SNS COLLEGE OF TECHNOLOGY

Coimbatore – 35

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

19ECT311 / Wireless Communication

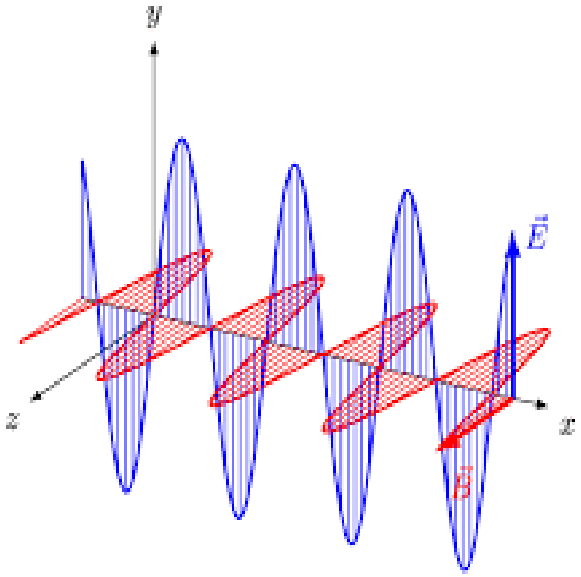
III ECE/ VI SEMESTER

Unit II - **MOBILE RADIO PROPAGATION**

Topic 2 : Three basic propagation mechanisms

GUESS?????? THE TOPIC

Radio Waves



- The term Radio waves are electromagnetic waves in the frequency range of 0.001 hertz to 10^{16} hertz
- Wavelength ranging from 3×10^{-8} m to 3×10^{11} m
- Radio waves comprises of both Electric and Magnetic fields

Classification of Radio Waves

Based on Frequency:

Band	Frequency range	Wavelength range
Extremely low frequency (ELF)	< 3 kHz	>100 km
Very low frequency (VLF)	3 - 30 Hz	10 - 100 krn
Low frequency(LF)	30 - 300 kHz	1 - 10 km
Medium frequency (MF)	300 kHz - 3 MHz	100m - 1km
High frequency (HF)	3 - 30 MHz	10 - 100m
Very high frequency (VHF)	30 - 300 MHz	1 - 10m
Ultra high frequency (UHF)	300 MHz - 3 GHz	10cm - 1m
Super high frequency (SHF)	3 - 30 GHz	1 - 10cm
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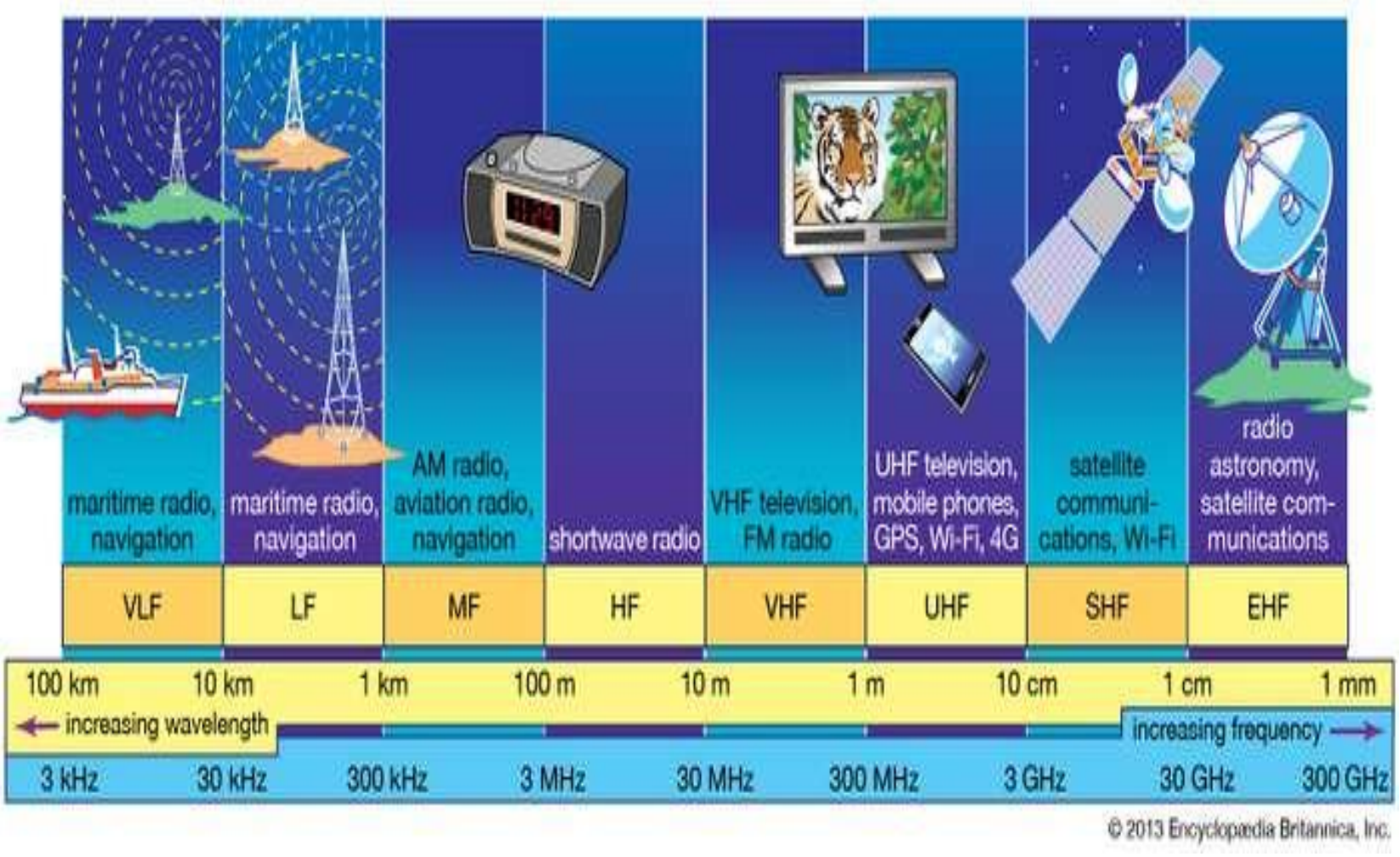
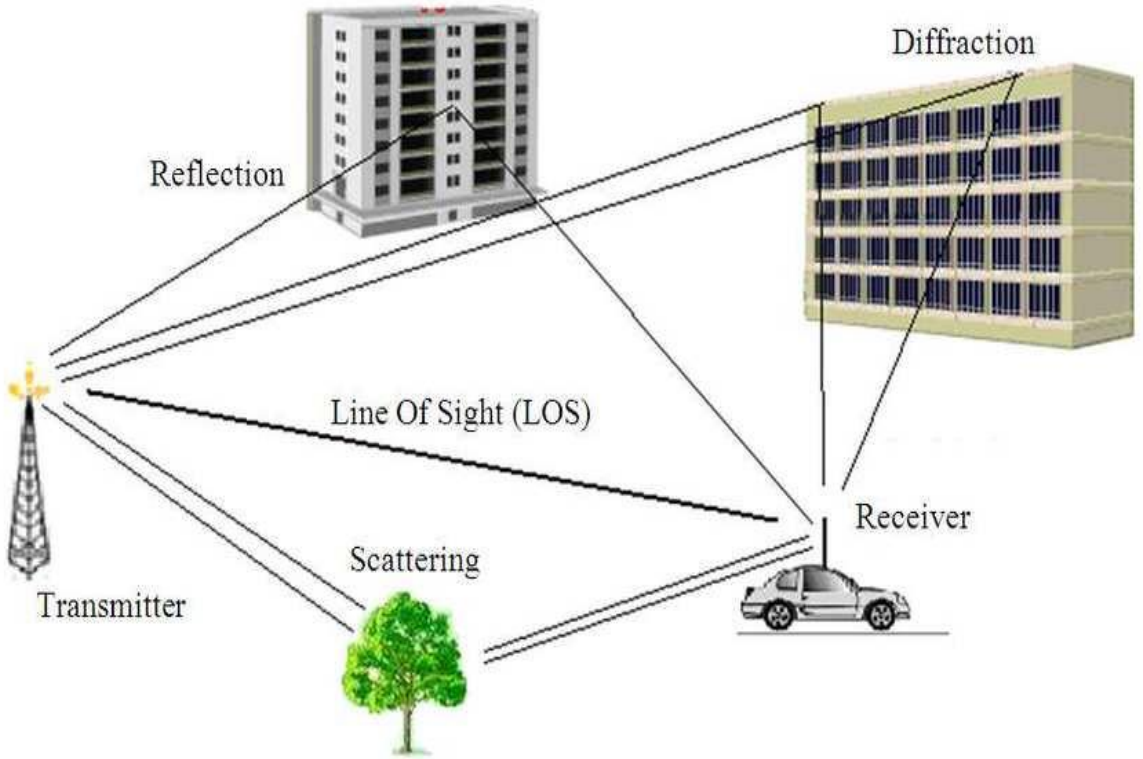
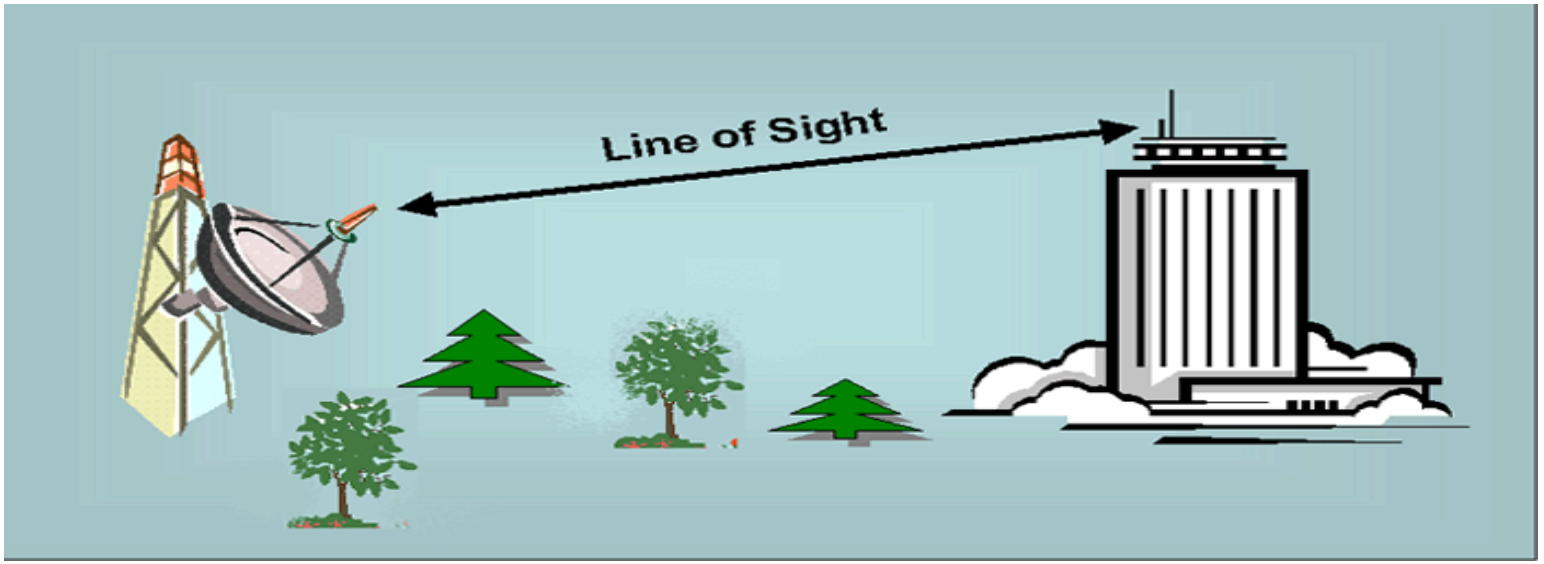


Propagation Mechanism

- LOS propagation
- Reflection
- Diffraction
- Scattering



Line of Sight Transmission



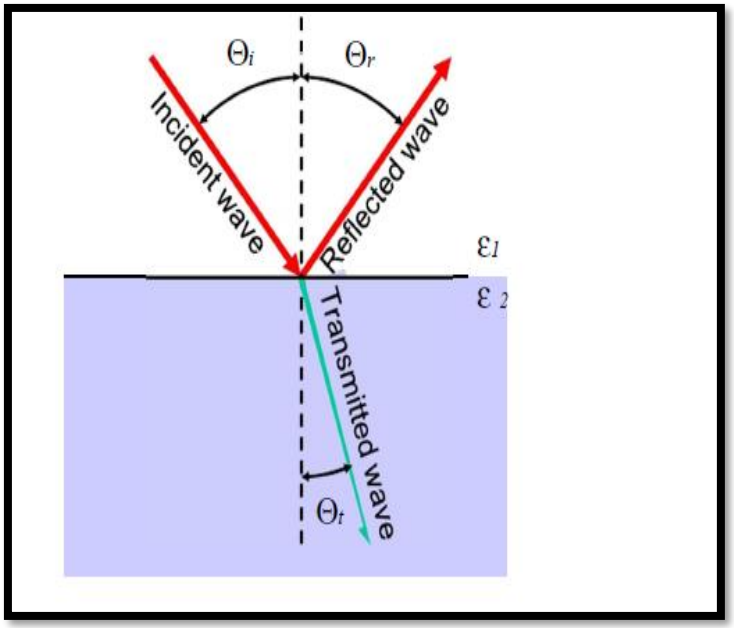
- Line of sight (LoS) is a type of propagation where transmit and receive stations are in view of each other
- Any sort of an obstacle does not exist between them
- FM radio, microwave and satellite transmission are examples of line-of-sight communication

ACTIVITY

Activity: Draw a logo which may describe your character or things you like.

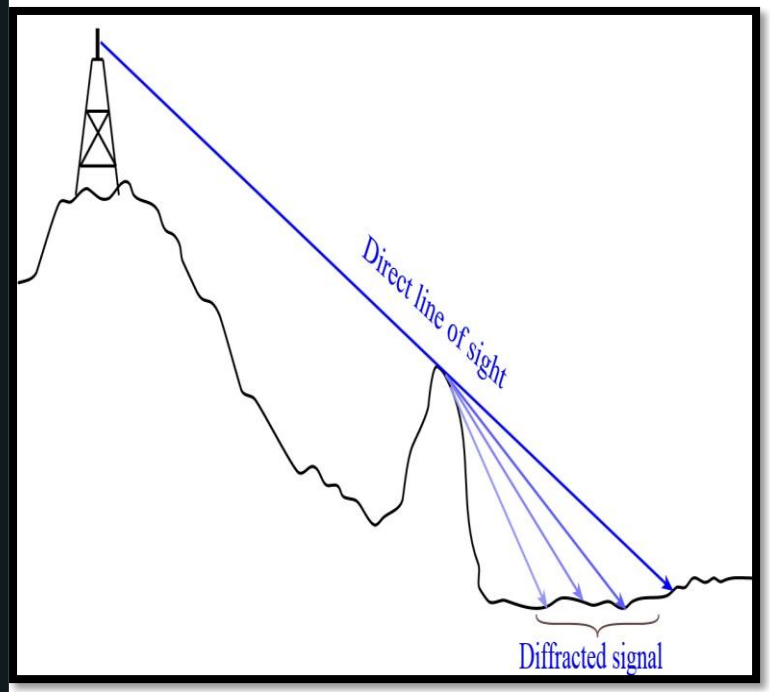
Reflection

- The abrupt change in direction of a wave front at an interface between two dissimilar media
- So, that the wave front returns into the medium from which it originated



- Reflection is the result of digital TV signal hitting on obstructions with properties (thickness, length) much larger than the wavelength of the radio wave (e.g. smooth surface of walls and hills/mountains)

Diffraction



- **Diffraction** occurs when the signal encounters an edge or a corner

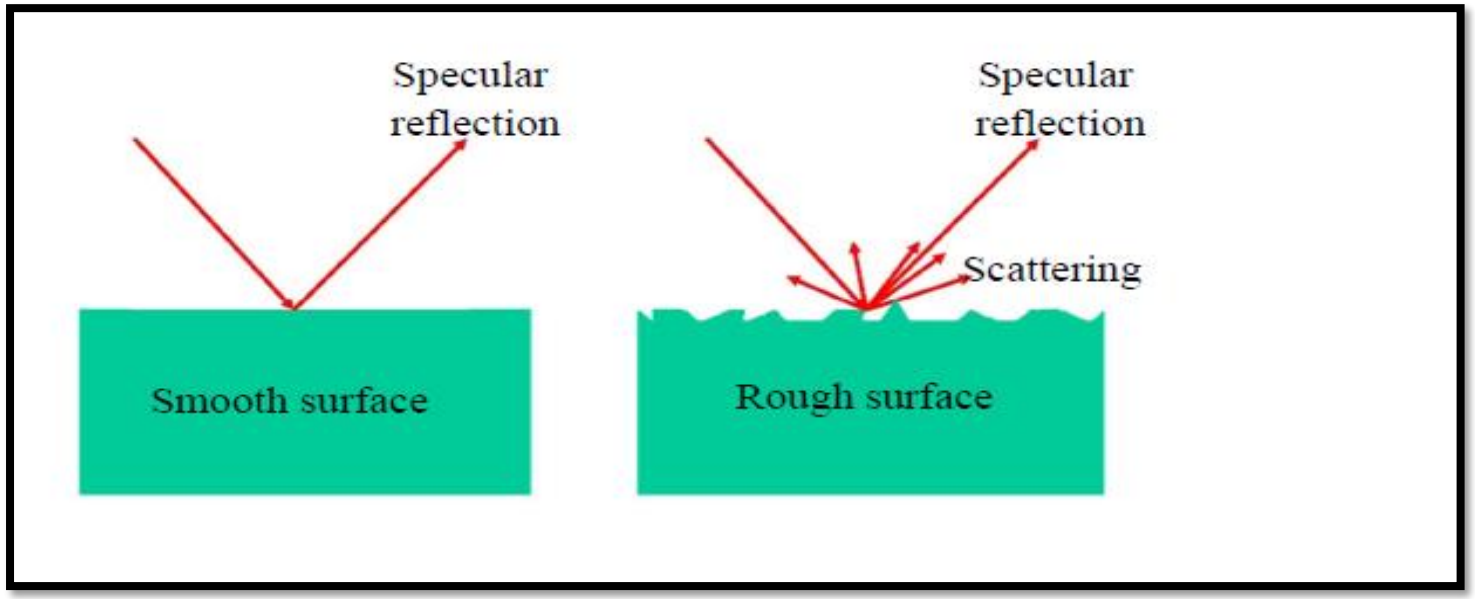
- Whose size is larger than the wavelength of the signal, e.g., an edge of building roofs and Mountain tops.

➢These act as secondary sources re-radiating into the shadow region.

➢It is due to the diffraction effect that radio frequency energy travels in dense urban environments where there is no clear Line-of-Sight between two antennas

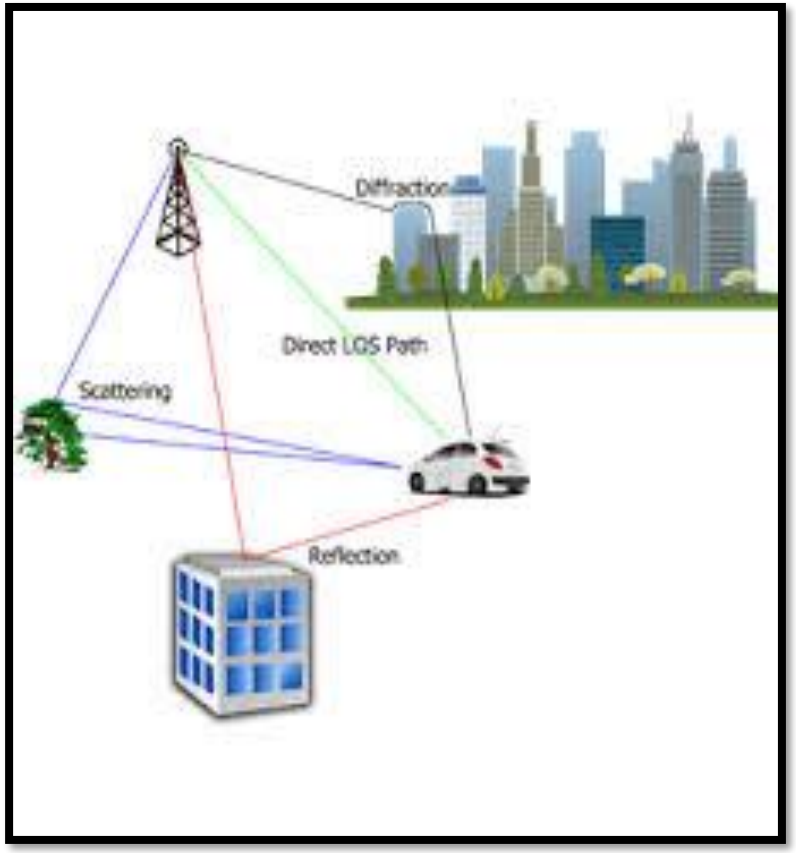
Scattering

- **Scattering** occurs when the signal encounters small objects of size smaller than the wavelength of the signal
- Results in a disordered or random change in the energy distribution



Multipath propagation

- Multipath propagation is that multiple copies of a signal propagation taking multiple paths, arrive at receiver at different times
- Signal received at a point affected by the **interaction of signals** propagated along multiple paths

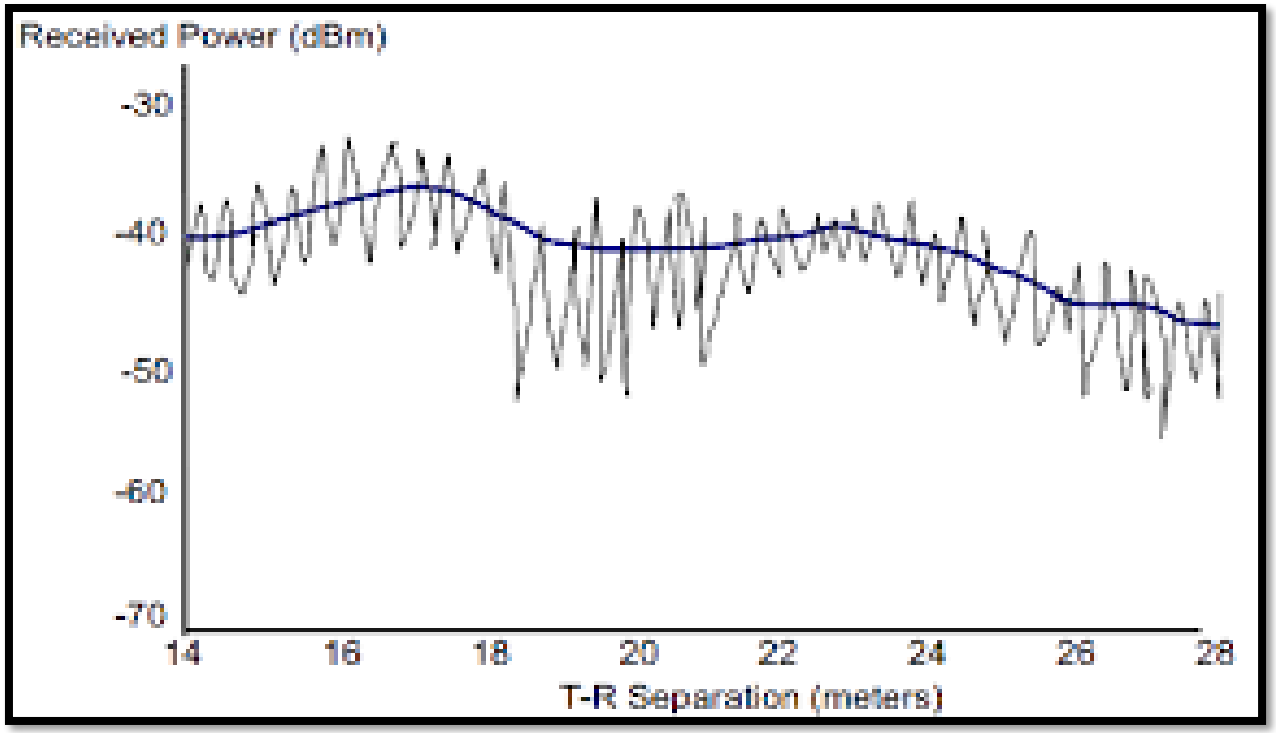


Small scale Fading

Small scale fading

• Small scale fading is concerned with rapid fluctuations of received signal strength over very short distance and short time period.

• It depends on propagation environment



Large scale Fading

Large scale fading

• Large scale fading occurs when an obstacle comes in between transmitter and receiver. It is related to large fluctuations of the signal over distance

• It includes path loss and shadowing effects

Assessment

- **1. The rainbow pattern seen on a CD is an example of**
  1. Reflection
  2. Refraction
  3. Diffraction
  4. None of the above
- **2. Fresnel Reflection Coefficient is a factor of**
  1. Polarization of the wave
  2. Properties of the material at which reflection occurs
  3. Angle of incidence of wave

  a. 1) and 2) are correct

  b. All the three are correct

  c. 1) and 3) are correct

  d. 2) and 3) are correct.

- **3. Diffraction, at high frequencies, depends upon**
  1. Geometry of the object
  2. Polarization of the incident wave
  3. Amplitude of the incident wave
  4. Frequency of the incident wave

  a. 1) and 2) are correct

  b. 1), 2) and 3) are correct

  c. 2) and 3) are correct

  d. All are correct