

STATIC



February 2012

WHAT'S YOUR ANGLE?

From Jack Stone's column, Stone's Throw from the February issue of antennaX. Jack is the publisher of antennaX magazine, a fine source of antenna articles and information. Please visit www.antennax.com.

Regular *Stone's Throw!* readers know I use the antenna discussion forum as a guide in determining what topics are of the most interest to *antenneX* readers. Last month the forum came through again.

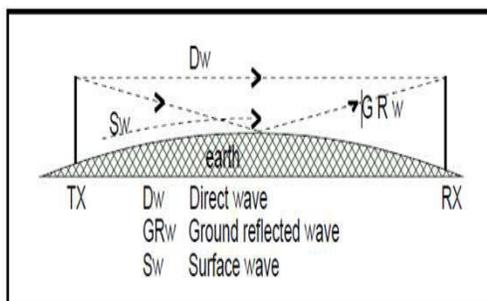
Recently, a long discussion played out on low angle radiation from vertical antennas, and I realized that every transmitted signal not only has a wave angle but a preferred wave angle at that; one that is optimum to get the intended job done. This is a universal subject, whether you are looking to talk around the world or across town and is the subject of the next two *Stone's Throw!* Columns.

Over the course of these two columns I will be relying on Marcel De Canck's (ON5AU) excellent six-volume "Radio Wave Propagation" series of books, published by *antenneX* in 2003. It was great to reacquaint myself with this work; it is very well done and Marcel covers the material masterfully.

Let's start with the basics of HF wave propagation. Understanding the medium we launch our signals into is essential to our successes in transmitting to and receiving from those places we wish to communicate. Different types of waves are involved, there are the dynamics of the Ionosphere, and the frequencies that should be used and why.

Let's begin with some different types of waves:

Ground waves. There are three components: the surface, direct, and earth reflected waves, as shown below:

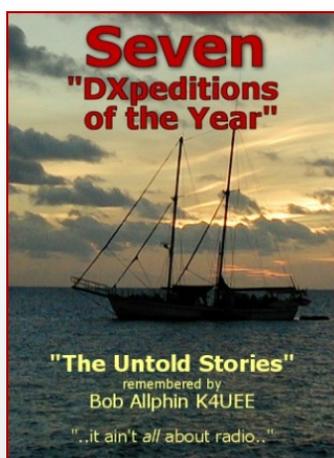


Ground waves can be direct, be ground reflected, or follow the surface

LBARA MEETING SCHEDULE

MONTH	BOARD	REGULAR
FEB	NOTE: BOARD	2/16
MAR	MEETINGS WILL NOW	3/15
APR	TAKE PLACE ONE	4/19
MAY	HOUR PRIOR TO THE	5/17
SEPT	REGULAR MEETING	9/20

February's Program



Seven DXpeditions of the Year tells compelling stories of fear, frustration and sheer joy as DX traveler Bob Allphin, K4UEE, recounts the highlights (and lowlights) of his most heralded trips. It is personal, emotional, humorous and sometimes frightening. This lets you look on to these DXpeditions:

AH1A - Howland Island

XR0Y - Easter Island

VK0IR - Heard Island

FO0AAA - Clipperton Island

A52A - Bhutan

3Y0X - Peter One

VU7RG - Lakshadweep

“It is about ham radio....but as you will see.....it ain't *all* about radio”

Monday Night Net (7 PM)

System	Location	Freq	Offset	PL
MCARS	Bullhead City	145.27	-	131.8
	Kingman	146.76	-	131.8
	Kingman	448.25	-	131.8
	Lake Havasu	146.62	-	131.8
	Willow Beach	147.12	-	131.8
CRRRA	Lake Havasu City	146.96	-	162.2
	Lake Havasu City	224.24	-	156.7
	Lake Havasu City	146.64	-	156.7
	Lake Havasu City	449.95	-	141.3
BARN	Lake Havasu City	447.54	-	136.5
	Las Vegas, NV	449.95		136.5
	Onyx(Palm Springs)	449.34	-	136.5
	Orange County, CA	447.54	-	100



The **surface wave** travels along the earth's surface, as you might guess from its name, and is launched from a vertical antenna. It has no "wave angle" per se, as the wave never leaves the plane of the earth. **Direct and earth reflected waves** are also known as "line of sight" waves. When radio waves travel from the transmitter antenna toward the receiver antenna in a straight line, both antennas are within each other's horizon view. Typically, the lowest possible wave angles are useful here.

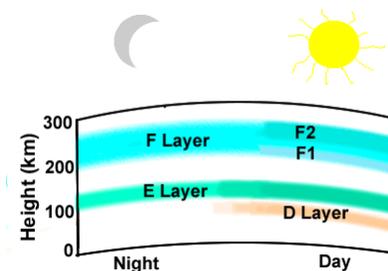
Troposphere Waves. At VHF frequencies and above, signals that enter the Troposphere can be refracted, scattered, or ducted (Tropospheric Ducting). Most of the long distance communications on VHF, UHF, and microwave frequencies are the result of troposphere propagation properties. The angle at which the wave enters the Troposphere can determine how it is returned to earth.

Sky Waves. This is the wave that HF DXer's are interested in. These waves use the earth's Ionosphere for long range communication. In general, the lower the angle at which a wave enters the Ionosphere, the further away it will be returned to earth. This is the area where we will concentrate a large portion of this column.

The Ionosphere. The ionosphere derives its name from the term *ION*. High up in our atmosphere, roughly between 60 km. (38 miles) and to 500 km (310 miles) or even higher, we encounter regions of rarefied diffused gases. It is the level of ionization level of these regions, or layers that determines HF propagation. Here, in Marcel's own words, is a brief explanation of the mechanisms of the Ionosphere:

"What causes the formation of ions? At the outer reaches of the earth's environment, solar radiation strikes the atmosphere with a power density of 1370 Watts per square meter, a value known as the *Solar Constant*... We find different layers of rarefied gases at different heights and with different ionization densities. Why does the ionization density differ among layers? As we noted earlier, it is the radiation of the sun that causes the ionization. So the sun is the prime motor that drives the whole process."

And, true to form, anything that causes a variation in the arrival of sunlight to the Ionosphere will affect it – day or night, time of day, season, and location on the planet are all influences. Each plays a part that contributes to the dynamic nature of HF propagation.



(graphic courtesy Wikipedia)

The Ionospheric layers, are, in brief:

The D Layer. The D-layer is the lowest and closest to the earth. The D-layer layer is not an aid to our communications; in fact, it is a gigantic attenuator; an absorber of our HF waves especially for the lower frequencies.

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SATURDAY MORNING'S BREAKFAST

You're all invited to join LBARA members for a great breakfast each and every Saturday morning at Rusty's Resturant located at the southwest corner of Lake Havasu Ave and Kiowa Blvd. Breakfast is served at 6 a.m. (or earlier if you want a good seat!) Most important, the food is great!!!!

2012 ARRL Southwestern Division Convention

8th Annual

Yuma Hamfest & Arizona State Convention Yuma, Arizona

Feb. 17 & 18, 2012

Yuma County Fairgrounds
2520 East 32nd Street, Yuma, Arizona

www.yumahamfest.org

Check the Website for Additional Information
and a Current Schedule of Activities and Seminars



Gates Open for Camping Thursday, 2 pm Vendor Setup Friday, 7 am - Noon	Event Hours Friday, Noon - 5 pm Saturday, 8 am - 5 pm	Buzzard BBQ & Grand Prize Drawing Saturday Night 6:00 - 8:00 pm
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**Vendors & Exhibitors
Consignment Sales
License Testing
Hourly Door Prizes
On-site RV Camping
Famous Buzzard BBQ
ARRL Forum
\$5.00 Admission**

**Tailgating (Swap Meet)
Full Seminar Schedule
DXCC Card Checking
Grand Prizes worth \$10K
Emergency Preparedness
iPad 2 Admission Prize
Hospitality Area
Antenna Clinic & T-Hunt**

Hamfest Talk-In Frequency: 146.840 (-) PL 88.5 Hz

Email Contact: info@yumahamfest.org



We are proud to have the Amateur Radio Council of Arizona (ARCA) as a sponsor of our event.

The Yuma Hamfest is an American Radio Relay League (ARRL) sanctioned event.



Presented by the Yuma Amateur Radio Hamfest Organization

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The E Layer. About 100 to 125 km (60 to 75 miles) up, we encounter the next region of interest in the ionosphere. This layer is the first portion of the ionosphere that is more or less useful for long distance communication.

The F layer. From approximately 150 km (94 miles) height, we encounter the third region. This layer is the most interesting one for our long distance communications. During daylight, it splits the layer into two parts (F-1 and F-2 layers). The F1-layer is much weaker and plays only a minor role in propagation. This is the most durable and completely ionized layer of all and therefore also the most important aid to short-wave signal propagation.

And, to wrap up Part One of this two part series on wave propagation and wave angles, we look at how the frequency you operate at plays a part in successful radio communication.

The first frequency to be aware of is the **Critical Frequency**.

First, with a sufficient ionization intensity (electron density) and a frequency low enough, we have the possibility and the reality that a radio wave, even if it enters the layer perpendicularly to the earth, will be refracted enough to be reflected back to earth. The frequency that just penetrates (these layers) is known as the Critical Frequency.

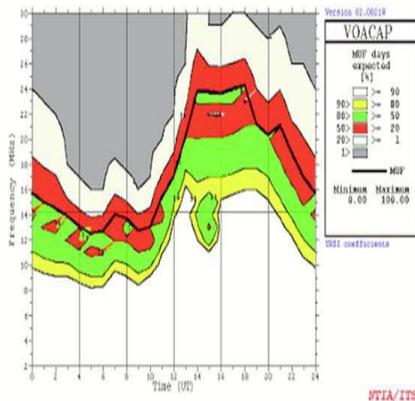
Both the critical frequency and the maximum electron density height are very important data to study and calculate radio wave propagation. They are used to determine **maximum usable frequencies (MUF)**.

The MUF: is one of the most interesting parameters in radio communication and prediction. It is the highest frequency supported by the ionosphere to communicate between two stations (locations); it is the maximum usable frequency for that path. There are three forms of MUF that should be recognized.

Basic or Classical MUF: is the highest frequency that can be supported and refracted to earth by the ionosphere between two specified locations.

Operational MUF: is the highest frequency that permits acceptable propagation between two locations at a given time and under specified conditions.

Standard MUF: is an approximation to the Classical MUF.



The sample MUF graph here shows how, over the course of a day, the MUF varies and also an estimate of the availability of the predicted MUF for a given hour. Note how it peaks during daylight hours (this graph was for a location in Texas, USA) and drops at night, coinciding with the solar ionization mentioned earlier.

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Next month, in Part Two of this series, we will look at a few important propagation modes and put all of this theory to use investigating:

- HF wave angles and the antennas to achieve them (what angle is needed for the type of communication you want to have: local, regional, long distance)
- VHF/UHF angles and antennas (line of sight propagation, some ionospheric influences).

Until then.....

(Note: You might want to listen to an audio version of the column by going to this antennaX site: <http://www.antennex.com/Stones/st0212/st0212.html>. This is offered in two formats: Streaming for those with “RealPlayer” and MP3 for a “MS Media Player type program.....*editor*)

Dave Berry Speaks Up

A will is a dead giveaway.

A chicken crossing the road: poultry in motion.

A calendar’s days are numbered.

A boiled egg is hard to beat.

Santa’s helpers are subordinate clauses.

Acupuncture: a jab well done.

She was only whiskey maker....but he loved her still.

Upcoming Activities and Hamfests

February 17-18, 2012 ARRL SW Division Convention - Yuma, AZ

July 20-22, 2012 ARCA/Williams Hamfest - Williams, AZ

Are you looking to upgrade your license?

Give our VE Exam Team a call.

See Ed Gillespie, AB7EM at #453.7412

FOR SALE/TRADE



Alinco DX-70 160-6 Meter, All-band Transceiver. It is in pristine condition with no scratches or dents. Protective cover is still on the LCD. Used very little in the motor home while on vacation once or twice a year. Includes power cable, stock mike, manual. \$350 before it goes on eBay or to Quartsite. Tim Lotspeich, KX7P, kx7p@arrl.net.

Don Sgro Is Cleaning House:

Kenwood PS-40 Switching Power Supply - 20 Amp.....\$70

Ray Jefferson Marine Radio - Model 989 Handheld, with AC power supply (needs battery pack).....\$7

MFJ Model MFJ-281.....\$3

Radio Shack Dual Trunking Scanner, w/batter pack and AC PS (no manual). Programmed for LHC.....\$50

See Don Sgro (KC0YP) at 505.2183.



Alinco DX-77 HF All-Band transceiver. Has a CW filter installed. Volume control is a bit scratchy, but is usable.

Will take \$125.

See Jim Varner (AE6N) at 680.7259.

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www.lbara.net

FROM THE EDITOR

If you have anything you would like to see included in these issues, please let me know. I'm always looking for articles, news items, construction articles, or anything that might be of interest to our readers. You can contact me at 928.855.7941 or email at grf@uneedspeed.net or francej@ajsinsurance.com.

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STATIC

ATTENTION READERS

Please note that this issue represents a “work-in-progress” and there are a number of changes to be made in subsequent issues. I would greatly appreciate your comments, both good and bad, as well as any suggestions for future issues. This issue also begins our first attempt to deliver the **STATIC** to your doorstep electronically. Please keep me abreast of any email address changes you may have and I promise to have this delivered promptly and accurately. Also, I still have a number of articles awaiting publication and will do so in the future. This is your newsletter, so keep the articles, letters, and pictures coming. I can be reached at home (855.7941) or via email at grf@npgcable.com .

EQUIPMENT FOR SALE

EDITOR'S NOTE: List your items for sale here. Ham radio related only, please. Include a picture if you like (please use a jpg format). Email all to me at grf@npgcable.com) along with your name and phone number.

