Polarisation of Electromagnetic Waves

Polarisation is a property of transverse waves that refers to the geometric orientation of the oscillations of the corresponding wave. The radiation field of an antenna is composed of electric and magnetic lines of force. In this field emitted by an antenna, the lines of force of the electric field are perpendicular to the magnetic field. Both field components depend on the position of the antenna relative to the earth's surface. The direction of the electric field determines the direction of the polarisation of electromagnetic wave. A distinction is declared between linear and circular polarisation.

Linear Polarisation :

Vertically and horizontally mounted antennas are designed to transmit or recieve vertically and horizontally polarised waves, respectively. Therefore, changes in polarisation cause changes in the magnitude of the recieved signal due to the inability of the antenna to

recieve polarisation changes.

Two main forms of polarisation can be obtained from linear polarisation:

* In a vertically polarised wave, the electric lines of force lie in a vertical direction.

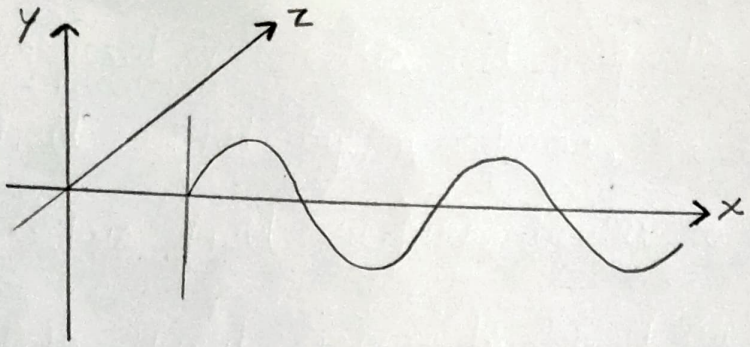

Fig: Vertically linear polarised electric field.

* In a horizontally polarised wave, the electric lines of force lie in a horizontal direction.

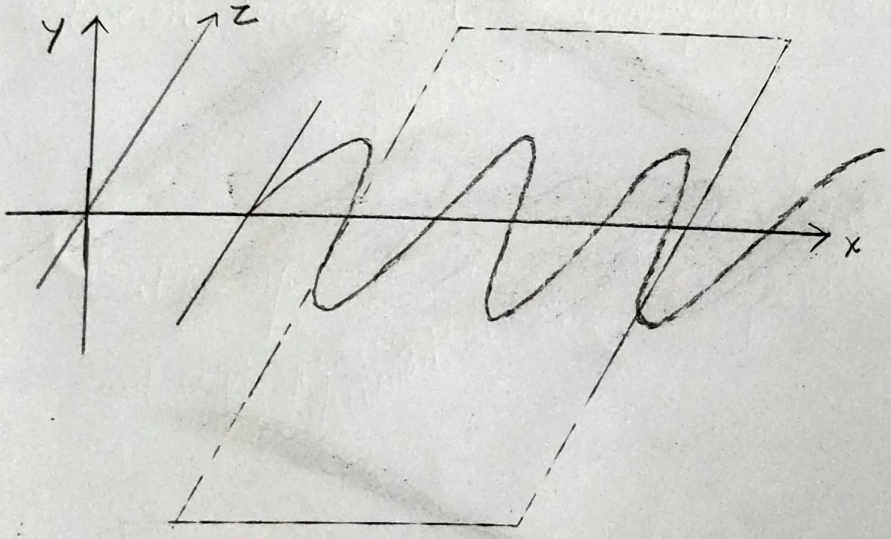

Fig: Horizontally linear polarised electric field

Of course, linear polarisation can also take all other directions in space, whereby in addition to vertical and horizontal, only the positions 45° are especially designed:

* sloping +45° and
* sloping -45° have been assigned specific names.

Circular Polarisation:

Circular polarisation has the electric lines of force rotating through 360 degrees with every cycle of rf energy. Circular polarisation arises by two 90° simultaneously. The electric field was chosen as the reference field since the intensity of the wave is usually measured in terms of electric field intensity (volts, milli volts, or microvolts per metre). In some cases, the orientation of the electric field does not remain constant. Instead, the field rotates as the wave travels through space. Under these conditions, both horizontal and vertical components of the field exist and the wave is said to have elliptical polarisation.

Circular polarisation can be right-handed or left-handed A circularly polarised wave is reflected by a spherical raindrop in the opposite sense of transmission. On reception, the antenna rejects waves of the opposite sense of circular polarisation.

Depolarisation:

The polarisation state of an electromagnetic wave can change when the electromagnetic wave scatters from a target. Under optical conditions depolarisation is a measure of the change in the degree of polarisation of partially wave upon scattering. For example, a target may scatter a wave with a greater degree of polarisation than the incident wave, in which case the depolarisation is negative.