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.

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| --- | --- |
| 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.

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| **Companies** | **Comments** |
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**Proposal:**

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

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| --- | --- |
| Parameters | Values |
| PUCCH format type | Format 1, 2bits UCIFormat 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.

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| **Companies** | **Comments** |
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**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.

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| **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: 300nsRural 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.

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| **Companies** | **Comments** |
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### 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.

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| **Companies** | **Comments** |
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## 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.

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| **Companies** | **Comments** |
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### FR2

**Proposal:**

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

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| --- | --- |
| **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 PDSCHFFS: 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.

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| **Companies** | **Comments** |
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**Proposal:**

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

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| --- | --- |
| **Parameters** | **Values** |
| Number of antenna elements for BS | Indoor scenario: 128Urban scenario: 256Suburban: 256FFS: (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: 30nsUrban scenario: 100nsSuburban scenario: 100ns |
| Latency requirements for voice | 50ms/100ms |
| PRBs/TBS/MCS | Reported by companies. |

Companies are invited to provide views on the above proposal.

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| **Companies** | **Comments** |
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**Proposal:**

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

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| --- | --- |
| **Parameters** | **Values** |
| PUCCH format type | Format 1, 2bits UCIFormat 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 repetitionThe maximum number of repetitions is 8. |
| PUCCH duration | 14 OS |

Companies are invited to provide views on the above proposal.

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| **Companies** | **Comments** |
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**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.

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| **Companies** | **Comments** |
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## 2.3 Discussion proposals with low priority

### FR1

**Proposal:**

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

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| --- | --- |
| 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.

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| **Companies** | **Comments** |
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### 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.

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| **Companies** | **Comments** |
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**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.

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| **Companies** | **Comments** |
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## 2.4 Others

### FR1

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

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| **Channel** | **Companies** | **Comments** |
| PRACH |  |  |
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| Msg2 |  |  |
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| Msg3 |  |  |
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| Msg4 |  |  |
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| SSB |  |  |
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| PDSCH |  |  |
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| Others |  |  |
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### FR2

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

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