1. Enumerate the main changes on the physical layer to fulfill the V2X-requirements
2. List the main changes on the MAC layer
3. What is the motivation behind the operation mode *outside-the-context of BSS*?
4. Explain briefly the advantages of doubling timing parameters on the physical layer
5. What is the main drawback of increasing a frame duration in time domain?
6. What is the delay spread?
7. What is the source of fast fading?
8. List the four wave propagation characteristics specific to V2X communication
9. When does scattering occur?
10. What is multipath propagation?
11. How does increasing the symbol length affect the communication performance?
12. What are the advantages of Orthogonal Frequency-Division Multiplexing (OFDM)?
13. How does OFDM deals with subcarriers overlaps?
14. What are the factors that cause inter-symbol interference (ISI)?
15. What is the role of the preamble?
16. What is the content of the physical layer convergence procedure (PLCP)
17. List the sequences during frame reception
18. How does frame body capture effect works?
19. How does frame body capture effect reduces the impact of hidden terminal?
20. What is a channel propagation model?
21. Briefly provide two approaches for channel modeling
22. What is the difference between NLOS and OLOS?
23. Briefly present the Two-Ray interference model
24. Derive the phase difference as well as the angle of incidence of the Two-Ray interference model
25. What is the motivation of providing an approximation of Two-Ray interference model?
26. Briefly present the 3D Ray-optical channel model

27. What are the limitations of 3D Ray-optical channel model?

28. Briefly present the log-normal channel model

29. Consider the following vehicular network topology shown in Figure 1 where vehicles B, C and D broadcast their frames with a transmission power $P_t = 23$ dBm at the frequency $f = 5.9$ GHz. For the path loss calculation between stations, assume a free space channel model with a path loss exponent of $\alpha = 2.0$.

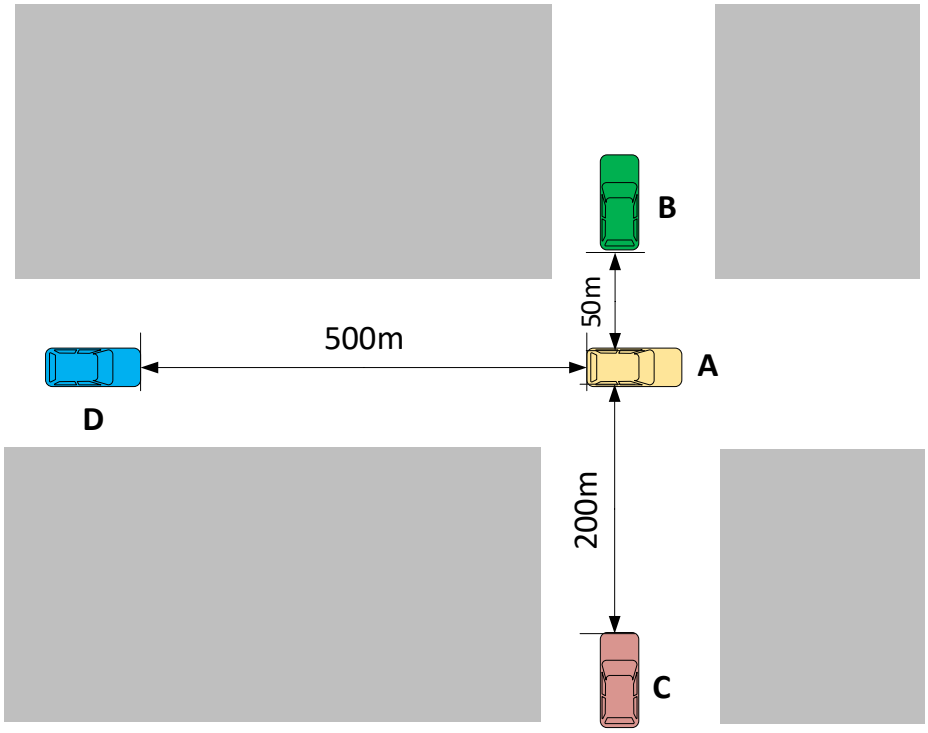

Figure 1: An intersection scenario

(a) The broadcasting vehicles transmit at different times without frame overlaps at any receiver. Calculate the received power $P_{r,B}$, $P_{r,C}$, and $P_{r,D}$ in dBm at the receiving vehicle A. Assume transmitter/receiver .antenna gain $G_t = G_r = 0$ dBi

(b) Now assume that vehicles B and C transmit simultaneously their respective frames B and C which overlap at the receiving vehicle A.

i. Calculate the signal interference noise ratio (SINR) of each frame considering a noise power $N_0 = -100$ dBm

ii. How does the frame body capture help in such a situation?