

Satellite Radio Relations With Micro Waves

Microwaves are the portion of the electromagnetic spectrum where the wavelength falls between about one millimeter and thirty centimeters. Microwave frequency bands extend from about one gigahertz to three hundred gigahertz and are useful for short range, high reliability radio and television links. Systems operating at microwave frequencies are radar, mobile radio, satellite communications, terrestrial line of sight and troposphere links. Microwaves travel in essentially straight lines through the atmosphere, are not affected by the ionized layers, and are affected very little by temperature inversions and scattering. However weather effects limit the distance between the transmitter and the receiver to a few miles. Repeater stations placed along the propagation path extend the distance over which communication can occur. A microwave repeater is a receiver/amplifier/transmitter combination used for relaying microwave signals in long distance, overland communication links. As frequencies increase distance between repeaters must decrease.

The primary mode of propagation in the microwave range is line of sight. The range of line of sight communication depends upon the height of the communicating antennas and the nature of the terrain between them. The line of sight range is limited to the radio horizon. Line of sight microwave repeaters i.e. link systems of radio carry large quantizes of voice and data traffic and are subject to transmission impairments thus limiting the distance between relay points. Most radio link systems carry analog signals principally frequency modulated, although a few carry digital signals. Terrestrial radio link systems offer highly directional, point to point transmission of voice and data signals. Satellite radio link systems offer multiple path transmission for such signals as television broadcast. Frequencies in the microwave spectrum are normally transmitted through waveguides, the walls of which are highly polished and sometimes specially plated to reduce resistance and consequently power losses. Waveguides may be constructed of brass, copper or aluminum and are made in sections of various lengths. These sections may be straight, bent, twisted or flexible. Common form of waveguide is rectangular in cross section although round waveguides may be used. Within certain limits microwaves can be transferred by coaxial cable, micro strip, strip line and optical fibers. Transmission of light modulated signals through optical fibers is the modern method. Because the waveguides provide excellent shielding and low loss so they can transmit greater amounts of power with less energy loss than coaxial cables. To be an effective transmission line a rectangular waveguide must have the sides measuring at least 0.5λ and a circular waveguide must be at least 0.6λ in diameter. Microwaves can be propagated in waveguide in the transverse electric or transverse magnetic mode. Interior walls of waveguide must be kept clean and free from condensation.

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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