November, 2020 Volume 44, Issue 11

The LongPath

A North Alabama DX Club Publication

Contents

From the President

In November we have to go to the polls and vote. The important elections, of course, are at NADXC. We have a slate of officers and the pollsters, if you trust them, say that slate is way ahead. The first vote will be for club officers. The second will be our annual DXer of the Year. I think we can conduct the second election via private texts inside of Zoom. We'll explain at the meeting, collect the votes, and announce the winner at the December meeting.

In December we normally have our annual Christmas Party, but due to the epidemic this year, we will just have a normal Zoom meeting.

I've visited hundreds of hamshacks over the years and find that we put a lot of effort into visualizing and arranging our equipment to be the most efficient for us. I look at what other have done and bring their best ideas back home to incorporate into my own hamshack. I'm always rearranging and too many of you have heard my critiques. So here is what my shack looks like today. I'd like to get your photos and descriptions of why you set yours up as you did.

Cont'd on p. 13

Using Software Tools to Work DX from a Moderate Station

November Program by Fred Kepner, KF3FRK

We've are exposed to more and more software as part of ham radio in general and DXing specifically. Several recent LongPath articles have dealt with this. Fred will treat this from the viewpoing of the moderate station—no 12-tower antenna farm needed. Look for Bob's email late Sunday or Monday with the Zoom link. Meeting starts around 7, Fred's program by 7:30.

How to Join

** Come to a club meeting;*

** or send in an application by mail (form on www.NADXC.org)*

Retirement and COVID Project Update 7

By Steve Werner, AG4W

I received an update on the Swains DXPedition. American Samoa has not allowed any tourists into the country for the last 8 months. It is expected that they will be one of the last countries to reopen. Most of the team are hopeful that we can go to Swains sometime in October or November next year.

I sure did miss the superstations like D4C in the CQWW SSB contest. I did a single band 160 meter entry and it seemed like no one was on from the Caribbean. The propagation was bad on 160 meters all weekend and the storms on Friday night made it even more difficult. I could only work the very best stations in Europe. I wish they would give you a half point in CQWW for all the zone multipliers I gave out to US stations.

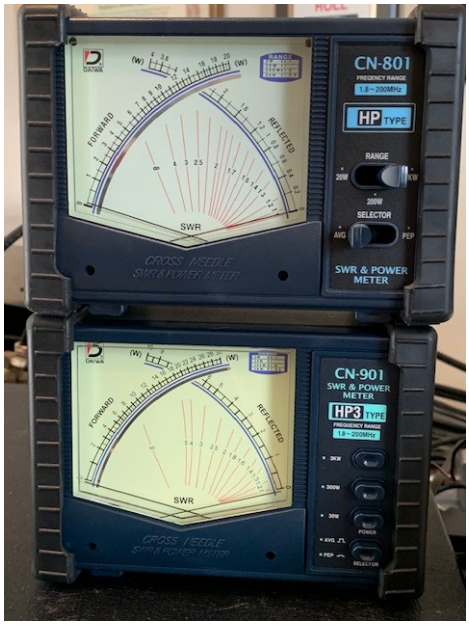
During October I burned up the wattmeter I use for 2 meter EME. I wonder how many hams can say that? It is a

Crispy Parts

Daiwa CN-801 2 KW wattmeter. It did ok at 700 watts, but burned up at 1100 watts. As shown above, most of the components in the pickup got very hot and were charred. I thought it was funny that it said don't open this seal on the pickup unit, shown at the top of the next column. I guess they don't want you seeing the design. I pur-

Don't Open this Seal, and Don't Say We Didn't Warn You!

chased a replacement Daiwa's CN-901 HP3 which is designed for 3 KW. I was surprised to see how many of the ham stores were sold out of wattmeters. It also gets hot at 1100 watts. It turns out in the manual for both meters in the notes it said "Add 15 % of full power at 160-200 MHz. Power Rating MAX 1kw (144MHz)". You never see that until after the purchase and read the manual more than once. I called to see if you could get the CN-801 wattmeter repaired. The place in the US that repairs them said the repair would cost more than the new meter and they would have to order parts. I expect I will get a used Bird wattmeter when we have a Dayton Hamfest again.



Old and New Daiwa Wattmeters at AG4W

I continue to really enjoy 2 meter EME. The 2nd half of the ARRL EME contest is the same weekend as CQWW CW. I have decided to work the EME contest instead of CQWW CW. It is fun working new countries and grid squares on EME. During CQWW I rarely get a new band country even on 160 meters. I made 45 contacts during the first EME contest weekend in October. Last year I made 40 contacts total over both weekends. I have now worked 185 unique stations on EME. Some of those stations I have worked several times. I recently sent a card to EW7AW since it was a new country on EME and he doesn't use LOTW. I was surprised when it came back to me saying sending of cash was forbidden. The amazing part is the cash was still in the envelope. The postmaster in Belarus did not take the cash.

I did receive the QSL cards I ordered from UX0UO. They sure are nice, but they took 6 weeks in the mail this time instead of the normal 2-4 weeks due to COVID. Check out all the Ukraine stamps on the box they came in. Now I

can send EW7AW a new card, but I will have to make the money less obvious. I will not include an SASE this time– check out the picture on the next page.

I got a new circuit card holder this month. It also includes a magnifier and lamp. It has already come in handy for

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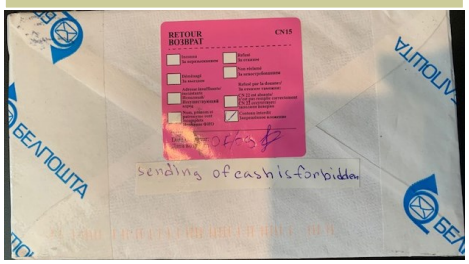
COVID & Retirement

(cont'd from p. 2)



No Green Stamps here!

my projects. You never have enough hands when it is just you and a good magnifier is great for SMD components. I also highly recommend the lighted headlamp that I use. It comes with 5 different magnifying lens and is rechargeable.

73 Steve AG4W

Helping Hands, Hexapod Version

NADXC Officers and Directors

President	**Bob De Pierre, K8KI**
Vice President	**Steve Molo, KI4KWR**
Secretary/ Treasurer	**Chris Reed, AI4U**
At-large	**Kevin Hibbs, KG4TEI**
Directors	**Tom Duncan, KG4CUY**
(Ex-Officio)	**Steve Werner, AG4W**

Adventures in QRO

By Mark Morgida, AA2MA

Most of my ham radio operating over the last 20 years involved HF and VHF mobile operation. Only after moving back to Huntsville in early 2018 did I finally decide to put down some roots, grow an antenna and set up a fixed station at my QTH. To do that, I started collecting equipment to supplement my well used, mobile IC706MkIIG. One such piece is an old, well used Yaseu FL2100B linear amplifier that I picked up at a HARC auction in 2018 for about $1/lb.

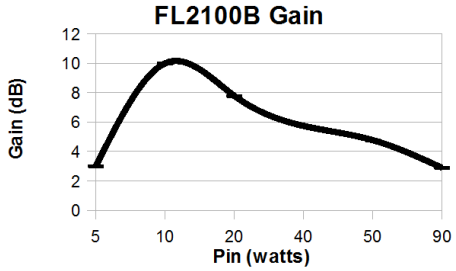
For those of you who don't know or have forgotten, the FL2100B is a dual triode (572B) linear amplifier of 1970's vintage that produces up to 1200 watts PEP plate input for SSB or 1000 watts plate input for CW using a 100 watts exciter. This was the matching amplifier for Yaseu's FT101E. My FL2100B sat in a box for the better part of a year until we moved into our current QTH and got sufficiently unpacked for me to justify to my XYL that it was time to set up the ham shack with some space to work.

First order of business was to open it up, inspect and clean the innards with isopropyl alcohol. I checked for cracked insulators or other components as well as leaky capacitors in the power supply. I noted that the capacitors had no leaks and might have been been replaced judging from the non-OEM soldering. I carefully removed the tubes to clean them and made sure I marked them so they could be returned to the correct socket. I observed that one of the 572Bs had a loose base but it appeared that the vacuum hadn't been compromised. Everything was cleaned with the alcohol using a chip brush and rags and then reassembled.

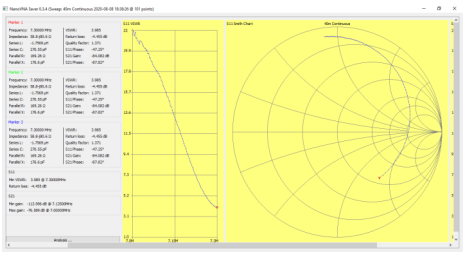
Since setting up my ham shack, my home operations thus far have been QRP running mostly digital modes and some CW using a FLEX-1500 I acquired in 2019. After a couple of attempts at RTTY contests as a QRP entry with only limited results, I started wondering if I could drive that amplifier with the FLEX to increase my output to the 25 watt range to better compete – a modest 7 dB. I committed myself to the task and in late July, conducted a 'smoke test' and was pleased that the amp powered up and appeared to be operating with a slightly low plate voltage of 2.2 KV. I researched the interface requirements for the amplifier TR relay as well as the interface specifications for an old Yaseu FT890 I'd acquired from an estate sale. I also borrowed a watt meter and a dummy load that was up to the task of testing the amplifier from Bob, K8KI. Interfacing the Yaseu radio to a Yaesu amplifier turned out to be trivial requiring only a single 2 conductor cable from the transceiver's 'TX GND' input to the appropriate relay and ground terminals on the FL2100B. Connecting the exciter, amplifier, watt meter and dummy load stressed my supply of coaxial jumper cables and adapters but I was able to make it work.

I ran a test on both 40 meter and 20 meter frequencies by varying the input power from 5 watts up to 90 watts while measuring the output power. I found that from 10 watts input and up, the power gain decreased as I increased exciter input. At roughly 100 watts drive, the most I was able to get out was 200 watts Not a good sign. The following graph tells the story.

Cont'd on p. 4



While testing, I noted that the Load control seemed to have no impact on the tune-up and output power. At Bob's suggestion, I used my nano-VNA (vector network analyzer) to test both the input and output circuits to confirm that the both circuits were functional, see below.

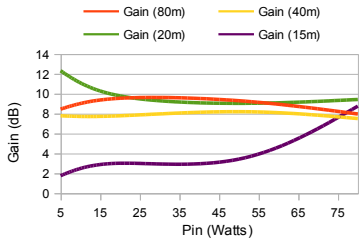


Three conclusions from this initial round of tests:

1. This amplifier, in its current state wouldn't give me the 7 dB I'm looking for with only 5 watts of drive.
2. The performance didn't meet my expectations as I wanted to see 500 watts output with 100 watts of drive (7 dB) and instead only got about 200 watts (3 dB).
3. Everything seemed to be in working order except for the 572B's,

So off to the inter-webs I went searching for a new pair of 572Bs. My preference was to order from a US supplier and to get a warranty if possible which ruled out the half-dozen direct from China offerings I found. Reputable dealers such as RFPARTS.COM and DX Engineering didn't have any stock, and MFJ didn't offer a matched pair. I finally located a pair from a Machlett-direct store-front on Ebay that were competitive with the Chinese offerings but met my other requirements. My first order was immediately canceled by the company because the advertised items were found to not be 'matched'. A good sign I thought, as it indicated perhaps somebody was actually checking lot numbers and dates if not actually conducting some tests. I continued to watch the 'store' until I saw additional stock advertised a few weeks later.

My new tubes arrived the last week of September. I set about installing them, setting up the test bench and re-running the test on all supported bands (80m – 10m) and at multiple drive levels.



My 3 conclusions from this round of testing were:

1. On some bands (80m – 20m) I could actually drive the amp with 5 watts and get between 30 and 85 watts output.
2. The amp seemed to love 20m showing 700 watts output for 80 watts of drive.
3. Above 20m, the amp wanted to be driven hard to get any gain. On 15m, it took 80 watts before gain would jump to 8 – 9 dB. And on 10m, I was unable to see any gain at all up to 80 watts input. The exciter couldn't generate any more power.

The results impressed me. The old beast was putting out between 450 and 700 watts CW depending on the band with 80 watts of drive. My investment was still only a modest $5.40/lb (or $0.43/watt). I couldn't wait to put the beast into service in the upcoming WW-JARTS-RTTY contest the next week.

As a new QRO operator, I have much to learn. Suffice it to say, the RTTY contest was lots of fun but quite frustrating as I learned about EMI/RFI and susceptibility of the various pieces of equipment in my shack as the contest wore on. First, I discovered my attached keyboard wouldn't work while transmitting. No worries, I thought. I'll just rely on my macros. How naive of me. Next, I noticed problems with my laptop, specifically FLDigi would stop sending. I chalked that up to memory corruption and found I had to restart the software in order to get it to send again. Finally, I noticed the FT890 would sometimes reset mid-transmission to 7.000 MHz and then resume transmitting! I tried to solve the problems as they arose: I re-arranged my operating position to move the laptop further away from the rig; I exhausted my supply of clamp on ferrites; I reworked my grounding straps; and I put in a current choke on the feed line coming into the shack. I finally gave up – but not before making 112 RTTY QSOs including 14 new DX entities for me.

73 de Mark, AA2MA

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What Makes a "Good" DXer?

By Bruce Smith, AC4G

I recently began wondering which specific traits makes a ham operator a good or successful DXer. Being a good or successful DXer might be relative, but one can be successful in their own way relative to one's own goals. There are a few qualities that make a DXer a "good" DXer observed over the years. For example, having a knowledge of various antennas; knowledge of equipment and being able to operate that equipment; having success working DX from a rare location; perseverance & dedication by being able to awake in the middle of the night only to log a new one; and operating proficiency; that is become good at CW, digital modes, or even a good SSB operator, but do these traits make one a good DXer? Or is it having worked every DXCC entity on the ARRL DXCC list or every CQ Zone that is available to work? After reading many articles in the past, I believe there is one way to determine if a DXer a "good" DXer. I believe a good DXer develops the ability to follow a disciplined conduct. I would like to introduce the discussion of a "good" DXer by discussing a few characteristics of a good DXer observed over the years.

First, in a DX pileup, a good DXer has discipline, patience, and perseverance. When a DX stations responds to a callsign in a pileup, a good DXer listens, and does not call. How many times have you heard multiple stations responding to the DX only to give their callsigns which are not even close to the callsign the DX requested and causes mass confusion on the band with the DX having to repeat a callsign? A good operator will help the DX station desiring to be "worked" by spreading the pileup out. You can increase your chance of getting logged by finding the station being called and know where he was transmitting and either move up or down the band, but not on top of the station being called. Sometimes 'tail-enders' get lucky, but not often. Try to find a pattern the DX operator is using. It does not take long to figure out his pattern. He may slowly move up the band in short frequency increments, down in frequency, or alternating either side of the pileup. A good DXer listens and knows when to transmit; that is, when the DX has stopped transmitting and is listening. I often move up to a clear frequency above the pileup, stay on a particular frequency and call a few times when the DX is listening. It is difficult for the DX to hear you calling if you call while he is transmitting. Rest assured, a "good" DXer will follow this advice and eventually will put the DX being chased 'in the log'.

Secondly, Listen! A good DXer listens and follows the DX station's instructions whether it be SSB, CW, or digital modes. The DX may change their frequency or QRX for some reason (bathroom break). They may change their QSX frequency. If you call continuously, you will never hear the frequency change. I have worked many DX stations by carefully listening and being the first to QSY to the new QSX frequency. For those with QSK capability, they have an advantage over those who don't have that capability. Most of all, stop transmitting when the DX transmits. Just the other day, trying to work a semi-rare DX entity (5Z-Kenya) in a pileup, one station called continuously. I was in and out in a minute successfully making the QSO, because of listening to the DX instructions and following their directions in a CW pileup as he was QSX up two (2) not up one (1). As far as I know, the station continuously calling was only split up a few KHz and probably never worked the DX. My gain, their loss.

Third, do not transmit on top of the station responding to the DX. A good DX operator will stay with the station they called until they finish their QSO or exchange. If you QRM the station being called, it only causes repeats and slows down the rhythm created by the DX. That may result in reduced time for you to work him before the propagation changes and even goes out. The DX station may get frustrated and QRT due to an unruly pileup not following instructions. The DX station should be allowed to work as many stations as possible and as quickly as possible. Callers who send continuously only slow down the rhythm and reduces your opportunity to make a QSO. Who knows, the DX may mentally 'black ball' you if you continue to cause deliberate interference. I know because I was DX once as V73CW, V7G, and AC4G/KH9.

Fourth, a good DXer knows how to operate their equipment and place their transmitter on a proper frequency. This does not mean zero beat the last station, but adjust your frequency to increase your chance of making the QSO. Know how to operate your equipment, so that you do not transmit on the DX station accidently. Again, transmitting on the DX slows down the DX QSO rhythm for everyone and wastes precious time during a potentially short band opening. How many times do you hear intentional "QRMers" either jamming the frequency or non-intentional stations calling on top of the DX which gets your blood pressure up when the rare DX entity has a good signal, but deliberate QRM (DQRM) is prohibiting you from making the QSO. This act only makes things worse for those chasing the DX and needing a QSO. Know your equipment!

Next, if you have limited resources on the low bands, focus on your receive antenna(s). You can work more DX with

good ears, rather than a big mouth. Being an alligator that cannot hear anything is not productive and slows down the QSO rate, sometimes, makes other DXers flustered and mad. I remember and perhaps you may have as well, when we first operated 160m. I had to learn that separate receive antennas are a must on the low bands. I attempted to make QSOs on 160m, but only caused havoc, because I could not hear most DX stations – even those nearby DX entities in the Caribbean. But there were many who heard me. After a few emails from flustered DXers, only then did I realized I was an alligator transmitting, but not hearing. A good DXer (especially on the low bands) receives weak signals of the DX station being chased as well as having a decent transmit antenna.

Next, a good DXer sends their full callsign, not partial suffixes. Partial callsigns again slows down the QSO rate for the DX. Sending only the suffix of your callsign means several exchanges will be required by the DX only to get your callsign. It also required another exchange to obtain signal reports. A good operator always sends their full callsign to help the DX achieve some efficiency working as many stations as they can giving everyone affair chance.

A good DXer sends their callsign on CW with proper and consist spacing. When breaking the cadence of your callsign, the DX gets confused and attempts to decipher your callsign and most often deciphers it incorrectly. How many times have you seen this happen and often takes as many as five or more exchanges in order for the DX to get the your callsign or exchange. It frustrates those in the pileup attempting to make a QSO with the rare and semi-rare DX station. Particularly on 160m, the DX may be having difficulty receiving your callsign. Anything one can do to help the DX station to copy your callsign and exchange that is beneficial is much appreciated because the DX is there to make QSOs and log you in their logbook. Why send your callsign again if the DX has copied it correctly. Repeating your callsign only send a message to the DX and confuses the DX because they think they may have miscopied your callsign. It may take several exchanges for the DX to realize that they had your callsign correct and that you are a "lid" for confusing them with your callsign being repetitiously transmitted.

A good DXer, listens and knows the station's callsign they are attempting to make a QSO. Some recommend sending the stations callsign to be sure they have it correctly logged after working them, but I have seen in contests that it takes more time to send the DX entities callsign that you should have already copied and should already know. This might be okay to send the DX callsign if more than one DX station is transmitting on the same band near each other, but I believe it wastes more time. I have been in contests where stations send the DX stations callsign only to slow down my rate and I am sure the DX station's rate. It surely affects my and other DXers patience level as well.

Next, listen to the DX station's reports and match their sending speed if using CW. If the DX is sending your report at 15 WPM, do not reply at 40 WPM. If the DX has incorrectly copied your callsign, send only the part that he is missing. Repeat the missing part of the callsign several times at a constant rate. Again weak stations want to get your callsign correct. Noise and bad propagation only make conditions worse. A good DXer will match the speed of the DX when attempting to make a QSO.

Last of all, Listen...listen...listen! Too many DXers jump-in and begin calling without having followed the instructions of the DX station and add to the confusion the already exist with a pileup. They might not knowing the callsign of the DX or perhaps they saw

Cont'd on p. 7

DX Code Of Conduct

I will listen, and listen, and then listen again before calling.
I will only call if I can copy the DX station properly.
I will not trust the DX cluster and will be sure of the DX station's call sign before calling.
I will not interfere with the DX station nor anyone calling and will never tune up on the DX frequency or in the QSX slot.
I will wait for the DX station to end a contact before I call.
I will always send my full call sign.
I will call and then listen for a reasonable interval. I will not call continuously.
I will not transmit when the DX operator calls another call sign, not mine.
I will not transmit when the DX operator queries a call sign not like mine.
I will not transmit when the DX station requests geographic areas other than mine.
When the DX operator calls me, I will not repeat my call sign unless I think he has copied it incorrectly.
I will be thankful if and when I do make a contact.
I will respect my fellow hams and conduct myself so as to earn their respect.

More Info : http://www.dx-code.org/

Upcoming Election of 2021 Officers and Directors

The NADXC Nominating Committee has put together the following slate of candidates for consideration in the upcoming election of officers and directors for 2021.

President — Bob DePierre K8KI
Vice President — Steve Molo KI4KWR
Secretary/Treasurer — Chris Reed AI4U
Director — Tom Duncan KG4CUY
Director — Kevin Hibbs KG4TEI

Susan Seaford, AI4VV and
Fred Kepner, KF3FRK
NADXC Nominating Committee

Voting for 2021 Officers and Directors will be held at the upcoming November 10th Zoom meeting. Prior to the vote, the floor will be opened for those wishing to nominate additional candidates. Such candidates must be in attendance to confirm their willingness to run and serve.

The officers and directors of the NADXC look forward to your presence at Tuesday's meeting to participate in business coming before the club, to hear and see the program, and to vote.

What Makes a Good DXer?

(cont'd from p. 6)

a spot on the spotting network and begin calling blindly later to find it was someone else and not the DX they were chasing. A "good", seasoned DXer will evaluate the pileup before transmitting to make sure they are calling on the correct frequency and the correct DX station. They will try to pattern the DX stations operating habits to be able to successfully make a QSO with that rare entity.

In conclusion, as a DXer, many of us may be already adhering to these suggestions. If you are not, these can help you to be a "good", well respected DXer. If you work many DXpeditions, being a good operator will allow you to be recognized by the DX team and make QSOs much more easily obtained because they remember the DXers that operate with respect and patience more than those that might be "black listed". I am always surprised how many times rare DX acknowledges me by my name as well as callsign in a pileup. Perhaps my conduct and behavior has gone unnoticed. My hope is that these items I have observed in past DX pileups and adhere to, will make us all better DXers. I am always extremely thankful to get 'in the log'. If you are wondering if these follow the DX Code of Conduct, they should be similar if note same (See below). Good luck DXing and taking on the traits of a "good" DXer.

73 de AC4G

More Fun with ISM Transceiver Modules

By Tom Duncan, KG4CUY

In September an article appeared in the LongPath entitled "Infrared and RF Control Links" in which I introduced the using small, inexpensive, low-power hybrid transceiver modules for RF remote control projects. In this article, that notion will be expanded into a full-fledged bidirectional data link.

At least three common variants of hybrid transceiver modules are available from multiple manufacturers: those which are geared toward a particular protocol (e.g., Bluetooth or 802.11); cell phone transceivers; and those with no specific end use in mind, but which are readily adaptable. My needs quickly eliminated the first two categories. This still left multiple modules from which to choose, but as a home-workshop experimenter there were more requirements we're all familiar with: relative low cost (especially in terms of home workshop infrastructure), part form factors amenable to a ham with average soldering skills, manageable complexity, and usable documentation. The field was now much smaller, and I chose the Microchip MRF89XAM9A. Other modules and other manufacturers also fit the bill.

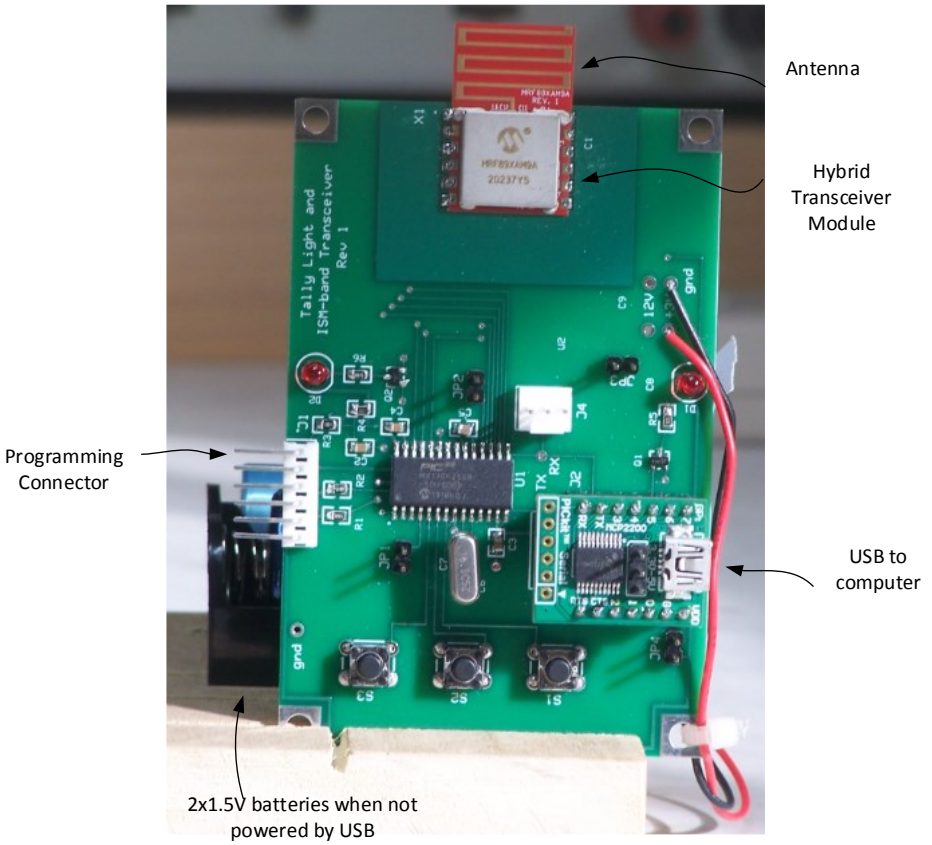
The term "hybrid transceiver module" means that in addition to the "almost-an-entire-radio-with-all-the-interfacing-circuitry-on-a-chip", other important parts are packaged on some sort of substrate into an easily-used part. In my case, "other important parts" means the antenna, the antenna matching network, and the bandpass filter used in both receive and transmit modes. This surface-mount module solders onto a PC board providing power, a ground plane for the antenna, and eight control lines.

While the transceiver module is easy to use compared to the transceiver chip and many handfuls of additional parts, it is not plug-and-play with a data source like your computer. A microcontroller or processor of some sort needed to interface with those eight control lines, and associated firmware (about 700 lines worth in my case) are also needed. Here the field is rich with choices—the designer may wish to use a somewhat simple solution like a microcontroller (my approach), or may use something like a Raspberry Pi or Arduino. Either approach will work.

Where in the spectrum will these radios operate? We've already eliminated cell phone transceivers, and with them the 700, 800, 850, 1700, 1800, 1900, 2100… MHz bands. The ISM allocations remain, including 433, 868, 915, and 2400 MHZ bands. We are hams after all, so why not use the 902-928 MHz allocation, which we share on a secondary basis with ISM in region 2 as our 33 cm band? Depending on how we do things in terms of following the rules, we can operate as a 47CFR15 device, requiring us to observe manufacturer and FCC stipulations, or as hams under 47CFR97. If we operate under part 15, we cannot modify the hybrid transceiver module, which is no hardship, since we're using it to take advantage of the work the manufacturer has done for us. Should we decide we don't like the built-in antenna, we would need to operate as hams under part 97 to saw it off of the module and substitute an SMA connector so we could drive a dipole.

With all of this in mind I put together two identical transceivers based on the Microchip MRF89XAM9A module for use in the 33 cm band, one of which is shown below. The module is untouched and installed per manufacturer recommendations. In normal opera-

Cont'd on p. 9



Picture 1—Transceiver Board based on MRF89XAM9A Hybrid Transceiver Module

tion the transceiver uses a USB port for power and to exchange data with a computer, but there is also a mode where trivial messages are sent from one transceiver to the other, echoed back, and checked at both ends. This is used for testing purposes, particularly for usable range tests which will be described shortly.

The transceiver chip itself has many programmable characteristics described in the two manuals totaling 175 pages which must be understood to some degree to develop firmware residing in microcontroller U1 in the middle of the PC board. One characteristics is the transmitter power, which may be set in 3 dB increments between –8 dBm and 13 dBm. Most of my testing was done at –8 dBm, relying on the line-of-sight range increasing as the square root of radiated power. Everything else being the same, if a given setup yields a 100 foot range between transceiver boards at –8 dBm, at +13 dBm the range should be

$$100 \cdot 10^{\left(\frac{13+8}{20}\right)} = 1122\ feet$$

Range measurements were made at John Hunt Park in Huntsville, where unobstructed line-of-site distances of 1/2 mile are to be had. One must be careful to dodge runners and golfers, but otherwise this is a great place. My wife Janet, KI4WLX, guarded the fixed end of link, where a transceiver board was mounted on a camera tripod 36 inches off the ground. I walked with the other transceiver, periodically pushing a button on the board to transmit a test message, which the other end echoed back, and proceeded until reliable communications was lost. The distance between transceivers was measured with a Garmin GPS sports watch, reporting to the nearest 1/100th mile.

With this setup, at –8 dBm a range of 0.06 miles was obtained with vertical polarization, and 0.09 miles with horizontal polarization. These results were very repeatable.

These seemed like in-the-ballpark numbers using Friis' equation. With an antenna gain for the PCB trace antennas of –6 dB and a receiver sensitivity of –95 dBm, Friis says 0.15 km or around 0.09 miles, and certainly within our Garmin's accuracy and precision. But—and there are always plenty of "buts"— the spec sheet shows an antenna model with about –0.9 dB gain, and a receiver sensitivity of –102 dBm. I might not want to argue the sensitivity, but –0.9 dB is I think pretty optimistic for a PCB trace this small at 915 MHz. The spec sheet doesn't say what the model is relative to, so let's go with –6 dB. Another caveat is that 36" off the ground isn't really free space, as the difference between vertical and horizontal polarization ranges bears out. At +13 dBm transmit power, it seems I should have right at a mile range with horizontal polarization, which seems satisfying—particularly since there are no requirements regarding range anyway.

Recognizing that hams have tremendous latitude to experiment with antennas under part 97 rules, I wanted to try a directional antenna while continuing to use the PCB monopole provided as part of the hybrid transceiver module. A corner reflector in back of the transceiver board seemed like an easy way to do this. I slapped together one aluminum foil 16" x 16" 90-degree reflector. Now operating under part 97, I added a CW ID with my call to the test transmission.

Picture 2—Corner Reflector

With the reflector setup vertically polarized as shown in picture 2, the range was 0.14 miles, for an antenna gain of about 7.36 dB. With the reflector horizontally polarized, the range was 0.27 miles for a gain of about 9 dB. I haven't yet rationalized the gain difference, but I like the numbers, since that means a range of about 3 miles at +13 dBm transmit power. The test was run with only one reflector—with two, the +13 dBm range should increase to about 8.45 miles. These are incredibly optimistic numbers with a link budget of 0 dB: I will expect much shorter ranges if I ever get around to trying it out.

The journey from a remote video camera tally light (see the September LongPath article) to a data link using and off-the-shelf RF module aided by a corner reflector has been interesting, instructive, and possibly even of some value, some time. I would encourage those with interest in this sort of thing to give it a try.

73, Tom KG4CUY

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1) *915 MHz Ultra Low Power Sub-GHz Transceiver Module,* 2012, Microchip.

2) *MRF89XA Data Sheet*, 2019, Microchip.

3) *ISM-Band and Short-Range Device Antennas*, 2005, Texas Instruments.

4) *ARRL Antenna Book*, 21st Edition, 2007, ARRL.

How Dipoles Radiate—The Hiker's Bent Dipole

By Kai Siwiak, KE4PT

Pedestrian HF mobile is a delightful way to combine amateur radio with trail hiking. In the previous Ionospherica we the big picture of the Earth-Sun system that governs the behavior of the ionosphere. We also saw how reflections from earth interact with an antenna to form vertical standing waves that vary the signal strength at different antenna heights. But what if the antenna is at ground level? What if half of the antenna lies on the ground? Ed Breneiser's, WA3WSJ, pedestrian mobile trek inspires this episode [1]—the hiker's antenna and its radiation properties. The concepts carry over to other antenna that use a counterpoise.

The hiker's antenna seen in Figure 1 comprises two antenna elements. One is a vertical whip above the backpack radio, and the second is a wire that drops to the ground and trails behind the hiking radio operator. Since both the vertical whip portion and the trailing wire portion contribute to the radiation, the antenna pattern of this "bent dipole" is far from omni-directional.

The stylized envelope surrounding the hiker suggests a directional antenna pattern. A hapless bird behind the hiker "feels the heat", while the "whoing" owl in front remains less than well illuminated. This is the story of how the hiker's bent dipole radiates, its directional characteristics, and how it couples to the ionosphere.

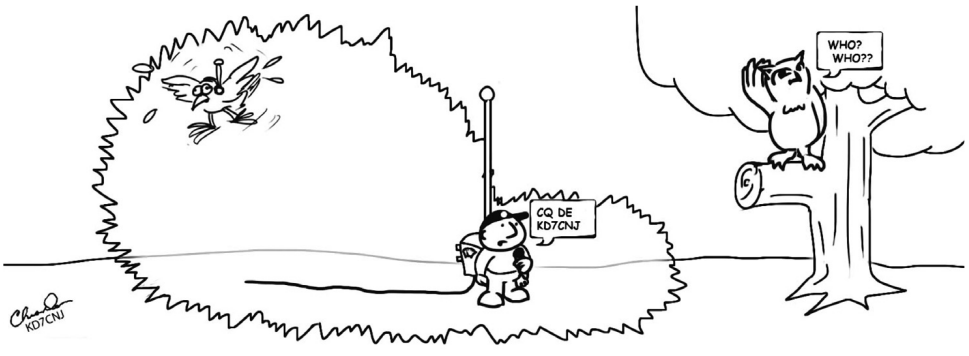

Figure 1—The hiker's HF portable antenna has two elements: a vertical whip, and a trailing wire. These elements form a bent dipole that has directional properties.

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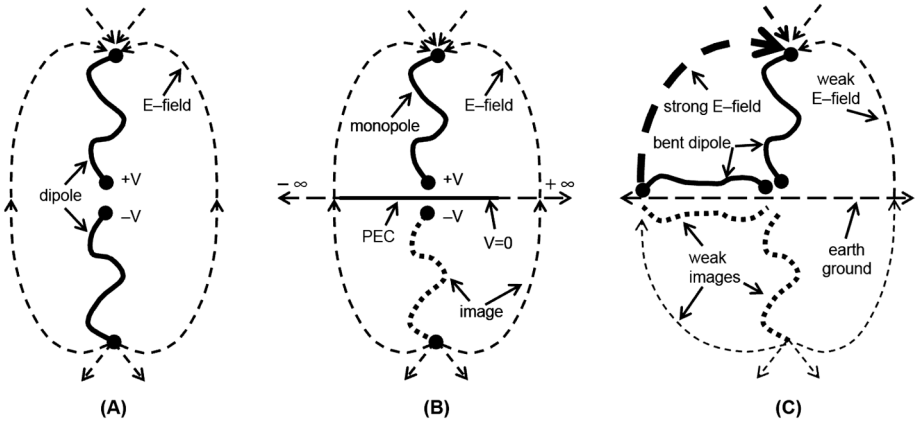

Figure 2—An electric antenna, like a dipole (A), needs two ends or tips that attach the E-field lines between them. In an arrangement (B) over a PEC one half of the dipole appears as an image in the PEC, including image fields. A bent dipole © above an earth ground has a weak image in the ground, and weak image fields, and has directional properties.

We'll confine our discussions to wire antennas with elements that are each generally less than a quarter wave long, but otherwise this story is relatively independent of frequency. Also, we don't require that the wire elements self-resonate. That's a detail we handle by antenna matching circuits, or with an automatic antenna tuner.

It Takes Two to Tango

Dipoles by definition have two ends. Radiating electric fields connect between those two end points to radiate. Said another way, there are no monopole antennas in isolation. However, an image of the antenna in a "mirror" such as a perfect electric conductor (PEC) can take the place of the second element. However we do it, there must be a counterpoise below the whip element protruding from the backpack radio—a second dipole element.

Figure 2 portrays the electric fields of (A) a dipole, (B) a monopole with a perfect image in a PEC of infinite extent, and (C) a bent dipole entirely above an earth ground. The dipole is in isolation, that is, it is not near ground. There is a certain symmetry in the elements, but they need not be straight, and they may include loading elements such as inductors. Apply a balanced voltage, +V and –V to the feed terminals of the dipole. The electric fields that appear around the dipole seem to emanate primarily from a pair of "point sources" at the two tips of the dipole elements. These fields are depicted by dashed lines in Figure 2. Note that the fields, like those between the plates of a capacitor, originate at one end and terminate at the other end of the dipole. That holds true whether the dipole is in isolation (A), or is a an element against a counterpoise (B), or is a bent dipole (C) near the ground.

Cont'd on p. 11

Indeed, this two-point source picture conforms with the exact mathematical expression for the total fields of a half-wave long dipole fed at a single frequency [2]. It takes a pair of terminals to feed the dipole. It takes two end points to radiate the electric field.

What if Earth Were a Copper Sheet

We can rely on a mirror image to take the place of the lower dipole element as in the configuration in Figure 2 (B). The monopole, of course, is not a complete antenna. It needs an image in the mirror—a counterpoise. We feed that antenna with an unbalanced voltage +V against a PEC (or our imagined copper Earth). The PEC provides the second terminal for the return current path of the feeding voltage +V. It also provides the mirror image of the monopole tip, with its opposite charge, so that the electric fields can terminate properly and therefore radiate.

How much of a counterpoise do we need? We've portrayed an infinite half space of PEC in Figure 2 (B). However, we can get away with far less. That leads us to the Hiker's Bent Dipole

The Hiker's Bent Dipole

The vertical whip element and a wire trailing on earth ground is about as minimalist as one can get to realize a dipole for the trail-walking backpacking radio-toting ham. We portray that dipole in Figure 2 (C). Now the earth ground is not perfect, the ground images are weak, but we do have two elements with two distinct end points, and we have two feeding terminals.

We've lost the symmetry evident in (A) and (B), but we've gained a configuration that is very suitable for pedestrian mobile—a dipole with a vertical whip element and a trailing wire element. Both elements are equally important to the radiation process. As depicted in (C), the bent dipole will tend to have a comparatively strong electric field joining the two wire ends, and weaker fields interconnecting the weak images in the real earth ground.

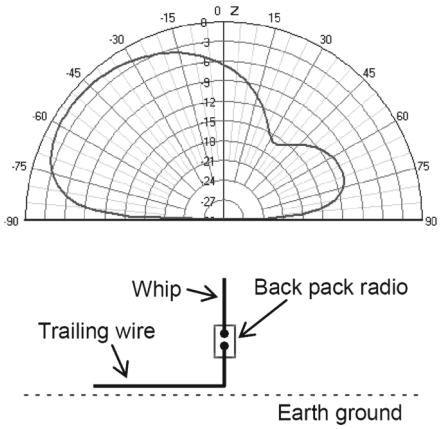

Figure 3—Calculated elevation pattern of the Hiker's Bent Dipole. The rear to front ratio is nearly 10 dB.

Consequently, the bent dipole will favor radiation in the direction of the trailing wire.

Antenna Pattern of the Hiker's Dipole

We can simulate the performance of the Hiker's Bent Dipole using Numerical Electromagnetic Code (NEC), such as EZNEC [3], or 4NEC2 [4] using the geometry shown in Figure 3. The pattern in the plane of the bent dipole has a back to front ratio of nearly 10 dB. The back to side ratio is about 5 dB. Thus the hiker experiences about two S units stronger signals from behind compared to the front, and about one S unit lower to the sides compared to the rearward direction.

The pattern seen in Figure 3 has a broad elevation pattern peak between about 15 and 60 degrees above the horizon, and significant signal coverage down to 5 degrees above the horizon. That's suitable for coupling into the ionosphere for long distance communications as well as for shorter hops.

While this "hiker's beam" antenna requires some additional hiking to make it rotate, at least now you know the favored pattern directions.

Estimating Radiation Patterns

Figure 2 provides us with some insights into how we can qualitatively estimate radiation patterns and radiation polarization. Rather than worrying about how the currents flow in the wires, observe how the E-fields must form to connect the farthest two ends of a dipole. From Figure 2 (C) we can estimate that the polarization in the rear and front directions is essentially vertical. However, the fields emanating to the sides of the hiker are polarized half-way between vertical and horizontal.

Summary and Conclusions

The bent dipole model lets us estimate the performance of the hiker's antenna very conveniently. Peak signals with a broad elevation pattern are behind the hiker, and antenna polarization varies from vertical to the rear and front, to a significant tilt towards the sides. We can use the same technique to estimate the radiation properties of mobile antennas.

References

1. E. R. Breneiser, WA3WSJ, "Colorado QRP Pedestrian Mobile or Bust." *QRP Quarterly*, Winter 2014.
2. K. Siwiak and Y. Bahreini, *Radiowave Propagation and Antennas for Personal Communications*, Third Edition, Artech House, Norwood MA: 2007, Chapter 11.
3. EZNEC from R. Lewallen, W7EL, available at www.eznec.com
4. 4NEC2 from A. Voors, available at www.qsl.net/4nec2/

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DXpedition Funding

By Steve Molo, KI4KWR, NADXC Vice President

Something currently not on the radar is DXpeditions due to the current situation the world is facing with COVID-19. Something many of us do not ever think about is what does a DXpedition require to happen?

TEAM: These operators should be avid Contest and DX chasers on both SSB and CW. More today we are seeing Teams having dedicated personnel for SSB/CW and now Digital modes. Typical Team is anywhere from 10-20 operators that cover often 12 hour shifts for up to three weeks while on the location of the DXpedition. Setup and tear-down of the site being used.

After the Team is gathered the next piece is…Where / When / Transportation / Permits / Budget. I could break them all down, but this article would be several pages no doubt.

INFRASTRUCTURE: This is the equipment required to include radios/ amplifiers/coax cable/antennas/power requirements/fuel/computers. I left out the most expensive part from the last sentence; transportation. Not all places the Team can fly to. Some require a boat chartered with the most popular among many DXpeditions being the MV Braveheart. This vessel is operated by Nigel Jolly, K6NRJ. Nigel is based out of New Zealand. So now we have the basis of what is required for the infrastructure.

PROPAGATION: When would the DXpedition work for 160/80/40/20/15/10 and even 6-meter operation. Some even do satellites and EME if possible. This piece is planned out and data is provided via the DXpedition website which is the announcement and critical piece to let the world know what they plan on doing.

MONEY: Without fundraising a DXpedition will not happen at all. Smaller ones are typically paid for by the Team but with ones like Bouvet Island 3Y0Z which was cancelled one mile from the location due to several reasons with some that will never be disclosed. One factor was seaworthiness of the vessel being used to get there and equipment on the Island. This DXpedition was close to 1 million dollars and the Team made up for a if I recall 30 percent of the funds needed to make this happen. The remaining 70 percent is donations from DX foundations like INDEXA (International DX Association) / NCDXF (Northern California DX Foundation). Then you have the Clubs around the world and lastly individual donations. Something you see if you attend the DX Dinner or even Contest Dinners is DXpediton fundraising if one is planned and upcoming. This is where close to 30% of my Dayton budget goes; support the upcoming DXpedition in some form…because it helps them to achieve the mission.

Since I am the INDEXA Social Media Chairman I can give some requirements for INDEXA support:

DXPEDITION REQUIREMENTS (Part of the requirements for INDEXA's support)

1. DX entity to be activated must be in the Top 60 of Club Log's Most-Wanted List.
2. Individual team members must make a substantial personal contribution to the project.
3. INDEXA believes that funds contributed to a DXpedition should be used only for that purpose.
4. DXpedition must upload their logs to Logbook of the World (LoTW) within six months after the DXpedition concludes.
5. DXpedition team members must be required to review and understand information found in the booklet "DXpeditioning Basics" written by Wayne Mills, N7NG. (on website)
6. Good operating practices and operating ethics are required for INDEXA support.

But where does that support from INDEXA come from? Well that is easy becoming a member of INDEXA.

INDEXA Application for $20/year allows you to become a supporter. That membership assists INDEXA with providing funds requested for the DXpedition.

Another side of INDEXA is "Hams with Hearts" founded by Zorro Miyazawa JH1AJT. To qualify for humanitarian grants, DXpeditions must present a clear plan for a humanitarian project to coincide with their DXpedition. The project must provide direct, physical benefit to the local population and go beyond leaving behind ham equipment, making a video, or giving a class in amateur radio. Examples of acceptable projects include, but are not limited to, providing school supplies, clothing, medical supplies, first aid equipment, water purification supplies, etc. INDEXA suggests that humanitarian grants be focused on the top 100 DXCC entities as listed on Club Log's current Most Wanted List using "No Mode Filter, All Bands and Global Log".

In closing, without the support of DX Foundations/Clubs and Individuals allot of the DXpeditions in the last 10 years would not have happened without their help.

NOTE: NADXC and INDEXA is supporting Swains Island W8S for Spring 2021 which has Stephen Werner AG4W as a Team Member. Swains Island W8S

From the President
(cont'd from p. 1)

In my case, I can't see very well any more, so I have to keep equipment close. I don't like to reach for buttons, so I want every single one easily within reach, without having to move my body. I want all functions integrated into my computer. Auto-tuning has become cheap and easy, so I have integrated that everywhere I can. My transistor amp is small and light, and pushes out 1500W when I need it. It requires no warm-up time and has a 4-port antenna switch, which is handy since I have 4 antennas. Big screen monitors are now inexpensive. Mine used to rest on my table, but that took up too much space, so I mounted them on the wall, which allowed me to move the equipment much closer together. Equipment I don't need to touch often is out of the way and hidden (the rig, the 2m, speaker, power supply). Laptops now have Thunderbolt USB connections, which means you only have a single wire touching the computer (all power and data). The rest of the wires go to the docking station, which is out of sight. I now have my power meters on the left and the antenna controls on the right, so I don't have to keep looking back and forth. And I don't allow any debris to enter my field of view.

The program this month is from Fred, KF4FRK, and the subject is "Using Software and Online Tools to Hunt and Work DX from a Moderate Station." Fred has some really good ideas that we can all try. So come join us for another covid-free virtual meeting of the NADXC on Tuesday, November 10. We'll use Zoom again. I'll send you another invitation, but the sign-on will be exactly the same. I'll open Zoom for informal discussion at 6:30, and start the meeting at 7pm.

October Meeting Minutes
By Chris Reed, AI4U

Bob K8KI called the virtual meeting of the North Alabama DX Club to order on Zoom on Tuesday October 13th, 2020 at 7pm.

Chris, AI4U introduced two applications for membership. Wil, AI4QT and Cat, W4DXY. The vote to accept was unanimous. Welcome Wil and Cat to NADXC!

Bob, K8KI made a few more announcements, then meeting was adjourned for the program. Bruce, AC4G presented the program "HF receive antennas". The next virtual meeting is scheduled for 7 p.m. Tuesday, November 10th on Zoom. Information will be sent prior to the meeting.

Respectfully submitted,

Chris Reed, AI4U

Treasurer's Report
By Chris Reed, AI4U

October 1 Balance	$ 8,394.68
Deposits	15.00
November 1 Balance	$ 8,409.68

The Casual DXer
By Kevin Hibbs, KG4TEI

Greetings All. **I DID IT!** I have 101 confirmed on 17M. Based on what I have been told about how long the DXCC process takes, hopefully Santa will have some new DXCC certificates under the tree this year. This brings my mixed total up to 151, 30 more than I started the year with. When I look back on this crazy year this will definitely be near the top of my list among the good things that happened.

DXing aside, I have started to play with two different Raspberry PI operating systems geared toward the ham radio operator. The first is HamPI from W3DJS. From everything that I have read and seen this distribution is very complete. There are lots of ham radio applications and everything is highly organized. The only issue I have had with it so far was getting it downloaded. When it was released the primary download method was to use Bittorrent, a downloading service, but now it can be downloaded via a web browser. There is lots of information available on YouTube about this distribution.

The other distribution is called Build A PI by Jason Oleham, KM4ACK. I still haven't used this one yet, but the great thing about this distribution is the creator has lots of great YouTube videos with a step by step process to get it working. While HamPI is a very complete general use release, Build A PI seems much more focused on EMCOM; digital modes like FT8 and JS8CALL; and portable operations. The nice thing about this release is that it comes ready to make the Raspberry PI a wifi hotspot. This means once the PI is configured it can run without a monitor and can be controlled from another computer or tablet. Once I have a few hours to play with both of these operating systems some more I will write up some thoughts about how well they work for my setup.

More to come next month as I start to work on other bands for DXCC. With the sun spots starting to tick back up I'm sure the higher bands are about to become way more active. 15M has had some great openings lately. I even managed a couple contacts to Argentina on 10M today. Hope to see you all online in the meeting next week.

73,

Kevin KG4TEI

DX Contests for November

By Chuck Lewis, N4NM

Ukranian DX Contest (CW/SSB), 160-10 meters

Nov. 7, 1200Z to Nov. 8, 1200Z

Exchange: RS(T) or 2-letter oblast

See page 74, Nov. QST and www.urdxc.org/rules.php?english

WAE DX Contest (DIG), 80-10 meters

Nov. 14, 0000Z to Nov. 15, 2359Z

Exchange: RST plus serial number (see rules for QTC)

See page 74, Nov. QST and www.waedc.de/referate

Japan Int'l DX Contest, (SSB), 80-10 meters

Nov. 14, 0700Z to Nov. 15, 1300Z (48 hours)

Exchange: RS plus CQ zone; JAs send prefecture

See page 74, Nov. QST and www.jidx.org/jidxrule-e.html

OK/OM DX Contest, CW, 160-10 meters

Nov. 14, 1200Z to Nov. 15, 1200Z

Exchange: RST plus serial number or OK/OM district

See page 74, Nov. QST and www.okomdx.crk.cz

LZ DX Contest, (CW/SSB), 80-10 meters

Nov. 21, 1200Z to Nov. 22, 1200Z

Exchange: RS(T) plus ITU zone or LZ district

See page 74, Nov. QST and www.lzdx.bfra.org/rulesen.html

All Austria 160 Meter Contest, (CW), 160 meters

Nov. 21, 1600Z to Nov. 21, 0700Z

Exchange: RST plus Serial Nr. (OEs send district)

See: page 74, Nov. QST and www.oevsv.at/

CQ Worldwide CW, (CW), 160-10 meters

Nov. 28, 0000Z to Nov. 29, 2359Z

Exchange: RST plus CQ zone

See page 74, Nov. QST and www.cqww.com/rules.html

ARRL 160 Meter Contest, (CW), 160 meters

Dec. 4, 2200Z to Dec. 6, 1600Z

Exchange: RST plus Section

See: www.arrl.org/160-meter

ARRL Ten Meter Contest, (SSB/CW), 10 meters

Dec. 12, 0000Z to Dec. 13, 2400Z

Exchange: RST plus State/ Prov.; DX sends RST + S.N.

See: www.arrl.org/10-meter

Dates & times often change or are misprinted in the journals; beware. Have fun!

Chuck, N4NM