The LongPath

November 2021 — Volume 45 Issue 11 A North Alabama DX Club Publication

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Contributors:
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From the President

By Bob DePierre, K8KI

Anyone who has had an HF radio turned on over the past month has noticed the difference. Sure, we're at the bottom of the solar cycle, but the DXpeditions suddenly turned back on after a two-year disappearance. I've been working them every day. We can finally talk DX again, and tell the stories of who got the rare one! I'm finally back in heaven again.

Speaking of DXpeditions, I received a request for DXpedition support from Adrian Ciuperca, who was our banquet speaker. When he was here, I asked Adrian where he got the money to go on all those DXpeditions. Well, Adrian is not only an immigrant, but only has a checking account to fund anything. He is now one of 11 hams who plan to embark for Bouvet Island next November. The history of Bouvet DXpeditions was chronicled in the recent How's DX column in QST. There haven't been many, and those who tried didn't often make it. Anyway, I'm thankful for what Adrian did for us, and I'd like to get 3Y0J into my logbook. Let's talk about it at the next meeting.

I've been searching for a club activity that might garner some widespread interest and may have hit on a topic at the last meeting. There were a number of members who wanted to enter a CW DX contest, but for one reason or another have never done it. Now CQWW is in 2 weeks, and the DX is going to be out there. I have my own ideas of how to do this. I got one member going for ARRL DX earlier this year. I told him to visit me for an hour during the contest and I'd have him operating at 30 wpm in an hour. I don't think we need to learn conversational CW to work either DX or contests. If you are interested, please make sure I hear from you today. And that's another subject for the meeting.

At the last meeting, I offered a number of presentation subjects for future meetings. The one voted highest was one on the museum by Marc Bendickson. Marc says he'll try for that one early next year. While I'm on the subject, Marc needs a lot of volunteer hours from members of the club. If you have a few hours available, he could use your help. Please let me know if you'd like to volunteer.

On Tuesday we need to talk again about the Christmas Party. Do we want to have the party at the museum or at a restaurant? We have been going to Terranova's for a few years.

We have two elections on the schedule this month. The first is for club officers, which Fred/K3FRK will

From the President (continued)

run. Then we'll vote on DX'er of the Year. We'll again award that one at the December meeting.

The November presentation comes from K6MM via Zoom. He'll relive his adventures at Baker Island KH1/KH7Z in 2018. As you'll remember, this is the remote Pacific area where Amelia Earhart disappeared in 1937. Bill tells me 20% of our members made it into his log.

So, let's have the next NADXC club meeting on Tuesday, November 9, at the Museum of Information Explosion at 1806 University. The Zoom sign-on will be exactly the same as in the past. I'll send members the Zoom invitation on Sunday just before the meeting. Again, remember to pick up your dinner on the way over. I'll get a few of you to help set up the tables and we'll just eat here. I'll open the doors by 5:45. The meeting will start at 6:30, and the program a little before 6:45.

The Museum of Information Explosion

Ionospherica

By "Kai" Siwiak, KE4PT

Antenna Pattern Peaks and Nulls — A Calculator Solution

You can hand-sketch a pretty good approximation of the vertical pattern for a horizontally polarized antenna elevated above ground (Figure 1). Furthermore you don't need any electromagnetic modeling software such as numerical electromagnetic code (NEC) to do so.

NEC, as implemented in several popular software packages like *EZNEC*[1] and *4nec2*[2], can give excellent results for modeling your antenna in free space, or over a perfectly flat and perfectly smooth Earth. But a hand calculator is all you need to find basic pattern features like peak and null angles. A scientific calculator such as *calc.exe* is available in every version of Microsoft Windows, or a calculator app on your smart phone, will do the job. Just specify the antenna height above ground in wavelengths.

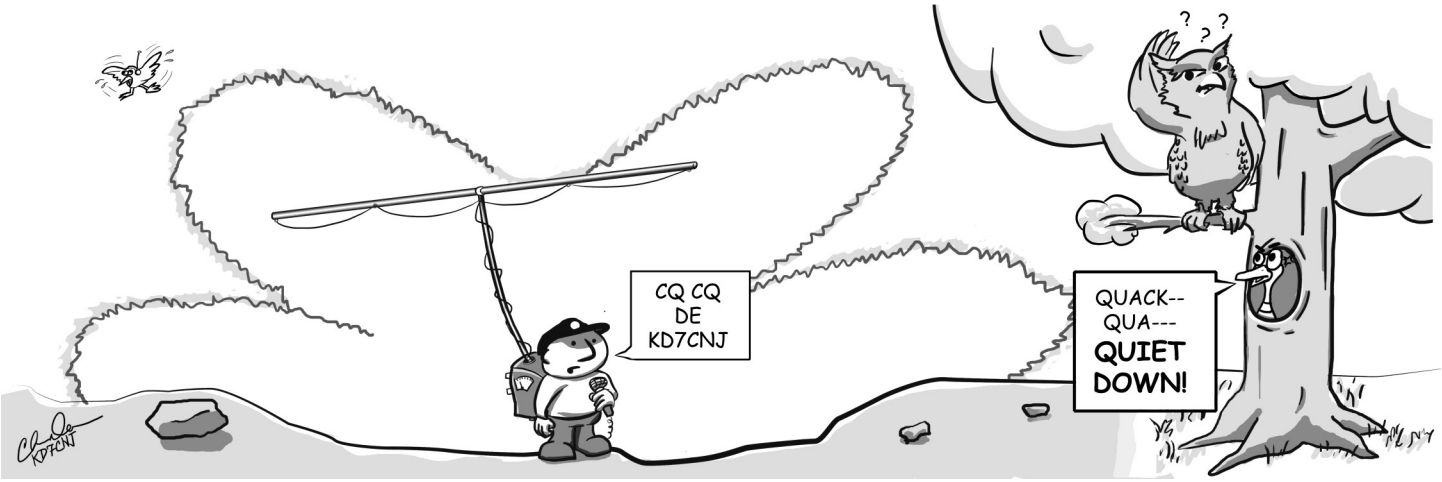


Figure 1 – You can predict the number of peaks, and the peak and null angles of your horizontal dipole using calculator. [Chris Dean, KD7CNJ, image]

Ionospherica (continued)

Imagine that you've set up camp and hung your portable station dipole up at about 10 m height (30 ft). You're ready to try some 28 MHz CW. Curious about the elevation plane dipole pattern?

Elevation Peaks and Nulls

We've already seen the phenomenon responsible for pattern nulls and peaks due to ground reflections in the October 2013 *Ionospherica* column.[3] Signals arriving from the distant ionosphere take a direct and a ground-reflected path, to form a vertical standing wave pattern at the receiving antenna location.

In the present example, we've chosen an antenna height based on physical limitations at our camp site. Figure 2 shows the details of the signal paths. For signals transmitted to, or received from, an elevation angle α, there are two paths to/from the dipole placed at a height of H_λ wavelengths.

There is a direct path, and a ground-reflected path. The path lengths differ, and the ground reflected path undergoes a phase change upon ground reflection. For shallow angles that ground reflection coefficient is -1. So we immediately know that the "zero order null" in the elevation pattern is at α=0°!

The Pattern Nulls

First we determine how many peaks p there are in a forward quadrant of the antenna pattern. We answered that in the October 2015 *Ionospherica*,

$$p = 2H_\lambda \qquad (1)$$

Note that p need not be an integer — as H_λ increases, peaks continue to be added gradually from the vertical direction, while the lower angle peaks get compressed, see Figure 3.

Also, the straight up (90° elevation) peak maximum occurs for antennas that are at even multiples of a half wavelength, minus a quarter wavelength, such as 0.25λ, 0.75λ, 1.25λ, 1.75λ, and so on.

The number of nulls above the zero angle null is the integer part of p.

Using simple geometry and image theory, see Figure 2, we can see that the ground-reflected path is $2H_\lambda\sin(\alpha)$ longer than the direct path to the distant horizon. Also, signals along the ground reflected path are multiplied by the -1 ground reflection coefficient. The signal copies along the two paths will cancel whenever the added path length, or phase delay, is a multiple m of a wavelength λ. That is,

$$2H\lambda\sin(\alpha) = m\lambda \qquad (2)$$

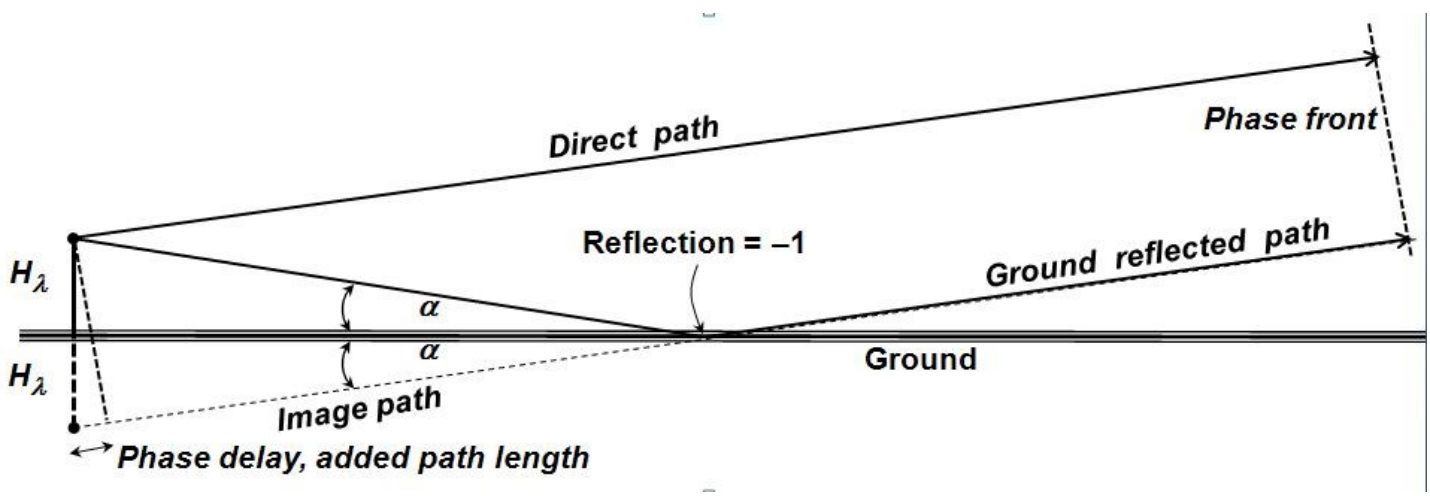


Figure 2 – Using image theory and geometry, the *added path length* of the ground reflected path is $2H_\lambda\sin(\alpha)$, where H_λ is the antenna height.

Ionospherica (continued)

Solve for the angle α of the *m-th* null,

$$\alpha_{m\_NULL} = \arcsin\left(m/2H_\lambda\right) \qquad (3)$$

I used a simple scientific calculator with the inverse sine function!

The m=0 null occurs at 0°, and the first null is at $\alpha_1 = \arcsin(1/2H_\lambda)$.

We hung our 28 MHz dipole at about a 10 m height (H_λ=1), so there are p=2 complete lobes in the forward quadrant of the pattern, and 2 nulls above the 0° null: one at arcsin(1/2) =30°, and the second at arcsin(2/2)=90°.

The Pattern Peaks

The signal copies travel along the two paths and combine constructively to double the field strength (+6 dB above the free space value) for a perfect ground — or about 4-5 dB for medium ground — whenever the path difference, or phase delay, is an odd multiple m of a half wavelength. That is,

$$2H_\lambda \sin(\alpha) = (2m-1)/\lambda \qquad (4)$$

Solve for the angle α,

$$\alpha_{m\_PEAK} = \arcsin\left((2m-1)/4H_\lambda\right) \qquad (5)$$

which is easily computed on a scientific calculator using the inverse sine function!

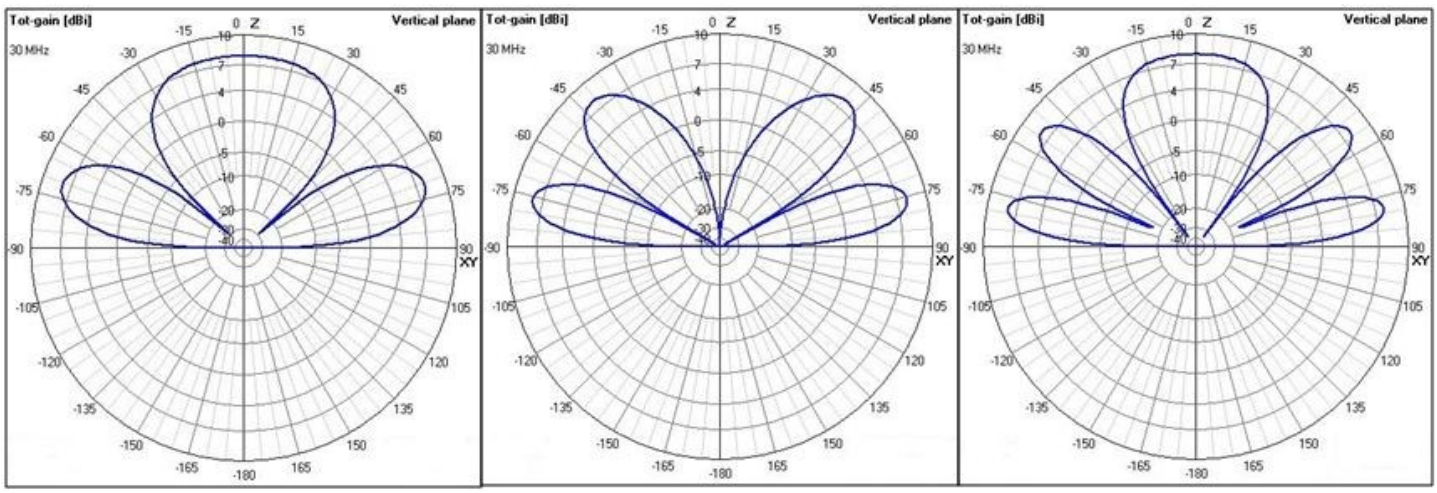


Figure 3 – For a horizontally polarized antenna H_λ wavelengths above ground, use Eq (1), (3) and (5) to discover the number of peaks p, in the forward quadrant, the elevation angles α above the horizon of nulls and peaks, which can be verified with *4nec2* as shown above.

[LEFT] H_λ=0.75, so there are p=1.5 lobes in the forward quadrant; my calculator shows the peaks are at α=19.5° and 90° above the horizon, and the nulls are at α=0° and 41.8°.
[CENTER] H_λ=1.0, so there are p=2.0 lobes in the forward quadrant, the peaks are at α=14.5° and 48.6° above the horizon, and the nulls are at α=0°, 30° and 90° above the horizon.
[RIGHT] H_λ=1.25, so there are p=2.5 lobes in the forward quadrant, the peaks are at α=11.5°, 36.9° and 90° above the horizon, and the nulls are at α=0°, 23.6° and 53.1° above the horizon.

When H_λ is a multiple of a half wavelength minus a quarter wavelength, [LEFT and RIGHT], there is a peak 90° above the horizon, whereas if H_λ is a multiple of a half wavelength [CENTER] there is a null at 90°.

Ionospherica (continued)

The first peak (there is no zero-order peak) happens at $\alpha_1 = arcsin(1/4H_\lambda)$.

For the 28 MHz dipole at height of 10 m (H_λ=1), the first peak occurs at arcsin(1/4) =14.5°, and the second one is at arcsin(3/4) =48.6° as seen in the CENTER pattern in Figure 3.

Verify with NEC

I set up three scenarios with the dipole at 0.75, 1.0, and 1.25 wavelengths above the ground, and used Eq (1) to get the number of nulls *p* in the forward quadrant, and then Eq (3) and (5) to find the elevation angles of the nulls and peaks.

I then used *4nec2*, with a perfect ground, to calculate the antenna patterns to verify my hand-calculated results. Had I used a medium ground, the nulls would not have been so deep, and peaks would be slightly less pronounced, but angles would still match.

Calculator is All You Need

Knowing the height in wavelengths of your dipole antenna, apply the three simple formulas to predict the number of peaks, and the elevation angles of the pattern peaks and nulls.

The peak lobe amplitude is 4 to 6 dBi above the free space value depending on the type of ground.

References

1. *EZNEC* antenna modeling software, Roy Lewallen, W7EL, www.eznec.com.

2. NEC modeling software *4nec2* by Ari Voors, www.qsl.net/4nec2.

3. K. Siwiak, KE4PT, "Ionospherica, Pitching and Catching Radio Waves — The Last Bounce", *QRPQ* Vol 54 No. 4, Oct 2013, pp 32-33.

Kazimierz (Kai) Siwiak, KE4PT, is an avid DXer who packs a DX Go-Bag station on his travels.

The DXCC Challenge - A Worthwhile Goal

By Stephen Smith, KY4G

We have been in the doldrums of low solar sunspot activity for some time now. While Solar Cycle 24 ended in December 2019, Solar Cycle 25 has been off to a slow start until recently. Have you been looking to add some excitement in your Amateur Radio activities? Do you need some motivation for putting up an antenna on a new band or two? Perhaps the ARRL DXCC Challenge coupled with the recent increase in sunspot activity may be the right prescription for you!

"The DXCC Challenge Award is earned by working and confirming at least 1,000 DXCC band -points on any Amateur bands, 160 through 6 meters (except 60 meters). Certificates are not available for this award; however, there is a distinctive wall plaque available to display your achievement. Plaques can also be endorsed in increments of 500 additional band points. Deleted entities do not count for this award. All contacts must be made after November 15, 1945. QSOs for the 160, 80, 40, 30, 20, 17, 15, 12, 10, and 6 meter bands qualify for this award. Bands with less than 100 contacts are acceptable for credit for this award and you do not have to have an active award on a band for it to qualify." – From the ARRL website.

It may sound like a formidable goal, but it is very reachable and a ton of fun. In fact, seventeen of our NADXC members have already achieved it. Several have gone over and above to rack up some truly impressive entity counts! You can see the entity totals yourself via the NADXC

The DXCC Challenge - A Worthwhile Goal (continued)

website on the DXCC Standings page. Here are some tips that can help rack up a lot of qualifying contacts:

1. Put up an antenna to cover a new band. The more bands you can operate on, the less contacts per band are needed. One great thing about each new band is that there are 340 more opportunities for a qualifying contact. 40m, 20m, and 15m, are obvious band choices. 80m will yield a lot of contacts as well. 30m is sizzling with FT8 and other non-voice traffic these days. 17m and 12m are also avenues for making a substantial number of contacts. 160m and 6m can be more challenging for different reasons, but even meager antennas can yield more contacts that count toward the challenge. I have an OCFD that I use for 40m, 80m, and 160m that yielded me 236 entities; however, 793 of my entities were made using the 30m-6m antennas in my attic. All contacts were made with 100 watts or less and simple wire antennas, except for a 6m hexbeam.
2. The sun is really starting to pick up and so is activity on the higher bands. There have been several openings on 15m, 12m, and 10m. In fact, I've been pleasantly surprised to see 12m open and a lot of people actually on it! I've worked at least 24 DX stations on 12m in the past month and many were "new ones." Solar activity should continue to increase until it peaks around July of 2025.
3. Try some different modes. FT8, and previously JT65, provided some great opportunities for QSOs with very weak signals, albeit with other inherent limitations. This was a big help while being at the bottom of the solar cycle, but it is easy to get stuck in a rut and we should not limit ourselves to just those types of modes. Personally, I'm excited about conditions being better to support more voice contacts! Pursuing the DXCC Challenge has also motivated me to improve my exceedingly marginal CW skills as I saw too many workable contacts get away because I simply didn't have my CW skills where they needed to be. This is a personal goal of mine.
4. One can concurrently make progress towards achieving DXCC on individual bands. The DXCC Challenge can take a while to achieve, but you likely will reach other goals along the way. During my pursuit of the Challenge, I qualified for DXCC on quite a few individual bands and made substantial progress on others. My number of "Mixed DXCC" entities also climbed quite higher as well. These other milestones along the way provide a good bit of satisfaction to keep you going.
5. DXpeditions are a great opportunity to add to your score. Many activations are on most, if not all of the HF bands. That ATNO sure is exciting, but why not try collecting additional bands while you are at it? I recently worked 3DA0RU on six bands, and J5HKT on seven bands. It was a lot of fun!
6. There are tools available to help you identify which calls are "new ones" on each band such as JTalert so you can contact that badly needed entity. Some logging software packages also do this as well as help you track which contacts still need a follow up to get that important QSL. Logbook of the World has resources that help you track your progress and credits submitted for other DXCC awards also apply towards the Challenge.
7. Patience pays off! ClubLog has a great OQRS feature that will help yield cards through the bureau for those stations who don't use LoTW. There will be some contacts for which direct mail will be the only way to get a QSL. I usually let these sit for a while, as I often end up working a station on multiple bands and then get a few QSLs with a single international stamp which keeps costs down. You might be surprised how many paper cards you end up with. Just ask our very patient ARRL card checker, and NADXC member, Steve Werner (AG4W) who checked large stacks of cards for me that went towards my entity count.
8. Finally, don't stop just because you reached the qualifying goal of 1000. There are en-

The DXCC Challenge - A Worthwhile Goal (continued)

dorsements for higher levels of achievement. We have eight members that have over 2000 entities and N4KG was just 14 shy of 3000 entities!

I hope you will consider pursuing the DXCC Challenge either now, or sometime in the near future. There are several worthwhile goals mentioned in this article that may help you take another "baby step" to get there. The "challenge" itself is very relevant to the primary focus and interest of our club. Furthermore, from experience I can tell you that it really is a lot of fun!

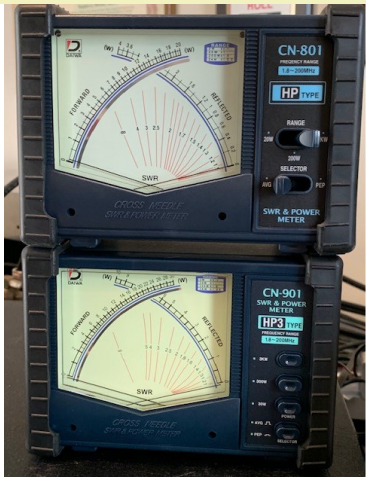
Wattmeter Accuracy - What is Your Gold Standard?

By Steve Werner, AG4W

I have owned a Telepost LP-100 for almost 9 years now and it has been my Gold Standard wattmeter. It is a great wattmeter that works on 160 to 6 meters. The specified power accuracy is 5 percent with 3 percent typical. It is calibrated on a per band basis which makes it likely to be the most accurate. They have an option to add a second coupler to the display. The standard couplers are rated at 3KW. In the last year mine was damaged by lightning and I had it repaired which included a new display. It has been intermittent since which has been frustrating so I sent it back to Telepost again for repair. It still has intermittent problems.

Telepost LP-100 wattmeter

I purchased a Coaxial Dynamics wattmeter to use for high power on 2 meter EME. It is very similar to a Bird wattmeter and can even use Bird slugs. It is rated at 5 percent accuracy. Previously I used a Daiwa CN-901 HP-3 which really can't handle a kilowatt. On HF it is rated for 3 KW. In the fine print in the manual it states on 2 meters it is rated for a kilowatt. I have burned one up running about 800 watts.



Daiwa CN-801 HP and CN-901 HP3 wattmeters

I have been pleased with the Coaxial Dynamics wattmeter on 2 meters. I have used it up to 1100 watts and the unit showed no heating of the connectors. Using the Daiwa meter the connectors were very hot at 800 watts. I use the 2500 watt slug on 2 meters. I was going to purchase an HF and 6 meter high power slug at the Huntsville Hamfest. There were no HF slugs available, but I did get a 6 meter Bird slug that did not show much use.

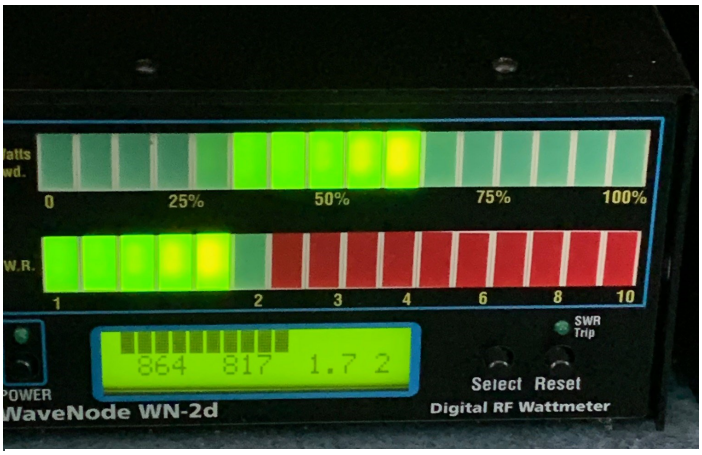
Coaxial Dynamics wattmeter

One of the reasons I got the Telepost LP-100 is that if it showed an SWR that is too high it will cut off the amplifier. This is a great feature to have especially for contesting. After over 30 hours of operating it is easy

Wattmeter Accuracy - What is Your Gold Standard? (cont.)

to make a mistake using the wrong antenna.

Due to my frustration with the intermittent LP-100 I looked for other alternatives. I found the WaveNode WN-2d. It can use up to 4 couplers. The cable length between the display and couplers is not critical. On the LP-100 the cable length is fixed and there are 2 cables. RF is passing between the LP-100 couplers and the display. DC is sent with the WaveNode couplers. It also has a measurement accuracy of 5 percent. It also has an amplifier cutoff capability. They also have 10 different couplers that are available to handle various powers and frequencies from HF to 1.2 GHZ. I decided to get a coupler for 2000 watts for 1.8- 60MHz and another for 2000 watts for 120-170 MHz. I can now use the same display head for my HF and EME station.



WaveNode WN-2d wattmeter

Comparing the Wattmeters

<u>50 watts stated on FTDX-101MP on 50.3 MHz</u>
LP-100 41.7 watts SWR 1.44:1
WN-2d 42.5 watts SWR 1.5:1
AT1500DT Palstar tuner 47 watts SWR 1.3:1

<u>Amplifier output</u>
LP-100 963 watts
WN-2d 1065 watts
AT1500DT Palstar tuner 950 watts
Coaxial Dynamic 81000A- 850 watts SWR 1.5:1

The QST review of the WaveNode showed the reading about 11 percent high on 6 meters. It was within 5 percent accuracy on the 1.8-28 MHz bands. If you subtract 11 percent from the 1065 you get 948 watts. Based on the results I expect the LP-100 is still the Gold Standard for accuracy. It was interesting the Palstar tuner wattmeter was very accurate. I was disappointed that the Coaxial Dynamics meter came up low. That is one disadvantage of buying a used slug even though it showed little use. The WaveNode and the Coaxial Dynamics meter show almost the same readings with high power on 2 meters. I bought the 2 meter slug new for the Coaxial Dynamics meter.

Palstar AT1500DT antenna tuner w/ wattmeter

Both the LP-100 and WN-2d come with software for PC control. One advantage of the LP-100 is it is a vector wattmeter. It can measure impedance R+jX. The WaveNode can also be used as a rotor controller with the software and can monitor 4 other voltages. I plan to use that to monitor temperature, voltage and current in my 2 meter amplifier.

Upcoming NADXC meeting:

Tuesday, November 9th, 2021

5:45 PM Doors Open / 6:30 PM Meeting

Location: Museum of Information Explosion and via Zoom

Upcoming DX Contests

By Chuck Lewis, N4NM

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

Nov. 6, 1200Z to Nov. 7, 1200Z

Exchange: RS(T) or 2-letter oblast

See page 79, Nov. QST and www.urdxc.org/rules.php?english

WAE DX Contest (RTTY), 80-10 meters

Nov. 13, 0000Z to Nov. 14, 2359Z

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

See page 79, Nov. QST and https://www.darc.de/der-club/referate/conteste/wae-dx-contest/en/

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

Nov. 13, 0700Z to Nov. 14, 1300Z (48 hours)

Exchange: RST plus CQ zone; JAs send prefecture

See page 79, Nov. QST and www.jidx.org/jidxrule-e.html

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

Nov. 13, 1200Z to Nov. 14, 1200Z

Exchange: RST plus serial number or OK/OM district

See page 79, Nov. QST and www.okomdx.crk.cz

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

Nov. 20, 1200Z to Nov. 21, 1200Z

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

See page 79, Nov. QST and http://lzdx.bfra.bg/rulesen.html

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

Nov. 20, 1600Z to Nov. 20, 0700Z

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

See: page 79, Nov. QST and www.oevsv.at/

ARRL EME Contest, (CW/SSB/DIG)

Nov. 20, 0000Z to Nov. 21, 2359Z

Exchange: Signal Report

See: Page 79, Nov. QST or http://www.arrl.org/eme-contest

Upcoming DX Contests
(continued)

REF 160 Meter Contest, (CW), 160 Meters

Nov. 20, 1700Z to Nov. 21, 0100Z
Exchange: RST, Serial, Department code
See: Page 79, Nov. QST or https://concours.r-e-f.org/contest/a-propos/ref-160m-contest/

CQ World Wide DX Contest

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

Nov. 27, 0000Z to Nov. 28, 2359Z
Exchange: RST plus CQ zone
See page 79, Nov. QST and
https://www.cqww.com/rules.htm

ARRL 160 Meter Contest, (CW), 160 meters

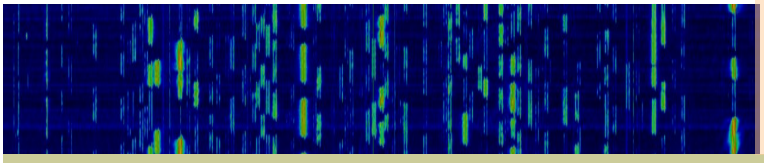
Dec. 1, 2200Z to Dec. 3, 1600Z
Exchange: RST plus Section
See: www.arrl.org/160-meter

OTHERS:

ARRL 160-Meter Contest
2200Z, Dec 3 to 1600Z, Dec 5

ARRL 10-Meter Contest
0000Z, Dec 11 to 2400Z, Dec 12

Dates & times often change or are misprinted in the journals; beware. Also, check the cluster: "sh/contest". Have fun!



2021 NADXC Officers and Directors

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

How to Join

Come to a club meeting or send in an application by mail (form on www.NADXC.org)

This edition of The LongPath published by: Fred Kepner, K3FRK

DXpeditions in November 2021

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Start Date	End Date	DXCC Entity	Call	QSL via	Info
2021 Oct30	2021 Nov15	**Central African Rep**	**TL7M**	LoTW	By LA7GIA; HF; end date approximate; QSL via Club Log OQRS or LA7GIA direct
2021 Oct30	2021 Nov05	**Saba & St Eustatius**	**PJ5**	PD1BAT	By PD1BAT as PJ6/PD1BAT fm Saba I; 40 20 10m; mainly FT8, some SSB; QRP; end-fed wire
2021 Nov01	2021 Nov05	**eSwatini**	**3DA0LP**	ZS6DPL Direct	By ZS6DPL fm Manzini; HF
2021 Nov01	2021 Nov30	**Maldives**	**8Q7RM**	HB9SHD	By HB9SHD fm Kandolhu I; 40-6m, perhaps 80m; mainly FT8, some SSB, slow CW; spare time operation, especially nights for NA and SA
2021 Nov10	2021 Nov24	**St Kitts & Nevis**	**V47JA**	LoTW	By W5JON fm Calypso Bay; 160-6m, incl 60m; SSB FT8; yagi, verticals; QSL also OK via W5JON direct
2021 Nov18	2021 Dec08	**Mali**	**TZ1CE**	DK1CE (B/d)	By DK1CE fm Bamako; 160-10m CW SSB FT8; log periodic, yagi, dipoles, inverted-V
2021 Nov19	2021 Nov24	**St Barthelemy**	**FJ**	KP4DO Direct	By KP4DO as FJ/KP4DO; 40-10m
2021 Nov22	2021 Dec01	**Mauritius**	**3B8**	F5CWU	By KX7M and M0SDV as 3B8/KX7M; HF; QSL via F5CWU OQRS
2021 Nov24	2021 Dec01	**Rwanda**	**9X4X**	4Z5FI	By 4Z4KX 4X6YA 4Z5FI 4Z5LA 4Z1DZ 4X1VF; 160-10m; CW SSB RTTY FT8; QRV for CQWW DX CW

October Meeting Minutes and Financial Report

By Chris Reed, AI4U

NADXC October 2021 Meeting Minutes

- The October meeting of the NADXC was called to order by President Bob DePierre, K8KI at the museum of Information Explosion.

- Fred Kepner, K3FRK, on behalf of the nomination committee, reported the slate of Officers for 2022.
  President, Bob DePierre, K8KI
  Vice President, Steve Molo, KI4KWR
  Secretary-Treasurer, Chris Reed, AI4U
  Ex-Officio, Steve Werner AG4W
  Director at Large Bruce Smith, AC4G
  Director at Large Fred Kepner, K3FRK

- Nominations will be taken from the floor for the November election. Officers elected will be installed in December.

- The minutes from the previous meeting and financial report were approved as published in the Longpath.

- Bob asked the group for suggestions to get more members involved similar to the HARC soldering class.

- Norm Skylar made the suggestion of an NADXC email list to share ideas. Bob asked him to lead the effort. Chris stated he would be glad to assist as a moderator.

- Chris suggested an entry level CW class.

- Bob thanked all those who contributed to the Longpath which was 22 pages by 11 contributing authors.

- 80% of those in attendance agreed to hold a Christmas Party.

- We vote on Ham of the Year in November and announce in December.

- Bob held a DX quiz. All of the answers are published in the Longpath.

- Next meeting will be November 9, at the Museum of Information Explosion.

- The meeting was adjourned at 8:47 pm. Bob, K8KI presented the program "The Early Years of the Information Explosion, The 1800's.

October 2021 Financial Report

Oct.1 Balance	$8543.22
Oct. 8 Deposit	$318.00
Oct. 31 Balance	$8861.22

Announcements

Via Steve, AG4W — Due to the continued difficulty in travelling through American Samoa, the W8S Swains Island DXpedition has been postponed. The W8S team is now planning to be on Swains Island for 15 days during March 2023. With Solar Cycle 25 going strong at that point, we can expect improved propagation on the high bands.

Via Barry, W4WB — Elecraft has announced an across-the-board price increase. The new prices will take effect on November 15th, 2021. Any orders placed before November 15th will be honored at the lower price. Orders for K4 or K4D transceivers placed today are expected to be delivered in the April/May 2022 timeframe.

Diversity Reception Special Edition: Member Tips and Experiences

Introduction

By Fred Kepner, K3FRK

Chris Reed, AI4U and Mark Brown, N4BCD shared some of their experiences with diversity reception in last month's Longpath. Their articles inspired this month's special edition. Bob, K8KI conducted a poll at the October meeting which revealed that many of our members own a transceiver capable of diversity reception but few have taken advantage of the benefits. Hopefully this month's articles will inspire you to give it a shot, on your transceiver or a fellow ham's.

Learning About Diversity Reception

By Susan Seaford, AI4VV

Diversity reception has not only been our DX club's theme the past two months but for others as well. Our president has described it as a "potentially difficult subject" and I agree. I found a YouTube video issued last month that provided a good place to start. It is by ham John Fallows VE6EY who in the last few years has made diversity reception his major project. This was because he had a neighbor who was causing an RFI problem. This video is on the Cycle25 Hub video channel. Its title is "Diversity Reception Primer" and its address is https://youtu.be/vu8D87aVUTQ. He was also interviewed on the podcast Ham Radio Workbench #140 recently and it starts at 1:13:00.

He gives a bit of history starting with Henry Beverage at RCA in 1926 when he used separate antennas. McLaughlin and Lamb published in QST 1936 used space and polarization diversities. This video summarized the different types of diversity: space, polarization, frequency, angle of arrival and time that can be used. Frequency was used in WWII. Eventually he talks about his current situation working with diversity the receiver RSPDuo and an ANAN-7000 which he feels is the best receiver for diversity for hams at this point. He suggests that our ham manufacturers should pay more attention to this subject. Now diversity manipulations are more easily managed digitally by

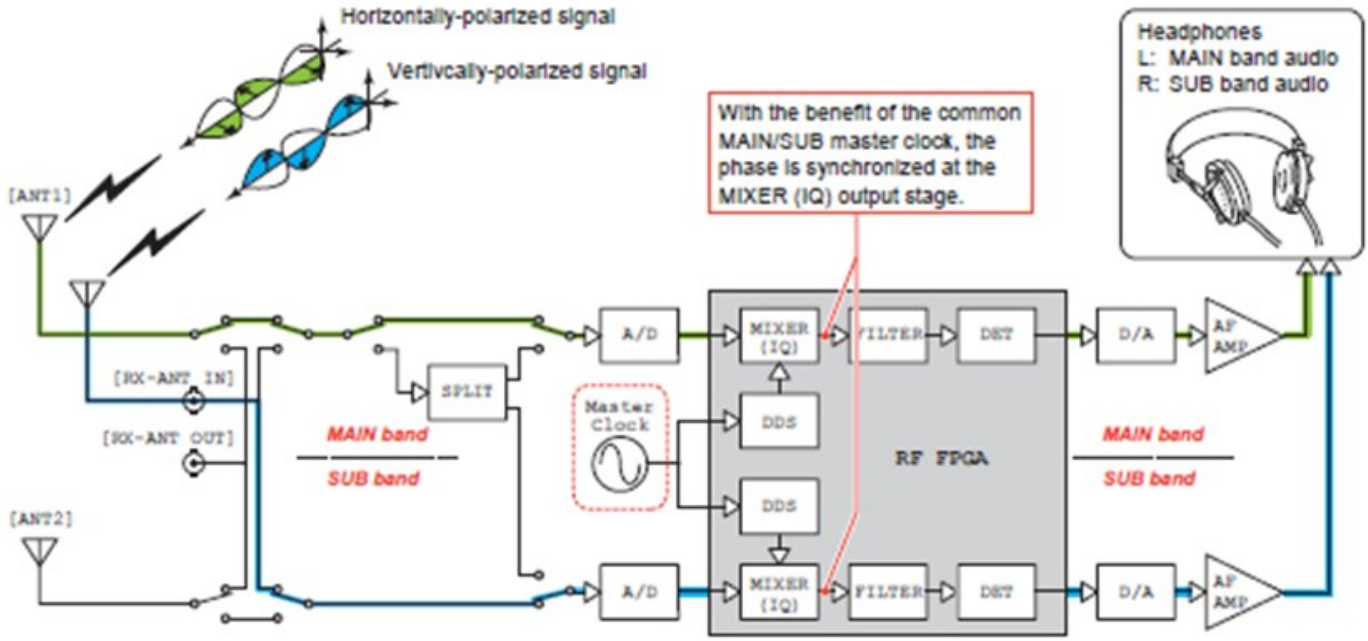


Figure 01-09: Concept of diversity reception

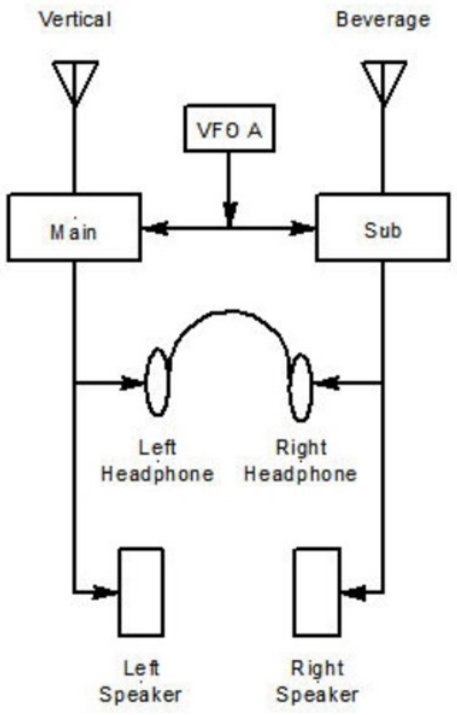
manipulating the IQ signals.

My own experiments with diversity reception have involved the Icom 7610 with its RX-Ant port and a DX Engineering RG-5000 protector. John says that this is not diversity reception because it still uses a left and right channel and a brain to connect the two. At first, I used 2 different wire antennas and did not see much difference. The next project will involve a borrowed magnetic loop and my usual doublet. I am continuing to learn. Other learning resources used include the posts by John on his site, Making it Up, and the chapter on diversity in Receiving Antennas by Eric Nichols published by the ARRL.

A Brief Experiment in Diversity Reception Using the K3s Transceiver

By Walter Miller, AJ6T

First of all, what is diversity reception? This block diagram from *The Elecraft K3 and P3* book by Fred Cady, KE7X (SK), provides a simple explanation:



Using two different antennas, a rig with two separate (ideally identical) receivers, and a single VFO that phase locks the receivers together, the left and right audio channels provide your brain with a unique listening experience.

In my case I needed to start with a brief refresher course on how to setup the K3s for diversity reception. Depending on the choice of an internal coax jumper, the K3s offers a couple of possibilities for the correct antenna port on the back of the rig for the second antenna. My configuration was indicated by [CONFIG KRX3 Ant=bnc] which meant I needed to connect the second antenna to the AUX RF BNC connector. To activate diversity reception the K3 SUB button must be depressed for two seconds.

I performed my diversity reception test during the recent CQWW SSB contest on 75 meters. The main antenna was a 75-meter top-loaded wire vertical strung between trees. The subreceiver antenna was a horizontal all-band off-center fed dipole (W8JI design) about 75 feet away from the vertical. This kind of a setup is called polarization diversity.

I noticed some interesting audio effects while tuning across the pileups. I was wearing a headset for maximum effect, rather than listening to speakers. Most signals could be heard by both ears, and the audio appeared to be “centered” inside my head, slightly to the left. However, there was a subtle difference between the simultaneous left and right audio that gave me the impression of having two separate “lenses” for interacting with the band. Every so often the diversity effect was startling when the mishmash of pileup signals in the left ear was essentially unintelligible, but there was one caller in the clear coming from the right side. Listening carefully and taking note of callsigns and looking up QTHs, it became clear that the right horizontal channel was picking up relatively close-in stations arriving via high-angle propagation. Those stations were not heard at all

A Brief Experiment in Diversity Reception Using the K3s Transceiver (continued)

on the left vertical antenna, or at least they were buried in the din of the other callers.

Diversity reception is usually touted as a way to overcome fading. There was no obvious fading on the 75-meter signals I was listening to during my brief experiment, so the anti-fading feature was not evident to me. However, the polarization effect was quite pronounced and very worthwhile.

These results have encouraged me to start thinking about installing dedicated RX-only antennas and operating full time with diversity reception. An important part of that setup will be convenient switching between various main and sub-receiver antennas. If you have a transceiver capable of diversity reception it is very worthwhile to add that feature to your RF arsenal.

Diversity Reception from a Different Approach

By Bruce Smith, AC4G

When the topic was selected for last month's and this month's feature article in the North Alabama DX Club (NADXC) newsletter, the "Longpath", I had to stop and think why this topic. Since the NADXC President chose the topic, I suddenly realized that he owns a Flex Radio and one of "Flex's" selling point is dual receivers and diversity reception. However, this topic is seldom discussed, if any.

I am in favor of any ideas that will help me receive better, especially on the low bands (40m-160m) where weak signals get mixed and lost in the heterodyne and noise. Many signals on 160m experience fading and phase shifting due to path diversity moving across the globe during a transmission. After attempting to improve noise and receive antennas with modern rigs and building better antennas, diversity reception is another weapon in our arsenal to combat this ever-existing problem of QSB (signal fading in & out) and noise on the HF low bands.

However, one can accomplish diversity reception without a fancy HF transceiver having dual receivers. This article helps to explore and discover diversity reception from a different approach or angle. How can we implement diversity reception on our older rigs? Let us dig a little deeper.

The definition of diversity reception as defined by Flex Radio is "… a set of techniques using multiple receivers connected to separate antennas for improving the intelligibility of received signals by improving the signal to noise ratio mitigating signal fade and dropouts." [Flex Radio website] Flex goes onto say that "the techniques can be used in combination for increasing levels of signal reception enhance by three different combination using the following combinations of diversity reception technique."

1. Stereo or dual diversity reception (Good)
2. Stereo/Dual Diversity plus antenna or space diversity reception (Better)
3. Stereo/Dual Diversity plus antenna/space diversity plus polarization diversity reception (Best)

I will reserve the Flex Radio discussion for those owners of Flex Radios and or to the ham operators utilizing fancy state-of-the-art HF transceivers like the Yaesu FTDX101MP or Icom 7610. If one searches the internet, they will see that Flex Radio is not the only vendor using diversity reception.

The difference is in how each vendor approaches and accomplishes diversity reception.

Diversity Reception from a Different Approach (continued)

NASA's Jet Propulsion Lab (JPL) defines diversity reception a little different according to their JPL Wireless Communications Reference Website.

According to JPL, diversity reception is "A signal transmitted at a particular carrier frequency and at a particular instant of time may be received in a multipath null. Diversity reception reduces the probability of occurrences of communication failures (outages) caused by fades by providing several copies of the same message received over different channels. In general, the efficiency of diversity techniques reduces if the signal fading is correlated at different branches." JPL's method for obtaining multiple data depends on the antenna, site, polarization, frequency, and time diversity. JPL accomplishes this by various techniques known to combine the signals from multiple diversity branches as follows.

1. Pure selection diversity – system selects the antenna branch with the best SNR.
2. Threshold diversity – a special form of diversity that is least expensive to implement,
3. Equal gain combining – better than selection diversity, but less complex signal processing
4. Maximum Ratio Combining – For noisy systems, but without interference results in the best SNR.
5. Interference Rejection Combining – Used in smart antennas.

Now that we see approaches to diversity reception described above by Flex Radio (Flex's software defined radio – expensive/fancy rig) and NASA JPL, let us discuss another approach I plan use to deal with diversity reception at the AC4G QTH. My approach deals with my low band reception system that I plan to implement that connects my Yaesu FTDX3000 transceiver having a single receiver to an external variable phase controller. My approach for low band diversity reception deals with my low band receiving antennas and use of my transmit antenna to receive signals received in & out of phase, but being able to adjust the phase and eliminate fading & noise. I will be able to select any combination of antennas to receive an incoming signal; hence, a manual diversity reception approach.

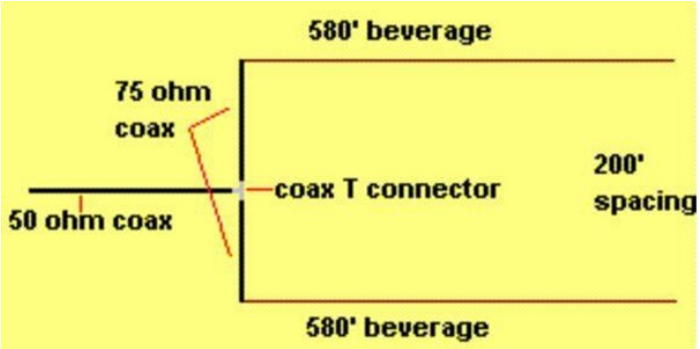


Figure 1: AC4G Phased Beverage Antenna

First, many know that I have several single beverage antennas covering different directions at my QTH. My first issue to tackle is to begin by adding another beverage antenna to my existing beverage antenna (580 feet) being spaced approximately 200 feet apart, but having a single feed point to eliminate incoming signal fading. The antenna RDF for this phased beverage antenna is near 11dB providing with a huge increase in gain over a single beverage antenna. Reference Figure 1: AC4G Phased Beverage Antenna. A pair of beverage antennas significantly enhance the front-to-back ratio as compared to a single beverage antenna. The deep rear null can be steered by a variable phase controller. The key to the AC4G system to be able to provide diversity reception is using a manual, adjustable receive antenna phase controller device (See Picture 1).

The phasing system controller is a two-channel receive signal phasing device with a special relay system that allows the ham operator to combine and independently adjust the phase and

Diversity Reception from a Different Approach (continued)

Picture 1: Phase Controller

level of two antenna inputs. This creates a fully adjustable phased array. When combining two stationary antennas, an array pattern is created with signal peaks and dips, called nulls. Adjusting the phase control has the effect of electronically rotating or steering that pattern. The operator can steer the null direction to significantly weaken strong interfering signals or noise (local or distant) and enhance the reception of weaker signals from many directions. This device is especially useful on low frequencies, where phase nulling with small receive antennas can provide amazing benefits for DXers, casual hams, and contesters. The phase controller includes receive transmit relay, which expands the benefits of antenna phasing for interference reduction in two ways. First, the phase controller can combine signals from an HF transmit antenna and a separate HF receive antenna or two different HF receive antennas. Second, the user of any standard HF transceiver, that does not have a separate receive antenna input, can enjoy the enhanced reception of signal and noise nulling because this phase controller has multiple ports for multiple receive antenna connections.

This controller can be used with many other combinations of receiving antennas including Single and Reversible Beverage & Beverage-On-the-Ground (BOG) Antennas, Receive Four-Square and Eight Circle Arrays, K9AY Loops, and more. Typical applications include:

1. Combining two similar non-directional antenna elements to create a directional pattern.
2. Combining two similar directional antennas to produce an enhanced pattern.
3. Reducing overload or interference by removing or reducing a strong signal or noise.
4. Reducing interference from distant signals or noise. [DX Engineering]

The array can be steered "electronically" even though the antennas are physically stationary. The user can adjust the controls to obtain a null or a peak. The phased response can often be changed from a perfect null to the perfect peak with a flip of a switch. Finally, the front panel adjustments compensate for less-than-ideal installations, making a directional array possible in most situations.

In summary, the AC4G configuration & solution to diversity reception can provide good manual diversity reception with the ham operator in control of selecting the best antennas for signal reception. We have shown that one can achieve diversity reception with similar results being obtained in a different way with a lesser than expensive solution not having to purchase a new, expensive transceiver. However, the new expensive rigs provide a cleaner, smoother built-in solution to provide diversity reception to acquire those distant, weak signals making operating a pleasure not a frustrating, tiring task, but with an easy diversity reception solution. For those of us who cannot afford a $4,500-$10,000 transceiver, there is a solution for us. Every ham operator will be impressed using the less expensive AC4G solution using a single-receiver transceiver and a variable phase controller. As the old saying goes, "there's more than one way to skin a cat." Either solution yields great results.