 145.200 MHz with a negative offset and a PL of 127.3. Many thanks to PVARC and Paul WD6EBY for hosting our meeting on the repeater. We also have a Zoom meeting during the net at 20:00; see the K6MEP.groups.io calendar for details.

The rules are as follows: The person who checks-in to the K6MEP Monday Night Net Contest must hold a valid Amateur Radio License. If a non-member wins, they will be given a two-year membership in the club. The awards consist of $100.00 for first place, $50.00 for second place and $25.00 for third place. In case of ties, the awards will be split equally among the members who qualify for the monetary award.

Many thanks to all of our members who volunteered in 2021 and provided our net control operations as well as led our after-net Zoom meeting.

On the next page is the Monday Night Net Contest Totals. Our groups.io has all of the documents in the files folder.

(Continued on next page)

K6MEP Monday Night Net Update (Continued)

Monday Night Net Contest Totals to Date

Week #	Date	Total	Visitors
1	1/11/2021	22	4
2	1/18/2021	22	3
3	1/25/2021	22	6
4	2/1/2021	18	3
5	2/8/2021	17	2
6	2/15/2021	18	3
7	2/22/2021	20	4
8	3/1/2021	17	3
9	3/8/2021	26	8
10	3/15/2021	20	5
11	3/22/2021	22	7
12	3/29/2021	17	3
13	4/5/2021	20	7
14	4/12/2021	19	4
15	4/19/2021	18	3
16	4/26/2021	17	4
17	5/3/2021	20	4
18	5/10/2021	13	2
19	5/17/2021	15	1
20	5/24/2021	19	5
21	5/31/2021	16	2
22	6/7/2021	20	3
23	6/14/2021	14	2
24	6/21/2021	23	5
25	6/28/2021	14	1
26	7/5/2021	21	5
27	7/12/2021	19	2
28	7/19/2021	17	2
29	7/26/2021	16	1
30	8/2/2021	17	1
31	8/9/2021	16	1
32	8/16/2021	13	2
33	8/23/2021	16	1
34	8/30/2021	16	1
35	9/7/2021	16	1
36	9/13/2021	14	2
37	9/20/2021	15	2
38	9/27/2021	15	2
39	10/4/2021	16	1
40	10/11/2021	12	3
41	10/18/2021	11	1
42	10/25/2021	16	2
43	11/1/2021	14	2
44	11/8/2021	13	2
45	11/15/2021	14	2
46	11/22/2021	11	1
47	11/29/2021	16	2
48	12/6/2021	17	3
	Total	820	136

Thoughts from the West - Reese West KQ6TT

ELECTRIC FIELD PROBLEMS

I have written several times about the fact that a propagating electric field cannot not have 'volts per meter' as the units it is measured with if the field is in a continuous loop. If you choose a starting point in the loop and move in either direction, the voltage will increase or decrease as you move around the loop. But you return to the original starting point where the voltage is the reference point. Obviously this is self-contradictory. That does not mean that the concept should not be used in actual use for short distances. This faulty concept is useful for engineering design use. I have no problem with that at all. However, there is another place and another probably faulty reason where a concept goes astray. This is when field strength meters reading out in volts per meter are used. I really don't know how they are calibrated and used, but I assume that they read out for fifty-ohm systems. The wrong part is that the fields are not propagating in a fifty ohm medium. The fields are propagating in free space with a three-hundred-seventy-seven ohm impedance. In fact the field strength meter should read out for that higher impedance to be a 'field strength meter'. That is a 7.54 difference in impedance. It should read out in energy in a certain space to be correct. I could be totally wrong here. I welcome any comments or corrections. There are probably quite a few places where engineering design methods and assumptions are useful and give good useful design numbers, but are really just plain wrong. The result is to use the basic design methods. All this writing is purely academic.

WELL, LAST MONTH WAS NOT THE END OF THE TOPIC.

I really don't know if anyone reads all this. I will keep it short.

Electric fields are guided by metal structures. Sixty cycle power lines do not carry power in the wires. All the energy is external to the wires in fields. For years I have stated the position that the fields are guided by the metal-air interface. I also believe that the propagating electric and current fields are an interface phenomenon. That interface would be between our four-space, three dimensions and time, and what I called NTNS, no time no space. In what is generally called the big bang, our four-space came from NTNS. This interface is everywhere in our four-space. This is how energy particles come and go from existing one side or the other. When a particle has a lifetime and winks out--where does it go? I believed that the magnetic fields propagated in our four-space and the electric field propagated in NTNS. I had no way to defend that position until now. Now I can defend part of it. I believe that in antenna energy calculations, that the capacitance from one side of a dipole antenna to the other, assumes instantaneous connections through the capacitive displacement current. If this is correct, then it does not happen in our four-space. It has to happen in NTNS. If I am wrong and the calculations use the expected time delays involved with the speed of light, please let me know. One is never wrong only if one never does anything.

Laurice West KQ6TT
December 24, 2021

Video via the Ventura County Mesh Network

By Dave KM6FQ
As reported to Orv W6BI

This is my experience deploying a high speed communication service via Ventura County's ham radio network at Aid Station G site for the Santa To The Sea half marathon on December 12th.

Mesh networking is an amateur radio version of Wi-Fi so you would not normally expect it work to work 16 miles but with the right gear it does.

The planning phase consisted of determining what mesh backbone nodes were reachable from Aid Station G, located in Oxnard. Only one, Sulphur Mountain, was available but was 16 miles away and 13 degrees up angle.

At Aid station G the dish would have to see over two story houses and rows of palm trees that were even higher. The antenna of choice to go 16 miles is a big dish. I use a 21" wide, 27 db gain Mikrotik LHG 5 XL dish (plus radio & electronics) which is surprisingly light weight at about 2 pounds.

I visited the aid station site several times in the week before the event to determine what was needed to be able to see a mesh backbone node. I initially tried a tripod and telescoping mast where I thought the aid station would be located. The vectors to the known backbone nodes were known and I used the compass app on my iphone7 to do the initial alignment of the dish. The dish was mounted on the mast, with a bottom shim to approximate the 13 degree up angle, and the mast was plumbed vertical with a bubble level, and finally raised to 13'. This is as high as I was comfortable without guying.

The next step is to power the dish and use a browser to log into the dish and run the "chart" feature of the ARDEN software to listen for a signal. The Ubiquiti company was kind enough to create a little device called an AirGateway which is powered from a 5V micro USB source and outputs a 24V POE to the dish and it also is a wifi access point. The USB source was a small 15Ah lithium battery that I use to recharge my smartphone. The 2 amp port on the battery provided adequate power for the AirGateway and the dish. My smart phone was able to connect to the AP and I opened a browser to log into the dish. Installed on the mast was a ring, held in place by a band clamp, and the ring rested on the top of the tripod so that the mast could easily be rotated by hand. With all the gear in place the the chart program running I slowly rotate the mast and scanned for a signal from the remote nodes. Nothing was heard. I would have to be much higher than 13'. My time was up and it was getting dark. It was obvious that I would be making another trip to Oxnard.

A possible solution was provided by Mother Nature in the form of approximately 30' high sand dunes but they were about 100 yards from the site (Continued on next page)

Video via the Ventura County Mesh Network (Continued)

[330 feet according to Google Maps - Orv]. The next day I made another trip to Oxnard to check out the reception from the top of the sand dune. It was a workout to get the big MFJ tripod and mast (I only brought two sections to save weight) to the top of the dune.

The gear was assembled and I was able to connect to Sulphur Mountain at -75 db; not great but good enough. Now the problem was how to reach the aid station 100 yards away in a high traffic area. I dusted off a pair of Nanostation M5s that would be used to make an rf link from the dish to the aid station site. All the gear was assembled in my backyard.

The dish channel was temporarily changed from 172 to 176 in order to connect to the Chatsworth Peak node and the NSM5s were programmed to channel 143 to minimize interference with the weak signal on ch176. The dish and NSM5 were powered by a 35Ah deep discharge battery in a battery case that had extra room for the RigRunner power distribution, 24 volt inverter and Netgear switch. The gear for the aid station was another 35Ah battery and case, Rigrunner panel, Mikrotik hAP lite for the router, and a Reolink wired camera. The hAP provided the access point so that I could use my smartphone to access the mesh and verify the streaming video. The setup worked but I was in for some surprises.

On race day I discovered that getting the heavy battery to the top of the sand dune was exhausting and time consuming. I forgot to pack the AirGateway so another trip to the car was needed to get the hAP to allow accessing the dish from the dune site. The Arden software “chart” application was reporting a solid -40 db signal which was obviously wrong. I realized that it was reporting the NSM5 not Sulphur Mountain. I unplugged the NSM5 and now the chart program was able to report when I had the dish properly aligned. I plugged in the NSM5 and verified that Sulphur Mountain was still connected with good statistics.

About this time the race crew arrived and made it clear where the aid station will be located. I assembled the station gear with the other NSM5 and camera mounted on a studio tripod. I connected the gear and powered it up. (Continued on next page)

Video via the Ventura County Mesh Network **(Continued)**

It worked but not well. I noticed that I had placed the dune site NSM5 directly below the dish and the NSM5 was pointed about 45 degrees from where the aid station was located. I made another trip to the dune to move the NSM5 but I could not reach it. I retrieved a small step ladder from my van but I still could not reach it. I wished I had brought along my 7' step ladder. To fix the problem I would have to take down the tripod but that meant retrieving the hAP from the aid station site to realign the dish and there wasn't time with the first runner due in minutes. Oh well, it would have to do.

Back at the aid station I could log into the camera but I could not get a live picture. I do not know why it worked at home but not at the aid station site. I discovered that the camera "snapshot" feature did show what the camera was looking at so I was able to align the camera. Later I tried to zoom in on the mesh relay on the dune but ended up taking the camera out of focus. I found out later that there is a Reolink app that may have shown a picture and provide a workable zoom but I have not yet tried it.

I will have to reassemble the gear in my backyard to find out why my phone was able to use the camera at home but not on the dune site. It might have something to do with internet access via my house Wi-Fi which was absent at the dune site. I did not take my laptop because I knew it would need a table and would also be a time sink because of mesh apps installed on it. I also intentionally did not install the solar panels to save time and trips to the dune.

Back at home I watched the video Orv W6BI uploaded to YouTube and discovered that I had not enabled the sound. Another item for my mesh checklist. I also checked the charge on the batteries and one was 80% and the other was 90%. Not bad for running the mesh gear for six hours. The solar panels would have given the setup a near 24x7 capability. **(Continued on next page)**

Video via the Ventura County Mesh Network (Continued)

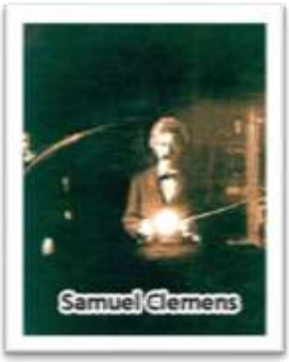
It is clear to me now that a complete event mesh site with a mesh relay is more than one person can handle in a reasonable timeframe given that mesh app checkout alone is distracting and time consuming. And then there is the easy-up, VHF/UHF go-box, and antenna setup. I am glad that I did not attempt all that at the SttS event.

73

Dave KM6FQ
Orv W6BI

Trivia by Dana KG6WXE

Someone once said:



Mark Twain (Samuel Clemens) once said
“Never argue with a fool. On lookers may not be able to tell the difference”.

Baseball player Satchel Paige once said
"Don't look back. Something might be gaining on you."

Did you know military personal in the Iraq war used the toy called Silly String to help find IED tripwires?

Happy New Year.
Dana
KG6WXE

K6MEP Monday Night Net Script (revised)

QST- QST- QST. This is ----(name) -----(call sign) , with the Ventura County Amateur Radio Club Net. If there is any station with EMERGENCY or PRIORITY Traffic that needs the immediate use of this frequency, please come now.

Hearing none, the following is a QST. This is ----(name) -----(call sign), tonight's net control station for the Ventura County Amateur Radio Club Net. If, at any time, during tonight's net, anyone needs this frequency for emergency or priority traffic, please call net control, and we will respond appropriately.

This is a directed net, open to all amateur radio operators and is sponsored by K6MEP, the call sign for VCARC. This net begins each Monday evening at 20:00 local time on the WD6EBY linked repeater system.

The primary frequency of this net is 145.200 MHz with a minus offset and a PL of 127.3 Hz. If the repeater should fail for any reason, we can use South Mtn. repeater on 146.385 MHz with a positive offset and a PL of 127.3 Hz as backup.
All amateurs are welcome to check in after the following announcements.
A roundtable will follow the check-ins. A rag chew session may follow the formal net. We will have a Zoom meeting following the net.

At this time I will call on tonight's alternate net control station -------- (Name) -------- (Call) (Pause for alternate NC check in). If for any reason my station should become inoperable the alternate net control station will proceed with the net.

K6MEP, the Ventura County Amateur Radio Club, meets at 19:00 hours on the second Friday of each month at The Dudley House, 197 N Ashwood Ave, Ventura, CA. The club meeting will also be on Zoom. Our next meeting will be on Friday (date) (location) (presenter) (topic). We urge any non-members interested in the VCARC to contact us at K6MEP@qsl.net. Non-members interested in amateur radio are welcome to attend our meetings.

Our 2022 Contest starts on January 3rd and ends on December 5th. Make sure to set your calendar alarms to remind you to check-in and join the Zoom get-together that follows.
The rules are as follows: The person who checks-in to the K6MEP Monday Night Net Contest must hold a valid Amateur Radio License. If a non-member wins, they will be given a two-year membership in the club. The awards consist of $100.00 for first place, $50.00 for second place and $25.00 for third place. In case of ties, the awards will be split equally among the members who qualify for the monetary award.

When you check-in, please give your call sign (phonetically), name and if you are a VCARC member. If you are not a member of the club, please include your QTH or location.
Please check in now.
(Check-ins completed or a lull in the check-ins): Hearing no other check-ins at this time, we will now begin with our Roundtable (Start with the first check-in and ask him/her about ham radio activities during last week, then move on to the next person). At every ten minute mark, identify with your first name, call sign and VCARC net.
Any last comments? ******** Any late, missed, or visitor check-ins?
Please check-in now.
Hearing no new check-ins, does anyone have anything else they would like to add to tonight's net?
Hearing none;
(Closing): This concludes the VCARC weekly net at _____hours. Thank you for your interest and participation. Also thanks to Paul Strauss, WD6EBY, for the use of the repeater for our K6MEP net.
73, this is ----(name) -----(call sign), tonight's VCARC net control, signing off and returning the repeater to its normal use.

Selected Contests & Special Events

Please see QST or the ARRL website (www.arrl.org) for any details and QSL information.

Maty Weinberg, KB1EIB, 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!

Jan. 1 – Jan. 9, 0000Z-2359Z, W2P, Trenton, NJ. Delaware Valley Radio Association. **American Revolution — Battle of Princeton**. 14.250. Certificate* & QSL. DVRA, P.O. Box 7024, Trenton, NJ 08628. **www.w2zq.com** *or* **www.qrz.com/db/w2zq**.

Jan. 2 – Jan. 31, 0000Z – 2359Z, K3Y/0-9, KH6, KL7, KP4, worldwide. Straight Key Century Club. **16th Annual Straight Key Month**. 3.550 7.055 14.050 21.050. Certificate & QSL. SKCC c/o Jeremy Downard, K8JAD, 511 W. Pottawatamie St., Tecumseh, MI 49286. *DX member stations in six WAC areas operating straight key, bug, and cootie keys. QSL card confirms one QSO per area, up to 19 for all-area sweep. See website for operating schedule/map, stats, etc. This is an operating event.* **www.skccgroup.com/k3y**

Jan. 15, 1400Z – 2000Z, W1M, Russell, MA. Western Mass Council, Scouts BSA. **WHOA weekend, Scouts BSA**. 7.190 10.115 14.060 14.290. QSL. Tom Barker, WA1HRH, 329 Faraway Rd., Whitefield, NH 03598. *Paper logging and eQSL.*

Jan. 15, 1800Z – 2300Z, N9WH, Crystal Lake, IL. The 415 Amateur Radio Club. ***The 415***. 7.250 14.250 146.415. QSL. The 415 Amateur Radio Club, 3208 Bay Rd., Crystal Lake, IL 60012. **www.qrz.com/db/n9wh**

Jan. 19 – Jan 24, 0400Z – 0359Z, WW2FLY, Attica, NY. WWII Flying Fortress Amateur Radio Club. **80th Anniversary of the 8th Air Force**. 1.900 3.850 7.180 14.250. Certificate & QSL. WWII Flying Fortress Amateur Radio Club, 3339 Stroh Rd., Attica, NY 14011. *SSB and FT8; check spotting networks to find us on HF.* **www.qrz.com/db/ww2fly**

Jan. 21 – Jan. 23, 0000Z – 2359Z, K5D/KF5UPC, Alice, TX. Coastal Band Digital Group and South Texas Amateur Radio Club. **Silent Key Memorial Weekend**. 7.265 14.265. Certificate. Pedro Saenz, Jr., 611 Schley, Alice, TX 78332. **pedrojr45@yahoo.com** ***or*** **https://m.facebook.com/784535814939833**

Jan. 22, 1000Z – 1700Z, W9RH, Milwaukee, WI. Milwaukee Radio Amateurs' Club. **105th Anniversary**. 7.250 14.250 145.390. Certificate. MRAC Special Event, P.O. Box 26938, Milwaukee, WI 53226. *See website for operating frequencies (HF, VHF, WIRES-X) and certificate information; operating from HRO-Milwaukee.* **www.w9rh.org**

Jan. 22 – Jan. 29, 1400Z – 0700Z, W7Q, San Luis, AZ. **Quartzfest**. 7.277 14.285 28.415; 7.074 14.076 28.074 21.740. Certificate. Tom Luther, 7690 W. Derry Rd., Kirkland, AZ 86332. **https://quartzfest.org**

Jan. 29 – Jan. 31, 1600Z – 0001Z, AG6AU, Coloma, CA. El Dorado County Amateur Radio Club. **California Discovery of Gold**. 7.248 14.248 21.348 28.348. QSL. El Dorado County ARC, P.O. Box 451, Placerville, CA 95667. *174th anniversary of the discovery of gold in Coloma, California starting the 49'er gold rush.* **www.edcarc.net**

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. *Note: Some clubs may ask for a nominal fee to cover the cost of the certificate or QSL. Request will be made on air during the event or on the club's website.

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 **April** *QST* would have to be received by **February 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 acknowledgement 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**

Volunteer Monitor Program Report

The Volunteer Monitor (VM) Program is a joint initiative between ARRL and the FCC to enhance compliance in the Amateur Radio Service. This is the October 2021 activity report of the WM Program.

♦Technician operators in Yarmouth Port, Massachusetts, and Richmond, Texas, received advisories after making numerous FT8 contacts on 40 and 20 meters. Technician licensees are not allowed to transmit data on 40 meters and have no operating authority on 20 meters.

♦Operators in Mims, Florida; Moorefield, West Virginia; State Road, North Carolina; and Grottoes, Virginia, received advisories concerning excessive SSB bandwidth on 40 and 75 meters. The operator in Moorefield, West Virginia, previously received an advisory for out-of-band operation on 7.138 MHz. His case will be referred to the FCC for further enforcement action, which could include removal of voice privileges from, or revocation of, his General-class license.

♦An operator in Cave Creek, Arizona, received an advisory for making lengthy transmissions without identifying as required by Commission rules.

♦An operator in Highlandville, Missouri, was reminded that a beacon on 30 meters cannot be automatically controlled, pursuant to 97.203(d) of the Commission's rules, and must have a control operator present at all times of transmission. He was further advised that the FCC may request a schedule of control operators and their duty hours.

♦The final totals for monitoring in September were 1,909 hours on HF frequencies and 2,716 hours on VHF frequencies and above, for a total of 4,625 hours.

♦There was one recommendation to the FCC for case closure and renewal of a license, and one request to review a license application. The FCC referred two cases to the VM Program. — *Volunteer Monitor Program Administrator Riley Hollingsworth, K4ZDH*

Contest Corral

Bruce Draper, AA5B, aa5b.corral@gmail.com

Contest Corral — January 2022

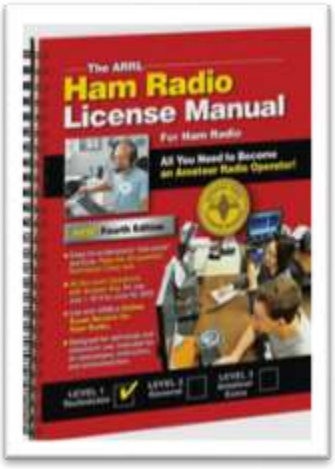
Check for updates and a downloadable PDF version online at **www.arrl.org/contest-calendar**.
Refer to the contest websites for full rules, scoring information, operating periods or time limits, and log submission information.

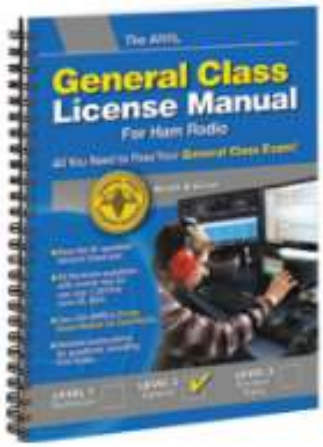
Start - Finish Date-Time		Date-Time		Bands	Contest Name	Mode	Exchange	Sponsor's Website
1	0000	1	0100	3.5	AGB New Year Snowball Contest	CW Ph Dig	Category, ARRL section	www.qsl.net/eu1eu/agb_nysb.htm
1	0800	1	1100	3.5, 7	SARTG New Year RTTY Contest	Dig	RST, serial, name, "HNY" greeting	rttyops.com/index.php/contests
1	0900	1	1200	3.5-14	AGCW Happy New Year Contest	CW	RST, serial, mbr (if any)	alt.agcw.de/index.php/en
1	1200	2	1200	1.8-28	WW PMC Contest	CW Ph	RS(T), PMC abbreviation or CQ zone	s59dcd.si/index.php/sl/ww-pmc
1	1400	1	1800	144, 432	AGCW VHF/UHF Contest	CW	RST, serial, power class, 6-char grid	www.agcw.de/contest/vhf-uhf
1	1500	1	1800	3.5-28	QRP ARCI New Years Sprint	CW	RST, SPC, mbr or power	qrparci.org
1	1500	2	1500	3.5-14	Original QRP Contest	CW Ph	RST, serial, power category	qrpcc.de/contestrules/oqrpr.html
1	1800	1	2359	3.5, 7, 14, 18, 21, 24, 28, 2 repeaters	ARRL Kids Day	Ph	Name, age, QTH, favorite color	www.arrl.org/kids-day
3	0000	3	0100	1.8-28	K1USN Slow Speed Test	CW	Max 20 WPM; name, SPC	www.k1usn.com/sst.html
4	0100	4	0159	1.8-50	Worldwide Sideband Contest	Ph	RS, OM, YL, or Youth	wwsac.com/rules.html
4	0200	4	0400	3.5-28	ARS Spartan Sprint	CW	RST, SPC, power	arsqrp.blogspot.com
4	1700	4	1900	3.5-14	RTTYops Weeksprint	Dig	Other's call, your call, serial, name	rttyops.com
5	0200	5	0330	7	QRP Fox Hunt	CW	RST, SPC, name, power	www.qrpfoxhunt.org
5	1300	5	1400	1.8-28	CWops Mini-CWT Test	CW	Name, mbr or SPC	cwops.org/cwops-tests
5	1700	5	2000	144	VHF-UHF FT8 Activity Contest	Dig	4-char grid square	ft8activity.eu/index.php/en
5	1900	5	2000	1.8-28	CWops Mini-CWT Test	CW	Name, mbr or SPC	cwops.org/cwops-tests
5	2000	5	2100	3.5	UKEICC 80-Meter Contest	Ph	6-char grid square	ukeicc.com/80m-rules.php
6	0000	7	0300	7	Walk for the Bacon QRP Contest	CW	<13 WPM; RST, SPC, name, mbr or power	qrpcontest.com/pigwalk40
6	0300	6	0400	1.8-28	CWops Mini-CWT Test	CW	Name, mbr or SPC	cwops.org/cwops-tests
6	0700	6	0800	1.8-28	CWops Mini-CWT Test	CW	Name, mbr or SPC	cwops.org/cwops-tests
6	1700	6	1900	3.5-14	RTTYops Weeksprint	Dig	Other's call, your call, serial, name	rttyops.com
6	1800	6	2200	28	NRAU 10-Meter Activity Contest	CW Ph Dig	RS(T), 6-char grid square	nrricontest.no
6	2000	6	2200	1.8-50	SKCC Sprint Europe	CW	RST, SPC, name, mbr or "none"	www.skccgroup.com
7	0100	7	0230	3.5	QRP Fox Hunt	CW	RST, SPC, name, power	www.qrpfoxhunt.org
7	2000	7	2100	1.8-28	K1USN Slow Speed Test	CW	Max 20 WPM; name, SPC	www.k1usn.com/sst.html
8	0000	8	2359	3.5-28	PODXS 070 Club PSKFest	Dig	RST, SPC	www.podxs070.com
8	0000	8	2359	3.5-28	YB DX Contest	Ph	RS, serial	ybdxcontest.com
8	0500	8	0900	3.5-28	Old New Year Contest	CW Ph	RST, sum of age and years on the air	www.radio.ru/cq
8	1200	9	2359	1.8-50	SKCC Weekend Sprintathon	CW	RST, SPC, name, mbr or "none""	www.skccgroup.com
8	1300	8	1700	3.5, 7	RSGB AFS Contest, CW	CW	RST, serial	www.rsgbcc.org/hf
8	1800	9	2359	3.5-28	ARRL RTTY Roundup	Dig	W/VE: RST, SP; non-W/VE: RST, serial	www.arrl.org/rtty-roundup
8	2000	9	0700	1.8	EUCW 160-Meter Contest	CW	RST, name, mbr or "NM"	www.eucw.org/eu160.html
9	0630	9	0830	3.5, 7	NRAU-Baltic Contest, SSB	Ph	RS, serial, fylke/län/province/region	nraubaltic.eu
9	0900	9	1059	28	DARC 10-Meter Contest	CW Ph	RS(T), serial, DOK (if any)	darc.de/der-club/referate/conteste
9	0900	9	1100	3.5, 7	NRAU-Baltic Contest, CW	CW	RST, serial, fylke/län/province/region	nraubaltic.eu
10	0100	10	0300	1.8-28	4 States QRP Second Sunday Sprint	CW Ph	RS(T), SPC, mbr or power	4sqrp.com/SSS/sss_rules.pdf
12	1700	12	2000	432	VHF-UHF FT8 Activity Contest	Dig	4-char grid square	ft8activity.eu/index.php/en
15	0000	16	2359	3.5-28	Malaysia DX Contest	Ph	RS, age	9mdxc.com
15	1200	16	1159	1.8-28	Hungarian DX Contest	CW Ph	RS(T), HA county or serial	ha-dx.com/en/contest-rules
15	1200	16	1159	3.5-28	PRO Digi Contest	Dig	RST, serial, "M" if a member	www.procontestclub.ro
15	1200	16	1200	3.5-28	UBA PSK63 Prefix Contest	Dig	RSQ, UBA section or serial	uba.be/en/hf/contest-rules
15	1800	16	0559	1.8-28	North American QSO Party, CW	CW	Name, SPC	www.ncjweb.com
15	1900	15	2300	1.8	WAB 1.8 MHz Phone	CW Ph	RS, serial, WAB square or country	wab.intermip.net
15	1900	17	0359	50 and up	ARRL January VHF Contest	CW Ph Dig	4-char grid square	www.arrl.org/january-vhf
15	2000	16	0559	1.8-7	Feld Hell Sprint	Dig	RST, mbr, SPC, grid	sites.google.com/site/feldhellclub
16	1300	16	1700	3.5, 7	RSGB AFS Contest, Data	Dig	RST, serial	www.rsgbcc.org/hf
16	2300	17	0100	1.8-28	Run for the Bacon QRP Contest	CW	RST, SPC, mbr or power	qrpcontest.com/pigrun
20	0000	21	0300	14	Walk for the Bacon QRP Contest	CW	<13 WPM; RST, SPC, name, mbr or power	qrpcontest.com/pigwalk20
20	0130	20	0330	3.5-14	NAQCC CW Sprint	CW	RST, SPC, mbr or power	naqcc.info
22	1200	23	1200	3.5-28	BARTG RTTY Sprint	Dig	Serial	bartg.org.uk
22	1300	22	1700	3.5, 7	RSGB AFS Contest, SSB	Ph	RS, serial	www.rsgbcc.org/hf
22	1800	23	0559	1.8-28	North American QSO Party, SSB	Ph	Name, SPC	www.ncjweb.com
22	1800	23	0559	1.8-28	NA Collegiate Championship, SSB	Ph	Name, SPC	www.w9smc.com/nacc
23	1400	26	0800	1.8-144	Classic Exchange, Phone	Ph	Name, RS, SPC, rig manuf/model	www.classicexchange.org
26	0000	26	0200	1.8-50	SKCC Sprint	CW	RST, SPC, name, mbr or "none"	www.skccgroup.com
26	2000	26	2100	3.5	UKEICC 80-Meter Contest	CW	6-char grid square	ukeicc.com/80m-rules.php
26	2300	30	2300	1.8-7	AWA Linc Cundall CW Memorial	CW	RST, eqpt year, input power	antiquewireless.org
27	0130	27	0330	1.8	NAQCC CW Sprint	CW	RST, SPC, mbr or power	naqcc.info
28	2200	30	2200	1.8	CQ 160-Meter Contest, CW	CW	RST, SP or CQ zone	www.cq160.com
29	0600	30	1800	3.5-28	REF Contest, CW	CW	RST, French department or serial	concours.r-e-f.org/reglements
29	1300	30	1300	3.5-28	UBA DX Contest, SSB	Ph	RST, serial, province (if ON)	uba.be/en/hf/contest-rules
29	1900	30	1900	All	Winter Field Day	CW Ph Dig	Category, ARRL section	winterfieldday.com

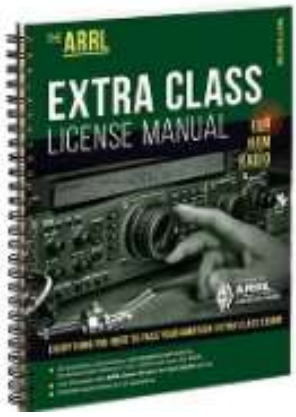
There are a number of weekly contests not included in the table above. For more info, visit: **www.qrpfoxhunt.org**, **www.ncccsprint.com**, and **www.cwops.org**.
All dates refer to UTC and may be different from calendar dates in North America. Contests are not conducted on the 60-, 30-, 17-, or 12-meter bands.
Mbr = Membership number. Serial = Sequential number of the contact. SPC = State, Province, DXCC Entity. XE = Mexican state. Listings in blue indicate contests sponsored by ARRL or *NCJ*. The latest time to make a valid contest QSO is the minute listed in the "Finish Time" column. *Data for Contest Corral is maintained on the WA7BNM Contest Calendar at* **www.contestcalendar.com** *and is extracted for publication in* QST *2 months prior to the month of the contest. ARRL gratefully acknowledges the support of Bruce Horn, WA7BNM, in providing this service.*

Upcoming FCC Exam Session Preparation Sites

(Virtual only; physical classes are unavailable this month within 250 miles of Ventura)







Upcoming FCC Exam Test

(Within 50 miles) Due to the Coronavirus outbreak, please verify with your VE team that the exam session is being held.
GLAARG is offering remote testing; see https://glaarg.org/remote-sessions/ for details

Santa Monica CA 90403-5610

01/08/2022
Sponsor: The PAPA system
Date: Jan 08 2022
Time: 7:00 AM (No Walk-ins / Register or Call ahead)
Contact: Norm Goodkin
(818) 613-2257
Email: hamclass@goodkin.net
VEC: Greater LA VEC
Location: Fromin's Deli and Rest
1832 Wilshire Blvd
Http //Papasys Org
Pre-registration required
Santa Monica CA 90403-5610

Valencia CA 91355-2008

01/15/2022
Sponsor: Santa Clarita ARC
Date: Jan 15 2022
Time: 8:00 AM (No Walk-ins / Register or Call ahead)
Contact: Ronald B. Klein
(661) 259-0948
Email: testing@w6jw.org
VEC: Greater LA VEC
Location: United Methodist Church of Valencia
25718 McBean Pkwy
Rm B
Valencia CA 91355-2008

Sylmar CA 91342

EXAM SESSION

01/16/2022
Sponsor: Southern California VE Group
Date: Jan 16 2022
Time: 1:00 PM (No Walk-ins / Register or Call ahead)
Contact: Steve T. Ryan
(949) 648-6322
Email: steve@ryantecheng.com
VEC: ARRL/VEC
Location: Sklmar California
15915 Foothill Blvd
Sylmar CA 91342

On Exam Day Bring the Following Items:

1. One legal photo ID (identification):
   a. State Driver's License, b. Government issued Passport, c. Military or Law Enforcement Officer Photo ID card, d. Student School Photo ID card, e. State Photo ID card.
2. If no photo ID is available, two forms of identification:
   a. Non-photo State ID card (some states still have them), b. Birth certificate (must have the appropriate seal), c. Social security card, d. Employer's wage statement or Minor's work permit, e. School ID card, f. School or Public Library card, g. Utility bill, bank statement or other business correspondence that specifically names the person; or a postmarked envelope addressed to the person at his or her current mailing address as it appears on the Form 605.
3. Students/minors without a photo ID need to bring only one of the above items if a legal guardian presents their photo ID; otherwise two non-photo IDs are required. Minor children (under the age of 18) may be accompanied in the room by an adult during the test.
4. FCC Registration Number (FRN): VECs are required by the FCC to submit your FRN with your license application form. New license applicants must create an FCC user account and register their Social Security Number (SSN) in the FCC Commission Registration System (CORES) before attending exam sessions. Registrants will be assigned an FRN which will be used in all license transactions with the FCC. For instructions on how to register your SSN and receive an FRN from the FCC, visit the FCC's Registration page and the FCC's Registration instructions page. Per FCC rules, a valid email address is also mandatory on the application form.
5. If applicable, bring a printed copy of your Amateur Radio license. Acceptable copies or printouts of licenses are available from the following sources: the official license or reference license printed from the FCC website or license data printed from the ARRL website or QRZ website. The original(s) and photocopy(s) of any Certificates of Successful Completion of Examination (CSCE) you may hold from previous exam sessions. If your license has already been issued by the FCC, the CSCE showing license credit is not needed. The candidate is required to show proof of the current license to the team but the team is no longer required to submit the proof to the VEC. Expired license proof must be submitted to the team and to the VEC for processing to FCC. These photocopies will not be returned. Instructions on how to obtain an official FCC license copy are on our Obtain License Copy web page.
6. Two number two pencils with erasers and a pen for in-person sessions.
7. A calculator with the memory erased and formulas cleared is allowed. You may not bring any written notes or calculations into the exam session. Slide rules and logarithmic tables are acceptable, as long as they're free of notes and formulas. Cell phone must be silenced or turned off during the exam session and the phones' calculator function may not be used. In addition, iPhones, iPads, Androids, smartphones, Blackberry devices and all similar electronic devices with a calculator capability, may NOT be used.
8. Bring a check, a money order or cash to cover the exam session fee(s). Check the ARRL VEC's current exam fees. The FCC hasn't started to accept the $35 fee, which will be paid directly to the FCC.
9. Be aware that some information about you will be made publicly available on the FCC's website.

Convention and Hamfest Calendar

Steve Ewald, WV1X, sewald@arrl.org; www.arrl.org/hamfests-and-conventions-calendar

Convention and Hamfest Calendar

A = AUCTION
D = DEALERS / VENDORS
F = FLEA MARKET
H = HANDICAP ACCESS
Q = FIELD CHECKING OF QSL CARDS
R = REFRESHMENTS
S = SEMINARS / PRESENTATIONS
T = TAILGATING
V = VE SESSIONS

Abbreviations
Spr = Sponsor
Tl = Talk-in frequency
Adm = Admission

Arizona (Glendale) — Jan. 15 D F H Q R S T V
7 AM – noon. *Spr:* ARCA, Thunderbird ARC. Glendale Nazrene Church, 5902 W. Cactus Rd. *Tl:* 446.15 (100.0 Hz) or 147.040 (162.2 Hz) linked. *Adm:* $5. **www.w7tbc.org**

QUARTZFEST CONVENTION
January 23 – 29 Quartzsite, Arizona
F H S T V
All day, every day. *Spr:* Quartzfest Committee. Roadrunner BLM, US-95 and 53rd St. N. RV and tent dry camping. *Tl:* 146.55 simplex. *Adm:* Free. **quartzfest.org**

Colorado (Loveland) — Jan. 15 D H R S V
9 AM – 1 PM. *Spr:* Northern Colorado ARC. The Ranch, 5280 Arena Circle. *Tl:* 448.025 (100 Hz). *Adm:* $7. **ncarc.net**

Florida (Arcadia) — Jan. 29 D H R T
6 AM – noon. *Spr:* DeSoto ARC. DeSoto County Turner Center Exhibit Hall, 2260 NE Roan St. *Tl:* 147.075 (100 Hz). *Adm:* $5. **desotoarc.org**

Florida (DeFuniak Springs) — Jan. 8 F H R T
8 AM – 1 PM. *Spr:* Walton Co. ARC. Life Enrichment Senior Center, 312 College Ave. *Tl:* 147.285 (100 Hz), Echolink node: 637806. *Adm:* Free. **wf4x.wordpress.com**

Florida (Fort Myers) — Jan. 21 – 22 D H Q R S T V
Fri. noon – 5 PM, Sat. 8 – 3 PM. *Spr:* Fort Myers ARC. Florida SouthWestern State College, 8099 College Parkway. *Tl:* 147.165 (127.3 Hz). *Adm:* $10. **swflhamfest.info**

Florida (New Port Richey) — Jan. 15 T V
8 AM – noon. *Spr:* Gulf Coast ARC. Millennium Academy, 10005 Ridge Rd. *Tl:* 146.67 (146.2 Hz). *Adm:* $5. Email: **keavbv@msn.com**

ARRL NATIONAL CONVENTION
February 10 – 13 Orlando, Florida
D F H Q R S T V
Thurs. 8:30 AM – 5 PM, Fri. 9 AM – 5 PM, Sat. 9 AM – 5 PM, Sun. 9 AM – 2 PM. *Spr:* Orlando ARC. Central Florida Fairgrounds and Expo Park, 4603 West Colonial Dr. *Tl:* 146.760 (103.5 Hz). *Adm:* $20. **hamcation.com**, **www.arrl.org/expo**

Florida (Tampa) — Jan. 8 F H Q R T V
8 AM – 1 PM. *Spr:* Tampa ARC. 7801 N. 22nd St. *Tl:* 147.105 (146.2 Hz). *Adm:* $5. **www.hamclub.org**

ARRL MIDWEST DIVISION CONVENTION
January 22 Collinsville, Illinois
D F H Q R S V
8 AM – 4 PM. *Spr:* St. Louis and Suburban Radio Club. Gateway Convention Center, 1 Gateway Dr. *Tl:* 146.970 (141.3 Hz). *Adm:* $8 Advanced, $10 door. **winterfest.slsrc.org**

Illinois (St. Charles) — Jan. 16 D H R S V
8 AM – 1 PM. *Spr:* Wheaton Community Radio Amateurs. Kane County Fairgrounds Expo Center, 525 S. Randall Rd. *Tl:* 145.31 (107.2 Hz). *Adm:* $8 Advanced, $10 door. **www.w9ccu.org**

Louisiana (Hammond) — Jan. 15 D F H Q R S V
7 AM – 3 PM. *Spr:* Southeast Louisiana ARC. Pennington Student Activity Center, 1350 North General Pershing St. *Tl:* 147.00 (107.2 Hz). *Adm:* $5. **cms.selarc.org/about/hammond-hamfest**

Michigan (Royal Oak) — Jan. 23 D H R
8 AM – noon. *Spr:* Hazel Park ARC. Royal Oak Farmers Market, 316 E. Eleven Mile Rd. *Tl:* 146.640. *Adm:* $5. Email: **n8rel@arrl.net**

ARRL DELTA DIVISION CONVENTION
January 28 – 29 Jackson, Mississippi
D F H Q R S T V
Fri. 5 PM – 8 PM, Sat. 8 AM – 3:30 PM. *Spr:* Jackson ARC. Mississippi Trademart,1200 Mississippi St. *Tl:* 146.76 (77 Hz). *Adm:* $10. **www.msham.org**

New Mexico (Albuquerque) — Jan. 29 F H R T
6 AM – 11 AM. *Spr:* 146.580 Simplex Group. Stoneface Tavern parking lot, 8201 San Pedro Dr. NE. *Tl:* 145.330 (100 Hz) and 444.000 (100 Hz). *Adm:* Free. Email: **kh6jtm@comcast.net**

New York (Marathon) — Jan. 15 F H R V
7 AM – noon. *Spr:* Skyline ARC. Marathon Civic Center, 16 Brink St. *Tl:* 147.180 (71.9 Hz). *Adm:* $5. **skylinehamradioclub.org**

Ohio (Shade) — Jan. 16 D F H R V
8 AM. *Spr:* Sunday Creek Amateur Radio Federation. Shade Community Center, 2380 Old US 33. *Tl:* none. *Adm:* $6. **QRZ: KC8AAV**

ARRL NORTH TEXAS SECTION CONVENTION
January 14 – 15 Forest Hill, Texas
D F H R S T V
Fri. 3 PM – 7 PM, Sat. 7 AM – 3 PM. *Spr:* Cowtown ARC. Forest Hill Civic and Convention Center. *Tl:* 146.940 (110.9 Hz). *Adm:* $8. **cowtownhamfest.com**

To All Event Sponsors

Before making a final decision on a date for your event, you are encouraged to check the Hamfest and Convention Database (**www.arrl.org/hamfests-and-conventions-calendar**) for events that may already be scheduled in your area on that date. You are also encouraged to register your event with HQ as far in advance as your planning permits. See **www.arrl.org/hamfest-convention-application** for an online registration form. Dates may be recorded up to 2 years in advance.

Events that are sanctioned by ARRL receive special benefits, including an announcement in these listings and online. Sanctioned conventions are also listed in *The ARRL Letter*. In addition, events receive donated ARRL prize certificates and handouts. Once the form has been submitted, your ARRL Director will decide whether to approve the date and provide ARRL sanction.

The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **February 1** to be listed in the **April** issue. Information in this column is accurate as of our deadline; contact the sponsor or check the sponsor's website for possible late changes, driving directions, and other event details. Please note that postal regulations prohibit mention in *QST* of games of chance, such as raffles or bingo.

Promoting your event is guaranteed to increase attendance. As an approved event sponsor, you are entitled to special discounted rates on *QST* display advertising and ARRL web banner advertising. Call ARRL's toll-free number at 1-800-243-7768, or email **ads@arrl.org**.

ARRL News

(All photos and icons from ARRL.org or other specified sources).

January 2022 Kids Day

1800 UTC – 2359 UTC Saturday, January 1, 2022

The first Saturday in January is the time to encourage young people to get on the air and experience what amateur radio is all about!

Sponsored by the Boring (Oregon) Amateur Radio Club, this event has a simple exchange suitable for younger operators: first name, age, location, and favorite color. After that, the contact can be as long or short as each participant likes.

Kids Day is the perfect opportunity for you or your club to open your shack doors and invite kids over to discover the excitement of amateur radio.

Shea Moroney participated in the ARRL 2021 Kids Day along with her father, Michael Moroney, KD7RF. After making a few contacts, Shea felt comfortable calling CQ and handing out signal reports, and she's looking forward to receiving QSL cards from the stations they worked. [Michael Moroney, KD7RF, photo]

Complete rules can be found at www.arrl.org/kids-day

The ARRL February School Club Roundup

This event begins on Monday, February 14 at 1300 UTC and runs through Friday, February 18 at 2359 UTC.

- Stations may operate for up to 24 hours during the entire contest and may only operate for 6 hours during any single 24-hour period. Any mode — SSB, CW, or digital — is allowed.
- There are five club participation categories: Elementary/Primary, Middle/Intermediate/Junior High School, Senior High School, College/University, and Non-School. There is an additional category for individuals.
- School Club Roundup is co-sponsored by ARRL and the Long Island Mobile Amateur Radio Club (LIMARC). Results will be available in *QST* and online at **contests.arrl.org**. The top three entries in each category will receive an award certificate.
- Don't forget to share your team's photos and stories! One of the best parts of School Club Roundup is showing off your team members and station. You can upload your photos and stories when you submit your score at **contests.arrl.org/arrlscrscoresubmission.php**. Logs are due by 2359 UTC on March 5.

For complete rules, logging sheets, and other resources, visit www.arrl.org/school-club-roundup

School Club Roundup participants can download certificates to proudly display their achievements. Student members of the Tiger Radio Club, KF5CRF, in Mangum, Oklahoma, achieved first place in the Senior High School category in the February 2021 event. Certificates can be downloaded at **contests.arrl.org/certificates.php**.

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ARRL News (Continued)

Maria Somma, AB1FM, ab1fm@arrl.org

Exam Info

New Technician Question Pool to Take Effect July 1

On July 1, 2022, a new Element 2 Technician-class question pool will take effect for examinations. VECs and VEs will have new test designs available that must be used at exam sessions effective on that date.

The newly revised pool released in December 2021 by the Question Pool Committee (QPC) of the National Conference of Volunteer Examiner Coordinators (NCVEC) must be in use starting on July 1. There are three graphics required for this pool and 412 questions, which is down from 423 in the previous pool. To view all three question pools, visit the NCVEC website at **www.ncvec.org**.

Previous ARRL VEC-supplied Technician-class exam booklet versions (2018 series) and computer-generated Technician-class exams created from the 2018 question pool are only valid until midnight on June 30, 2022. At that time, VE team leaders may destroy the old versions of the Technician-class exams.

ARRL VEC will supply its officially appointed field stocked VE teams with new Technician exam booklet designs by mid-June. VE teams will not receive an updated package if they no longer meet the field stock requirements, they have not conducted a session in the past 2 years, or they have been keeping supplies without qualifying through the VEC. Non-field stocked VE teams should be returning their exam packages and supplies to ARRL VEC after the session is completed. The officially stocked VE teams receive their exam supplies in a large box, which covers 6 months to 1 year, depending on the team's activity levels. To see if your team qualifies to be field stocked with a bulk quantity of our test materials, visit **www.arrl.org/field-stocked-ve-teams**.

2022 ARRL VEC Examination Fee

A $15 fee is charged to every person seeking a new license or upgrade, as listed on the candidate roster. That one fee pays for one attempt at each of the three exam elements. If an applicant retests an exam element, another $15 fee is charged (and another roster entry is created).

VEC activities and fees are governed by FCC rules. VECs are allowed to collect an examination reimbursement fee from each candidate who takes one or more exam elements. Per FCC Rule §97.527, VECs and VEs may be reimbursed by examinees for out-of-pocket expenses incurred in preparing, processing, administering, or coordinating an examination for an amateur operator license.

As long as the expense is warranted and has been prudently incurred, and the expense is specifically related to exam administration, then ARRL VE teams may retain up to $7 of this fee. The team should keep a complete record of the expenses paid (with receipts) in team records for 2 years. Records must be made available to ARRL VEC upon request. Costs should not exceed the allowable reimbursement fees and may not be kept if no expenses were incurred.

Exam fee and reimbursement information for VE teams and examinees are on the ARRL VEC exam fee page at **www.arrl.org/arrl-vec-exam-fees**.

Session Documents Upload Webpage

Teams can upload exam session documents for quicker service. VE teams can upload in-person documents or video-supervised session files via ARRL VEC's secure webpage.

New and upgraded licenses are issued within 1 to 2 business days for weekend sessions, and they are usually issued on the same day for weekday sessions.

Please contact the VEC department (**vec@arrl.org**) for information and instructions on e-filing exam session documents through our upload page. Authorized VEs will be sent the upload page URL, which is hidden from the public.

Resources for ARRL VEs

The ARRL VEC VE Resources page (**www.arrl.org/resources-for-ves**) offers information you will need to help conduct exam session business. Our support page offers easy access to session forms and information, online examinations, and remote video session instructions, VE Manual supplemental information, FCC rules, basic qualification question procedures, and much more. There is also some helpful information for the community, such as preparation resources for candidates, in-person and remote video exam session search, vanity call sign information, and more.

ARRL VEC VE Newsletter

The e-newsletter relays important updates relating to FCC rule or policy changes, exam session document or procedural changes, test booklet updates, the exam session documents upload webpage, online examinations system, and other topics. Subscribe to the ARRL VEC VE Newsletter at **https://reflector.arrl.org/mailman/listinfo/ve-list**.

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ARRL News (Continued)

Rick Palm, K1CE, k1ce@arrl.net

Public Service

Practical Peripherals for Public Service Operators

Peripheral devices can help optimize radio operation in the field, such as at a support and gear (SAG) station during a bike race or at a portable station in a disaster area. These devices connect between radios, batteries, solar panels, ac and dc power supplies, and computers to support input/output functions. They're often overlooked, but can add efficiency to your operation. The units discussed below can all be found in my own ham shack and have been used often over the years, both at home and in the field.

Direct Current Power Management

West Mountain Radio N8XJK Super Booster

If you have problems with low dc power input affecting RF power output, you should consider the West Mountain Radio N8XJK Super Booster (**www.westmountainradio.com/product_info.php?products_id=battery-boost**).

Twelve-volt batteries are a mainstay of dc power management, and modern transceivers require a specific input voltage range to operate optimally. For example, my Yaesu FT-2980R FM transceiver requires 13.8 V, ± 15%, which is a range from 11.7 to 15.8 V. When input supply voltages are lower than this range, the radio might not be able to compensate, which will degrade RF power output. Battery voltage falls for two main reasons: the obvious routine discharging through normal use, but also Ohm's Law. Ohm's Law ($E = I \times R$) says that as the load (the radio) increases its current demand — as when switching from receive to transmit — the supply voltage at the radio will decrease because the current must pass through the combined internal resistance of the battery and resistance of the supply cables. This drop is transient in nature — as soon as the transceiver switches back from transmit to receive, its current demand drops, reducing the $I \times R$ voltage loss. The supply voltage then returns to its previous value, minus the amount lost through battery discharge.

For me, the solution for maintaining my radio's supply voltage was a booster, specifically, the West Mountain Radio N8XJK Super Booster (see Figure 1). When the battery voltage drops, for the reasons described above, the Super Booster automatically raises it back up to a set value (adjustable by a trimmer pot to any value up to 15 V) to maintain optimal transmission. Because my sealed lead-acid (SLA) battery is good for use down to 10.5 V, my Super Booster allows me to make use of that extra ampere-hour capacity below 11.7 V that wouldn't otherwise be available. This boost capability is not without cost, as the device does draw a small amount of current, adding slightly to the demand on the battery.

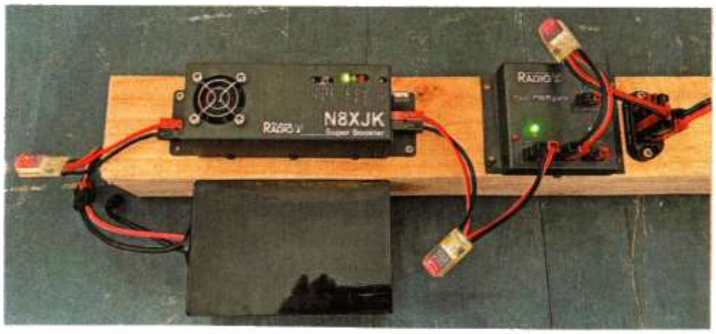

Figure 1 — My "dc power train" consists of a 12 V 20 Ah Bioenno Power LiFePO4 battery, and a West Mountain Radio N8XJK Super Booster and Epic PWRgate dc power management/charge controller power distribution terminal block.

West Mountain Radio Epic PWRgate

I've used my Epic PWRgate dc power management/charge controller system from West Mountain Radio (**www.westmountainradio.com/product_info.php?products_id=epic-pwrgate**) for several years now (my Product Review appears in the December 2018 issue of *QST*). I wrote that the device "seamlessly controls the components of an uninterruptible 12 V dc power supply and manages charging for several popular battery types from an ac-sourced dc power supply or solar panel(s)." I use it with my gel-type SLA battery and also with my lithium iron phosphate (LiFePO4 or LFP) battery. The Epic PWRgate has four sets of Anderson Powerpole® connectors, plus a micro-USB port for connection to my laptop, where I run its companion device diagnostics utility software for monitoring the system or programming various charge parameters. The Powerpole connections are for the power supply, solar panel, battery, and output to the radio. The device assures that my radio will continue to run during ac power outages and dc power supply failures. With its small footprint, I run the

(Continued on next page)

ARRL News (Continued)

unit in conjunction with my Super Booster, along with my LiFePO4 battery, on my wooden mobile "dc power strip" (see Figure 1). For monitoring critical values of voltage and ampere-hours, I use small inexpensive dc inline power meters between components.

Batteries, Solar Panels, and Generators

Bioenno Power® LiFePO4 Battery

My 12 V Bioenno Power LiFePO4 battery, Model BLF-1220A (**www.bioennopower.com/collections/lifepo4-batteries-for-communication-equipment-ham-radio/products/12v-20ah-lfp-battery-pvc-blf-1220a**), has a capacity of 20 Ah. At 5.4 pounds, it is much lighter than my traditional SLA battery (25 lb and 31 Ah), yet it offers more than 1 V higher output at full charge, with no load (14.7 V vs. 13 V). Comparing capacity to weight, my SLA battery offers 1.25 Ah per pound, while my LiFePO4 battery boasts 3.7 Ah per pound.

I derive my power budget for a battery by dividing its capacity by the estimated power consumption. My radio idles at 1.2 A. Therefore, I can expect about 16 hours on idle receive with the LiFePO4 battery.

Renogy 50 W Solar Panel

Using solar for your radio operations is great for two reasons: it's a time-tested battery charger (and it may be the only one you have out in the field), and it is clean, renewable energy. I employ a Renogy 50 W 12 V monocrystalline solar panel (**www.renogy.com/50-watt-12-volt-monocrystalline-solar-panel/?gclid=EAIaIQobChMI7c_vx-n58wIVPwaICR3hGw6-EAAYASAAEgIon_D_BwE**) with my Epic PWRgate charge controller system. I mounted it on a small utility trailer for portability to charge my LiFePO4 battery (see Figure 2). I used zip ties to secure the panel for ease of removal and replacement. This setup has proven quite successful.

Figure 2 — My small utility trailer with a mounted solar panel and secured Honda generator.

Honda 120 V 20 A Gasoline Generator

Also mounted on my small utility trailer, is my Honda EG2800i portable, gasoline-powered generator that puts out 120 V with a load capacity of 20 A (**https://powerequipment.honda.com/generators/models/eg2800i**). I've had good luck with it, and it's quiet and reliable. I put some heavy duty 12-gauge extension cords in the bed of the trailer, preparing it for deployment and use. (Consult an electrical chart for determining the proper gauge and length of a cord for safety reasons. Also, consider using multi-outlet cords with USB connectors for charging peripheral devices.)

Grounding Your Station

A grounding system is also a peripheral, and it provides electrical safety, RF grounding, and lightning protection. More information on grounding can be found at **www.arrl.org/grounding**.

All photos by the author.

(Continued on next page)

ARRL News (Continued)

Using an Ionosonde to Understand the Ionosphere

This specialized HF radar system can show you how radio propagation is affected by the ionosphere and help you make the most out of your DX operations during Solar Cycle 25.

Eric Nichols, KL7AJ

The upper regions of the atmosphere, namely the ionosphere, are primarily responsible for long-distance HF communications, and solar indices explain how the ionosphere is supposed to behave. Because the sun's EUV light is the main source of the ionosphere, propagation forecasters look at solar numbers as the be all and end all, taking a "top down" approach to try to understand the ionosphere's behavior. Solar numbers are important, but they don't explain what's happening in your neighborhood at an exact moment, which can greatly affect your ham radio operations.

One of the most important and useful tools for figuring out what the ionosphere is doing and how it affects your radio propagation, is the *ionosonde*, which is a specialized form of radar used for probing the ionosphere. Because the ionosphere is invisible (except during an active aurora), we have to look at it somewhat indirectly. For many years, ionosondes were only available to universities and other scientific institutions. Now, real-time ionosonde data in the form of an *ionogram* is continually available on the internet.

Essentially, an ionogram is a map of the local ionosphere that primarily shows the height of the reflection of radio waves as a function of frequency. A large network of Lowell Digisonde International (LDI) DIGISONDE® (Digital Ionospheric Goniometric IonoSONDE) ionosondes produce new ionograms about every 15 minutes, and there are about 90 of these ionosondes in the world. Most of the highly standardized DIGISONDE ionograms can be accessed at **www.digisonde.com/stationlist.php**.

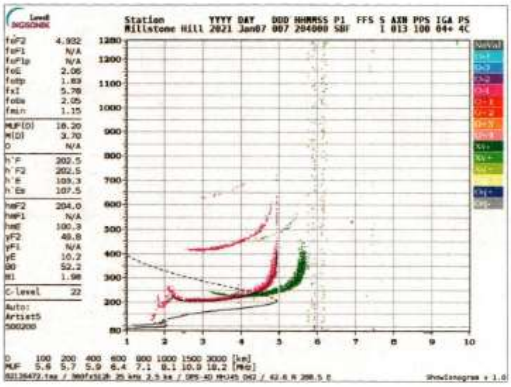

Figure 1 — This ionogram from the Millstone Hill, Massachusetts, DIGISONDE shows that the 17-meter band had good operating conditions on January 7, 2021.

Interpreting an Ionogram

The ionosphere is sparse, which is why ionograms can change so rapidly, and why real-time ionospheric sounding is so important. The part of the atmosphere most responsible for long-distance HF propagation is the F layer (the highest layer) of the ionosphere, which is between about 200 – 600 kilometers in altitude.

An ionosonde sends a short radio pulse straight up from Earth, looks for a reflection, increases the frequency by a few kHz, sends another pulse upward, looks for a reflection, and then repeats the process from the beginning. An ionogram from the Millstone Hill, Massachusetts, DIGISONDE can be seen in Figure 1.

(Continued on next page)

ARRL News (Continued)

You'll see that the frequency is swept between about 1 and 10 MHz. However, each DIGISONDE can be set up slightly differently. The time it takes for the pulse to be reflected is directly related to the height of the radio pulse, assuming it travels at exactly the speed of light (see the sidebar, "Understanding the Speed of Radio Propagation").

In an ionogram, the x-axis of the graph is typically the frequency in MHz, and the y-axis usually reads the vertical reflection height in kilometers. The column to the left of the graph shows the various critical frequencies. In Figure 1, the "main" critical frequency is 4.932 MHz. Any vertical incident signal below this frequency is reflected (or more accurately, refracted) back to Earth. Any signal transmitted above this frequency goes right through the ionosphere and into outer space.

It's important to view the Maximum Usable Frequency (MUF), which is shown in the left column, as well as below the graph. The D measurement above MUF at the bottom of the graph is the ground distance to where the hop comes down (the signal's journey from Earth to the ionosphere and back to Earth). The MUF increases above the critical frequency as the launch angle (the angle of transmission above the horizon) is decreased. In Figure 1, a horizontally radiated signal has an MUF of 18.2 MHz, telling us that the 17-meter band is pretty good to operate on. This is not an estimation — it's an actual, real-time measurement. Typically, solar indices are not this accurate.

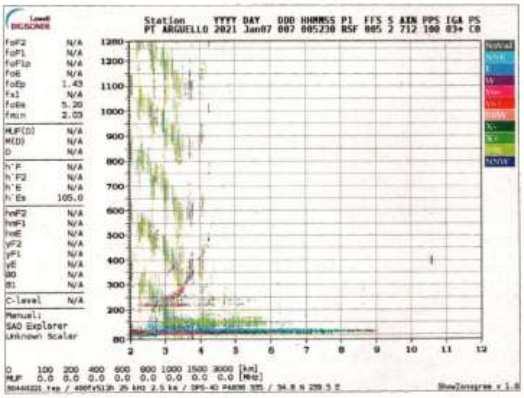

Figure 2 — There was some great sporadic-E propagation at the Vandenberg Space Force Base in Lompoc, California, on January 7, 2021, shown by the horizontal trace at about 90 kilometers from 0 to 9 MHz.

The Importance of Free Electrons

To interpret an ionogram, it's important to understand that the main components responsible for long-distance radio propagation are free electrons (and lots of them). When there are a lot of free electrons in the atmosphere, you will have good radio propagation. However, a lot of other things have to happen first.

The various critical frequencies and MUFs shown in the figures in this article are obtained from ionosonde reflection data, which is represented by the red and green curves on the graph. The curves tell us that there are multiple Earth-ionosphere-Earth reflections, which is not too surprising. Whenever you see duplicate reflections at exact multiples of the lowest reflection, as in Figure 1, and especially Figure 2, this is a pulse going up, coming back down, going back up again, and coming back down again (and so forth). The multiple reflections are at the same height — in reality, the ionosonde measures time of flight, and twice the time of flight looks like twice the height. When multiple reflections occur, this tells us that the absorption of the signal is fairly low. I've seen as many as six reflections, telling me that absorption was nearly non-existent at that time (which is almost always a harbinger of great propagation, especially on the low bands). However, in Figure 1, the most important reflection is the point where the red curve turns abruptly upward, which is the critical frequency (foF2) of the F layer at 4.932 MHz. This frequency also coincides with the maximum free electron density in the F layer, which is shown by the black curve that's solid on the bottom and dashed on top. The peak of this curve (200 kilometers) shows where the highest concentration of free electrons is.

Circular Polarization

When an HF signal is launched into the ionosphere, the Earth's magnetic field causes it to split into two different rays or waves: ordinary (O mode), which is displayed in red on the ionogram, and extraordinary (X mode), which is displayed in green. The O mode wave is right-hand circularly polarized, and the X mode wave is left-hand circularly polarized. On average, the critical frequency for the X mode is about 1 MHz higher than the O mode. Generally, the O mode signal is a bit stronger than the X mode (especially as you go lower in frequency). Both modes naturally skew off the great circle path a bit due to the Earth's magnetic field. The great circle path is the shortest distance between two points on the surface of a sphere, such as Earth, which is your normal guide for steering a directional antenna toward a particular DX station. Even HF operators with multi-element Yagi-Uda antennas would find it difficult to determine how far off the O mode and X mode are from the great circle path.

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ARRL News (Continued)

All ionospherically propagated HF signals are circularly polarized. You'd normally never notice this unless you use a circularly polarized antenna on HF. For more information on X and O modes, read my December 2010 *QST* article, "Gimme an X, Gimme an O, What's that Spell? — Radio."

Understanding Electron Density Profiles

Typically, the sun creates a nice, smooth, even bath of EUV radiation. EUV radiation is what removes electrons from air molecules, creating free electrons. When the sun has lots of sunspots, the EUV radiation is more intense. However, contrary to popular opinion, sunspots themselves do not cause EUV radiation, they're only an indicator of it. This is why sunspots are helpful, even if they are on the "wrong" side of the sun.

When it comes to electron density profiles, there are two conflicting factors. At very high altitudes (low pressures), it's easy to ionize an air molecule. But, as I suggested before, there aren't many located at these altitudes to ionize in the first place. At lower altitudes (high pressures), there are a lot more ions, but the air molecules are much harder to ionize. Therefore, the peak electron density is the height at which these two conflicting factors balance out, and it usually happens between about 200 and 250 kilometers.

More Ionogram Examples

Figure 2, an ionogram from the Vandenberg Space Force Base in Lompoc, California, is a great example of seeing sporadic-E propagation. When reading this ionogram, you can ignore the pale green/yellowish marks near the left side, that's just noise. Take a look at the horizontal trace at about 90 kilometers from 0 to 9 MHz. The reddish and greenish traces are essentially right on top of each other, meaning that there's basically no X and O dispersion. Magnetic effects don't occur until much higher altitudes. The colors also tell you about Doppler shift. A shift toward the red means the ionosphere is receding, and a shift toward the blue tells us the ionosphere is moving downward. Sporadic-E propagation is not dependent on frequency like F-layer propagation, which is why there's no MUF information on this ionogram. Also, the E layer is much lower than the F layer, so skip distances (the distance the radio wave travels) will be much shorter.

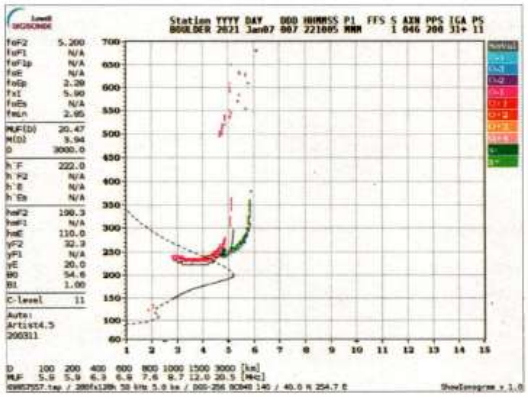

Figure 3 — This ionogram from Boulder, Colorado, shows that on January 7, 2021, the O mode critical frequency (foF2) was 5.200 MHz, which is ideal for working 75- and 80-meter near vertical incidence skywave (NVIS) propagation.

In Figure 3, an ionogram from Boulder, Colorado, we see that the O mode critical frequency (foF2) is 5.200 MHz. This is ideal for operating 75- and 80-meter near vertical incidence skywave (NVIS) propagation. You might even be able to get by with some 60-meter NVIS propagation. For this type of propagation, you want to be about 10% below the critical frequency.

Understanding the Speed of Radio Propagation

When working with ionosondes (or studying the ionosphere in general), one will encounter two related terms: virtual height and true height. The speed of radio propagation through the ionosphere can be considerably less than the speed of light in free space. Like a transmission line, the ionosphere has a velocity factor (VF), but unlike a transmission line, the VF of the ionosphere is continually changing with respect to height. This can make things a little complicated.

The height of reflection is important to hams, because on the most fundamental level, it tells us how far we can get on a single skip. Usually, the "higher" the ionosphere is, the more distance we can get per hop, which is generally good for DX operations.

Because the VF through the ionosphere is so difficult to determine, the virtual height can tell us the distance to the reflection point (assuming the VF is 1.0), or the speed of light in free space. This can be significantly different than the true height, which is very difficult to calculate. The DIGISONDE ionogram provides both heights to the left of the graph, and the difference between them is the "thickness" of the ionosphere.

If you're interested in exploring this aspect more deeply, visit **https://ulcar.uml.edu/digisonde_dps.html** for more information.

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ARRL News (Continued)

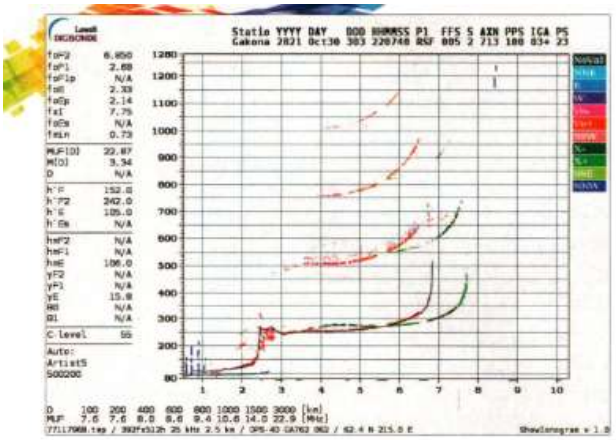


Figure 4 — A more recent ionogram, from the High-frequency Active Auroral Research Program (HAARP) facility in Gakona, Alaska, on October 30, 2021, shows truly vertical incident reflections.

But what's even more encouraging is the 3,000-kilometer first hop MUF at 20.5 MHz. This means you'll probably have some decent 15-meter possibilities and definite 17-meter activity.

More recent propagation has also allowed me to capture some great ionograms from nearby DIGISONDES, particularly the one located at the High-frequency Active Auroral Research Program (HAARP) facility in Gakona, Alaska (see Figure 4).

First, notice how thin the O (red) and X (green) traces are, as well as how pure they are in color. This means that the reflections are truly vertical incident reflections, coming straight down from above. If they were arriving from off-vertical directions, the colors would be altered from their pure hues, which can be seen in the legend in the upper right corner. Cooler hues indicate arrival from the general north, while warmer hues indicate arrival from the general south. (Newer versions of the DIGISONDE indicate the direction of arrival in greater detail.) The thinness of the traces also indicates great stability. If the ionosphere was moving around or returning from multiple wrinkles (or gravitational waves), the traces would be thicker. We also see that there are four visible O-mode traces, and a small hint of a third X-mode trace. These multiple reflections tell us that the ionosphere is essentially non-absorptive — there isn't a D layer to disrupt things. Perfect conditions all around! The O-mode MUF shown at this time is 22.9 MHz, which is one of the highest MUFs we've seen in Alaska in years (typically, there's no ionosphere here).

Visit **www.digisonde.com/digisonde.html** to find additional resources that are available for download, such as the *Digisonde 4D Manual* and *Antenna Array Configuration*.

Conclusion

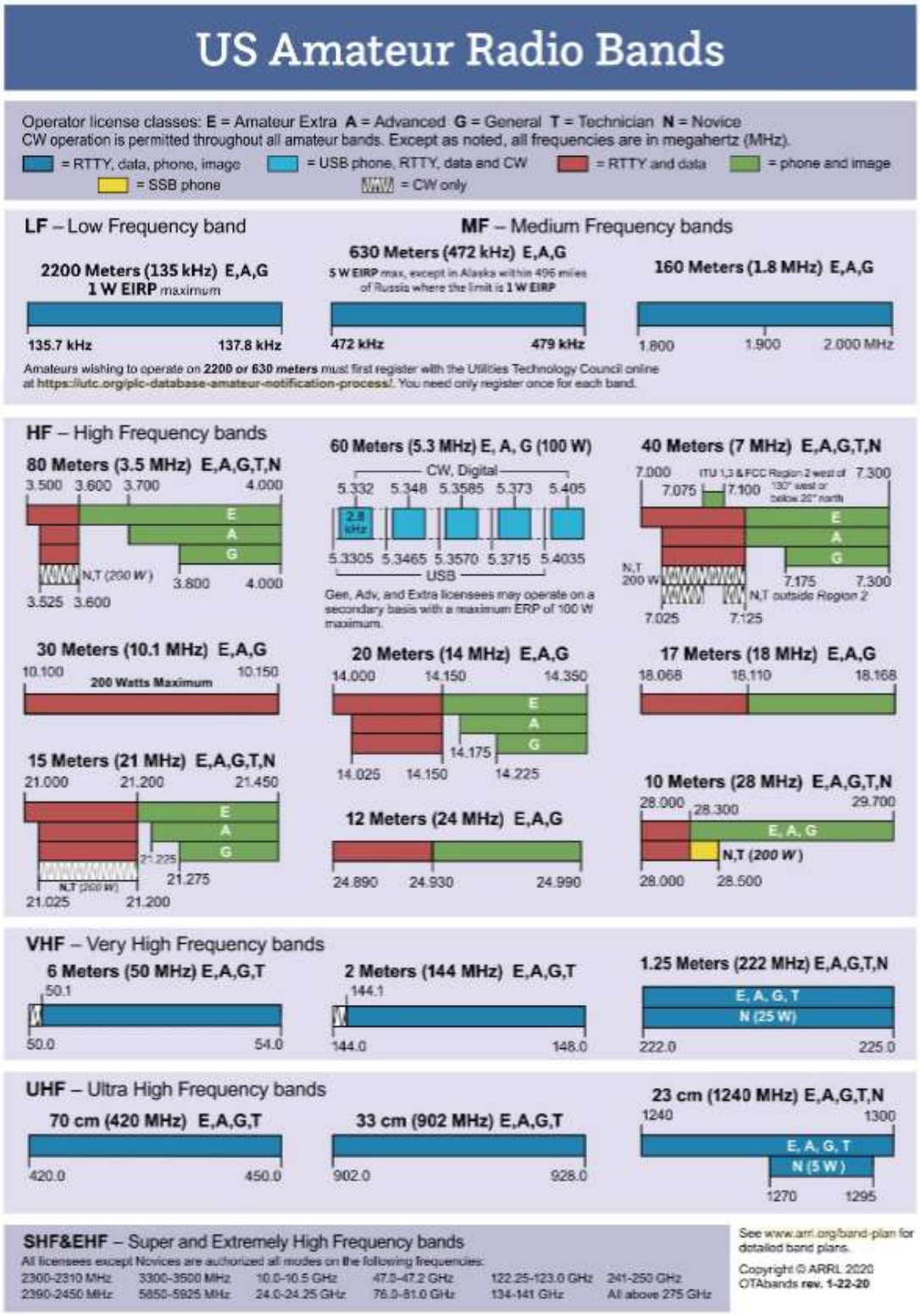
I hope that this introduction to understanding the ionosphere through the use of ionosondes can help you with your next DX radio adventure. Despite how informative ionograms can be, there's really no substitute for getting on the air and experiencing radio propagation for yourself.

All figures by the author.

Eric Nichols, KL7AJ, has been an active radio amateur since 1972. He is a two-time recipient of the ARRL Bill Orr, W6SAI, Technical Writing Award. Eric has written numerous articles for *QST* and *QEX*, as well as four ARRL books, the latest being *Receiving Antennas for the Radio Amateur*. Eric's latest focus is on encouraging experimentation on our two new bands on 2,200 and 630 meters, while attempting to make LF contacts in England and other European countries with LF privileges. He can be reached at **kl7aj@arrl.net**.

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

US Amateur Radio Bands



W1AW Schedule

W1AW Schedule

PAC	MTN	CENT	EAST	UTC	MON	TUE	WED	THU	FRI
6 AM	7 AM	8 AM	9 AM	1400		FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
7 AM-1 PM	8 AM-2 PM	9 AM-3 PM	10 AM-4 PM	1500-1700 1800-2045	VISITING OPERATOR TIME (12 PM-1 PM CLOSED FOR LUNCH)				
1 PM	2 PM	3 PM	4 PM	2100	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM	4 PM	5 PM	2200	CODE BULLETIN				
3 PM	4 PM	5 PM	6 PM	2300	DIGITAL BULLETIN				
4 PM	5 PM	6 PM	7 PM	0000	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
5 PM	6 PM	7 PM	8 PM	0100	CODE BULLETIN				
6 PM	7 PM	8 PM	9 PM	0200	DIGITAL BULLETIN				
6:45 PM	7:45 PM	8:45 PM	9:45 PM	0245	VOICE BULLETIN				
7 PM	8 PM	9 PM	10 PM	0300	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
8 PM	9 PM	10 PM	11 PM	0400	CODE BULLETIN				

W1AW's schedule is at the same local time throughout the year. From the second Sunday in March to the first Sunday in November, UTC = Eastern US time + 4 hours. For the rest of the year, UTC = Eastern US time + 5 hours.

♦ Morse code transmissions: Frequencies are 1.8025, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675, 50.350, and 147.555 MHz.

Slow Code = practice sent at 5, 7½, 10, 13, and 15 WPM.

Fast Code = practice sent at 35, 30, 25, 20, 15, 13, and 10 WPM.

Code bulletins are sent at 18 WPM.

For more information, visit us at
www.arrl.org/w1aw

♦ W1AW Qualifying Runs are sent on the same frequencies as the Morse code transmissions. West Coast qualifying runs are transmitted by various West Coast stations on CW frequencies that are normally used by W1AW, in addition to 3590 kHz, at various times. Underline 1 minute of the highest speed you copied, certify that your copy was made without aid, and send it to ARRL for grading. Please include your name, call sign (if any), and complete mailing address. Fees: $10 for a certificate, $7.50 for endorsements.

♦ Digital transmissions: Frequencies are 3.5975, 7.095, 14.095, 18.1025, 21.095, 28.095, 50.350, and 147.555 MHz.

Bulletins are sent using 45.45-baud Baudot, PSK31 in BPSK mode, and MFSK16 on a daily revolving schedule.

Keplerian elements for many amateur satellites will be sent on the regular digital frequencies on Tuesdays and Fridays at 6:30 PM Eastern time using Baudot and PSK31.

♦ Voice transmissions: Frequencies are 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59, 50.350, and 147.555 MHz. Voice transmissions on 7.290 MHz are in AM double sideband, full carrier.

♦ Notes: On Fridays, UTC, a DX bulletin replaces the regular bulletins. W1AW is open to visitors 10 AM to noon and 1 PM to 3:45 PM Monday through Friday. FCC-licensed amateurs may operate the station during that time. Be sure to bring a reference copy of your current FCC amateur license. In a communication emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

W1AW code practice and CW/digital/phone bulletin transmission audio is also available real-time via the *EchoLink Conference Server* W1AWBDCT. The conference server runs concurrently with the regularly scheduled station transmissions. The W1AW Qualifying Run texts can also be copied via the EchoLink Conference Server.

During 2022, Headquarters and W1AW are closed on New Year's Day (observed December 31, 2021), Presidents Day (February 21), Memorial Day (May 30), Independence Day (July 4), Labor Day (September 5), Veterans Day (November 11), Thanksgiving and the following day (November 24 and 25), and Christmas Day (observed December 26).