



Ground Reflected Waves

Space wave propagation, or line-of-sight propagation, is not necessarily smooth, as seen in the diagram. It signifies that this method of transmission may encounter impediments that cause signal attenuation or loss. To avoid these problems, the height of both the transmitting and receiving antennas, as well as the distance between them, must be adjusted. In this case, the formula below appears to be useful:

$$DM = (2RhT)^{-1/2} + (2RhR)^{-1/2}$$

where **DM** is the distance measured between the two antennas,

R is the radius of the earth,

hT is the height of the transmitting antenna, and

hR is the height of the receiving antenna.



Space Wave Propagation

Read more: [Questions on antenna sizing](#)

Space Wave Propagation Applications [\[Click Here for Sample Questions\]](#)

The propagation mode of space waves is used in a variety of communication systems, including:

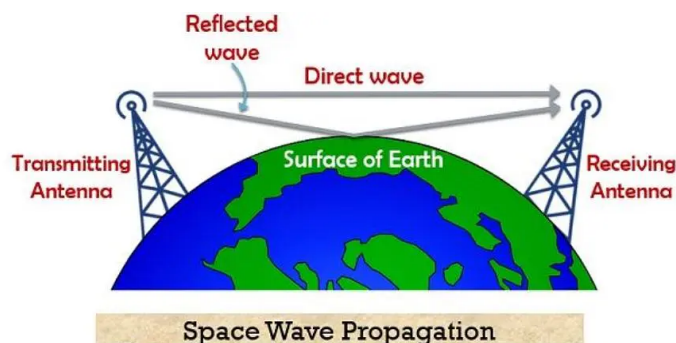
- Satellite communication
- Line-of-sight communication
- Radar communication
- Microwave Linking
- Television Broadcasting

Very high-frequency bands ranging from 30 MHz to 300 MHz, ultra-high frequency (UHF) bands, and microwaves all utilize space waves. Because both skywave and ground wave propagation fail at such high frequencies, this is the case.

These frequencies have smaller antennas that can be installed at heights of several wavelengths above the ground. The curvature of the earth blocks the waves here due to the line-of-sight aspect of this propagation. As a result, if one wishes to receive a signal from beyond the horizon, one must guarantee that the receiving antenna is tall enough to intercept line-of-sight waves.

The line of sight distance, which is defined as the distance between the transmitting and receiving antennas at which both can see one another, is the limit of space wave propagation. It's also known as the communication range, and it can be enhanced by raising the antennas' heights. Furthermore, the curvature of the globe has an impact on the propagation of space waves.





Process of Space Wave Propagation

Also Read: [Difference Between AM and FM](#)

Limitations of Space Wave Propagation [\[Click Here for Sample Questions\]](#)

The limitations of space wave propagation are:

- These waves are influenced by the earth's curvature.
- The propagation of these waves occurs along the line of sight distance, which is defined as the distance between the transmitting antenna and the receiving antenna and is also known as the range of communication.

Also Read: [space travel equipment](#)

Things to Remember [\[Click Here for Sample Questions\]](#)

- The behavior of radio waves as they spread from one location to another or into different areas of the atmosphere is known as radio wave propagation.
- Space wave propagation refers to radio waves that occur within 20 kilometers of the troposphere and includes both direct and reflected waves.
- When radio waves from a broadcasting antenna travel into space around the Earth to reach a receiving antenna, this is known as space wave propagation.
- Waves can propagate directly from the earth's surface to the troposphere's surface in tropospheric propagation.
- The waves travel in a straight line and cover the shortest distance possible in line-of-sight propagation. It indicates that the waves propagate to a point where they can be seen with the naked eye.
- The curvature of the earth and the straight path traveling nature of the space waves affect the space wave propagation.
- Line-of-sight communication, television broadcasting, and microwave connecting are all examples of applications that involve space wave propagation.

Check Out PYQs:

1. For plane electromagnetic waves propagating in the z direction, which one of the following...? [JEE 2015]
2. During the propagation of electromagnetic waves in a medium? [JEE 2014]
3. Consider an electromagnetic wave propagating in vacuum. Choose the correct...? [JEE 2016]
4. An EM wave from air enters a medium. The electric fields are...? [JEE 2018]
5. A plane polarized monochromatic EM wave is traveling in vacuum along z direction such that...? [JEE 2018]
6. A plane electromagnetic wave of wavelength λ has an intensity I. It is propagating along the positive...? [JEE 2018]
7. A plane electromagnetic wave in a non-magnetic dielectric medium is given by...? [JEE 2013]
8. A lamp emits monochromatic green light uniformly in all directions. The lamp is 3% efficient...? [JEE 2014]
9. A plane electromagnetic wave is propagating along the direction...? [JEE 2020]
10. A 27mW laser beam has a cross-sectional area of 10mm^2 . The magnitude of the maximum...? [JEE 2018]
11. The magnetic field of an electromagnetic wave is given by...? [JEE 2019]
12. Which of the following functions does not represent a stationary wave...? [KCET 2012]
13. Which of the following are the longest wavelength? [KCET 2019]
14. Which of the following establishes the transverse nature of electromagnetic waves? [JEE 2018]
15. A sound absorber attenuates the sound level by 20 dB. The intensity decreases by a factor of? [KEAM]
16. X-rays are not used for radar purposes, because they are not? [KEAM]
17. What is the name given to that part of the electromagnetic spectrum which is used for...? [KEAM]
18. Which of the following wave can't travel in vacuum? [KEAM]

