Wireless Communication HW4

User Blast

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Contents

1 Problem 1

$$A_e = \text{effective area}$$
$$f = \text{frequency}$$
$$c = \text{speed of light}$$

2 Problem 2

1. Slow fading vs Fast fading Fast fading means the change of attenuation is very fast in a time unit. Slow fading means the change of attenuation is slow in a time unit.

2. Diffraction vs scattering Diffraction is wave change it's propagating direction when facing impenetrate object whose size is large than wavelength. Scattering is wave change it's propagating direction when facing impenetrate object whose size is same of less than wavelength.

3. Flat fading vs selective fading Flat fading means the change of attenuation is almost zero for every frequency components. Selective fading means the change of attenuation is huge for every frequency components.

3 Problem 3

1. Thermal Noise Noise that cause by agitation of electrons.
2. Intermodulation Noise Noise cause by multiple signals of different frequency pass through same medium and add up to create a new frequency component as a new noise.
3. Crosstalk Noise cause by same frequency but different sender. The receiver receive wrong signal send by others.
4. Impluse Noise Noise cause by some impulse that is from other source like lightening or hammer

4 Problem 4

1. Wave length:
$$\lambda = \frac{c}{f} = \frac{3 * 10^8}{300} = 10^6 m$$
Half wave length long:
$$\frac{\lambda}{2} = \frac{10^6}{2} = 5 * 10^5 m$$
2. Wave legth:
$$(\frac{\lambda}{2}) * 2 = 3 * 2 = 6m$$
Frequency:
$$\frac{c}{\lambda} = \frac{3 * 10^8}{6} = 5 * 10^7 Hz$$

5 Problem 5

$$d = 3.57\sqrt{Kh}$$
$$h = \frac{(\frac{d}{3.57})^2}{K} = \frac{(28.0112)^2}{K} = \frac{784.62757}{K} = 1046.1701m$$

6 Problem 6

1. Thermal Noise

$$N = kTB = 1.38*10^{-23}*(17+273.15)*30*10^{3} = 1.38*10^{-20}*290.15*30$$

$$= 12012.210 * 10^{-20} = 1.2012 * 10^{-16}W$$

Compare with the operating power, the Thermal noise is much smaller than operating power.