

Unit 7 - Week 6 - Wide Sense Stationary Uncorrelated Scattering (WSSUS) Channel Model

Course outline

How to access the portal

Overview of Cellular Evolution and Wireless Technologies

Wireless Propagation and Cellular Concepts

Cellular System Design, Capacity, Handoff, and Outage

Week 4 - Multipath Fading Environment

Week 5 - BER Performance in Fading Channels

Week 6 - Wide Sense Stationary Uncorrelated Scattering (WSSUS) Channel Model

● MGF Part II, WSSUS Model

○ WSSUS Part II, Coherence Time, Doppler Spectrum

○ Doppler, Temporal Characteristics of Fading Channels

○ WSSUS – Characterization of Time Dispersive Fading Channels

○ WSSUS – Classification of Fading Channels

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○ Week 6 Feedback : Introduction to Wireless and Cellular Communications

● Assignment 6 Solutions

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Week 7 - Computer simulation of Rayleigh fading, Antenna Diversity

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Week 10 - Introduction to CDMA

Week 11 - CDMA Receivers

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Text Transcription

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Assignment 6

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2019-09-11, 23:59 IST.

1) Consider two users U1 and U2. U1 is travelling in a car at a high speed while U2 is a pedestrian walking much slower than U1. Which user will experience a more highly correlated channel? **1 point**

- U1
 U2
 Both U1 and U2 will experience same channel
 None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
U2

2) Which of the following statements is true? **1 point**

- In high Doppler condition, frequency hopping gives better performance
 Large interleaver size is required for channels with high coherence time
 Both (a) and (b)
 None of these

No, the answer is incorrect.
Score: 0

Accepted Answers:
Large interleaver size is required for channels with high coherence time

3) Let the probability of error in AWGN for a particular modulation type be defined as: **1 point**

$$P_{e,AWGN} = 4e^{-\gamma}$$

where γ is the instantaneous SNR. What will be the probability of error in Rayleigh fading channel with average SNR ($\bar{\gamma}$) = 16 dB

- 0.10
 0.24
 0.35
 0.48

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.10

(Consider this for Questions 4 to 9): Consider a GSM system with channel bandwidth of 200 kHz operating across 10 MHz spectrum. Communication is happening using 2 GHz carrier.

4) A vehicle is moving at 72 kmph. Find the approx. coherence time of the channel. **1 point**

- 967 us
 470 us
 1.34 ms
 2.20 ms

No, the answer is incorrect.
Score: 0

Accepted Answers:
1.34 ms

5) Find the approximate spectral widening at the receiver? (Assume single tap Rayleigh fading channel) **1 point**

- 267 Hz
 370 Hz
 133 Hz
 400 Hz

No, the answer is incorrect.
Score: 0

Accepted Answers:
267 Hz

6) It is decided to incorporate Frequency hopping into the system. Find the hop rate to avoid fades. (Assume there is at least one good GSM channel at any instant of time) **1 point**

- 1034 per second
 517 per second
 640 per second
 745 per second

No, the answer is incorrect.
Score: 0

Accepted Answers:
745 per second

7) Find the maximum number of fades per second that can occur using the expression for N_f . **1 point**

- 178
 112
 143
 199

No, the answer is incorrect.
Score: 0

Accepted Answers:
143

8) If V_{rms} is set as the threshold then find the expected fade duration. **1 point**

- 2.6 ms
 2.6 μ s
 5.1 ms
 5.1 μ s

No, the answer is incorrect.
Score: 0

Accepted Answers:
5.1 ms

9) If a user is assigned a time slot and V_{rms} is set as the threshold, find the approximate throughput per user. Given that the max. data throughput per timeslot in GSM is 22.8 kbps. **1 point**

- 4.84 kbps
 6.23 kbps
 14.41 kbps
 8.39 kbps

No, the answer is incorrect.
Score: 0

Accepted Answers:
8.39 kbps

(Consider this for Questions 10 to 13): The Power - delay profile for a channel is defined below.

Delay(μs)	0	3.2	6.4	9.6	12.8	16
Power(dB)	0	-3	-6	-9	-6	-3

10) Calculate the mean delay in microseconds. **1 point**

- 8.54
 5.94
 5.61
 7.64

No, the answer is incorrect.
Score: 0

Accepted Answers:
5.94

11) Calculate the RMS delay spread in microseconds. **1 point**

- 4.23
 5.64
 6.27
 7.54

No, the answer is incorrect.
Score: 0

Accepted Answers:
6.27

12) Calculate the minimum coherence bandwidth in kHz. **1 point**

- 15.43
 31.89
 17.25
 27.65

No, the answer is incorrect.
Score: 0

Accepted Answers:
31.89

13) For which of the following symbol rates is an equalizer required? **1 point**

- 23.4 Ksymbols/sec
 35.1 Ksymbols/sec
 13.4 Ksymbols/sec
 Both (a) and (b)

No, the answer is incorrect.
Score: 0

Accepted Answers:
Both (a) and (b)

14) What does the term 'Doubly Selective Channel' imply? **1 point**

- Time-varying, Frequency selective channel
 Time-varying, Frequency flat channel
 Time flat, Frequency flat channel
 Time flat, Frequency selective channel

No, the answer is incorrect.
Score: 0

Accepted Answers:
Time-varying, Frequency selective channel

15) Consider a channel with coherence time $T_c = 2.12$ ms and coherence bandwidth $B_c = 15$ KHz. How would the channel appear to a signal with bandwidth of 20 KHz and symbol rate = 50 Ksymbols/sec? **1 point**

- Frequency selective, fast fading
 Frequency selective, slow fading
 Frequency flat, fast fading
 Frequency flat, slow fading

No, the answer is incorrect.
Score: 0

Accepted Answers:
Frequency selective, slow fading

16) GSM is designed for 900 MHz carrier and vehicular speeds of up to 250 Km/hr with an V_{rms} delay spread (σ_τ) = 15 μ s. The symbol duration is 3.7 μ s and duration of a time slot is 577 μ s. **1 point**

Statement 1: GSM is a slow fading, frequency selective cellular system.

Statement 2: Channel estimation and tracking is essential when the duration of demodulation exceeds coherence time.

State whether the above statements are True/False respectively.

- True, False
 False, True
 True, True
 False, False

No, the answer is incorrect.
Score: 0

Accepted Answers:
True, True