CCO RadioSport News

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The official newsletter of Contest Club Ontario. Devoted to the sport of ham radio contesting.

Riding the radio waves

Dick Arnold, AF8X, knows how to enjoy the warm weather soon to come. Dick is also a prolific writer and we'll be running many of his excellent articles over the next few issues. Thanks Dick.—Ed.

By Dick Arnold, AF8X

With the summer contesting lull approaching, Dick AF8X, shows us a way to keep hamming while getting into shape. –Ed.

Sooner or later most active hams start thinking about operating mobile, pedestrian mobile or bicycle mobile. I admit I am one of those.

I started thinking about setting up a bicycle mobile HF station after buying a new mountain bike. During the summer I ride from my house to Metro Park daily, weather permitting, about 12 miles round trip. This would give me ample time to indulge myself in my radio hobby while at the same time improving my physical condition.

(Continued on Page 2)

Successful year for CCO

By Bob Nash, VE3KZ

I want to congratulate our members that made CCO able to achieve the standings in Club Competition that are reflected in the accompanying table. We hold the Club Competition Record for the California QSO Party with that one million-plus score last October! With 30 members we set a record. With 50 entries, we might be able to put it away for years to come.

(Continued on page 2)

Inside this issue

Successful year	Page 1
Riding the radio waves	Page 1
HF Propagation—Part 4	Page 3
How's your code speed	Page 6
DXing 'Over Your Shoulder" with Beverages	Page 7
QRT by VE3HG	Page 9

(Continued from page 1)

The equipment I chose to use was an MFJ 9320 Cub transceiver with a 2-watt output, Sony earbuds, the Palm Mini Paddle, a 12-volt NiCad battery pack and a 20-meter Hustler mobile antenna.

I mounted the Hustler mast to the upright frame member that supports the seat post using a mirror mount antenna bracket. This placed the antenna at a backward angle, which made for more clearance beneath overhanging tree limbs. I placed the MFJ rig in a small bag on the handlebars along with the battery pack. I made a bracket to hold the Mini Paddle atop the handlebar just in front of the handgrip, allowing me to operate it without removing my hand from the handlebars.

I made a score of contacts while riding to and from the beach during the summer season and I learned a few things that I want to pass along. I picked 20 meters because the antenna is relatively small and surprisingly enough, the bike frame was enough of a counterpoise to allow a good match to the antenna. The use of "ear buds or Walkman type headphones allow you to hear outside sounds, important

when near traffic areas. The paddle was located so as not to interfere with steering.

As bicycles vibrate on rough surfaces, the radio should be protected from the vibration.

The antenna is mounted on a rearward angle which helps prevent strikes from overhead branches. Ride on a bike path. Riding in the street along with traffic while operating is asking to die!

Last and most important. Stay alert to your surroundings. Situational awareness is key to survival! The reason I do not operate bicycle mobile anymore is that at one point I could not remember crossing a busy intersection on my way to the beach.

If you do decide to give it a try, be careful. It can be a lot of fun, but again, it can be dangerous.

Successful Year for CCO

Will 10 metres allow us, or indeed any other club, do this? We will have to defend our standing next October for certain, 10m propagation or not!

California and Florida QSO Parties are definitely the most popular in North America. Coming first and third in such popular events is very encouraging. Geography is on our side when the high bands are open. Persistence on the low bands completes the equation. Another factor that makes our participation so effective is the fact that massive stations with stacked antennas are not necessary. High power isn't necessary. (This does not rule out VE3EJ or VE3AT making an appearance however!) More home stations can be in on the fun in an effective way. Let's add another number one score to our laurels this year, this time in the Florida QSO Party! There is even a power multiplier in this one. LP and QRP rule!

In June the ARRL VHF QSO Party, CCO has a chance to move upscale in the Club Competition. Looking at the three ARRL VHF events, our standing range from 11th to 17th. Typically 10 to a dozen participants send in their scores. Fire up that HF+6m rig on whatever antenna sounds good. I recommend a 40m dipole. Check 50.125 and up. Set your 2m FM rig on 146.550. If you are near any major population centre you can garner a pretty decent score and enhance those of your neighbours. With a little help from the propagation Gods, it could be very interesting indeed, wherever you are!

Good luck in your private endeavours and our collective ones!

73 Bob Nash, VE3KZ

President, Contest Club Ontario, VA3CCO

HF Propagation Part 4

The Layers Within The Ionosphere

By: Ian S. Amos, VE3ESH

Introduction

In my last article, HF Propagation Part 3 – Improving Propagation Predictions, I outlined how to improve your propagation predictions, by fine-tuning your propagation model in W6EL-Prop.

Also, I outlined Gray-Line DXing. In this article I will review the various layers within the ionosphere and how each layer effects propagation.

The Ionosphere

The earth's atmosphere is made up of a series of layers. They are the troposphere, stratosphere, ionosphere and lastly the magnetosphere. The ionosphere is the region or layer responsible for most of our HF propagation and it is also made up of a series of layers, each with its own unique effect on propagation.

The "D" Layer

The first layer is the "D" layer, which is located from 37 miles to about 57 miles above the earth's surface. The "D" layer is relatively close to the earth's surface and is therefore still fairly dense. This means that ions will collide and knock electrons free (ionization) and then recombine quickly into neutral atoms. This ionization occurs shortly after sunrise and dissipates quickly after sunset. The longer the wavelength of a signal the more energy will be absorbed because the signal spends more time in the "D" layer. This is also true as the entry angle of the signal increases. The "D" layer has little effect on signals with a frequency greater than 10 MHz, but below it will absorb most of the signals energy, which is why 40m through 160m are only good for short distance through the day.

The "E" Layer

The second layer is the "E" layer, which is located from 62 miles to about 71 miles above the earth's surface. This layer is not as dense as the "D" layer but does account for some signal absorption in the lower HF bands, but it also provides some refraction for signals in the upper HF bands. The "E" layer is ionized by solar radiation, meteors, and X-rays and it reaches maximum ionization at noon local time. In general the "E" layer does not do a lot to help HF propagation, however, there are two types of very unique propagation that do occur in the "E" layer.

Scatter propagation

The first type is meteor scatter propagation. This occurs when a meteor or comet enters the Earth's atmosphere and starts to burn up as it falls to the Earth's surface. Meteor scatter propagation is accomplished by bouncing signals off of a meteor's ionized trail. At 28 and 50 MHz, meteor scatter propagation can last from 30 seconds to several minutes. At 144 MHz and up, propagation may only last a few seconds. To take advantage of meteor scatter propagation both station must be able to see the same ionized trails. Using this type of propagation requires patience and practice, but is can provide some very exciting contacts.

(Continued on Page 4)

Club Competitions	CCO Rank
2004 CALIFORNIA QSO PARTY	1
2004 FLORIDA QSO PARTY	3
2003 ARRL 10M	4
2003 CQWW DX	4
2004 CQ 160M	5
2004 WAEDC (outside Europe)	5
2003 ARRL 160M	6
2004 ARRL RTTY ROUNDUP	8
2004 ARRL DX	10
2004 ARRL SEPTEMBER VHF QSO PARTY	11

HF Propagation - Part 4 ...

The second type is sporadic E propagation. This type of propagation is still not completely understood, but is highly effective when encountered.

It is believed that sporadic E propagation occurs when a localized area of the E layer develops a very large number of free electrons.

The electron count may be a much as 100 times as much as the normal electron count in the E layer.

When the electron density is high a signal will bounce off of the electron cloud like a mirror.

Three regions

There are three regions where sporadic E propagation (ES) occurs, and they are:

Auroral sporadic E, which occurs around the North and South poles. There are two types of auroral ES:

Night ES, which is a thick ionized layer that forms at night and is very irregular in shape and occurs at unusual times.

Night ES has many of the same characteristics as regular "E" layer ionization but is very localized in nature and can reflect radio signals up to 20 MHz.

Auroral ES follows a more typical type of ES propagation as described above.

Auroral ES can reflect radio signals up to 144MHz.

Equatorial sporadic E occurs at the magnetic equator during daylight hours and is only a couple hundred miles wide.

It also follows a more typical type of ES propagation as described above. Equatorial ES can reflect radio signals up 60 MHz.

Mid-latitude Sporadic E occurs between the other two regions. Mid-latitude ES is the most common type of sporadic E propagation and is formed in very thin layers of concentrated electrons that are very local in nature.

Mid-latitude ES can reflect radio signals up to 150 MHz.

The reason this type of propagation is called "sporadic" is because it happens very erratically and is very unpredictable.

The "F" layer

The last layer is the "F" layer, which is located from 100 miles to about 260 miles above the earth's surface.

The "F" layer is where most HF propagation occurs because air pressure is low enough to allow electrons to be bumped from an atom and to then move freely for longer periods of time before they bump into another atom and recombine into a neutral atom.

It is these free electrons that radio waves are bent (refracted) against.

The "F" layer can stay ionized long after sunset because the free electrons are still moving without re-combining into neutral atoms.

The "F" layer reaches its peak ionization levels at noon local time and declines to its minimum shortly before sunrise.

It is this reason that good DX communication can be achieve through out the nighttime hours.

The interesting fact about the "F" layer is that it sometimes splits into 2 parts, the "F1" and "F2" layers. When the split occurs, the "F1" layer behaves much like the "E" layer.

When this happens, the "F1" layer will reach maximum ionization around noon local time and disperses quickly after sunset.

This means it does not do much to enhance HF propagation.

Therefore, when the "F" layer does split, the "F2" layer is responsible for the majority of HF propagation.

Signal refraction in the ionosphere

Signal refraction is dependant on three separate items. They are:

Frequency or wavelength of the signal. As previously discussed, the refraction of a radio wave decreases as the frequency increases.

This means that a signal at 3.5 MHz will bend (refract) back to the earth easier than a signal at 28 MHz, but the 28MHz signal will travel further when refracted (skip distance).

(Continued on page5)

The Layers Within The Ionosphere

Multi-hop propagation

To be able to communicate world wide, a signal must be able to hop or skip multiple times. A signal will continue to skip until it runs out of energy due to attenuation or absorption. Remember that for each hop it losses energy because it goes through the ionosphere twice as well as losing energy when it reflects off of the earth's surface. Oceans (salt water) are excellent signal reflectors, but dry desert sand is a very poor reflector. Also note that multi-hop propagation will use a combination of "E" and "F" layer refraction which are all dependant on the above three variables, as well as time of day.

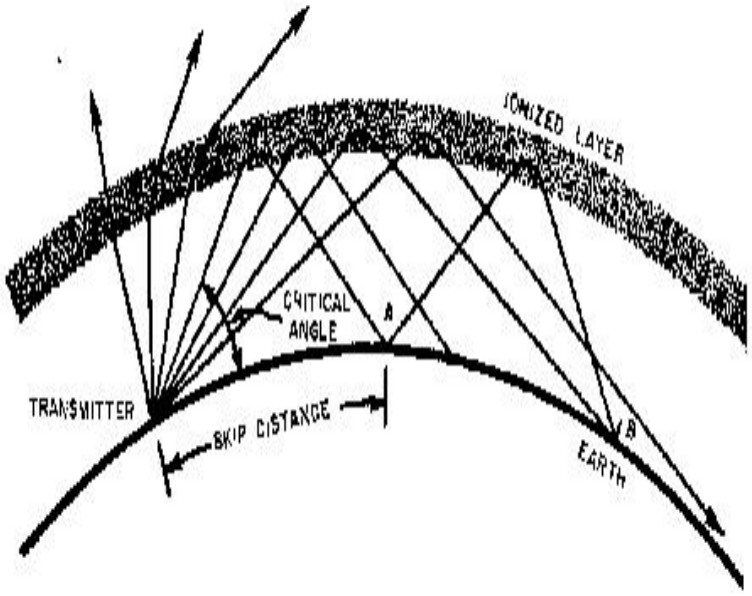


Figure 1 – Signal Refraction in the Ionosphere

W6ELProp Short-Path Prediction (Advanced) for 01/20/2004

File Info

```
TERMINAL A: 43.48 N   79.71 W  VE3ESH              Sunrise/Set: 1249/2210 UTC  Bearing to B: 330.6 deg
TERMINAL B: 35.00 N 137.00 E  Japan                Sunrise/Set: 2201/0804 UTC  Bearing to A:  25.8 deg
SSN:  67.7  Flux: 121.0  K: 4            THIS IS A POLAR PATH                    Path Length: 10530 km
```

UTC	MUF	Freq	Sig dB	S/N dB	Avail	Angle	Hop Configuration
2030	14.3	7.1	7	13	1.00	7	E-E-E-E-F-F
2030	14.3	14.1	46	60	0.55	2	F-F-F
2100	15.7	3.6	1	-2	1.00	2	E-E-E-E-E-E
2100	15.7	7.1	26	32	1.00	2	E-E-E-E-F
2100	15.7	14.1	46	60	0.80	2	F-F-F
2130	17.7	3.6	-5	-7	1.00	2	E-E-E-E-E-E
2130	17.7	7.1	11	17	1.00	5	E-E-E-E-E-F
2130	17.7	14.1	46	60	0.90	2	F-F-F
2130	17.7	21.2	44	63	0.08	2	F-F-F
2200	16.4	7.1	17	23	1.00	2	E-E-E-E-E-E
2200	16.4	14.1	45	60	0.83	2	F-F-F
2200	16.4	21.2	44	63	0.04	2	F-F-F
2230	15.3	7.1	16	22	1.00	2	E-E-E-E-E-E
2230	15.3	14.1	45	59	0.72	2	F-F-F
2300	14.4	7.1	7	13	1.00	5	F-E-E-E-E-E
2300	14.4	14.1	45	59	0.57	2	F-F-F
2330	13.6	7.1	17	23	1.00	2	F-E-E-E-E
2330	13.6	14.1	45	59	0.39	2	F-F-F

Line not shown if signal level below -10 dB or if predicted availability is zero

Show Long Path | Group by Frequency | Close

Press F1 for Help

Figure 2 – Short Path Propagation Prediction (Advanced) to Japan

To better understand multi-hop propagation you should run a W6ELProp propagation prediction. Start the program and select the "Predictions - On-screen" menu items.

Using my previous example select Prefix = JA, date = 01/20/04, solar flux = 121, and K = 4 and select the "OK" button.

Next, select "Show Prediction" button and then select the "Advanced" menu item. I prefer to use the "Sort by Time" option. The prediction is shown in Figure 2.

(Continued on page 6)

HF Propagation - continued

Scroll down until you see 2200 UTC (this is the same as my example in HF Propagation Part 3 – Improving Propagation Predictions).

If you analyze the data for 2200 UTC you will see:

At 7.1 MHz (the highlighted line) that there is six "E" layer hops (with up to 2000 km per hop this gets the signal to Japan at approximately 10,000 kms away), also at 14.1 and 21.2 MHz there are three "F" layer hops.

At 7.1 MHz the signal strength is 17 db with an availability of 1.00 will mean there is a possible path to Japan however, given the time of day and six hops it would probably make for a poor quality contact.

At 14.1 MHz, it is much more likely to be able to make a contact to Japan because signal strength is 45 db with an availability of 0.83 (A - level). Also note that the MUF is 16.4 MHz , and remember signal propagation is generally more reliable as you get closer to the MUF.

At 21.2 MHz even though a path is calculated with a signal strength of 44 db, the availability is very low (0.04), and the MUF is below this frequency.

By using this advanced propagation chart, you can view the different skip combinations that are calculated based on frequency, and time. This will allow you understand more about why you can make a contact or not.

Conclusion

Now you should now be able to predict propagation from your QTH to any location and understand how it is actually getting there. In my next article, HF Propagation Part 5 – Geomagnetic Influences, I will discuss what effect's the earth's magnetic field and how it in turns effects propagation.

How's Your Code Speed?

By Dick Arnold AF8X

You've been a ham for ten years and still can't copy CW faster than 15 WPM. If this sounds familiar, cheer up— anyone who has mastered the basics of CW can copy up to 35 WPM without years of practice.

I recently hired a temporary stenographer to finish up some work left to me by my partner. I was amazed at the skills this young lady possessed. She could take dictation at well over 200 WPM and type at the rate of 120 WPM! When I commented on her unusual proficiency, she told me she was trained at Professor Schmidt's School of Stenography in Berlin, Germany. A part of her training, she added, included a strict diet rich in carbohydrates and an aggressive exercise regimen, both of which she still maintained. This got me to thinking and I decided to do a study to see if a program like this would have an effect on radio operation, namely CW.

I assembled a study group of 30 hams from local clubs, 15 high-speed CW operators and 15 not so fast operators. A look at each group's diet showed some promise. 12 of the 15 high-speed ops ate a high-carb diet as opposed to the slower group of operators, whose diet consisted of almost all protein. The exercise part of the program was not very popular so I decided to proceed with the diet alone-.

Ten of the slow operators agreed to participate in a test involving a change of diet to high carb meals for 30 days. After only 15 days on this diet, six of the operators could copy 20 WPM and all but one of the others increased their code speed by at least 6 WPM. Further tests at the end of the 30 days showed improvement in all 15 op's code speed, with four of the group able to copy 35 WPM!

It appears that the effect of diet on mental quickness has been a closely guarded secret discovered by German scientists sometime during the war years of the '40s. Professor Schmidt was the first to apply this technique to commercial use. The U.S. Government has also been experimenting with different diets for their astronaut-training program.

DXing 'Over Your Shoulder' with Beverages

CCO RadioSport News thanks the **Ontario DX Association** and newsletter editor **Harold Sellers** for permission to reprint this article which originally appeared in the April 2005 issue of **Listening In.** For more information about ODXA please visit their website at www.odxa.on.ca

While this article was written with a shortwave listening audience in mind, it contains some interesting ideas about the use of Beverage antennas. With the sunspot cycle on its way to an 11-year low, ham radio contesters are looking for ways to remain competitive on the low bands. We trust you'll enjoy this article and thanks to author John H. Bryant for sharing it with us.

A Comparison Test: March 2005

By John H. Bryant

Over the past 15 years, I've been using relatively short Beverages, unterminated, at my home QTH in Oklahoma, USA. These low wires (average height about 6 to 8 feet) vary in length from 450 to 750 feet. I've found that such wires were useable directional antennas with very good lobes off of each end.

For about four of those years, I operated a "half-wagon wheel" of Beverages of that general length with the wires running East, SE, South, SW and West from a central point in my back yard.

At the time, I was primarily interested in SWBC DXing on the Tropical Bands (from 2.5 to 5.5 MHz.) and could use each antenna "directly," of course: for example, I could use the SE wire to look to my southeast for South America and for southern Africa.

Happily, I could also use that SE antenna "over the shoulder" to look to my northwest along my Great Circle route to East and South Asia.

In essence, by leaving the Beverages unterminated and thus bi-directional, I was operating quite nearly as if I had twice as many Beverages spread out in a full wagon wheel.

Using a simple unterminated single-wire Beverage antenna as a bi-directional device is well known in the literature, of course, and carries with it at least two inherent penalties:

By its nature, an unterminated Beverage is bi-directional and thus does not reject anything off the backside

The signals coming "over the shoulder" from the normal backside of the antenna travel the length of the Beverage, going away from the receiver, hit the far end and are reflected back to the receiver.

There is an inherent signal loss in this reflection and longer trip. Authorities and modeling programs differ slightly as to how much the "backside" signal is attenuated, but most tend to focus on 4 to 6 dB.

Over the past year, my Northwest MW DXing buddies and I have become quite interested in reverting to "12-Volt DC DXing" from automobiles and campsites on the Pacific seashore.

(Continued on page 8)

Stations to the SOUTH

Frequency	Location	North	South	Comments
640 kHz. both	Norman, OK	equal, equal	equal, equal	Absolutely equal on antennas!
1000 kHz.	Oklahoma City, OK	---	+6 dB, +6 dB	
1450 kHz.	Shawnee, OK	---	+3 dB, +3 dB	

Stations to the NORTH

Frequency	Location	North	South	Comments
580 kHz.	Topeka, KS	---	+6 dB, +3 dB	Wow, the reverse of expectations
900 kHz.	Wichita, KS	equal, equal	equal, equal	
1070 kHz.	Wichita, KS	+3 dB, + 5 dB	---	As expected
1280 kHz.	Arkansas City, KS	---	+6 dB, +4 dB	Again, the reverse!
1330 kHz.	Wichita, KS	---	+3 dB, +3 dB	The reverse!
1580 kHz.	Blackwell, OK	---	+3 dB, +3 dB	The reverse!

DXing 'Over Your Shoulder' with Beverages

Our beloved Grayland Motel is for sale and we are anticipating the loss of that near-perfect layout, with antennas of optimum length running in the correct directions and terminated virtually in the surf at high tide.

In the near future, we foresee many situations where we will be able to get our vehicles quite close to the shore, but where we will be so close that there simply is not room to run a Beverage out toward the sea.

There are a number of familiar venues, however, where we could be DXing very near the shore itself and run antennas directly away from the beach inland through the scrub or forest laying behind the beach itself. Unterminated, we could then use these antennas to DX the far Pacific shore "over the shoulder."

As we discussed this idea, there was quite a bit of disagreement as to just how much loss this "over the shoulder" approach might entail. Some of us held with the published "4 to 6 dB" figure…. and felt this to be a negligible amount, while others held with equal sincerity that the loss could be much greater.

I volunteered to run a field test this winter in my home area of central Oklahoma where the roads run, literally, straight for mile after mile and where the Southern Prairie is more or less one big flat cow pasture…. ideal for testing directional antennas.

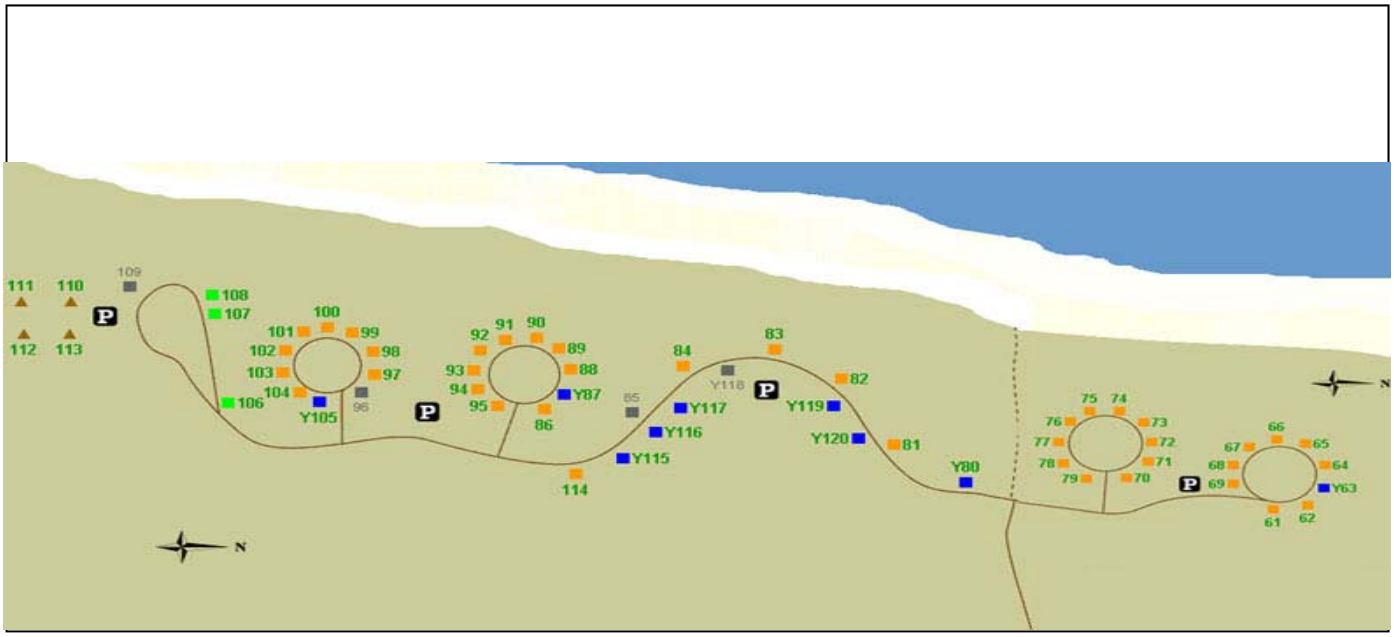
Test Arrangement

My automobile/DX shack was parked at the crest of a very gentle hill, with the antennas extended north and south from the vehicle, along the roadside tree line and suspended from the lower branches.

The road runs absolutely north-south. The antennas were two new 500 foot Beverages. When laid side-by-side, one wire was about 3 feet longer than the other, but was not trimmed (the south antenna was the longer). The slope of the hill was equal in both directions and was such that the far end of each antenna was about ten feet lower that the automobile.

The Beverages each went to one of a matched pair of new impedance transformers, then through identical 6' lengths of coax to an antenna switch and thence to an NRD-535 which was used to compare signal strengths on each antenna for a number of stations.

The stations to be measured were selected to be spread across the MW dial and to be those laying directly to the North or South of my location. Each station that was measured put in a moderately strong signal, varying in strength from 1280-Arkansas City, KS which came in at around S-8 to 640-Norman, OK, which put in an S-9+10 dB signal.



DXing 'Over Your Shoulder' with Beverages

The tests were run at solar noon, with no thunderstorms present or audible on the band. The signals were exceptionally steady and were each the only signal audible on the channel. The signal strengths were measured twice, about 10 minutes apart and are (both) presented below in a relativist chart.

NOTE: Two tests were also done to the side of the antennas: 1600 kHz., Cushing, OK to the due East came in about 3 dB better on the north antenna; 960-Enid OK, to the west-northwest also came in better on the north antenna by about 2 or 3 dB.

Discussion

With the exception of the slope of the ground (DX shack at crest of gentle hill, each antenna sloping parallel to the ground downward about ten vertical feet over the 500 foot length) the two antennas were virtually identical, but running in opposite directions. Given that the signals were fairly equal on both antennas and that the measuring instrument (NRD 535 S-Meter) was fairly crude, precise results were not expected.

In fact, the relative strength measurements of the stations to the SOUTH were about exactly what I expected: two of the three stations were stronger on the southerly antenna by 3 to 6 dB. The measurements of stations to the north, however, presented a real surprise: four (580, 1280, 1330 and 1580) were 3 to 6 dB stronger on the south Beverage that pointed away from them. This was so surprising to me that I exchanged the two lead-in + impedance transformer combinations prior to taking the second set of measurements. The results were identical except for a 3 dB drop in the 580 kHz. reading. One could still argue that, for some reason, the southern Beverage was just "working" better. That was my reason to measure the only two nearby signals that come in from nearly straight east and west. As you see from the note above, the two side signals were both received better on the north antenna!

Just exactly why these anomalous readings came about could be the subject of endless speculation. Happily, that discussion is not at all relevant to the purpose of this particular field test. The goal was to determine whether the backside losses of relatively short Beverages were negligible or large enough to be significant when forced to DX "over the shoulder." Based on this comparison test, I feel comfortable using a short Beverage and DXing over my shoulder, when better, more classic arrangements are not possible.

QRT by VE3HG

As we enter into the valley of the shadow of no propagation now is the time to start making preparations for that new dawn of solar activity that we all know will come.

First on the list should be a through review of your grounding system. I've seen more chronic problems disappear with a proper ground system.

Second on the list is the replacement of any coaxial cables that are older than 10 years. This is especially true if your cable has been buried for that length of time. If you've been limited by your antenna system, maybe this should be summer to take down the old beam and replace it with something just a little bigger. I've been thinking of adding a six-metre component even though it will be years before the magic band regains its luster.

Finally, there's no doubt if your rig is older than six or seven years, you've been left behind by technology. It's definitely time to upgrade.

CCO had a fabulous year of growth, achievement and fellowship in 2004. Let's make 2005 even better. See you in the pile-ups.

73,

Peter, VE3HG
Editor, CCO RadioSport News