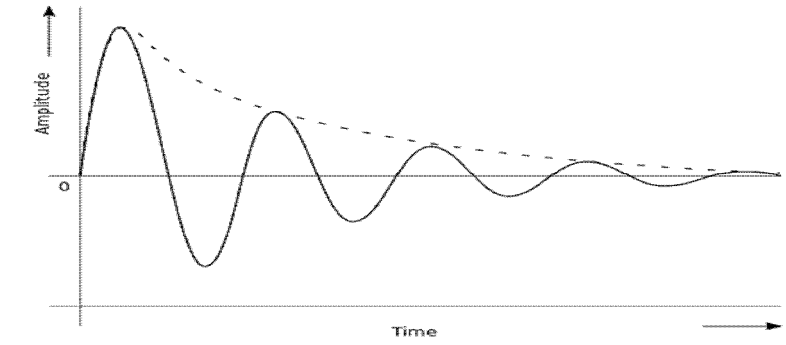
VHF signal will travel further than UHF



Have you ever wondered why a VHF signal will go further than an UHF signal?

The law in physics states that the power in a radio wave will decrease by the inverse of the square of the distance.

$$P=1/r^2$$

P = Power
r = Distance

The above equation makes no reference to wave length; the implication is that frequency should make no difference.
But this is not the whole picture, the above equation is true if the radio wave travels in a vacuum, in realty we transmit signals in varying conditions, when a signal travels in air, a variable medium, the water content, the particulates content are all factors that will cause varying degree of attenuation.

The level off attenuation will depend on the wave content in the air medium.
The other factor is that the higher the frequency the greater effect will water content have on the magnitude of attenuation.
As the content of water, dust, is a variable the degree of attenuation varies, we call this path conditions. One day we find that our signal will travel a lot further to another.

The above equation ignores the fact that for a signal to travel from point A to point B a number of waves are involved, interpreting the above equation it fair to say that attenuation will occur for every wave along to point B, that the power in the subsequent wave will reduce by the inverse of the square of the wave length. Mathematically we can replace "r" with "λ" that represent wave length.

$$P=1/\lambda^2$$

This implies that for every wave, the power will reduce following the inverse square law.
I make this point to show that a signal using a higher frequency will have a greater attenuation due to the greater number of waves required to travel from point A to point B
This makes the original equation a generality, it ignores wavelength, only true when the waves are relatively long and equal with respect to each other.
But when we compare signals that are 3 times different the picture changes a lot as does the result, the wavelength attenuation becomes the determining factor in what power is required to travel from point A to point B, a UHF signal will require greater power, since its wave length attenuation from point A to B requires more waves.
The path loss due to water etc. is not as important, but go higher in frequency, say in to the Giga Hertz and we enter a new set of conditional problems that will cause a reduction in wave power due to absorption factors that are more severe than wave length attenuation.

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