Super Refraction In Satellite Radios

While the M curve has a negative slope the curvature of the ray is concave downward on a plane earth diagram and the true curvature of the rays is greater than the curvature of the earth. Hence rays which enter the duct with sufficiently small angles are bent until they become horizontal and then are turned downwards. This particular form of refraction is called super refraction. These rays are trapped in the duct oscillating between the ground and an upper level in the case of ground based duct and between two levels in the atmosphere in the case of an elevated dust. The conditions depend upon the position of the transmitter with respect to the duct. These cases are possible when transmitter is inside the duct, transmitter is below the duct or the transmitter is above the duct. Conditions most suited for duct formation is when the transmitter is inside the duct. Even with this condition fulfilled not all waves are trapped in the duct.

The ground based ducts are formed generally when air flows from land out over cooler water. The evaporation of moisture from the water into the lower layers of air cools the air, increases the moisture lapse rate and produces a temperature inversion, a combination which usually results in formation of a good surface duct. Ground ducts are also formed by the nocturnal cooling of the surface of the earth. During a clear night the ground surface radiated its heat readily into outer space. Thus a clear dry land such as desert heats up considerably by the sun during the day time and it cools rapidly at night. This temperature variation may be relatively less in case of other types of land surfaces. This nocturnal cooling may cause temperature inversion in the lower layers of air on a clear night due to its contact with a cooler earth surface. However, over deep water the diurnal changes in surface temperature are, in general too small to cause the formation of ducts. The elevated ducts are generally formed be a metrological process called subsidence that is a slow downward setting of a large mass of air typically a stagnant high pressure area, combined with horizontal spreading of the air above the lower layers in the atmosphere. This subsiding air becomes considerably drier than the unaffected air below it, resulting in temperature inversion. This causes production of a duct with base several thousand feet above ground. Elevated ducts are typically found in the coastal areas at elevation of one thousand to five thousand feet and have depths typically varying from a feet to more than one thousand feet. A duct can be more often compared to a metal duct.

About the Author

Tymon Hytem has worked in the electronics field for the past 15 years. He enjoys helping people decide on electronic gadgets from telephones to XM Radio and choosing the perfect XM Satellite Radio system for their needs.

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