**3GPP TSG-RAN WG4 Meeting #102-e R4-2207211**

**Electronic Meeting, February 21st – March 3rd, 2022**

**Agenda item:** 10.18.3.2

**Source:** Nokia, Nokia Shanghai Bell

**Title:** WF on PUCCH demodulation performance of Rel-17 NR coverage enhancement

**Document for:** Approval

# Background

* The following WF was approved previously:
  + R4-2203031 WF on PUCCH demodulation performance of Rel-17 NR coverage, RAN4#101-bis-e.
* Corresponding Email summary in RAN4#102-e
  + R4-2207449 Email discussion summary for [102-e][329] NR\_cov\_enh\_Demod.

# WF on topic#2: PUCCH Enhancements of Rel-17 NR Coverage Enhancement

## General

**Issue 2-1-1: Test metric for BS PUCCH demodulation test cases**

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| Agreement:  Agree to reuse the existing test metric for different PUCCH formats as a baseline for BS PUCCH demodulation requirements with JCE (if introduced) i.e:   * + For PUCCH format 3: Test UCI block error probability   + For PUCCH format 1: Test NACK to ACK detection probability and ACK missed detection probability |

## PUCCH demodulation with Joint Channel Estimation (JCE)

**Issue 2-2-1: Whether to define BS PUCCH demodulation requirements with JCE**

* Option 1: Yes
* Option 2: No

**Issue 2-2-2: PUCCH format for BS PUCCH demodulation requirements with JCE (if introduced)**

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| Agreement:  Cover both format 1 and format 3 for BS PUCCH demodulation requirements with JCE (if introduced) |

**Issue 2-2-3: Actual TDW length for JCE in BS PUCCH demod requirements (if introduced)**

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| Agreement:  In case of BS PUCCH demodulation requirements with JCE is introduced, use the same aTDW agreed for PUSCH JCE. |

**Issue 2-2-4: Configured TDW length for JCE in BS PUCCH demod requirements (if introduced)**

* For TDD
  + Option 1: Use the max number cTDW length to be [16] slots
  + Option 2: cTDW length is configured same as the aTDW length
* For FDD
  + Option 1: 8 slots
  + Option 2: cTDW length is configured same as the aTDW length

**Issue 2-2-5: Number of repetitions for BS PUCCH demodulation requirements with JCE (if introduced)**

* Option 1: 8 for FDD and TDD
* Option 2: 2
* Option 3: Same with aTDW length

**Issue 2-2-6: Frequency hopping for BS PUCCH demodulation requirements with JCE (if introduced)**

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| Agreement:  In case of BS PUCCH demodulation requirements with JCE is introduced, agree to disable PUCCH intra-slot frequency hopping. |

* Inter-slot frequency hopping:
  + Option 1: Disabled
  + Option 2: Activate inter-slot frequency hopping, with inter-slot hopping interval length 2 for TDD and 4 for FDD

**Issue 2-2-7: TDD UL-DL pattern for BS PUCCH demodulation requirements with JCE (if introduced)**

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| Agreement:  Agree to use the same TDD UL-DL pattern for BS PUCCH demodulation requirements as in PUSCH JCE demod requirements. |

**Issue 2-2-8: Frequency range coverage for BS PUCCH demodulation requirements with JCE (if introduced)**

* Option 1: Only cover FR1
* Option 2: Cover both FR1 and FR2

**Issue 2-2-9: Phase and power offset modelling for BS PUCCH demod requirements with JCE (if introduced)**

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| Agreement:  Agree to align both phase offset model and power offset model with the JCE test modelling for PUSCH |

**Issue 2-2-10: Bit payload for BS PUCCH demodulation requirements with JCE (if introduced)**

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| Agreement:  Agree to use 2 bits payload for PUCCH format 1, and 16 bits payload for PUCCH format 3. |

**Issue 2-2-11: Resource allocation for BS PUCCH demodulation requirements with JCE (if introduced)**

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| Agreement:  Agree to use 14 symbols and 1 PRB for both PUCCH format 1 and format 3. |

**Issue 2-2-12: Other parameters for BS PUCCH demodulation requirements with JCE (if introduced)**

* **Antenna configuration:**
  + Option 1: 1T2R only
  + Option 2: cover 1T with 2Rx 4Rx and 8Rx
* **DMRS configuration for PUCCH format 3:**
  + Option 1: only with or without additional DMRS
  + Option 2: Cover both with and without additional DMRS
* **Other test parameters:**
  + Option 1: Apply existing test parameters specified in Rel-15 for PUCCH requirement with JCE as starting point
  + Option 2:

Table 2-1: Test Parameters for PUCCH JCE format 1

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| --- | --- |
| Parameter | Test |
| First PRB prior to frequency hopping | 0 |
| Group and sequence hopping | neither |
| Hopping ID | 0 |
| Initial cyclic shift | 0 |
| First symbol | 0 |
| Index of orthogonal cover code (*timeDomainOCC*) | 0 |

Table 2-2: Test Parameters for FR1 PUCCH JCE format 3

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| --- | --- |
| Parameter | Test |
| Modulation order | QPSK |
| First PRB prior to frequency hopping | 0 |
| Group and sequence hopping | neither |
| Hopping ID | 0 |
| First symbol | 0 |