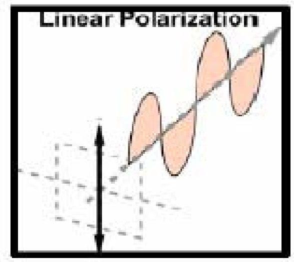
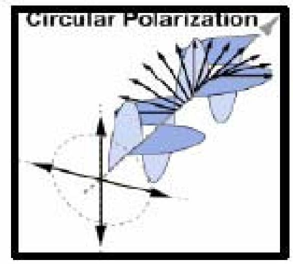
***Why Circular Polarization Antenna?***

## Polarization Types

An antenna is a transducer that converts radio frequency (RF) electric current to electromagnetic waves that are then radiated into space. Antenna polarization is an important consideration when selecting and installing antennas. Most wireless communication systems use either linear (vertical, horizontal) or circular polarization. Knowing the difference between polarizations can help maximize system performance for the user.




**Linear Polarization:** An antenna is vertically linear polarized when its electric field is perpendicular to the Earth's surface. An example of a vertical antenna is a broadcast tower for AM radio or the whip antenna on an automobile. Horizontally linear polarized antennas have their electric field parallel to the Earth's surface. For example, television transmissions in the USA use horizontal polarization. Thus, TV antennas are horizontally-oriented.




**Circular Polarization:** In a circularly-polarized antenna, the plane of polarization rotates in a corkscrew pattern making one complete revolution during each wavelength. A circularly-polarized wave radiates energy in the horizontal, vertical planes as well as every plane in between. If the rotation is clockwise looking in the direction of propagation, the sense is called right-hand-circular (RHC). If the rotation is counterclockwise, the sense is called left-hand-circular (LHC).

## Advantages of Circular Polarization

**Reflectivity:** Radio signals are reflected or absorbed depending on the material they come in contact with. Because linear polarized antennas are able to "attack" the problem in only one plane, if the reflecting surface does not reflect the signal precisely in the same plane, that signal strength will be lost. Since circular polarized antennas send and receive in all planes, the signal strength is not lost, but is transferred to a different plane and are still utilized.

**Absorption:** As stated above, radio signal can be absorbed depending on the material they come in contact with. Different materials absorb the signal from different planes. As a result, circular polarized antennas give you a higher probability of a successful link because it is transmitting on all planes.

**Phasing Issues:** High-frequency systems (i.e. 2.4 GHz and higher) that use linear polarization typically require a clear line-of-sight path between the two points in order to operate effectively. Such systems have difficulty penetrating obstructions due to reflected signals, which weaken the propagating signal. Reflected linear signals return to the propagating antenna in the opposite phase, thereby weakening the propagating signal. Conversely, circularly-polarized systems also incur reflected signals, but the reflected signal is returned in the opposite orientation, largely avoiding conflict with the propagating signal. The result is that circularly-polarized signals are much better at penetrating and bending around obstructions.

**Multi-path:** Multi-path is caused when the primary signal and the reflected signal reach a receiver at nearly the same time. This creates an "out of phase" problem. The receiving radio must spend its resources to distinguish, sort out, and process the proper signal, thus degrading performance and speed. Linear Polarized antennas are more susceptible to multi-path due to increased possibility of reflection. Out of phase radios can cause dead-spots, decreased throughput, distance issues and reduce overall performance in a 2.4 GHz system.

**Inclement Weather:** Rain and snow cause a microcosm of conditions explained above (i.e. reflectivity, absorption, phasing, multi-path and line of sight) Circular polarization is more resistant to signal degradation due to inclement weather conditions for all the reason stated above.

**Line-of-Sight:** When a line-of-sight path is impaired by light obstructions (i.e. foliage or small buildings), circular polarization is much more effective than linear polarization for establishing and maintaining communication links.

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