3GPP TSG RAN WG1 #101 R1-20xxxxx

**e-Meeting, May 25th – June 5th, 2020**

**Agenda item: 8.4.1**

**Source: Moderator (China Telecom)**

**Title: [101-e-Post-NR-Cov-Enh] Email discussion/approval focusing on remaining evaluation assumptions**

**Document for: Discussion and Decision**

# Introduction

This contribution summarizes the email discussion/approval focusing on remaining evaluation assumptions for NR coverage enhancements.

[101-e-Post-NR-Cov-Enh] Email discussion/approval focusing on remaining evaluation assumptions till 6/17 – Jianchi (CT)

* Focusing on high priority proposals first, target 6/11 for early approvals
* Followed by medium priority/low priority proposals

# Discussion

## 2.1 Discussion proposals with high priority

### FR1

**Proposal:**

* For link level simulation, adopt the following table for PUSCH for FR1.

|  |  |
| --- | --- |
| Parameters | Values |
| BLER for PUSCH | 10% iBLER for eMBB, 2% rBLER for voice. |
| Number of UE transmit chains for PUSCH | 1 or 2 |
| DMRS configuration for PUSCH | For 3km/h: Type I, 1 or 2 DMRS symbol, no multiplexing with data.  For 120km/h, (Optional: 30km/h): Type I, 2 or 3 DMRS symbol, no multiplexing with data.  For frequency hopping: Type I, 1 or 2 DMRS symbol for each hop, no multiplexing with data.  FFS: PUSCH mapping Type B.  FFS: DMRS position. |
| Waveform for PUSCH | DFT-s-OFDM, FFS: CP-OFDM |
| Repetitions for PUSCH | For eMBB, no repetition is assumed.  For VoIP, the maximum number of repetitions is 8.  FFS: Repetition type B |
| HARQ configuration for PUSCH | For eMBB, no retransmission is assumed.  For VoIP, the maximum number of HARQ transmission (limited by frame structure and latency requirements) can be reported by companies. |
| Latency requirements for voice | 50ms/100ms |
| PUSCH duration | 14 OS |

Companies are invited to provide views on the above proposal.

|  |  |
| --- | --- |
| **Companies** | **Comments** |
|  |  |
|  |  |
|  |  |

**Proposal:**

* For link level simulation, adopt the following table for PUCCH for FR1.

|  |  |
| --- | --- |
| Parameters | Values |
| PUCCH format type | Format 1, 2bits UCI  Format 3, [4bits (3 bits A/N + 1 bit SR)]/11/22 bits UCI |
| BLER for PUCCH | For PUCCH format 1:  DTX to ACK probability: 1%. NACK to ACK probability: 0.1%.  ACK missed detection probability: 1%.  For PUCCH format 3:  BLER for Ack/Nack, SR: 1%  FFS: BLER for CSI: 10%. |
| Number of PRBs for PUCCH | 1 PRB |
| Number of UE transmit chains for PUCCH | 1 |
| Number of repetitions for PUCCH | w/ and w/o repetition for PUCCH.  The maximum number of repetitions is 8. |
| PUCCH duration | 14 OS |

Companies are invited to provide views on the above proposal.

|  |  |
| --- | --- |
| **Companies** | **Comments** |
|  |  |
|  |  |
|  |  |

**Proposal:**

* For link level simulation, adopt the following table for PUSCH and PUCCH for FR1.
  + Note: Definition of TxRU refers to TR 36.897, 1 TXRU can be seen as 1 RF chain, which has a dedicated PA/LNA, and is associated with a set of antenna elements with the same polarization.

|  |  |
| --- | --- |
| **Parameters** | **Values** |
| Number of receive antenna elements for BS | Urban: 192 antenna elements for 4GHz and 2.6GHz,  (M,N,P,Mg,Ng) = (12,8,2,1,1)  Rural: 64 antenna elements for 4GHz and 2.6GHz  (M,N,P,Mg,Ng) = (8,4,2,1,1)  32 antenna elements for 2GHz and 700MHz  (M,N,P,Mg,Ng) = (8,2,2,1,1) |
| Number of receive TxRUs for BS | TDL: 2 or 4 TxRUs, FFS: 64TxRUs for urban  [CDL: urban: 64TxRUs, rural: 8 TxRUs for 4GHz and 2.6GHz, and 4TxRUs for 2GHz and 700MHz.] |
| Delay spread | Urban: 300ns~~, [240ns]~~  Rural: 300ns  Rural with long distance: 30ns |
| PRBs/TBS/MCS for eMBB for PUSCH | ~~Reported by companies.~~  [30PRBs] for 1Mbps, [4 PRBs] for 100kbps.  Other values of PRBs can be reported by companies.  TBS and MCS can be calculated based on e.g. the number of PRBS, target data rate, frame structure and overhead. |
| PRBs/MCS for VoIP for PUSCH | [4 PRBs] for VoIP.  QPSK |

Companies are invited to provide views on the above proposal.

|  |  |
| --- | --- |
| **Companies** | **Comments** |
|  |  |
|  |  |
|  |  |

### FR2

**Proposal:**

* Adopt the following target data rates for eMBB performance evaluation for FR2.
* Indoor: DL: 25Mbps, UL:5Mbps
* Urban: DL: 25Mbps, UL: 5Mbps
* Suburban: DL: 1Mbps, UL: 50kbps
* FFS:
* Indoor: DL:100Mbps, UL: 10Mbps
* Urban: DL: 100Mbps, UL: 10Mbps
* Suburban: UL: 200kbps

Companies are invited to provide views on the above proposal.

|  |  |
| --- | --- |
| **Companies** | **Comments** |
|  |  |
|  |  |
|  |  |

## 2.2 Discussion proposals with medium priority

### FR1

**Proposal:**

Identify the target performance and coverage bottlenecks based on target performance metric for FR1.

* FFS: the target performance metric and potential down selection.
* Option 1: The target path loss is considered as the target performance.
  + Derived from the target ISD.
* Option 2: The target MCL is considered as the target performance.
  + Alt1: Derived from the target ISD, considering shadow fading margin, penetration loss, etc.
  + Alt2: Fixed target MCL, e.g. 147dB for VoIP
  + Alt3: Relative MCL
* If optional SLS is performed, the target performance for SLS is determined by the 5th percentile SINR value in CDF curve for different physical channels
* Other target performance metrics are not precluded.

Companies are invited to provide views on the above proposal.

|  |  |
| --- | --- |
| **Companies** | **Comments** |
|  |  |
|  |  |
|  |  |

### FR2

**Proposal:**

* For link level simulation, adopt the following table for PUSCH and PDSCH for FR2.

|  |  |
| --- | --- |
| **Parameters** | **Values** |
| BLER | 10% iBLER for eMBB, 2% rBLER for voice. |
| DMRS configuration | For 3km/h: Type I, 1 or 2 DMRS symbol, no multiplexing with data.  For 30km/h~~, 120km/h:~~ Type I, 2 or 3 DMRS symbol, no multiplexing with data.  For frequency hopping, Type I, 1 or 2 DMRS symbol for each hop, no multiplexing with data.  FFS: PUSCH mapping type.  FFS: DMRS position. |
| Waveform | DFT-s-OFDM for PUSCH, CP-OFDM for PDSCH  FFS: CP-OFDM for PUSCH |
| Number of repetitions for PUSCH | For eMBB, no repetition is assumed.  For VoIP, the maximum number of repetitions is 8. |
| HARQ configuration for PUSCH | For eMBB, no retransmission is assumed.  For VoIP, the maximum number of HARQ transmission is 8. |
| PUSCH/PDSCH duration | 14 OS for PUSCH, 12 OS for PDSCH |

Companies are invited to provide views on the above proposal.

|  |  |
| --- | --- |
| **Companies** | **Comments** |
|  |  |
|  |  |
|  |  |

**Proposal:**

* For link level simulation, adopt the following table for PUSCH and PDSCH for FR2.

|  |  |
| --- | --- |
| **Parameters** | **Values** |
| Number of antenna elements for BS | Indoor scenario: 128  Urban scenario: 256  Suburban: 256  FFS: (M, N, P, Mg, Ng) |
| Number of TxRUs for BS | 2 |
| Number of UE antennas | 8(M, N, P) = (1,4,2) / (2,2,2)  [16(M, N, P) = (4,2,2)] |
| Number of UE TRXUs | 1 or 2 for PUSCH, 2 for PDSCH |
| Channel model for link-level simulation | CDL- A, TDL-A, [urban/suburban: TDL-C] |
| Delay spread | Indoor scenario: 30ns  Urban scenario: 100ns  Suburban scenario: 100ns |
| Latency requirements for voice | 50ms/100ms |
| PRBs/TBS/MCS | Reported by companies. |

Companies are invited to provide views on the above proposal.

|  |  |
| --- | --- |
| **Companies** | **Comments** |
|  |  |
|  |  |
|  |  |

**Proposal:**

* For link level simulation, adopt the following table for PUCCH for FR2.

|  |  |
| --- | --- |
| **Parameters** | **Values** |
| PUCCH format type | Format 1, 2bits UCI  Format 3, [4bits (3 bits A/N + 1 bit SR)]/11/22 bits UCI |
| BLER for PUCCH | For PUCCH format 1:  DTX to ACK probability: 1%. NACK to ACK probability: 0.1%, ACK missed detection probability: 1%.  For PUCCH format 3:  Block error probability: 1% |
| Number of PRBs for PUCCH | 1 PRB |
| Number of UE antennas for PUCCH | The same as PUSCH |
| Number of UE TRXUs for PUCCH | The same as PUSCH |
| Number of receive antenna elements for BS | The same as PUSCH |
| Number of receive TxRUs for BS | The same as PUSCH |
| Number of repetitions for PUCCH | w/ and w/o repetition  The maximum number of repetitions is 8. |
| PUCCH duration | 14 OS |

Companies are invited to provide views on the above proposal.

|  |  |
| --- | --- |
| **Companies** | **Comments** |
|  |  |
|  |  |
|  |  |

**Proposal:**

Identify the target performance and coverage bottlenecks based on target performance metric for FR2.

* FFS: the target performance metric and potential down selection.
* Option 1: The target path loss is considered as the target performance.
  + Derived from the target ISD.
* Option 2: The target MCL is considered as the target performance.
  + Alt1: Derived from the target ISD, considering shadow fading margin, penetration loss, etc.
  + Alt2: Fixed target MCL, e.g. 147dB for VoIP
  + Alt3: Relative MCL
* Option 3: The target performance based on SLS is determined by the 5th percentile SINR value in CDF curve for different physical channels.
* Other target performance metrics are not precluded.

Companies are invited to provide views on the above proposal.

|  |  |
| --- | --- |
| **Companies** | **Comments** |
|  |  |
|  |  |
|  |  |

## 2.3 Discussion proposals with low priority

### FR1

**Proposal:**

* For link level simulation, adopt the following table for PDCCH for FR1.

|  |  |
| --- | --- |
| Parameters | Values |
| aggregation level | 16 |
| payload | 40 bits |
| CORESET size | 2 symbols, 48 PRBs |
| ~~CCE-to-REG mapping type~~ | ~~Non-interleaved mapping~~ |
| Tx Diversity | With Tx Diversity, optional: without Tx Diversity |

Companies are invited to provide views on the above proposal.

|  |  |
| --- | --- |
| **Companies** | **Comments** |
|  |  |
|  |  |
|  |  |

### FR2

**Proposal:**

* For link level simulation, adopt the following table for PDCCH for FR2.

|  |  |
| --- | --- |
| **Parameters** | **Values** |
| aggregation level | 16 |
| payload | 40 bits |
| CORESET size | 2 symbols, 48PRBs  FFS: 1symbol |
| The number of SSB for broadcast PDCCH | FFS |

Companies are invited to provide views on the above proposal.

|  |  |
| --- | --- |
| **Companies** | **Comments** |
|  |  |
|  |  |
|  |  |

**Proposal:**

* For link level simulation, adopt the following table for PRACH for FR2.

|  |  |
| --- | --- |
| **Parameters** | **Values** |
| Format type | Format B4, (Optional: Format C2) |
| Scheduled PRBs | 12 PRBs |
| Performance metric | 0.1% false alarm, 1% miss-detection |

Companies are invited to provide views on the above proposal.

|  |  |
| --- | --- |
| **Companies** | **Comments** |
|  |  |
|  |  |
|  |  |

## 2.4 Others

### FR1

Companies are invited to provide views on the evaluation assumptions not covered by agreements or the above proposals.

|  |  |  |
| --- | --- | --- |
| **Channel** | **Companies** | **Comments** |
| PRACH |  |  |
|  |  |
|  |  |
| Msg2 |  |  |
|  |  |
|  |  |
| Msg3 |  |  |
|  |  |
|  |  |
| Msg4 |  |  |
|  |  |
|  |  |
| SSB |  |  |
|  |  |
|  |  |
| PDSCH |  |  |
|  |  |
|  |  |
| Others |  |  |
|  |  |
|  |  |

### FR2

Companies are invited to provide views on the evaluation assumptions not covered by agreements or the above proposals.

|  |  |  |
| --- | --- | --- |
| **Channel** | **Companies** | **Comments** |
| PRACH |  |  |
|  |  |
|  |  |
| Msg2 |  |  |
|  |  |
|  |  |
| Msg3 |  |  |
|  |  |
|  |  |
| Msg4 |  |  |
|  |  |
|  |  |
| SSB |  |  |
|  |  |
|  |  |
| PDSCH |  |  |
|  |  |
|  |  |
| Others |  |  |
|  |  |
|  |  |

# References

1. RP-193240, China Telecom, New SID on NR coverage enhancement, 3GPP TSG RAN Meeting #86, Sitges, Spain, December 9th – 12th, 2019.
2. R1-2005004, Moderator (China Telecom), [101-e-NR-Cov-Enh] Email discussion on evaluation methodology and simulation assumptions for NR coverage enhancements, e-Meeting, May 25th – June 5th, 2020.