System Parameters

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Parameter	Value
Carrier frequency	PC5 LTE-V2X and DSRC: 5.9 GHz
System bandwidth	10 MHz
Modulation and coding	PC5 LTE-V2X and DSRC: QPSK and ~1/2-rate
Tx power	20 dBm (PC5 LTE-V2X: +3dB offset for PSCCH RB compared with PSSCH RB)
Antenna height (UE)	1.5 m
Antenna gain	0 dBi for Tx and Rx (omni 2D)
# of antennas	Tx: 1, Rx: 2 (with MRC)
Noise figure	9 dB
PHY payload size	LTE-V2X: 300 Byte, DSRC: 317 byte
Message generation	Every 100 ms (default)
Packet discard timer	100 ms
Congestion Control	PC5 LTE-V2X: With and without table-based congestion control DSRC: With LIMERIC (with/without information sharing)
Retransmission	PC5 LTE-V2X: without retransmission DSRC: without retransmission
Size of PSCCH (for SA) and PSSCH (for data)	DSRC: N/A PC5 LTE-V2X: 2 PRB/subframe (for PSCCH) and 23 PRB/subframe (for PSSCH)
Resource Reservation Interval	DSRC: N/A PC5 LTE-V2X: Range in 100, 200, …, 900, 1000ms (interval is dynamically changed according to congestion control)

SA: Scheduling Assignment
MRC: Maximum Ratio Combining
DCC: Decentralized Congestion Control
LIMERIC: LInear MEssage Rate Integrated Control

Mobility Scenarios

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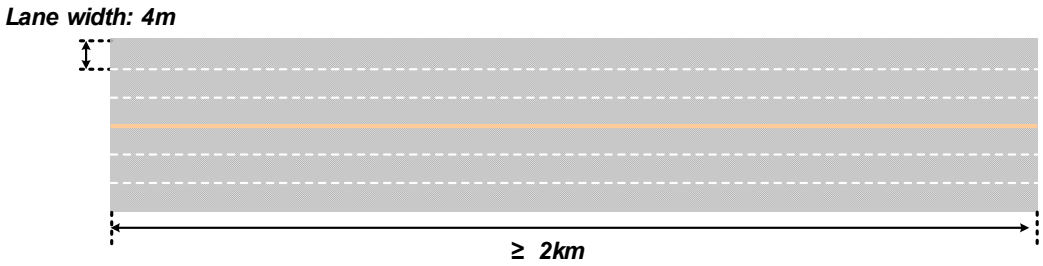
Freeway



Parameter	Freeway case
Number of lanes	3 in each direction (6 lanes in total in the freeway)
Lane width	4 m
Road grid size by the distance between intersections	N/A
Simulation area size	Freeway length >= 2000 m. Wrap around should be applied to the simulation area.
Vehicle density	Average inter-vehicle distance in the same lane is 2.5 sec * absolute vehicle speed. Baseline: The same density/speed in all the lanes in one simulation.
Absolute vehicle speed	140 km/h, 70 km/h, [15] km/h (new), [7.5] km/h (new)

Source: 3GPP TR36.885

These scenarios are not included in 3GPP TR36.886 but added for our simulation for congestion control evaluation.

Channel Model

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- We evaluate the performance in the following V2V channel model based on ITU-R P1411 path loss model
  - Because WINNER II path loss model used in 3GPP V2V model is severe, compared with measurement results in 5.9GHz DSRC.

Parameter	Freeway case
Pathloss model	ITU-R P1411-8 LOS Model (Eq. (5) in [1])
Shadowing distribution	Log-normal
Shadowing standard deviation	3 dB
Decorrelation distance	25 m
Fast fading	NLOS in Section A.2.1.2.1.1 or A.2.1.2.1.2 in [2] with fixed large scale parameters during the simulation.

Same as
3GPP V2V channel model

[1] ITU-R P.1411-8 : Propagation data and prediction methods for the planning of short-range outdoor radiocommunication systems and radio local area networks in the frequency range 300 MHz to 100 GHz
[2] 3GPP TR 36.843: "Study on LTE Device to Device Proximity Services"