**3GPP TSG-RAN WG4 Meeting #94-e R4-20xxxxx**

**Electronic Meeting, Feb.24th – Mar.6th 2020**

**Agenda item:** 7.11.4

**Source:** Moderator **(**Huawei, HiSilicon)

**Title:** Email discussion summary for RAN4#94e\_#86\_NB\_IOTenh3\_Demod

**Document for:** Information

# Introduction

During the last meeting, the work scope of performance part related with LTE Rel-16 WI additional enhancement for NB-IoT is discussed. The generally issue to identify the features that related BS and UE demodulation requirement is captured in WF R4-1915909.

|  |
| --- |
| * UE * FFS whether to introduce the UE demodulation performance requirement(s) to verify the UE performance when NPDSCH configured with multiple TB scheduling   + No other UE demodulation requirements will be introduced * BS * FFS whether to introduce the BS demodulation performance requirement(s) to verify the following features * NPUSCH configured with multi-TB scheduling * Coexistence of NPUSCH and NR * When NB-IoT transmission is postponed by subframe(s) for NR UL transmission * No other BS demodulation requirements will be introduced |

*List of candidate target of email discussion for 1st round and 2nd round*

* 1st round: TBA
* 2nd round: TBA

# Topic #1: Multi-TB scheduling

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **Title** | **Company** | **Proposals / Observations** |
| R4-2000312 | View on BS demodulation requirement for LTE additional enhancement for NB IoT | Samsung | **Observation 1: The interleaving granularity can be verified with valid-sub-frame configuration similarly**  **Proposal 1: No BS demodulation requirement for multi-TB scheduling.** |
| R4-2001353 | Open issues on UE/BS demodulation requirements for Rel-16 NB-IoT | Ericsson | **Proposal 1: RAN4 does not define new NPDSCH demodulation requirements with multi-TB scheduling.**  **Proposal 2: RAN4 does not define new NPUSCH format 1 demodulation requirements with multi-TB scheduling.** |
| R4-2001461 | Discussion on NPDSCH performance requirements for additional enhancements for NB-IOT | Huawei, HiSilicon | **Observation1: The longer the number of sub-frames sustained by TBs, the greater the interleaving gain.**  **Proposal 1: Define the performance requirement of multi-TB with interleaving.**  **Proposal 2: Use the simulation assumptions in Table 3 for multi-TB with interleaving performance requirements definition.**  **Table 3: Simulation assumptions**   |  |  | | --- | --- | | **Parameter** | **Value** | | Duplex mode | FDD/TDD | | System bandwidth | 180 kHz | | Carrier frequency | 900 MHz | | Operation mode | Stand alone | | Antenna configuration | 1T1R | | Channel model | TU 1Hz | | Frequency error | 0 Hz | | Timing error | 0μs | | NSF | 5 | | Repetition number | 32 | | Performance target | SNR@75% of maximum throughput | | Channel estimation | Realistic cross-subframe channel estimation | |
| R4-2001462 | Discussion on NPUSCH performance requirements for additional enhancements for NB-IOT | Huawei, HiSilicon | **Observation 1: The throughput of interleaved transmission is greater than the throughput of continuous transmission.**  **Observation 2: The gain of interleaved transmission can reach up to 1.28dB when the number of sub-frames occupied by one TB is 320.**  **Observation 3: The longer the number of sub-frames sustained by TBs, the greater the interleaving gain.**  **Proposal 1: Define the performance requirement of multi-TB with interleaving for Rel-16 NPUSCH.**  **Proposal 3: The parameters listed in Table 3 copied from Table 8.5.1.1.1-3 in TS 36.104 can be chosen to tested Rel-16 NPUSCH transmitted interleaved performance and the number of HARQ processes should be set to 2.**  **Table 3: Simulation assumptions**   |  |  | | --- | --- | | **Parameter** | **Value** | | Number of tones | 12 | | SCS | 15kHz | | Antenna configuration | 1T1R | | Channel model | ETU 1Hz | | Frequency error | 0Hz | | Timing error | 0μs | | *N*RU | 10 | | Repetition number | 32 | | Performance target | SNR@ 70% of maximum throughput | |
| R4-2001916 | UE and BS demodulation requirements for NB\_IOTenh3 | Nokia, Nokia Shanghai Bell | **Observation 1: For multi-TB scheduling, the performance benefit can be reasoned by increased time diversity of the radio channel rather than refinements to PHY layer reception.**   1. No separate UE / BS demodulation requirements are required for multi-TB scheduling for NPDSCH / NPUSCH. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 1-1: NPDSCH performance requirement(s) with multi-TB scheduling

*Sub-topic description:*

*As per the approved WF R4-1915909 in RAN4#93 meeting:*

* *UE*
* *FFS whether to introduce the UE demodulation performance requirement(s) to verify the UE performance when NPDSCH configured with multiple TB scheduling*

*Open issues and candidate options before e-meeting:*

**Issue 1-1: Whether to introduce NPDSCH performance requirements with multiple TB scheduling**

* Proposals
  + Option 1: Yes (Huawei)
  + Option 2: No (Ericsson, Nokia)
* Recommended WF
  + TBA

### Sub-topic 1-2: NPUSCH performance requirement(s) with multi-TB scheduling

*Sub-topic description*

*As per the approved WF R4-1915909 in RAN4#93 meeting:*

* *BS*
* *FFS whether to introduce the BS demodulation performance requirement(s) to verify the following features*
* *NPUSCH configured with multi-TB scheduling*

*Open issues and candidate options before e-meeting:*

**Issue 1-2: Whether to introduce NPUSCH performance requirements with multiple TB scheduling**

* Proposals
  + Option 1: Yes (Huawei)
  + Option 2: No (Samsung, Ericsson, Nokia)
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1:  Sub topic 1-2:  ….  Others: |

### CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #2: Coexistense of NPUSCH and NR

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **Title** | **Company** | **Proposals / Observations** |
| R4-2000312 | View on BS demodulation requirement for LTE additional enhancement for NB IoT | Samsung | **Proposal 2: No new BS demodulation requirement for coexistence of PUSCH and NR.** |
| R4-2001353 | Open issues on UE/BS demodulation requirements for Rel-16 NB-IoT | Ericsson | **Proposal 3: RAN4 discuss whether to define new NPUSCH demodulation requirements in the case of slot-level resource reservation.** |
| R4-2001462 | Discussion on NPUSCH performance requirements for additional enhancements for NB-IOT | Huawei, HiSilicon | **Proposal 2: No need to define the performance requirements for coexistence of NPUSCH and NR.** |
| R4-2001916 | UE and BS demodulation requirements for NB\_IOTenh3 | Nokia, Nokia Shanghai Bell | **Observation 2: For postponed NB-IoT UL transmissions, due to subframe-level reserved resources for NR, any performance impact can be reasoned by increased time diversity of the radio channel.**  **Proposal 2: No separate BS demodulation requirements for NPUSCH are required for coexistence of NB-IoT with NR.** |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 1-1: NPUSCH performance requirements for coexistence of NPUSCH and NR

*Sub-topic description:*

* *BS*
* *FFS whether to introduce the BS demodulation performance requirement(s) to verify the following features*
* *Coexistence of NPUSCH and NR*
* *When NB-IoT transmission is postponed by subframe(s) for NR UL transmission*

*Open issues and candidate options before e-meeting:*

**Issue 1-1: Whether to introduce BS demodulation requirements for coexistence of NPUSCH and NR**

* Proposals
  + Option 1: Further discuss whether to define new NPUSCH demodulation requirements in case of slot-level resource reservation (Ericsson)
  + Option 2: No (Samsung, Huawei, Nokia)
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1:  Sub topic 1-2:  ….  Others: |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |