[104-e-NR-R17-SL-03] Email discussion on 8.11.2 (remaining issues for sidelink evaluation methodology update for power saving) – Teng (CATT)

* 1st check point: Jan 28
* 2nd check point: Feb 3

# Introduction

This feature lead summary document captures the issues discussed on NR sidelink evaluation methodology update for power saving and other issues in AI 8.11.2 based on the submitted contributions [1]-[10].

Based on the submitted contributions and the discussion during last meeting, the issues are categorized as follows:

* **TOP priority**: 3 evaluation legacy issues are prioritized to be discussed/finished within this meeting. **Discuss and finish in this meeting.**
* **Medium priority**: 7 evaluation legacy issues are not so critical or large impact on SL evaluation performance. **No plan to be discussed.**
* **Low priority**: The rest issues are considered as low impact on SL evaluation, or non-evaluation issues that **are not discussed under this AI**.

# Issue list

**TOP priority (Discussion and determination)**

* Evaluation methodology legacy issues
  + 1.1.1 Reference system deployments for Commercial use cases
  + 1.1.2 Traffic models for Public Safety use cases
  + 1.1.3 Traffic models for Commercial use cases

**Medium priority (No plan to discussion)**

* Evaluation methodology legacy issues
  + 1.1.4 Simulation profiles for Public Safety use cases
  + 1.2.1 Traffic models for V2V/V2P/P2V
  + 1.2.2 Tx-Rx association for unicast and groupcast
  + 1.2.3 Definition of different profiles for P2V/V2P/V2V
  + 1.3.1 Combinations of Tx/Rx states and channels
  + 1.3.2 Modulation order clarification
  + 1.3.3 Tx power alignment among UEs

**Low priority**

* Evaluation methodology legacy issues **(No discussion)**
  + 1.1.5 Channel models for Public Safety use cases
  + 1.2.4 Other channel models for V2X
  + 1.2.5 Traffic models for P2P
  + 1.2.6 PUE hypothetical direction selection
  + 1.3.4 Power control
  + 1.3.5 Power consumption model for Public Safety use cases
* Non-evaluation issues **(No discussion)**
* 1.4.1 Re-evaluation and pre-emption in power saving
* 1.4.2 DRX related issues
* 1.4.3 Multi-carrier operation
* 1.4.4 SL relay

# Summary of contributions and FL proposals

## Sidelink evaluation methodology for Public safety/Commercial use cases

### **Reference system deployments for Commercial use cases**

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| **FL’s proposal in RAN1#103-e:**   * + - * For commercial use case, at least following layout option is supported:   + Option 3 of TR 36.843: Urban macro (500m ISD) (all UEs outdoor) * UE dropping as in Table A.2.1.1-1   + - All UEs are outdoors UEs   + Option 1: Urban macro (500m ISD) + 1 RRH/Indoor Hotzone per cell * UE dropping as in Table A.2.1.1-1   + - Mix of outdoor and indoor UEs |

3 contributions discuss this issue on the deployment for commercial use case. 1 company [OPPO] proposes to not evaluate the interaction links between indoor UEs and outdoor UEs. 1 company [LGE] proposes to agree the FL’s proposal in last meeting because it is simple for commercial use case reusing layouts for general scenarios specified in TR 36.843. 1 company [Xiaomi] proposes to use option 1 with mixture of indoor and outdoor UEs as a mandatory deployment.

**[FL]** By checking the discussion during last meeting, some companies supported option 3 as mandatory, because all outdoor UEs dropping deployment is considered as baseline for both public safety and commercial use cases. However, some other companies proposed to consider indoor UEs in option 1 because of practical scenarios in commercial use cases.

***FL Proposal:***

* *For commercial use case, at least following layout option is supported:*
  + *Option 3 of TR 36.843: Urban macro (500m ISD) (all UEs outdoor)* 
    - *UE dropping as in Table A.2.1.1-1*
      * *All UEs are outdoors UEs*
  + *Option 1: Urban macro (500m ISD) + 1 RRH/Indoor Hotzone per cell for optional*
    - *UE dropping as in Table A.2.1.1-1*
      * *Mix of outdoor and indoor UEs*

**Round 1 comments 1/26-1/27**

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| **Company** | **Views** |
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**Contribution Proposals:**

[OPPO]

* Proposal 2: For commercial use case, the following layout options are supported:
  + Option 3 of TR 36.843: Urban macro (500m ISD) (all UEs outdoor)
    - UE dropping as in Table A.2.1.1-1
      * All UEs are outdoors UEs
  + **The 2-site indoor layout in TR 36.873 ought to be considered as an optional layout**

[LGE]

* Proposal 1: For commercial use case, at least following layout option is supported:
  + Option 3 of TR 36.843: Urban macro (500m ISD) (all UEs outdoor)
    - UE dropping as in Table A.2.1.1-1
    - All UEs are outdoors UEs
  + Option 1: Urban macro (500m ISD) + 1 RRH/Indoor Hotzone per cell
    - UE dropping as in Table A.2.1.1-1
    - Mix of outdoor and indoor UEs

[Xiaomi]

* Proposal 1: For commercial use case evaluation, Urban macro (500m ISD) with mix of indoor and outdoor UE dropping are assumed.

### **Traffic models for Public Safety use cases**

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| **Options in RAN1#103-e:**   * Option 1: Full buffer model specified in TR36.843. * Option 2: VoIP model specified in TR36.843. * Option 3: FTP2 model specified in TR36.843. * Option 4: FTP model 3 with packet size of 0.5Mbytes and mean inter-arrival time of 200ms. * Option 5: FTP model 3 with packet size of 0.1Mbytes and mean inter-arrival time of 2s. * Option 6: Periodic traffic model 2 specified in TR 37.885 * Option 7: Periodic traffic model 3 specified in TR 37.885 * Option 8: Periodic traffic model with 200Kbits per packet, packet arrival time = 16.6ms, with 30ms latency requirement. * Option 9: VoIP model specified in TR36.843 with change of the value of outage definition into 0.01 and with packet delay budget of 75 ms. * Option 10: Others (please specify it)   **FL’s proposal in RAN1#103-e:**   * For public safety use case, at least following option is supported for traffic model:   + Option 2: VoIP model specified in TR 36.843.   + Option 7: Periodic traffic model 3 specified in TR 37.885   + Option 9: VoIP model specified in TR36.843 with change of the value of outage definition into 0.01 and with packet delay budget of 75 ms. |

6 contributions discuss about the legacy issue on traffic models for Public Safety use cases based on the options provided in during last meeting. According to these contributions, Option 4 is proposed to be added which considers typical services, e.g. MC PTT, MC Video and MC Data services.

**[FL]** By checking the discussion during last meeting,

* Option 2 from TR 36.843 is relative to voice service and FTP model 2. The outage definition is 0.02, and the PDB is 200ms.
* Option 9 was proposed based on option 2 to cover MC PTT voice communication. Option 2 cannot reflect the requirements of current Public Safety/commercial use cases, and the data rate of VoIP (Opt. 2) is too low to support potential use cases for public safety use cases. To reach the target, the parameters in TS 23.501 are used to update the parameters in option 2, i.e. outage of 0.01 and PDB of 75ms.
* Option 4 was supported to reflect more typical services, e.g. Mission Critical (MC) Data services and MC Video.
* Option 7 was supported large data rate scenarios, e.g. MC Video.

Table 1.1.2-1 Parameters for different traffic models from TR 36.843/TR 38.840/TR 37.885

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Packet size** | **Inter-packet arrival** | **PDB** | **Outage** |
| **Option 2** |  |  | 200ms | 2% |
| **Option 9** |  |  | 75ms | 1% |
| **Option 4** | 0.5Mbytes | 200ms |  |  |
| **Option 6** | 1.2Kbytes (20%), 0.8Kbytes (80%) | 10ms | 10ms |  |
| **Option 7** | 0.03Mbytes – 0.06Mbytes | 30ms | 30ms |  |

Table 1.1.2-2 Requirements for Mission Critical from TS 23.203/TS 22.281

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| --- | --- | --- | --- | --- |
|  | **Latency** | **Reliability (PER)** | **Data Rate** | **Traffic characteristic** |
| **MC PTT** | 75ms | 10-2 | 10-32Kbps | Periodic at 20ms interval |
| **MC Data** | 200ms | 10-6 | 10Kbps-1Mbps | MBB like |
| **MC video** | 30-100ms | 10-3 | 0.15Mbps-5Mbps | Periodic at 30-60 fps |

***FL Proposal:***

* *For public safety use case, at least the following options are supported for traffic model:*
  + *Option 2: VoIP model specified in TR 36.843*
  + *Option 4: FTP model 3 in TR 38.840 with packet size of 0.5Mbytes and mean inter-arrival time of 200ms*
  + *Option 7: Periodic traffic model 3 specified in TR 37.885*
  + *Option 9: VoIP model specified in TR36.843 with change of the value of outage definition into 0.01 and with packet delay budget of 75 ms*

**Round 1 comments 1/26-1/27**

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| **Company** | **Views** |
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**Contribution Proposals:**

[OPPO]

* Proposal 1: For public safety use case, the following options are supported for traffic model:
  + Option 2: VoIP model specified in TR 36.843.
  + Option 4: FTP model 3 with packet size of 0.5Mbytes and mean inter-arrival time of 200ms
  + Option 7: Periodic traffic model 3 specified in TR 37.885
  + Option 9: VoIP model specified in TR36.843 with change of the value of outage definition into 0.01 and with packet delay budget of 75 ms.

[vivo]

* Proposal 1. For the public safety scenario, the traffic model defined in TR36.843 can be reused.

[LGE]

* Proposal 2: For public safety use case, at least following option is supported for traffic model:
  + Option 2: VoIP model specified in TR 36.843.
  + Option 7: Periodic traffic model 3 specified in TR 37.885
  + Option 9: VoIP model specified in TR36.843 with change of the value of outage definition into 0.01 and with packet delay budget of 75 ms.

[Ericsson]

* Update traffic models in TR 37.885 with the following:
  + VoIP traffic model for MCPTT service: reuse Table A.2.1.3-1: Parameters for VoIP model in TR 36.843,
  + FTP and instant message traffic model for MC Data service: reuse FTP model 3 traffic with parameters as defined in TR 38.840, Section 8.2.
  + Use periodic traffic model 2 and 3 in TR 37.885 for MC Video services.

[InterDigital]

* Proposal 5: Update traffic model in TR 37.885:
  + VoIP traffic model for MC PTT service – utilize VoIP model in TR 36.843.

[Xiaomi]

* Propose 3: For public safety use case, VoIP traffic model is supported.

### **Traffic models for Commercial use cases**

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| Agreements: RAN1#103-e   * For commercial use case, at least following option is supported for traffic model: * Option 7: Periodic traffic model 3 specified in TR 37.885 |

1 contribution proposes additionally support Option 4 (FTP model 3 in TR 38.840) as traffic model by considering MC data services in commercial use cases.

***FL Proposal:***

* *For commercial use case, the following option is supported for traffic model:*
  + *Option 4: FTP model 3 in TR 38.840 with packet size of 0.5Mbytes and mean inter-arrival time of 200ms*

**Round 1 comments 1/26-1/27**

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**Contribution Proposals:**

[Xiaomi]

* Proposal 2: For commercial use case, FTP model 3 with packet size of 0.5Mbytes and mean inter-arrival time of 200ms is also supported.

### **Simulation profiles for Public Safety use cases**

1 company proposes to create a simulation profile for Public Safety use cases, because updates and additions are introduced. A specific simulation profile for PS would more appropriate and clear.

**[FL]** It is reasonable to have a separate simulation profile for Public Safety use cases. I would like to suggest that the proponents may provide a draft simulation profile for Public Safety use cases for further discussion.

***FL Proposal:***

* *A simulation profile for Public Safety use cases can be created.*

**Contribution Proposals:**

[Ericsson]

* Proposal 7: Create a simulation profile for PS use cases based on the above updates and power consumption models

### **Channel models for Public Safety use cases**

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| Agreements: RAN1#103-e   * For the public safety and commercial use cases, reuse the parameters of “Channel models” specified in Section A.2.1.2 of TR 36.843 with following modification: * Each component of channel model reuses what is specified in TR 38.901. |

1 contribution discusses on the channel model for Public Safety use cases. The current TR 37.885 captures only V2V channel models, but D2D channel models are more suitable for Public Safety scenarios due to the lower mobility of the users compared with V2V scenarios.

**[FL] It is agreed on the channel model for Public Safety use cases in last meeting. It is suggested doing the evaluation by following the above agreements.**

**Contribution Proposals:**

[Ericsson]

* Proposal 5: Update Section 6.2 – Channel model in TR37.885 with PL and Shadowing models specified in Appendix A of TR 36.843 and reuse fast fading model in TR 37.885 for PS use cases.
* Proposal 6: For LLS of PS use cases, reuse CDL models for Urban LOS and Urban NLOS in TR 37.885.

## Sidelink evaluation methodology for V2V/V2P/P2V/P2P

### **Traffic models for V2V/V2P/P2V**

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| Agreements: RAN1#103-e   * For V2P link, V2V traffic model and the following options for traffic model are supported. Companies declare which traffic model is used for their V2P evaluation. * Option 7: Periodic Model 2 specified in TR 37.885 with following change:   + Inter-packet arrival time: 500ms   + Latency requirement: 500 ms or 100 ms * Option 8: Aperiodic Model 1 specified in TR 37.885 with following change:   + Inter-packet arrival time: 250 ms + an exponential random variable with the mean of 250 ms   + Packet size: Uniformly random in the range between 200 bytes and 800 bytes with the quantization step of 200 bytes   + Latency requirement: 250 ms or 100 ms |

2 companies discuss on the traffic models in Sidelink.

* 1 contribution [OPPO] proposes to define a more intensive traffic model or narrower bandwidth for PUE. The simulation results show that the resource pool for PUE is not congested because the agreed parameters and conditions are loose, which with periodicity 100ms/aperiodicity 250ms mean/BW 40MHz/number of PUE 500/small packet size. Non-congested resource pool may lead to partial sensing with different evaluation results (i.e. PRR) from random selection and full sensing. Therefore, medium intensive traffic models or narrower BW can be defined to consider congested scenarios for P2V.
* 1 contribution [CATT, GOHIGH] proposes to consider mixed traffic model of V2V link and V2P link. V2P evaluation should consider both V2V traffic and V2P traffic. When inheriting Uu HARQ re-Tx timer or DRX inactive timer, V2V resource selection may have interference/impact on P2V resource selection, in which V2P re-Tx resources may exceed DRX ON duration of PUE. For evaluation simplicity, each VUE could perform either V2V or V2P traffic.

**[FL]** The reason why resource pool for PUE is not congested is that only P2V is considered in the resource pool. Technically, if a resource pool utilized by considering a mixture scenario of P2V/V2P/V2V, the congestion situation may be different. According to this analysis, two options can be further down selected to consider the traffic models in V2X.

***FL Proposal:***

* *Down-select from the two options:*
  + *Option 1: Define some traffic models with medium intensity for PUE or define a small bandwidth (e.g.20MHz) in the profile for P2V only.*
  + *Option 2: For V2P link, the mixture of V2V traffic and V2P traffic should be evaluated in V2P evaluation. Each V-UE could perform either V2V traffic or V2P traffic.*

**Contribution Proposals:**

[OPPO]

* Proposal 4: Define some traffic model with medium intensity for PUE or define a small bandwidth (e.g.20MHz) in the profile for P2V only.

[CATT, GOHIGH]

* Proposal 2: The mixture of V2V traffic and V2P traffic should be evaluated in V2P evaluation.
* Proposal 3: For each Tx V-UE, it could perform either V2V traffic or V2P traffic.

### **Tx-Rx association for unicast and groupcast**

1 contribution discusses the association between Tx UEs and Rx UEs for unicast and groupcast. Based on the association method in TR 37.885, the target Rx UEs will be changed dynamically for each TB transmission in both unicast and groupcast communication. However, for inter-UE coordination, at least for periodic traffic model, it requires a stable association between Tx UE and Rx UEs (assuming Rx UE is the coordinated UE), otherwise the validity of the resource coordination will be a problem.

**[FL]** It is suggested checking the views of other companies about the necessity on this definition.

***FL Proposal:***

* *In inter-UE coordination evaluation,* 
  + *For unicast communication, the target Rx UE could be determined according to TR37.885, but the association for unicast pair should not change dynamically for each TB, it could be maintained until the re-selection trigger happened due to SPS counter by Tx UE.*
  + *For groupcast communication, the target Rx UEs could be randomly selected N UEs from the Rx UEs determined according to TR37.885, but the association for groupcast should not change dynamically for each TB, it could be maintained until the re-selection trigger happened due to SPS counter by Tx UE.*
* *N is provided by company’s input.*

**Contribution Proposals:**

[CATT, GOHIGH]

* Proposal 1: In inter-UE coordination evaluation,
  + For unicast communication, the target Rx UE could be determined according to TR37.885, but the association for unicast pair should not change dynamically for each TB, it could be maintained until the re-selection trigger happened due to SPS counter by Tx UE.
  + For groupcast communication, the target Rx UEs could be randomly selected N UEs from the Rx UEs determined according to TR37.885, but the association for groupcast should not change dynamically for each TB, it could be maintained until the re-selection trigger happened due to SPS counter by Tx UE.
* N is provided by company’s input.

### **Definition of different profiles for P2V/V2P/V2V**

1 contribution proposes to define separate profiles for P2V, V2P and mixture case. In order to guarantee that the simulation results of companies can be compared with each other, 3 profiles are proposed with corresponding parameters.

* Profile 1-P2V: Evaluation on partial sensing.
* Profile 2-V2P: Evaluation on DRX.
* Profile 3-Mixture with P2V/V2P/V2V: Evaluation on co-existence of PUE and VUE with different RA schemes in the same resource pool.

***FL Proposal:***

* *Three profiles for P2V only, V2P only and the mixture of P2V, V2P and V2V are defined separately.*

**Contribution Proposals:**

[OPPO]

* Proposal 5: Three profiles for P2V only, V2P only and the mixture of P2V, V2P and V2V are needed.
* Proposal 6: On the basis of the profile agreed in RAN1#94bis, we propose the following profile for eSL evaluation：

|  |  |  |  |
| --- | --- | --- | --- |
|  | **P2V Only** | **V2P Only** | **Mixture(P2V,V2P,V2V)** |
| **Sidelink frequency (GHz)** | 6 | 6 | 6 |
| **Traffic models** | Periodic: Traffic model for P-UE’s transmission specified in TS 36.885  −The message size is fixed at 300 bytes and transmission frequency is 1 Hz  −‘100ms’ latency requirement  −100% vehicles generate packets.  Aperiodic: Aperiodic Model 1 specified in TR37.885 with following changes:  −Inter-packet arrival time: 250 ms + an exponential random variable with the mean of 250 ms  −Packet size: Uniformly random in the range between 200 bytes and 800 bytes with the quantization step of 200 bytes  −Latency requirement: 100 ms  −100% vehicles generate packets.  Note:  All PUEs use the same traffic for simplicity.  Periodic and aperiodic traffic are simulated separately. | Periodic: Medium intensity; [50] ms inter-packet arrival, [50]% vehicles generate packets.  Aperiodic: Medium intensity, 100% vehicles generate packets.  Note:  All VUEs use the same traffic for simplicity  Periodic and aperiodic traffic are simulated separately. | Periodic traffic for VUE: Medium intensity; [50] ms inter-packet arrival, [50]% vehicles generate packets.  Aperiodic traffic for VUE: Medium intensity, 100% vehicles generate packets.  Periodic traffic for PUE:  Traffic model for P-UE’s transmission specified in TS 36.885  −The message size is fixed at 300 bytes and transmission frequency is 1 Hz  −‘100ms’ latency requirement  −100% vehicles generate packets.  Aperiodic traffic for PUE:  Aperiodic Model 1 specified in TR37.885 with following changes:  −Inter-packet arrival time: 250 ms + an exponential random variable with the mean of 250 ms  −Packet size: Uniformly random in the range between 200 bytes and 800 bytes with the quantization step of 200 bytes  −Latency requirement: 100 ms  −100% vehicles generate packets.  Note:  All PUEs use the same traffic for simplicity.  All VUEs use the same traffic for simplicity  The traffic model of V2P and V2V is same for simplicity |
| **Cast type** | Broadcast | 33%, 33%, 34% vehicles generate unicast, multicast, broadcast packets, respectively. | VUE: 33%, 33%, 34% vehicles generate unicast, multicast, broadcast packets, respectively.  PUE: Broadcast |
| **Simulation environment, UE drop and mobility** | Urban: Option A  Amount of PUE: 500  All PUEs are dropped in 9 grids | Urban: Option A  Amount of PUE: 500  All PUEs are dropped in 9 grids | Urban: Option A  Amount of PUE: 500  All PUEs are dropped in 9 grids |
| **Channel model** | As defined | As defined | As defined |
| **SL simulation bandwidth (MHz)** | 20 MHz | 20 MHz | 40 MHz |
| **Resource selection scheme** | Full sensing  Partial sensing  Random selection  Each scheme is simulated separately (To compare with each other) | Full sensing (As a background to evaluate different DRX schemes) | VUE: Full sensing  PUE: Random selection or partial sensing  Note: All VUEs use the same resource selection scheme for simplicity  All PUEs use the same resource selection scheme for simplicity |

### **Other channel models for V2X**

1 company proposes some remaining issues for further discussion on V2X channel model described in TR 37.885 regarding pedestrian based links, especially for FR2 operation. It is proposed to consider about pedestrian blockage model and self-blockage and oxygen absorption.

**[FL] This issue is not discussed in the previous meetings, so the FL may ask the group for further determination on whether to discuss about it.**

**Contribution Proposals:**

[InterDigital]

Pedestrian Blockage Modeling

* Proposal 3: For V2X scenarios involving V2V, V2P, P2V and P2P links, the min Tx-Rx height-based blockage model given in TR 37.885 shall be updated to consider pedestrians as blockers also. Additionally, higher priority should be given to vehicles over pedestrians for selecting blocker type. As such the Link state NLOSv should be changed to NLOSvp to show pedestrian blocking may also occur.

Self-Blockage and Oxygen Absorption

* Proposal 4: 1. Self or hand blockages should be considered along with height-based blockage for V2X involving pedestrians. 2. Oxygen absorption should be applied to the respective cluster responses.

Evaluation results: Simulation results are also provided in [7].

### **Traffic models for P2P**

1 company discusses the necessity of traffic model for P2P. The traffic model for P2P link should be defined for modeling the interference in P2V scenario, and for scenario of path sharing between pedestrians on bicycles or balance cars. For simplicity, traffic model for P2V can be reused for modeling P2P.

By checking the discussion on traffic model for P2P during last meeting, majority companies did not support to evaluate P2P link for communication or for interference generation. Because P2P is out of scope of V2X use cases (e.g. V2V, V2I and V2P), and there is no clear reason to have a traffic model for P2P in evaluation.

**[FL] The FL suggests following the compromised consensus in last meeting, and no traffic model for P2P is supported.**

**Contribution Proposals:**

[vivo]

* Proposal 2. The traffic model of P2V link is reused for P2P link.

### **PUE hypothetical direction selection**

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| Agreements: RAN1#103-e   * For the fast fading parameters for P2P link, reuse fast fading parameters of V2V/V2P/P2V links. * Pedestrian UE speed is 3 km/h * Location update is not modelled for pedestrian UE * Note that the intention of channel model above is at least for modeling the interference generation in P2P link. The modeling P2P link is not applied to the scenario of V2P only, optionally applied or not to the scenario of P2V only, but applied to the scenario of combination of V2P and P2V. |

1 company proposes to consider about PUE moving directions. The current agreement on PUE considers moving speed with 3km/h but the location of PUE is not updated. Location updating with moving direction also influences the fast fading calculation. Therefore, PUE moving direction is considered, e.g. 50% probability on the sidewalk.

**[FL] It was agreed in last meeting that the location update is not modeled for PUE, it is suggested that not to re-open the discussion on this issue.**

**Contribution Proposals:**

[OPPO]

* Proposal 3: Each PUE selects a hypothetical direction from the two directions along with the sidewalk.

## Power consumption model

### **Combinations of Tx/Rx states and channels**

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| **Agreements:**  Confirm the following agreement with red changes:   * (Working assumption) Scaling of SL BWP size adaptation in RX perspective   + ~~X MHz is~~ by (0.4 +0.6\*(X-20)/80), where X is in MHz ~~\*100 MHz~~ * (Working assumption) For “PSCCH/PSSCH RX”,   + In non-PSFCH-slot (i.e., the number of PSCCH/PSSCH symbols is 13),     - the power consumption level is the same as that of “PDCCH+PDSCH” * (Working assumption) For power consumption level of “PSFCH RX”,   + the power consumption level is power consumption level of “PDCCH-only” for cross-slot scheduling     - Its minimum value is 50 |

3 contributions discusses about the combinations of Tx/Rx states and channels. 2 companies, [vivo] and [ZTE, Sanechips], propose to further define the Tx/Rx states by considering PSFCH in the slot, and the corresponding power consumption level with scaling factors are also provided. 1 company [LGE] proposes to define “PSCCH-only Rx” state for those UEs only perform sensing (UE only decodes PSCCH without PSSCH buffering), and this scenario is mainly considered for UEs are out of DRX ON duration.

**[FL]**

1. It can be discussed on further defining the power state of “PSCCH-only RX”, and correspondingly power consumption level.
2. The necessity of legacy issue on Tx/Rx states and channel can be further discussed by companies. If majority companies think it significant to consider and define these states, the details of power consumption model can be discussed.

***FL Proposal 1:***

* *When UE performs only sensing operation, it can be further considered to introduce power state of “PSCCH-only RX”.*
  + *In “PSCCH-only RX”, a UE decodes PSCCH for sensing operation, but not perform 2nd SCI or data buffering during the decoding time of PSCCH.*
* *For power consumption level of “PSCCH-only RX”,*
  + *The power consumption level is power consumption level of “PDCCH-only” for cross-slot scheduling.*
    - *Its minimum value is 50*

***FL Proposal 2: (If it is agreed to be discussed)***

* *The power consumption of “PSCCH+PSSCH RX” and “PSCCH+PSSCH TX” in a sidelink slot with PSFCH occasion is derived as that in a full sidelink slot multiplied by a scaling factor, where the scaling factor is 0.72 and 0.9 respectively.*
* *For the combination “SCI RX and PSFCH RX” and “PSCCH+PSSCH RX and PSFCH RX”, the power level is same as that of “PSCCH+PSSCH RX” in a full sidelink slot without PSFCH occasion.*
* *For the combinations with TX and RX coexisting in a sidelink slot, the power consumption level is simply the sum of the power level of each channel status.*

**Contribution Proposals:**

[vivo]

**Power levels in slot with and without PSFCH**

* Proposal 6. The power consumption of “PSCCH+PSSCH RX” and “PSCCH+PSSCH TX” in a sidelink slot with PSFCH occasion is derived as that in a full sidelink slot multiplied by a scaling factor, where the scaling factor is 0.72 and 0.9 respectively.
* Proposal 7. For the combination “SCI RX and PSFCH RX” and “PSCCH+PSSCH RX and PSFCH RX”, the power level is same as that of “PSCCH+PSSCH RX” in a full sidelink slot without PSFCH occasion.
* Proposal 8. For the combinations with TX and RX coexisting in a sidelink slot, the power consumption level is simply the sum of the power level of each channel status.

**Table 1 Combinations of TX/RX state and channels in sidelink slot**

|  |  |
| --- | --- |
| Combination type | status |
| SCI decoding for blind searching | agreed |
| PSCCH+PSSCH TX in **non**-PSFCH slot | agreed |
| PSCCH+PSSCH TX in PSFCH slot | undefined |
| PSCCH+PSSCH RX in **non**-PSFCH slot | agreed |
| PSCCH+PSSCH RX in PSFCH slot | undefined |
| SCI decoding for blind searching and PSFCH RX | undefined |
| PSCCH+PSSCH RX and PSFCH RX | undefined |
| PSCCH+PSSCH TX and PSFCH TX | undefined |
| SCI decoding for blind searching and PSFCH TX | undefined |
| PSCCH+PSSCH RX and PSFCH TX | undefined |
| PSCCH+PSSCH TX and PSFCH RX | undefined |

[LGE]

* Observation 1: When UE performs only sensing operation, it can be further considered to introduce power state of “PSCCH-only RX”.
  + In “PSCCH-only RX”, a UE tries to decode PSCCH for sensing operation, but not perform data buffering during the decoding time of PSCCH.
  + The power consumption level is power consumption level of “PDCCH-only” for cross-slot scheduling.
    - Its minimum value is 50

[ZTE, Sanechips]

* Proposal 1: UE power consumption in Table 2-1 should be adopted for PSFCH slot.
* Proposal 2: For the power consumption level of a combination of "GNSS process" and "one or more other power states", the power consumption level is a sum of power consumption level of "GNSS process" and "one or more other power states" in a slot.

**Table 2-1: UE power consumption in PSFCH slot**

|  |  |
| --- | --- |
| Power State | Power consumption |
| PSCCH/PSSCH RX | 0.8\*power consumption level of “PDCCH+PDSCH” |
| PSCCH/PSSCH TX | 0.8\*power consumption level of “UL” for long PUCCH or PUSCH |
| “PSCCH/PSSCH RX” and “PSFCH RX” | Sum of power consumption level of “PSCCH/PSSCH RX” in PSFCH-slot and power consumption level of “PSFCH RX” |
| “PSCCH/PSSCH TX” and “PSFCH TX” | Sum of power consumption level of “PSCCH/PSSCH TX” in PSFCH-slot and power consumption level of “PSFCH TX” |
| 1st SCI/2nd SCI RX” and “PSFCH TX” | Sum of power consumption level of “1st SCI/2nd SCI RX” and power consumption level of “PSFCH TX” |
| “1st SCI/2nd SCI RX” and “PSFCH RX” | Sum of power consumption level of “1st SCI/2nd SCI RX” and power consumption level of “PSFCH RX” |
| “PSCCH/PSSCH RX” and “PSFCH TX” | Sum of power consumption level of “PSCCH/PSSCH RX” in PSFCH-slot and power consumption level of “PSFCH TX” |
| “PSCCH/PSSCH TX” and “PSFCH RX” | Sum of power consumption level of “PSCCH/PSSCH TX” in PSFCH-slot and power consumption level of “PSFCH RX” |
| NOTE : The number of PSCCH/PSSCH symbols in PSFCH-slot is less than that in non-PSFCH-slot(i.e., the number of PSCCH/PSSCH symbols in PSFCH-slot is 10) | |

### **Modulation order clarification**

1 company proposes to reuse the modulation order of 256QAM in TR 38.840 as much as possible.

**[FL]** By checking the evaluation parameters provided by companies, most contributions are using 256QAM as the modulation order for power saving model in SL evaluation. It would be better to explicitly align the using of modulation order. If all companies think it 256QAM is used by default for power saving model in SL evaluation, nothing can be discussed/agreed here.

***FL Proposal: (If it is necessary to explicitly agreed)***

* *The modulation order of 256QAM in TR 38.840 is reused as the reference power model for Rel-17 sidelink evaluation.*

**Contribution Proposals:**

[vivo]

* Proposal 3. The modulation order of 256QAM is reused as the reference power model for NR sidelink power evaluation.

### **Tx power alignment among UEs**

1 contribution proposes for the UEs to use the same Tx power in the same resource pool. UEs using different Tx power (i.e. 0dBm/23dBm) may lead to different understanding on a same resource whether it is occupied or not. It may also lead to severe interference between UEs. It is unclear that the performance degradation is caused by power saving RA schemes or by different Tx powers. Therefore, UEs in the same resource pool should apply the same Tx power, either 0 dBm or 23 kBm.

**[FL]** According to the evaluation submissions, it seems that the working assumption is the same Tx power among the UEs in the same resource pool. This issue can also be checked by companies whether an explicit agreement is needed to restrict it.

***FL Proposal: (If it is agreed to be discussed)***

* *Either 0 dBm or 23 dBm is used during one time of simulation in FR1.*

**Contribution Proposals:**

[OPPO]

* Proposal 7: Either 0 dBm or 23 dBm is used during one time of simulation in FR1.

### **Power control**

1 company proposes to define power control model for SL evaluation, which has a significant impact on the power consumption evaluation results. The OOC scenario can be assumed as a mandatory scenario for SL evaluation for simplicity, where DL pathloss based OLPC is not applied. Furthermore, linear interpolation based on power at 0dBm and 23dBm are calculated for power consumption scaling to other Tx power.

**[FL] The current agreed power control model is used and followed, if no critical issue is found to impact the simulation results negatively/severely.**

**Contribution Proposals:**

[vivo]

* Proposal 4. For SL power consumption evaluation, the SL only scenario where DL pathloss based OLPC is not applied is the baseline.
* Proposal 5. The power scaling for other TX power is derived by the linear interpolation based on power consumption at 0dBm and power consumption at 23dBm.

### **Power consumption model for Public Safety use cases**

1 contribution proposes to define a power consumption model for SCS=30KHz. The current agreements allow to use SCS = 15 kHz which is important for public safety cases, but it is not possible to obtain a power consumption model for SCS = 15 kHz by using scaling for adaptation from the reference power consumption model for SCS = 30 kHz.

**[FL] This issue can checked by other companies on whether to define a new power consumption model for SCS 30KHz for Public Safety use cases.**

**Contribution Proposals:**

[Ericsson]

* Proposal 1: A dedicated reference power consumption model using SCS = 15 kHz is needed for public safety use cases/scenarios.
* Proposal 2: Use the configuration corresponding to SCS = 15 kHz specified in Table 1 as an additional reference configuration for power consumption model.
* Proposal 3: Use the configuration corresponding to SCS = 15 kHz and SL BWP = 20 MHz specified in Table 1 as a baseline for evaluation. If other SL BWP for SCS = 15 kHz need to be evaluated, scaling for adaptation is possible.
* Observation 2: It is expected for public safety uses cases to use n14 as frequency band. In this case, using a power consumption model with SCS = 15kHz is appropriate.

|  |  |  |
| --- | --- | --- |
| Parameter | FR1 (Reference) | Sidelink FR1 |
| SCS | 30 kHz | 15 kHz |
| BW | 100MHz | 20MHz |
| Rx branch | 4Rx | 4Rx |
| Tx branch | 1Tx | 1Tx |
| Light sleep | 20 | 20 |
| Micro sleep | 45 | 45 |
| Power consumption | PDCCH only 100 | PSCCH 75 |
|  | PDCCH+PDSCH 300 | PSCCH+PSSCH 100 |
| UL | 250 @0dBm  700 @23dBm | 80 @0dBm  215 @23dBm |

## Non-Evaluation issues

The issues/proposals in this section are not related to the evaluation legacy issues but related to power saving design in sidelink. These issues are now discussed in AI 8.11.1, and the corresponding design/proposals can be focused on that AI.

### **Re-evaluation and pre-emption in power saving**

1 company discusses re-evaluation and pre-emption in power saving mechanism. No further agreements are needed for the SL evaluation methodology. Assumptions on any open points can be reported with companies’ evaluation results. There is a trade-off between power consumption and performance. Both partial sensing and random selection with re-evaluation and pre-emption check can be a good power/performance trade-off point between full sensing and random selection.

**Contribution Proposals:**

[Samsung]

* Proposal 1: Support partial sensing with sensing window corresponds to intra-period reservation and inter-period reservation in Rel-17 NR SL power saving.
* Proposal 2: Further consider introducing re-evaluation and pre-emption check for power saving resource allocation schemes in Rel-17.

Table 1. Average power consumption of full sensing, partial sensing and random selection

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sensing scheme | Full sensing | Partial sensing | Random selection with pre-emption and re-evaluation | Random selection |
| Power consumption (%) | 100 | 56.85 | 30.74 | 12.58 |

### **DRX related issues**

2 companies discusses the issues and impacts when supporting DRX mechanism in SL. 1 [vivo] company proposes to introduce SL power saving signal in addition to DRX mechanism for power saving UEs. Power saving signal can indicate UE to fall-asleep/wake-up by not following DRX ON/OFF duration based on the prediction of potential (not) transmitting data. It also discussed the requirements and container for power saving signal. 1 company [Huawei, HiSilicon] also discusses the impact of DRX on PHY layer, including PSFCH/CSI reception during SL DRX OFF.

**Contribution Proposals:**

[vivo] SL power saving signal

* Observation 1. The SL power-saving signal facilitates the RX UE to dynamically adjust its "active/sleep" time according to the varying SL packet arrival, thus achieving higher power efficiency.
* Proposal 9. SL power-saving signal is supported to trigger RX UE to wake-up or fall asleep on SL.
* Proposal 10. The behavior of the RX UE upon no received power save signal and at least one received power signal should be specified.
* Proposal 11. SL power-saving signal should consider the following requirements
  + Low complexity and power consumption for detection.
  + Low false alarm possibility.
  + Be able to identify the TX UE and/or RX UE.
* Proposal 12. Several key aspects for SL power-saving signal should be further studied
  + Signal/channel for SL power-saving signal
  + T/F resources used for SL power-saving signal
  + Information carried by SL power-saving signal
  + Whether/how to identify the target TX UE/target RX UE/target DRX of a SL power-saving signal
  + Conditions on triggering the transmission/reception of SL power-saving signal
  + UE behavior after transmitting/receiving SL power-saving signal
* Proposal 12. Candidate signal/channel for SL power-saving signal can be
  + PSCCH
  + Dedicated SL RS

[Huawei, HiSilicon] PSFCH reception/CSI report reception during DRX OFF

* Proposal 1: PSFCH reception during sidelink DRX inactive time should be supported.

SL CSI feedback reception

* Proposal 2: CSI report reception during sidelink DRX inactive time should be supported.

### **Multi-carrier operation**

1 company proposes to support multi-carrier operation in Rel-17 sidelink design by reusing Rel-15 LTE eV2X carrier aggregation mechanism as much as possible. packet duplication at PDCP layer can enhanced reliability, and flexible BWP configuration on multi-carriers can further save power for UEs.

**Contribution Proposals:**

[InterDigital]

* Proposal 1: Support a baseline SL multi-carrier operation to enable packet duplication at PDCP layer over multiple carriers to increase reliability of R17 SL transmissions.
* Proposal 2: Consider including BWP adaptation in SL multi-carrier operation for power saving purpose.

### **SL Relay**

1 company proposes to discuss relay related design in RAN1, including RSRP/RSRQ measurement and how to handle latency requirement in RAN1.

**Contribution Proposals:**

[Samsung]

* Proposal 3: For Rel-17 NR sidelink relay, relay (re-)selection criterion and procedure including which signal to measure, how to measure, and/or when to measure should be studied in RAN1.
* Proposal 4: For Rel-17 NR sidelink relay, RAN1 should discuss handling of latency requirement including how to determine remaining PDB and whether/how to indicate remaining PDB during relay procedure.

# References

* 1. R1-2100143, “Remaining issues in sidelink evaluation methdology for power saving”, OPPO, e-Meeting, 3GPP RAN1#104-e, January 25th – February 5th, 2021.
  2. R1-2100353, “Remaining issues on sidelink evaluation methodology”, CATT, GOHIGH, e-Meeting, 3GPP RAN1#104-e, January 25th – February 5th, 2021.
  3. R1-2100468, “Other aspects on SL enhancements”, vivo, e-Meeting, 3GPP RAN1#104-e, January 25th – February 5th, 2021.
  4. R1-2100519, “Discussion on remaining aspects of sidelink evaluation methodology update for power saving”, LGE, e-Meeting, 3GPP RAN1#104-e, January 25th – February 5th, 2021.
  5. R1-2100689, “Remaining evaluation assumptions and methodology for power saving”, Ericsson, e-Meeting, 3GPP RAN1#104-e, January 25th – February 5th, 2021.
  6. R1-2100926, “Discussion on remaining issues for sidelink evaluation methodology”, ZTE, Sanechips, e-Meeting, 3GPP RAN1#104-e, January 25th – February 5th, 2021.
  7. R1-2100983, “On SL multi-carrier operation and remaining issues for simulation methodology update”, InterDigital, e-Meeting, 3GPP RAN1#104-e, January 25th – February 5th, 2021.
  8. R1-2101099, “Discussion on remaining issues of sidelink evaluation methodology”, Xiaomi, e-Meeting, 3GPP RAN1#104-e, January 25th – February 5th, 2021.
  9. R1-2101233, “On Sidelink Issues and RAN1 Impacts”, Samsung, e-Meeting, 3GPP RAN1#104-e, January 25th – February 5th, 2021.
  10. R1-2101254, “Physical layer impacts of sidelink DRX”, Huawei, HiSilicon, e-Meeting, 3GPP RAN1#104-e, January 25th – February 5th, 2021.

# Appendix A: Agreements for evaluation methodology

## RAN1#102-e

Agreements:

* For reference configuration for power consumption model,
* 14 SL symbols in a slot (including AGC and TX-RX switching period)
* SL sub-carrier spacing (SCS)
  + 30 kHz SCS for FR1
* SL BWP size
  + 100 MHz for FR1
* 2 OFDM symbols for PSCCH (excluding AGC symbol)
* TX antenna  port (AP)
  + 1 TX AP for FR1
* RX AP
  + 4 RX APs for FR1
* TX power of {0 dBm, 23 dBm} for FR1
* Note that FR2 is not precluded as an optional/additional reference configuration, and companies are encouraged to provide power consumption model for FR2.
* Note that 15 kHz SCS is not precluded as an optional/additional reference configuration, and companies are encouraged to provide power consumption model for 15 kHz SCS.

Agreements:

* For evaluation, the followings are baseline
* 2 RX APs
* 1 TX AP
* 40 MHz for SL BWP size
* Note that parameters or cases other than baseline is not precluded for evaluation, and companies are encouraged to provide the assumptions in details.

Agreements:

* For power consumption scaling for adaptation,
* (Working assumption) Scaling of SL BWP size adaptation in RX perspective
  + X MHz is (0.4 +0.6\*(X-20)/80)\*100 MHz
* Scaling for SL BWP size adaptation in TX perspective
  + No scaling
* Scaling for RX AP adaptation for FR 1
  + 2 RX is 0.7\*4 Rx power
* Note that scaling for adaptation on other parameters is not precluded for power consumption model, and companies are encouraged to provide the assumptions in details.

Agreements:

* For power consumption level,
* Reuse three states of “Sleep” specified in TR38.840 including transition time/energy consumption
* (Working assumption) For “PSCCH/PSSCH RX”,
  + In non-PSFCH-slot (i.e., the number of PSCCH/PSSCH symbols is 13),
    - the power consumption level is the same as that of “PDCCH+PDSCH”
* For power consumption level of “PSCCH/PSSCH TX”
  + In non-PSFCH-slot (i.e. the number of PSCCH/PSSCH symbols is 13),
    - the power consumption level is the same as that of “UL” for long PUCCH or PUSCH
* For power consumption level of “1st SCI/2nd SCI RX”,
  + the power consumption level is [0.7]\* power consumption level of “PSCCH/PSSCH RX”
* For power consumption level of “PSFCH TX”,
  + the power consumption level is [0.3]\*power consumption level of “UL” for long PUCCH or PUSCH
* (Working assumption) For power consumption level of “PSFCH RX”,
  + the power consumption level is power consumption level of “PDCCH-only” for cross-slot scheduling
* For power consumption level of “S-SSB TX” (in 13 symbol duration),
  + the power consumption level is the same as power consumption level of “UL” for (long PUCCH or PUSCH)
* For power consumption level of “S-SSB RX”,
  + the power consumption level is [1.5]\*power consumption level of “Uu SSB-processing”
* The power consumption level of “GNSS-processing” is 8
* When the synch reference source is gNB, reuse power consumption level of “Uu SSB processing”
* Power consumption level of “SL-CSI-RS processing” is not separately defined
* Note that power consumption level of other Power states is not precluded, and companies are encouraged to provide the assumptions in details.

Agreements:

* For evaluation metric, the followings are considered
* PRR
* PIR
* Power consumption reduction ratio = (power consumption for baseline scheme with Rel-16 Mode 2 resource allocation (i.e. full sensing) - power consumption for proposed scheme)/power consumption for baseline scheme with Rel-16 Mode 2 resource allocation (i.e. full sensing)
* Note that power consumption for baseline scheme with Rel-16 Mode 2 resource allocation (i.e. full sensing) and the power consumption for the proposed scheme are evaluated under the same evaluation assumptions.

## RAN1#103-e

**Agreements:**

Confirm the following agreement with red changes:

* (Working assumption) Scaling of SL BWP size adaptation in RX perspective
  + ~~X MHz is~~ by (0.4 +0.6\*(X-20)/80), where X is in MHz ~~\*100 MHz~~
* (Working assumption) For “PSCCH/PSSCH RX”,
  + In non-PSFCH-slot (i.e., the number of PSCCH/PSSCH symbols is 13),
    - the power consumption level is the same as that of “PDCCH+PDSCH”
* (Working assumption) For power consumption level of “PSFCH RX”,
  + the power consumption level is power consumption level of “PDCCH-only” for cross-slot scheduling
    - Its minimum value is 50

**Agreements:**

Remove the square brackets in the following agreements with red-colored clarification.

* Agreements made in RAN1#102-e meeting:
  + For power consumption level of “1st SCI/2nd SCI RX”,
    - the power consumption level is ~~[~~0.7~~]~~\* power consumption level of “PSCCH/PSSCH RX”
  + For power consumption level of “PSFCH TX”,
    - the power consumption level is ~~[~~0.35~~]~~\*power consumption level of “UL” for long PUCCH or PUSCH
  + For power consumption level of “S-SSB RX”,
    - the power consumption level is ~~[~~1.5~~]~~\*power consumption level of “Uu SSB-processing”

Agreements:

Support following three states for V2P/P2V links.

* LOS
  + A link is in LOS state if two UEs are in the same street and the LOS path is not blocked by vehicles
* NLOS (i.e., LOS path blocked by buildings)
  + A link is in NLOS state if the two UEs are in different streets.
* NLOSv (i.e., LOS path blocked by vehicles)
  + A link is in NLOSv state if the two UEs are in the same street and the LOS path is blocked by vehicles

Agreements**:**

For two UEs are in the same street in V2P/P2V links, reuse the probability of LOS and NLOSv states for Urban case specified in TR 37.885 (see below)



Agreements

For V2P/P2V links, reuse “additional vehicle blockage loss” specified in TR 37.885 (see below).

|  |
| --- |
| When a link is in NLOSv, additional vehicle blockage loss is added as follows:   * The blocker height is the vehicle height which is randomly selected out of the three vehicle types according to the portion of the vehicle types in the simulated scenario. * The additional blockage loss is max {0 dB, a log-normal random variable}. * Case 1: Minimum antenna height value of TX and RX > Blocker height * No additional blockage loss * Case 2: Maximum antenna height value of TX and RX < Blocker height * Mean: 9 + max(0, 15\*log10(d)-41) dB, standard deviation: 4.5 dB * Case 3: Otherwise * Mean: 5 dB + max(0, 15\*log10(d)-41), standard deviation: 4 dB |

Agreements**:**

For V2P/P2V links, reuse the fast fading parameters of V2V link specified in TR 37.885.

* Note: this does not imply that a Ped UE is required to use the same antenna configuration of a Veh UE

Agreements:

For the public safety and commercial use cases, reuse the parameters of “Reference system deployments” specified in Section A.2.1.1 of TR 36.843 with following modification:

* Carrier frequency:
  + Include 3.5 GHz for commercial use case (optional)
* System bandwidth:
  + Include 40 MHz for commercial use case (optional) and 20 MHz dedicated spectrum for out-of-coverage scenarios (optional)
* “eNB” is replaced by “gNB”
* FFS any refinement/variation is necessary, e.g., 19 vs. 7 sites, etc.

Agreements:

For the public safety and commercial use cases, reuse the parameters of “Channel models” specified in Section A.2.1.2 of TR 36.843 with following modification:

* Each component of channel model reuses what is specified in TR 38.901.

Update on 11/12/20

Agreements:

* + - * For the layout for public safety and commercial use cases, support “7 macro sites with 3 cells per site in the layout”

Agreements:

* + - * For public safety use case, at least following layout option is supported:
* Option 5 of TR 36.843: Urban macro (1732m ISD)
  + UE dropping as in Table A.2.1.1-1
    - All UEs are outdoors UEs
    - Mix of outdoor and indoor UEs

Agreements:

* For public safety and commercial use cases, at least following option is supported for UE RF parameters:
  + Reuse the number of TX AP, the number of RX AP, antenna gain for P-UE specified in TR 37.885.

Agreements:

* For public safety and commercial use cases, one OFDM symbol of NR SL slot is used for AGC

Agreements:

For public safety and commercial use cases, at least performance metrics for communication specified in A2.1.4.2 of TR 36.843 are reused with following modification:

1. “FTP2 traffic model” is replaced with “FTP traffic model or periodic traffic model”
2. Power consumption model agreed in R-17 NR sidelink enhancement WI is used
3. the metrics for latency and WAN are not needed

Agreements:

* For public safety and commercial use cases, reuse in-band emission model used for NR V2X specified in section 6.4E.2.4 in TS 38.101

Agreements:

* For the channel model for P2P link,
* Option 2: LOS, NLOS, NLOSv are supported.
  + Option 2-2: Reuse definition of NLOS state, the probability of LOS/NLOSv, and additional vehicle blockage loss for V2V/V2P/P2V, and modify the definition of LOS/NLOSv states as follow
    - LOS
      * A link is in LOS state if two UEs are in the same sidewalk in the same street ~~and the LOS path is not blocked by vehicles~~
      * A link is in LOS state if two UEs are in the different sidewalk in the same street and the LOS path is not blocked by vehicles
    - NLOS (i.e., LOS path blocked by buildings)
      * A link is in NLOS state if the two UEs are in different streets.
    - NLOSv (i.e., LOS path blocked by vehicles)
      * A link is in NLOSv state if the two UEs are in the different sidewalk in the same street and the LOS path is blocked by vehicles
* Note that the intention of channel model above is at least for modeling the interference generation in P2P link. The modeling P2P link is not applied to the scenario of V2P only, optionally applied or not to the scenario of P2V only, but applied to the scenario of combination of V2P and P2V.

Agreements:

* For the fast fading parameters for P2P link, reuse fast fading parameters of V2V/V2P/P2V links.
* Pedestrian UE speed is 3 km/h
* Location update is not modelled for pedestrian UE
* Note that the intention of channel model above is at least for modeling the interference generation in P2P link. The modeling P2P link is not applied to the scenario of V2P only, optionally applied or not to the scenario of P2V only, but applied to the scenario of combination of V2P and P2V.

Agreements:

* For P2V link, at least following traffic model is supported:
* Option 1: Traffic model for P-UE’s transmission specified in TS 36.885
  + The message size is fixed at 300 bytes and transmission frequency is 1 Hz
  + ‘100ms’ latency requirement
* Option 4: Aperiodic Model 1 specified in TR37.885 with following changes:
  + Inter-packet arrival time: 250 ms + an exponential random variable with the mean of 250 ms
  + Packet size: Uniformly random in the range between 200 bytes and 800 bytes with the quantization step of 200 bytes
  + Latency requirement: 250 ms or 100 ms

Agreements:

* For commercial use case, at least following option is supported for traffic model:
* Option 7: Periodic traffic model 3 specified in TR 37.885

Agreements:

* For the pedestrian UE dropping in V2X evaluation, reuse those specified in TR 36.885.
* Support that total number of pedestrian UEs is 1000 as optional

Agreements:

* For V2P link, V2V traffic model and the following options for traffic model are supported. Companies declare which traffic model is used for their V2P evaluation.
* Option 7: Periodic Model 2 specified in TR 37.885 with following change:
  + Inter-packet arrival time: 500ms
  + Latency requirement: 500 ms or 100 ms
* Option 8: Aperiodic Model 1 specified in TR 37.885 with following change:
  + Inter-packet arrival time: 250 ms + an exponential random variable with the mean of 250 ms
  + Packet size: Uniformly random in the range between 200 bytes and 800 bytes with the quantization step of 200 bytes
  + Latency requirement: 250 ms or 100 ms

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