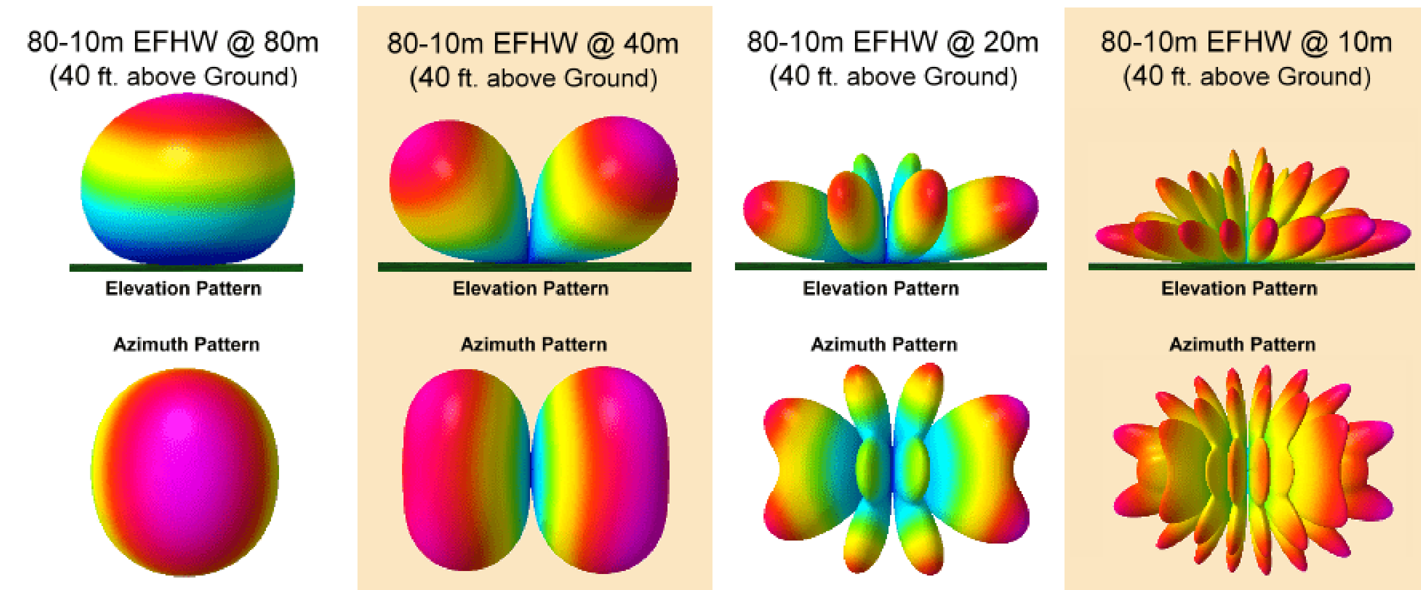
# *Editorial – Antenna pattern importance*

Say your antenna is emitting a signal at a particular frequency and power level. On a three-dimensional paper, place a dot to represent your antenna seen from a distance. Now, draw a line from there to any point on your 3-D paper, the length of the line representing the field strength of the signal in that chosen direction. Draw another line from the dot anywhere else, using the same method. Then another, and another, and repeat a thousand times. Finally, erase all the line segments except their end points.




***Elevation and Azimuth Radiation patterns of a 80-10m multiband EFHW Antenna is depicted for 80m, 40m, 20m and 10m bands. The height of EFHW (horizontal configuration) is kept at 40 ft. (~12m) AGL. There are deep broadside nulls on 40m and higher. NOTE: 20m and higher bands produce several deep nulls around the azimuth resulting in numerous area coverage gaps.***

*Computed and Compiled by Basu VU2NSB - https://vu2nsb.com/*

The result is a three-dimensional dotted picture of what we call your ***antenna radiation pattern***, or *antenna pattern* for short. This graphic offers a visual insight on how your particular antenna is performing at its particular location, and is something that should be understood by all HF operators about their antennas. By the way, this diagram isn't burdened by concerns of how the pattern appears due to one part of the antenna versus another, because the entire antenna is being viewed like a dot from a distance. We refer to this kind of *don't-care-about-nuances-at-the-antenna* viewpoint as the ***far-field radiation*** perspective. This is relevant to you because you typically don't care near as much how your signal behaves right near your antenna as you do with how it behaves after reaching much farther away.

## Texas vs. Georgia

One reason some amateur operators are puzzled by their poor antenna performance is their misunderstanding, or even complete lack of knowledge, of their antenna patterns. For example, using an end-fed antenna on 20 meters, an operator in Texas reports your signal as ***5 over 9***, clear as a bell, assuming bells are clear. You then hear an operator who's booming in from Georgia, but try as you might, the guy in Georgia can't hear you at all. You bring up the **WebSDR**, announce your call sign, and your signal shows up on the online waterfall with a bright 3 kHz line and you can hear yourself really well. Does the Georgia operator have a sub-standard receiver, or is he simply ignoring you?

# *Editorial – Antenna pattern, cont'd*

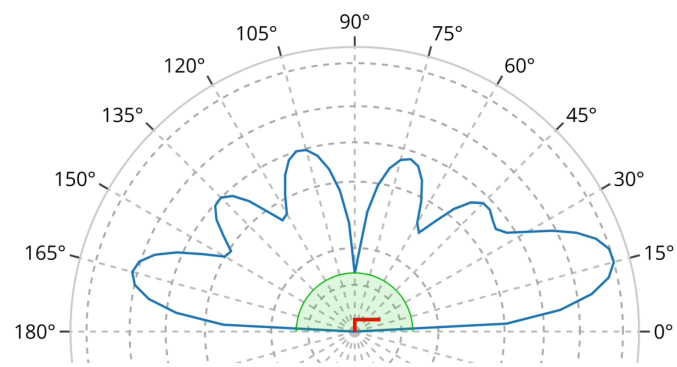
Assuming the graphic above was drawn for your particular antenna, if you examine it for 20 meters, you can see a bunch of butterfly "blimps" originating from your QTH (transmitting location). It's very possible that a line drawn from your QTH to the ionospheric F2 Layer, then back down to Texas goes right through one of those blimps (representing a strong signal), while another line drawn between you, the F2 Layer, then back down to Georgia goes right between two of the blimps (weak signal), a zone called a ***null***.

But wait, as you recall, if you can hear the operator, he should be able to hear you, right? Not necessarily. The adage is ***If you can't hear 'em, you can't work 'em***. But if you can hear him, there's no guarantee that he'll hear you, so the Georgia ham still needs to hear you, for you to make that contact.

As you can see, the antenna radiation patterns per band are three-dimensional directions of signal strength determined by antenna type, antenna shape, antenna height, antenna mounting style, frequency, terrain, and a few other factors. When displayed graphically, the zones of relatively strong signals appear as blimps, or lobes, as in ***brain lobes***.

So, to solve the problem with the Georgia operator, either raise your antenna a couple of feet, lower your antenna a couple of feet, or if either is not very convenient, forget the Georgia contact and go after the one in Delaware. (Another way to skin this cat, if you really need his contact, look up the Georgia operator on QRZ, email him, and ask him to change bands, since your patten might improve to Georgia on a different band.)

Examining your own antenna pattern also gives you some idea of the direction(s) of your strongest signals. Looking at the above diagram for an end-fed antenna mounted 40 feet up, 40 meters looks pretty ideal for making cross-country contacts, and maybe even DX contacts. On the other hand, at 40 feet up, working 80 meters looks closer to NVIS (near-vertical incidence skywave) propagation, meaning the greater portion of your signal is going straight up, to bounce back to Earth within a couple of hundred miles of your antenna. However, the pattern shows that *some of the signal* reaches out at DX elevations, allowing for limited distant communication.




## Two-dimensional patterns

All antenna patterns are three-dimensional; that is, they exhibit some amount of signal emission in all directions. However, due to a few assumptions we can often make about symmetry and redundant or repeating polarizations, a two-dimensional view of the same diagram can often prove more useful. While the 3-D diagram offers ***completeness***, a 2-D picture can offer ***clarity*** by displaying only relevant information for the task at hand. The 2-D diagram above, for example, displays the same pattern for the end-fed antenna on 20 meters, and helps us understand its radiation angles and nulls as well as the corresponding 3-D image, but without the extraneous lobe display.

Both 2-D and 3-D displays can present the pattern by looking at its side, known as an ***elevation*** view because it allows you to see its radiation angles of elevation headed skyward. Alternatively, they can present the pattern looking straight down onto it, known as an ***azimuthal*** view, because it allows you to see its radiation angles with respect to its azimuth, or compass directions.

*Anything to add? Email* ***editor@utaharc.org***