Where did those signals go on 80M?

So, I woke up in the middle of the night last night in a cold sweat. I kept asking myself, "What am I going to tell people about this week on the Ham Radio Blurb?" I haven't done a lot of ham radio that I can remember because of so many things happening during this past week. However, once I started to think about it, there were lots of things that I can talk about, and I was also fairly active on the HF nets. In fact, my week was pretty balanced in terms of the things I did including my down time in ham radio.

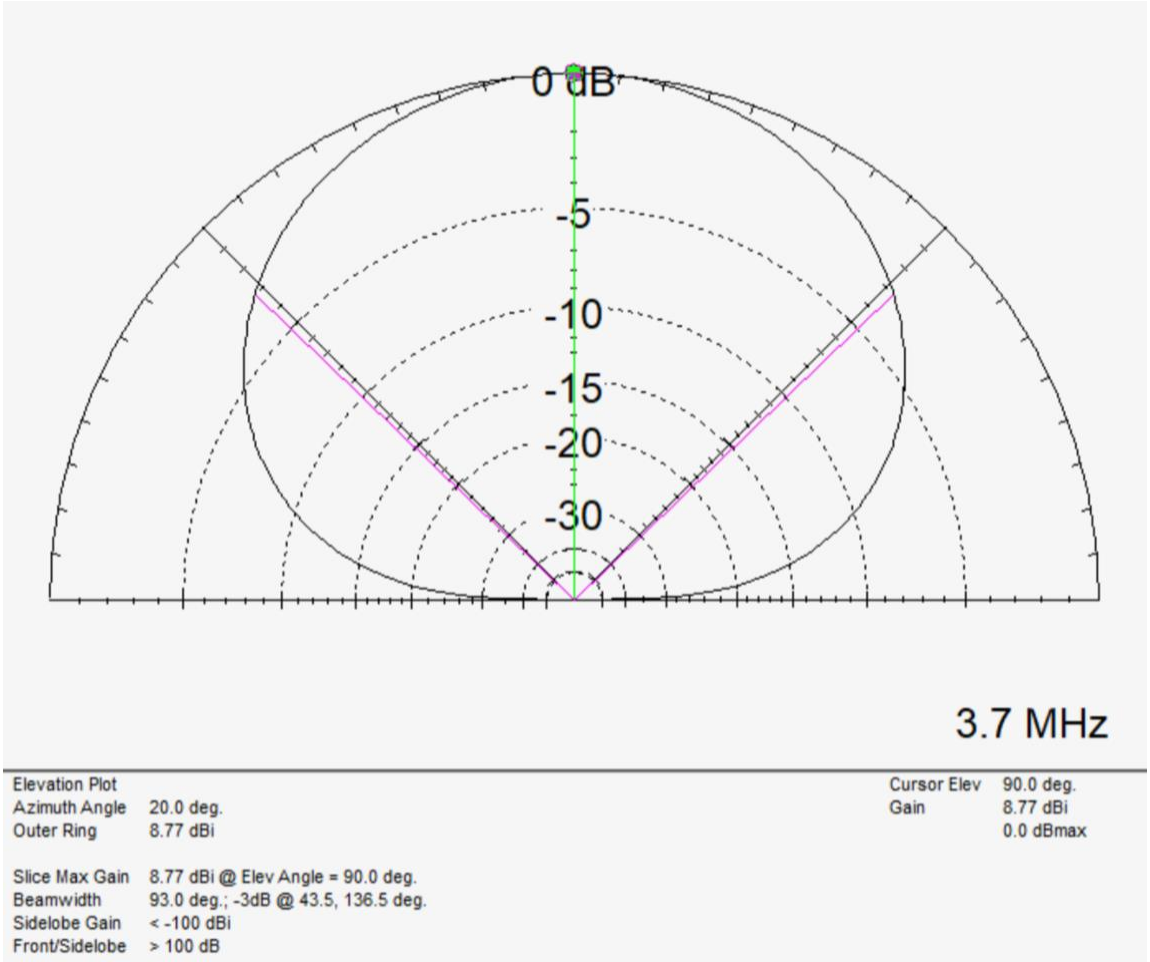
Let's talk about the band conditions. It is no surprise that things are changing in terms of propagation these days with the 80M band going long early in the evening and all that that brings to the table. It is so variable that you never know what you are going to be faced with.

So, you sit down at 01:00Z to get on the Saskatchewan PSN and it all seems pretty good for about 4 minutes and signals are really strong. And then it all goes away, and you realize that it happened a couple of minutes earlier tonight than last night. The "D" layer has simply gone away because the sun went down and there is nothing to refract that signal off unless it is a 1,000 Km's away or more. So much for local communications. If you remember the "D" layer is the closest ionized layer to the earth at about 70 to 90 Km's high and is ionized by UV light from the sun. So, when the sun goes down, the UV energy it usually receives during the day is cut off and POOF away goes the "D" layer.

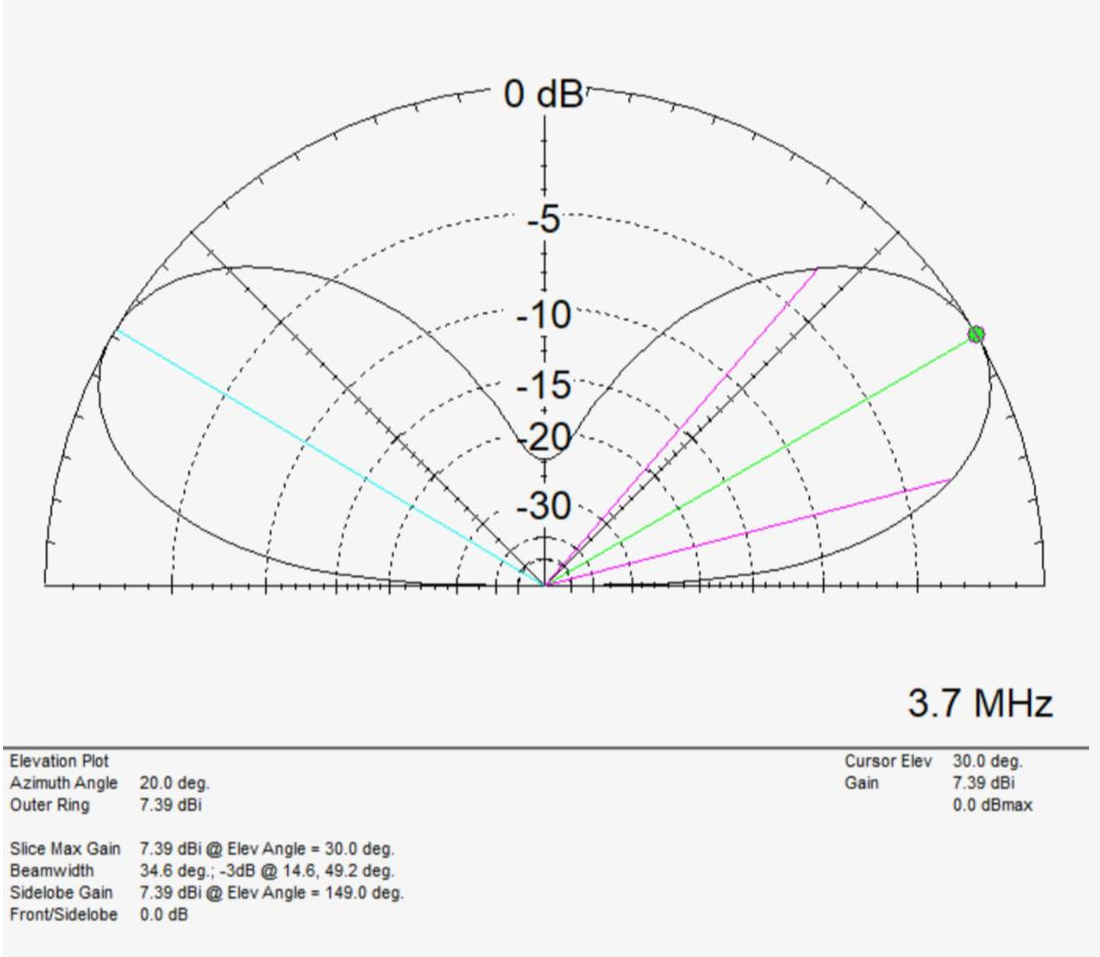
So, what does it mean when the band goes long? It means that the "E" layer is now doing the refracting and the signals bounce off it instead. The "E" layer is 100 to 120 Km's above the surface of the earth and therefore an angle of refraction comes into play and helps determine the "Skip Zone". The Skip Zone is the area between your transmitter and the first return of a refracted signal that comes back to earth. Of course, that will only work for a short period of time as well because the "E" layer needs UV radiation from the sun too and as soon as that layer is no longer receiving the life giving UV radiation, it will stop bouncing the signals and then the only layer left is the "F" layer. That is when you start hearing DX. If the combined F1 and F2 layer at night is still ionized, then it comes into play for longer and longer distances. Thing brings into the discussion the "angle of radiation".

So, what effect does the angle of radiation of your antenna have to do with all this? They tell us that in order to work DX it is always desirable to have the lowest angle of radiation possible. The lower the angle of radiation, the greater ability of your antenna to capture those DX signals effectively. Typically, a low angle of radiation is determined by the height above ground. The so called "Magic Height" is 1/2 wavelength for a dipole antenna. So, at 80M that would be about 130 feet or 40 meters. So that would be great if we could all achieve that. However not all of us have unlimited funds and live far enough away from an airport to be able to put up a couple of 130-foot towers and all the guy lines and lights and other stuff needed to support those kinds of structures. The standard amateur radio station tower is about 10 to 15 meters, 30' to 50' high. Unfortunately, the angle of radiation of a dipole antenna like that is about 90 degrees while the ideal angle is about 20 degrees. By keeping the antenna at a lower

height, it has become an omnidirectional antenna. It's great for local communications while we still have a ground wave captured within the "D" layer, but poor for DX.

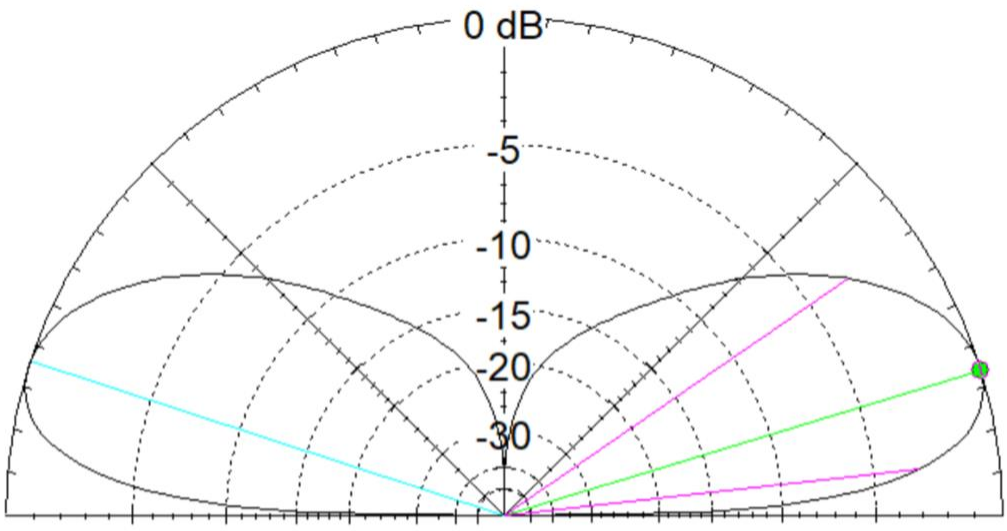


Above is the plot of a typical horizontal dipole at 30'. Notice the maximum gain or optimal angle of radiation, the green line is 90 degrees. Great for local communications.



Look at the angle of radiation on this same dipole at 130 feet. The optimal angle of radiation or maximum gain is 30 degrees. Great for DX communications.

So, is there a solution? Yes, and that is to use a vertical which has an inherent lower angle of radiation. Let's look at the angle of radiation of a typical vertical for 80M that is a 1/4 wave at 3.7 Mhz. This antenna is 65' high and is sitting on a bunch of radials to keep the angle of radiation down low.



3.7 MHz

Elevation Plot		Cursor Elev	17.0 deg.
Azimuth Angle	0.0 deg.	Gain	0.46 dBi
Outer Ring	0.46 dBi		0.0 dBmax
Slice Max Gain	0.46 dBi @ Elev Angle = 17.0 deg.		
Beamwidth	28.2 deg.; -3dB @ 6.4, 34.6 deg.		
Sidelobe Gain	0.46 dBi @ Elev Angle = 162.0 deg.		
Front/Sidelobe	0.0 dB		

A vertical antenna above shows the optimal angle of radiation is at 17.0 degrees. The gain is lower, but it has a much better angle of radiation to work with.

Now that looks a bit better, doesn't it? So, if you want to work some DX on the lower bands you can build or buy a vertical antenna that is a 1/4 wave at 80M which is about 65 feet high sitting on a whole bunch of radials buried in the ground. However, if you look at some of the amazing new verticals that are being sold out there, the prices are reasonable, and they provide some great results with similar angles of radiation on the lower bands. I have an old Butternut HF6V that's been converted to an HF9V with only 24 radials in my backyard. It is only 28 feet high and is at least 30 years old and works beautifully for DX. So go find one and get on the air effectively on all bands and start using a lower angle of radiation to work some DX on the lower bands now that cycle 25 is well underway. With the sunspot numbers rising like a phoenix from the ashes of the end of cycle 24, we can only look at great conditions for the rest of the cycle. By the way I look every day at the propagation reports and things are looking good, folks.

See ya next week,
73
Tom VE6ARG