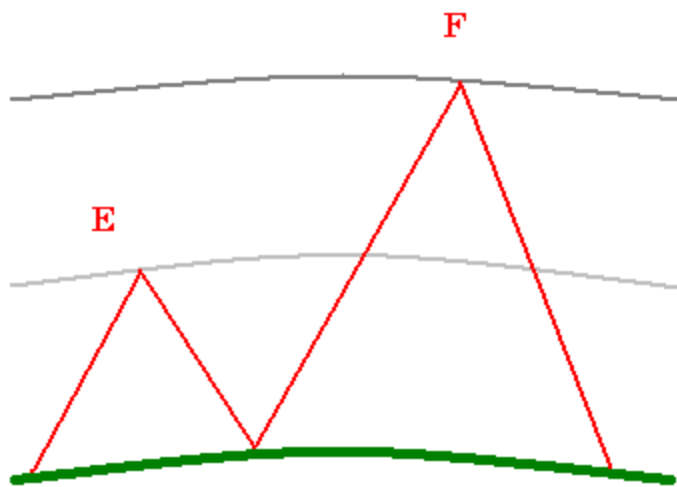


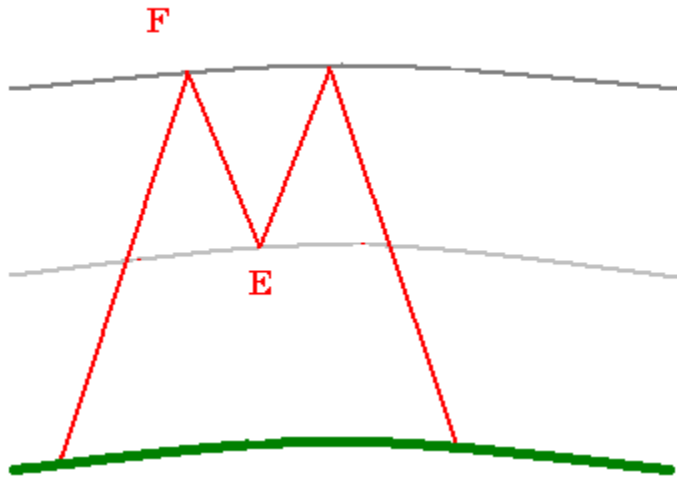
Multi-Hop Paths Explained

Mike DeChristopher, K1KAA

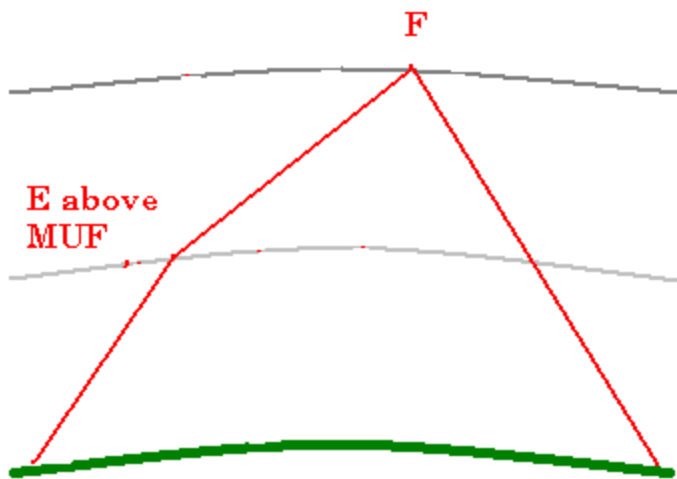
My main area of interest in propagation is multi-hop paths. Why? Well, because I deal mostly with sky wave propagation on HF. My goal here is to clear up some misconceptions about multi-hop paths. Since the easiest way to visualize what happens when you throw a radio wave into open space (or into the ionosphere, as the case may be) is to actually draw it, I have illustrated some common examples below.



This is the first example. Some (including the ARRL handbook) have referred to this as an "F-Layer Hookup", which is exactly what it is. Propagation is a virtual "crapshoot", keep in mind. Trying to map E-Layer absorption versus relative F-Layer absorption is nearly impossible, which is why this first example is so difficult to map.

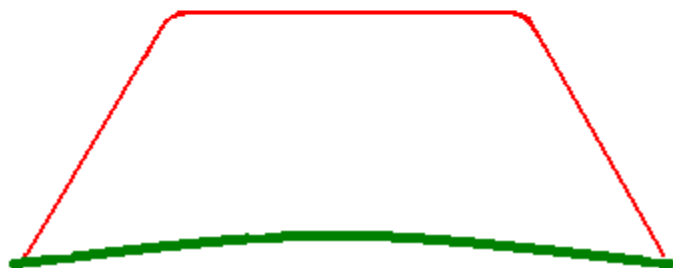


The second example is what I call the "square-knot" of paths. This is due to refraction in the E-layer, which shortens the distance of the two F-layer hops.



This is my personal favorite. The E-Layer above the maximum usable frequency (MUF) lacks the refracting ability to return a signal to earth. It does refract it enough, however, that it can continue on and refract back to earth via the F-Layer.

Pedersen Ray



The Pedersen Ray is our final example. This is because it is the most confusing, bizarre, and wonderful type of propagation, especially on 15m during CQWW. Why? Because it dynamically increases the distance of the hop. The initial refraction occurs in the F-Layer, and only when the signal originates from a very high take-off angle. Although prone to any minor atmospheric disruption, when conditions are right, this is the way to throw around "CQ's".

Okay, now that you have seen the paths, WHAT ABOUT GRAYLINE? Here are some facts to keep in mind: (1) At daybreak, D- and E-Layers appear (2) F-Layer MUF rises. Just the opposite happens at night. For a little while, during the transition between night and day (the grayline), the D- and E-Layers are not quite formed, yet the F-Layer MUF remains higher than 4MHz. Keep diagram 3 in mind for this. Although dia.3 details the E-Layer MUF, the same occurrence happens in the F-Layer. This enables great propagation on 80, 160, and even 40m. Also keep in mind that grayline propagation is still shortpath.

Multi-hop paths are very complicated to understand. Once you figure them out, you will have a greater understanding of how radio really works. You can look inside your transceiver all day long, but it is just a machine!