

ELEX 7860 : Wireless System Design
2024 Winter Term

Quiz 1

8:30 – 9:20

Monday, January 22, 2024

SW05-2895

This exam paper is for:

Paper, Test 1 A00123456

Each exam is equally difficult.

Answer your own exam.

Do not start until you are told to do so.

Name: _____

BCIT ID: _____

Signature: _____

Question 1**4 marks**

- (a) You measure the power of a Rayleigh fading signal three times and find the power levels are -16 dBm, -10 dBm, and -13 dBm. What would be a reasonable estimate of the mean power of the signal? Give your answer in dBm.¹
- (b) For the signal described above, what fraction of the time would you expect the signal level to be less than -33 dBm?

Question 2**3 marks**

A receiver is moving in a propagation environment that approximates Clarke's model for fading. The noise level is constant and the average signal-to-noise ratio (SNR) is 23 dB. The receiver outputs a noise pulse each time the SNR drops below 3 dB. You find that these pulses happen at an average rate of 10 per second. If the carrier frequency is 100 MHz, how fast is the receiver moving? Give your answer in km/h.

Question 3**4 marks**

You are setting up a point-to-point (line of sight) WLAN link operating over a distance of 1 km at a frequency of 2.4 GHz. The WLAN transceivers require a received signal level of -50 dBm to ensure adequate performance. At each end of the link you are using antennas with gains of 16 dBi. How much power do you need to transmit to achieve the required performance? Give your answer in dBm.

¹Hint: it would be unusual to add values given in dBm.

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Question 1**4 marks**

- (a) You measure the power of a Rayleigh fading signal three times and find the power levels are -16 dBm, -10 dBm, and -13 dBm. What would be a reasonable estimate of the mean power of the signal? Give your answer in dBm.¹
- (b) For the signal described above, what fraction of the time would you expect the signal level to be less than -33 dBm?

Question 2**3 marks**

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