Ionosphere Effect On Satellite Radio Waves

The radio waves traveling through the ionosphere possess kinetic energy. This kinetic energy is imparted to the free electrons. Thus these free electrons in the ionosphere are set to vibration. These vibrating electrons collide with gas molecules from time to time in spite of the low gas pressure in the ionosphere. An electron on colliding with the gas molecule gives away the kinetic energy that it has acquired from radio wave. So far as the radio wave is concerned this constitutes a loss of power. The amount of energy extracted by the free electrons and lost in the collision with the glass molecules depends upon the probability of collision of an electron with the gas molecule, the energy lost per collision and number of electrons. The probability of collision of an electron with the gas electron depends upon the gas pressure. More the gas pressure more is the probability of collision between a vibrating electron and a gas molecule and hence more is the absorption of energy suffered by a wave passing through the ionosphere. Accordingly most of the energy loss suffered by a radio wave passing through the ionosphere takes place at the lower edge of the ionosphere where the gas pressure is maximum that is in the lower part of the E layer and the D layer. The E layer consists of two layers.

The regular E layer constant is about hundred and ten kilometer height which is the lowest affected and helpful ionosphere layer. It is most useful for short wave frequencies above three megahertz. We have also sporadic and varying E layer between ninety kilometers and hundred and thirty kilometers whose appearance is unpredictable. This layer is all together absent at right. The remaining part of the ionosphere has very low atmospheric pressure so that the radio wave suffers very small energy loss in the remaining part. The energy lost per collision depends upon the velocity acquired by the electron in its vibration which in turn is proportional to the intensity of the electric field of the wave and inversely proportional to the frequency. Thus the absorption is greater lower the frequency. The earth's magnetic field also affects the energy lost through absorption. The loss tends to be high at frequencies close to the gyro frequency. Because of the finite energy loss through absorption the ionosphere may be considered to have a finite but small conductivity. Thus for a wave the ionosphere acts like a dielectric having small conductivity and relative dielectric constant less than unity. The values of both the conductivity and dielectric constant are influenced by earth's magnetic field and are different for the ordinary and extra ordinary rays.

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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