Now is the time to improve our stations.

- <u>WHY?</u> Propagation is great now
- This solar cycle will not be with us forever
- It will peak about a year from now
- DXpeditions know this and will be on the air NOW
- Perhaps *"once in a lifetime"* propagation is NOW.
- Time to learn the physics of the sun and propagation

What & How



Let's understand them all. Because of below email, Bob P. asked me to do a short talk.

In all of my years of following "sun spot" and "Solar index" I have <u>never seen a straight</u> <u>line jump</u> as we are seeing now (see A to B, chart below) and I have been watching this closely since 1974. Notice that this is way beyond what was predicted by almost 200%. It is well over 200 now. The full peek <u>should</u> happen next year. How high will it go? 250, or even off the chart? Perhaps my article in the summer TCHN on EMP was well timed. Are we protected? It might be a good time to look another look. → Present band conditions – 10/12m good till midnight; sometimes all night. 15m-40m good 24 hours most days. Lots of action and DX.

Three ways to predict propagation (Yes I know how to count)

- Understanding the science of the sun *and/or* feeding data into a computer.
- Understanding the rhythm of propagation. ← Very important
- Farmer's almanac approach to propagation.
- Trusting gray line propagation (*This is not a prediction because it always works*).

Topic <u>related</u> trivia questions Points→Correct=2, Wrong=0, ?=1

- **T/F**/? Going from 100 watts to 1,600 watts is 12db TX gain, **no** gain on RX. However Lowering your angle of radiation can give 20-40db gain on both TX & RX
- **T/F**/? CME affect propagation.
- **T/F**/? CME is a main cause of Aurora.
- **T/F**/? Double points for this question. Current science says that life can exist on a planet that does <u>NOT</u> have an aurora.
- **T/F**/? The <u>least</u> important factor in antenna efficiency is vSWR. (Page 9) <u>https://treasurecoasthams.com/wp-content/uploads/2024/08/TC-Ham-News-01-23.pdf</u>
- If it takes light about 8 minutes to reach earth, how long does a CME to reach earth?

Because we only have 20 minutes or less, will use both talk and links to articles.

We now have **4** jobs. **1**. Make station improvements **2**. Think about EMP. **3**. Work the DX, Great times happening. **4**. Disconnect station antennas when not in use.

Propagation- Now is the time to fix any antenna issues you still have. Expect great propagation on all bands; however, give special attention to 6-15 meters. Expect special surprises on those bands. On top of that, we are now leaving the summer doldrums and entering into the fall *"good time"* propagation. DXpeditions will be increasing. If you are not on the air, get on the air as quick as you can. If you need to improve antenna, do it now.

NOTE--> when the lower bands (20-160 meters) seem funny, go to the higher bands such 15-6 meters. If you hear echo or other distortion, check 6 meters for special surprises and joy. *Computer programs do not tell you this... knowledge will. Knowing when to go up or down in the bands are why some hams are able to work the DX and others can't. The other reason is understanding angle of radiation.*

Gray Line: page 12 <u>https://treasurecoasthams.com/wp-content/uploads/2024/08/TC-Ham-News-05-21.pdf</u> Great software for this - DX Atlas: <u>https://dxatlas.com/</u>

Extreme Ultraviolet Radiation – Would cook us if it could get through our atmosphere. It heats up the atmosphere and creates waves. One cause of "*Skew path propagation*." <u>https://en.wikipedia.org/wiki/Extreme_ultraviolet</u> Skew path propagation - You know what Short & Long path is. What is SKEW path?

How far can my signal go before it must hop? **Longest hop**? It is widely accepted that ground wave on HF bands is 20–100 miles and sometimes a bit more. Sky-wave distance can be between 1,000 miles and 2,500 miles. This is important. The distance of a single hop is <u>largely controlled by your antenna choices</u>, vertical angle of radiation and the frequency / band you choose. (*Band choices were discussed in an earlier article. See links* https://treasurecoasthams.com/wp-content/uploads/2024/08/TC-Ham-News- on page 12.)

Why are fewer hops best? If our angle of radiation is low we can get maximum of 2,500 miles per hop. That means a total of 5 or 6 hops are needed to reach the other side. On the other hand, if our angle of radiation is high we get only about 1,000 miles per hop or less. Thus, it would take 12 or 13 hops to reach the other side. Most likely, our signal would not arrive strong enough to be copied. See the graph below.



Move your signal hop from 1000 miles to 2500 miles with lower angle of radiation.

More info: page 12 https://treasurecoasthams.com/wp-content/uploads/2024/08/TC-Ham-News-07-21.pdf

How much signal do we lose due to hops? We know that our signal will lose an additional 12db to 20db per hop. 20db is a 100 power-fold loss. Thus, if we start with 100 watts erp, after just one hop our signal could be reduced to about 1 watt. This example shows rather dramatically how proper choice of an antenna with a low vertical angle of radiation can significantly improve our signal by reducing hops.

To put the above in a simple perspective, consider that in low to moderate noise conditions a modern day receiver can easily process signals at S3 (-109dbm) and sometimes even lower. That tells us that a good receiver can easily process a signal that has hopped 7 times in poor conditions or as much as 15 or more times under very good band conditions. The potential hop count for your signal is dependent on both your antenna choice (*angle of radiation*) and propagation conditions. Armed with this knowledge, antenna performance is now under your direct control.

Which is better? Purchasing the highest power amplifier you can afford, or reducing your antenna's angle of radiation? The answer is easy. \rightarrow The antenna wins. Reducing the signal path by only one hop can improve your signal by 20db (100 power-fold), while installing the largest legal amplifier to increase your power output from 100 to 1500 watts results in only a 12db or a 15x increase or 2 "S-units."

What is best – Horizontal or Vertical polarization? It depends on the height of the antenna.



How high does my horizontal antenna need to be? What if I can't go that high?

The table below shows height in feet by band for a horizontal dipole mounted $\frac{1}{2}$ (0.50) wavelength above ground for low angle of radiation.

1/2 wavelength height vs bands

l0m	17 feet high or greater
l2m	21 feet high or greater
I5m	24 feet high or greater
l7m	29 feet high or greater
20m	33 feet high or greater
40m	66 feet high or greater
80m	132 feet high or greater

160m \rightarrow 265 feet

What if you can't go $\frac{1}{2}$ wavelength? \rightarrow Consider a homebrew vertical. Ways to control angle of radiation: page 15, <u>https://treasurecoasthams.com/wp-content/uploads/2024/08/TC-Ham-News-10-21.pdf</u>

Important Terms

Magnetic Field: Creates the Corona and IMF. IMF: interplanetary magnetic field. Corona: outermost part of the Sun's atmosphere.

Active regions: Sunspots, solar flares, CMEs. Sunspots: Concentrated closed magnetic fields.

Solar Cycle: Rising, Maximum, declining, minimum. **Solar Wind**: Particles of magnetized plasma escaping from the sun's corona.

Coronal Holes: Source of high speed solar wind. **CMEs**: Powerful explosions of magnetized plasma.

Solar Flares: Intense X-ray and proton radiation. 27 day importance

Magnetosphere, Earth - pictures next page













Updated September 6, 2024





Investigate the links below and be a top DXer

Understanding Gray line (pipe line) propagation, Page 13: <u>https://treasurecoasthams.com/wp-content/uploads/2024/08/TC-Ham-News-05-21.pdf</u>

Band choices each hour of the day, Page 12: <u>https://treasurecoasthams.com/wp-content/uploads/2024/08/TC-Ham-News-06-21.pdf</u>

The sun how it affects propagation & band timing, Page 12: <u>https://t reasurecoasthams.com/wp-content/uploads/2024/08/TC-Ham-News-06-21.pdf</u>

Best kept secret, controlling multi-hop propagation with your antenna, Page 14: https://treasurecoasthams.com/wp-content/uploads/2024/08/TC-Ham-News-07-21.pdf

Angle of radiation for best propagation, Page 14: <u>https://treasurecoasthams.com/wp-content/uploads/2024/08/TC-Ham-News-09-21.pdf</u>

Angle of radiation for best propagation part 2, Page 15: <u>https://treasurecoasthams.com/wp-content/uploads/2024/08/TC-Ham-News-10-21.pdf</u>

Small (PSL) property lots are what most of us are stuck with. How can we compete with the "BIG GUN" stations? Page 13, <u>https://treasurecoasthams.com/wp-content/uploads/2024/08/TC-Ham-News-04-23.pdf</u>

Small property & wire antennas using tuners. Lots of misinformation about antenna tuners. They do work well if used properly. Page 9, <u>https://treasurecoasthams.com/wp-content/uploads/2024/08/TC-Ham-News-01-23.pdf</u>

What type of wire to use for your antenna? Page 8, <u>https://treasurecoasthams.com/wp-content/uploads/</u>2024/08/TC-Ham-News-03-22.pdf

NOAA Space weather: <u>https://www.swpc.noaa.gov/communities/radio-communications</u>

WM7D's Solar Resource Page: https://www.wm7d.net/hamradio/solar/index.shtml

NASA Solar cycle: https://www.nasa.gov/solar-cycle-progression-and-forecast/ NASA | Solar Cycle explained: https://www.youtube.com/watch?v=sASbVkK-p0w SFI index and K, I index: https://hamradiofornontechies.com/current-ham-radio-conditions/ Death of the Sun: https://youtu.be/QuHr3ErT34I The Solar Cycle As Seen From Space: https://youtu.be/Z0uIcLZ5rh8 How To Track The Solar Cycle: https://www.youtube.com/watch?v=rx9m6H6GeLs Everything We Know About The Sun | The New Frontier | Spark: https://youtu.be/4CqYFqvkOXk The Tremendous Power Of Solar Storms | Naked Science | Spark: https://www.youtube.com/watch?v=sMjZoa_nxdk&t=3s TCHN archive: https://treasurecoasthams.com/newsletter-archive/2022-treasure-coast-ham-news/ Video:https://www.youtube.com/watch?v=z4NwmSgFI_Y&list=PLaeFJLNZUKlkH004Uokcpeswty8N6n

<u>Solar Odds and ends</u>: About every 11 years the sun's magnetic field flips – Sun is 93 million miles away – Halo or Corona is 3 million degrees F – Center is 27 Mil degrees F – Solar winds travel slower, around a million miles per hour, so CME takes around 93 hours to get to earth.

vfG&index=4