

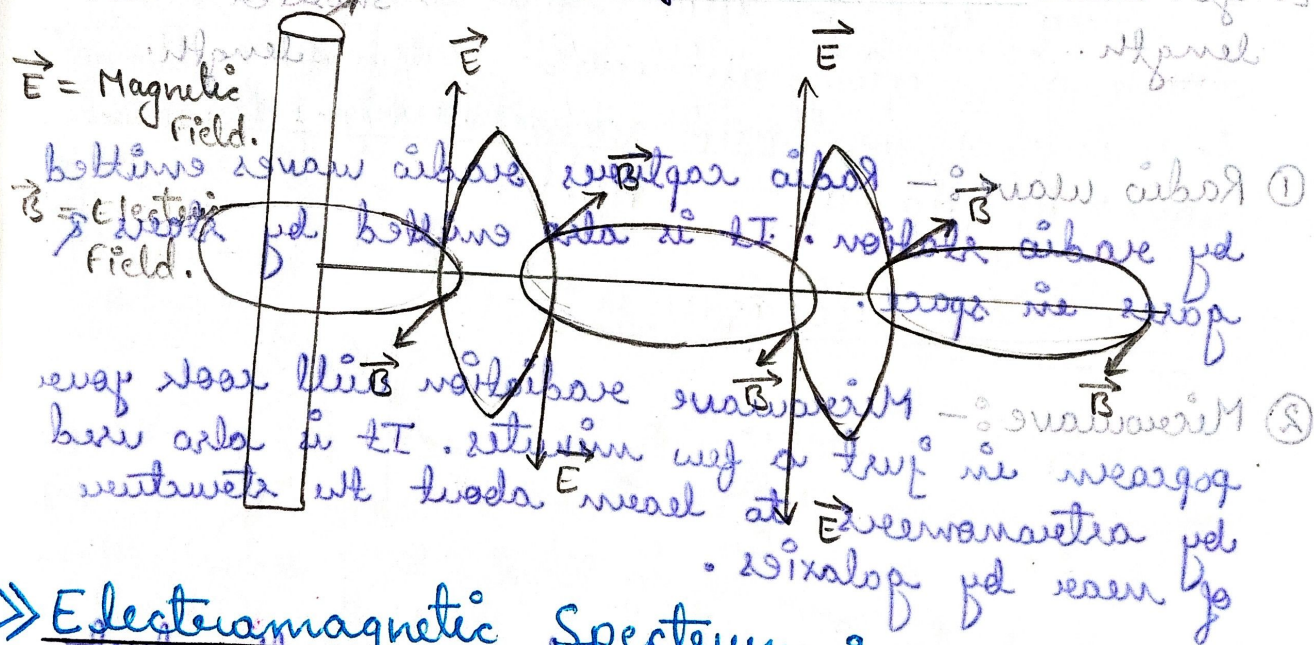
Wave Propagation

1) Fundamental of Electromagnetic waves:-

Electromagnetic waves made up of oscillating electric fields and magnetic field, which are mutually perpendicular to each other and generates energy, momentum and angular momentum with their wave and finally transfer to the object with which these wave its collides. The electromagnetic waves travel at the speed of light, whose speed is 3 lakh Kilometers per second. When a charge particle is at rest, it produces an electric field and when it is in constant motion, it produces magnetic field along with the electric field, which we call the combined electromagnetic field along with the electric field, ~~about~~ as soon as the particle start accelerating and it produce time varying electric field and magnetic field and the wave look like wave and is called KINK and we called this waves as electromagnetic waves.

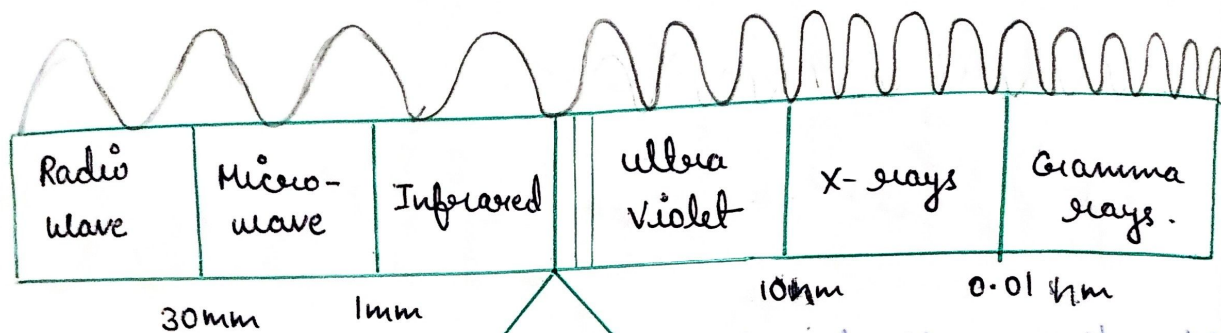


We know that when a charge particle move with velocity it produces an electric field and magnetic field and also we know that change in velocity per unit time is called acceleration, So, when the velocity varies, the electric field & magnetic field also vary with time. $A = V/T$



>> Electromagnetic Spectrum :-

The electromagnetic Spectrum is the range of all types of electromagnetic radiation. It is the entire distribution of electromagnetic radiation according to frequency and wavelength.



Longer wave length. → Shorter wave length.

① Radio wave :- Radio captures radio waves emitted by radio station. It is also emitted by stars & gases in space.

② Microwave :- Microwave radiation will cook your popcorn in just a few minutes. It is also used by astronomers to learn about the structure of near by galaxies.

③ Infrared :- In space it help us map the dust between stars.

④ Visible light :- Eyes detect visible light. Stars also emit visible light.

⑤ Ultra Violet :- It is emitted by sun and causes the sunburn skin tans and burns.

⑥ X-rays :- Dentist uses x-rays to image your teeth; airport security uses to see ^{through} your bag.

⑦ Gamma rays :- The biggest rays generate of all in universe. Doctors use gamma rays to image inside your body.

>> Modes of Wave Propagation :-

→ There are four modes of Propagation of waves

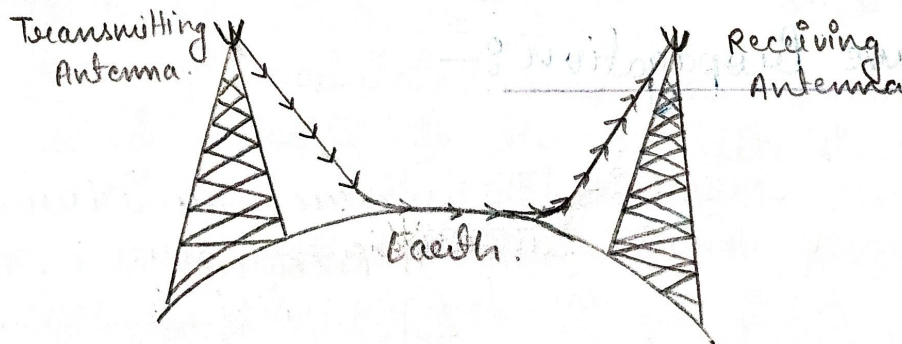
① Ground Wave Propagation.

② Sky Wave Propagation

③ Space Wave Propagation.

④ Satellite Propagation.

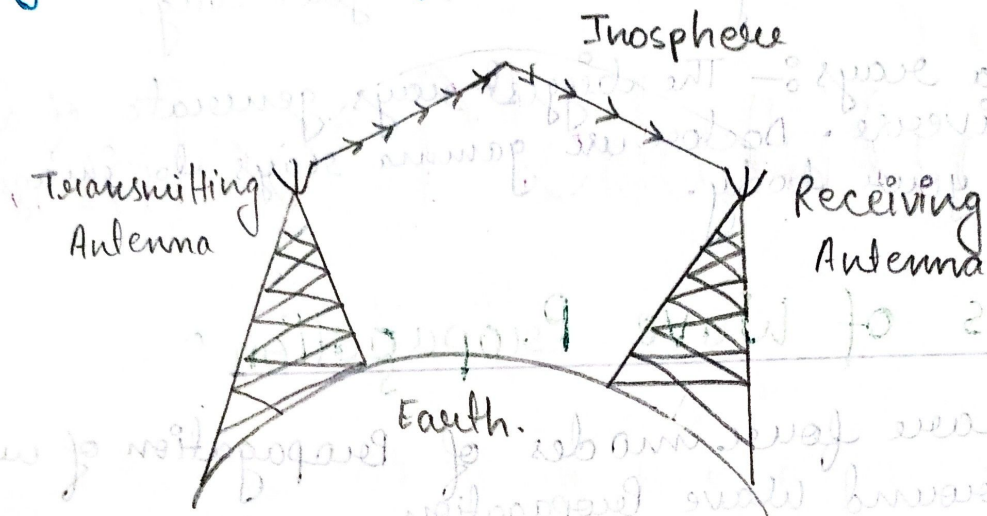
1) Ground Wave Propagation :-



It is the mode of Propagation in which ground has strong influence on the propagation of signal from the transmitting antenna to receiving antenna.

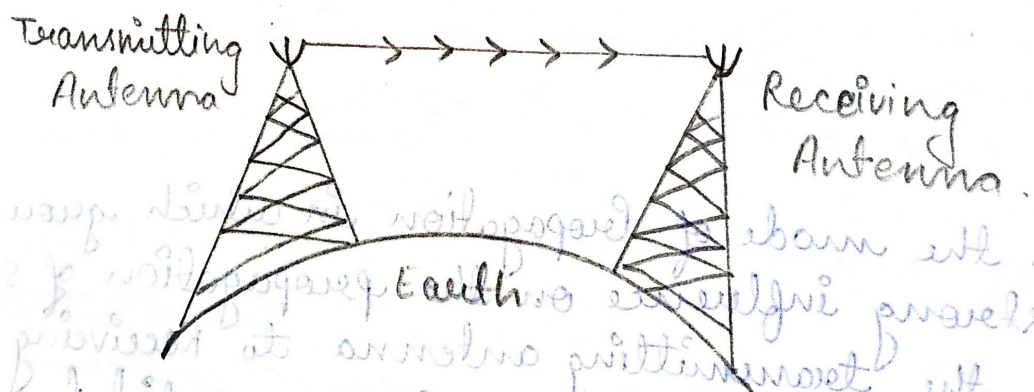
In this propagation the signal wave glides over the surface of earth. Therefore the loss in this type of propagation are large and hence its range is short. Frequency range is $530 \text{ kHz} - 1710 \text{ kHz}$.

2) Sky waves Propagation :-



In this type of propagation the rays are first transmitted from transmitting antenna through Ionosphere. After reflection from Ionosphere they reach at receiving antenna. In this propagation loss is very low and range is high. Frequency range is 1710 KHz to 40 MHz.

3) Space Wave Propagation :-

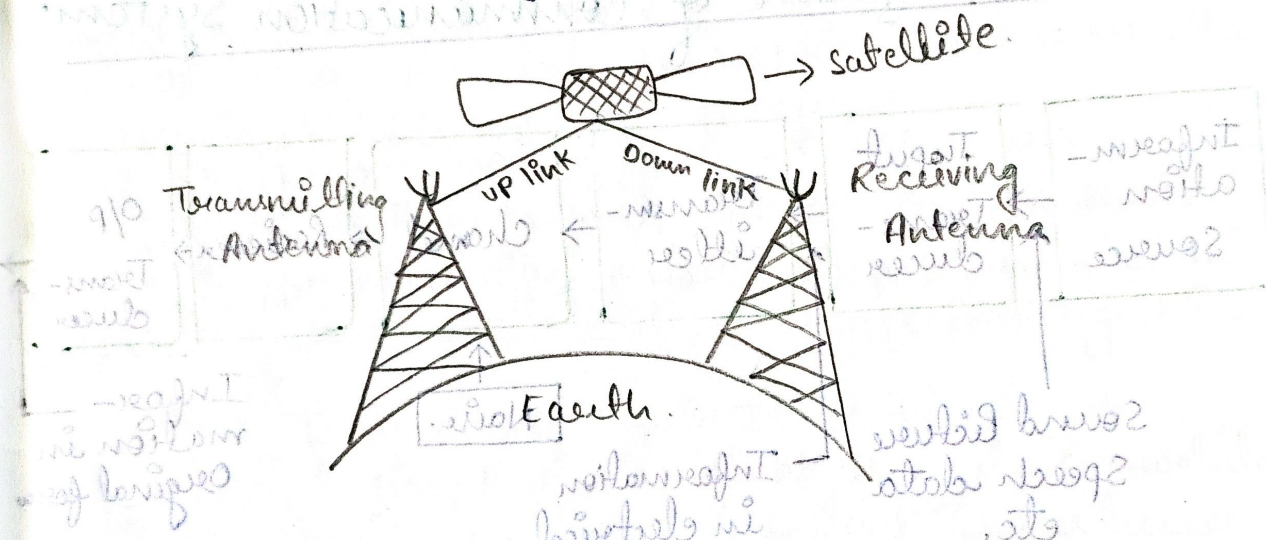


It is the mode of propagation in which the radio waves emitted from the transmitting antenna reach the receiving antenna through space as shown in fig. Frequency range 40 MHz to 42 GHz

The space wave travel in straight line from transmitting antenna to receiving antenna is line of sight. (LOS)

4) Satellite Propagation:-

It is the mode of propagation in which the information is transmitted from transmitter to receiver through satellite.



A beam of modulated microwave from transmitter is sent directly to the satellite is called up link. The satellite, which receives the coming signal, amplify it and return it to the receiving antenna is called downlink.

which converts the beam of energy into another form. When the message produce by the information source is not electronic