**3GPP TSG-RAN WG4 Meeting # 111 R4-2410122**

**Fukuoka, Japan, May 20 – 24, 2024**

**Agenda item:** 7.20.5

**Source:** Moderator (LG Electronics)

**Title:** Topic summary for [111][329] NR\_SL\_enh2\_demod

**Document for:** Information

# Introduction

*This document lists the open issues for demodulation performance of NR\_SL\_enh2. The open issues are summarized as follows:*

* Topic1: UE demodulation performance requirements
  + Sub-topic1-1: NR sidelink CA scenario
  + Sub-topic1-2: CR works

Recommendation of prioritized topics for online discussion

**Issue 1-1-1: Test setup for PSCCH decoding capability test**

**Issue 1-1-2: Test setup for PSFCH decoding capability test**

# Topic #1: UE demodulation performance requirements

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2407327 | LGE | ***Proposal 1:*** The PSFCH can be distributed proportionally to the number of subchannels in each carrier. So the description for the PSCCH decoding capability test can be updated as follow:   |  | | --- | | Where *Nk* is the number of subchannels in the bandwidth defined in the test; the number *xk* is derived by first ~~evenly~~ distributing the number of PSFCH(s) resources that the tested UE can transmit in a slot (i.e. [IE *psfch-TxNumber*] specified in clause 4.2.16.1.6 of  TS 38.306 [14]) across all carriers proportionally to the number of subchannels in each carrier, and carrier *k* gets *yk*, then *xi* = min(*yk* , *Nk*).. |   ***Proposal 2:*** Support to remove the square bracket in current draft big CR[2]. |
| R4-2407328 | LGE | The changes are:   1. Remove square bracket in PSFCH decoding capability test for CA 2. Remove square bracket and modify the contents in PSCCH decoding capability test for CA 3. Correct some number of subchannels of PSCCH |
| R4-2407329 | LGE |  |
| R4-2407332 | Qualcomm | **Proposal 1: Make the following change in endorsed big CR:**  **PSCCH decoding capability test:**  **Where *Nk* is the number of subchannels in the bandwidth defined in the test; [the number *xk* is derived by first distributing the number of PSFCH(s) resources that the tested UE can transmit in a slot (i.e. [IE *psfch-TxNumber*] specified in clause 4.2.16.1.6 of TS 38.306 [14]) across all carriers proportionally to the number of subchannels in each carrier, and carrier *k* gets *yk*, then *xi* = min(*yk* , *Nk*).]**  **PSFCH reception capability test:**  **The minimum requirements are specified in Table 11.1.9A.1.1-2 with the test parameters specified in Table 11.1.9A.1.1-1 [and the test procedure specified as follows for each carrier with index *k*:**  **- Based on the selected Option, the UEs transmit PSFCHs to the tested UE per slot on *xk* PSFCH resources in each carrier index *k*.**  **Where the number *xk* is derived by distributing the number of PSFCH(s) resources that the tested UE can receive in a slot (i.e. [IE *psfch-RxNumber*] specified in clause 4.2.16.1.6 of TS 38.306 [14]) across all carriers proportionally to the number of subchannels in each carrier.]** |
| R4-2408058 | Nokia | Adding a new section (11.1.9A) to introduce PSFCH decoding capability test for CA. |
| R4-2408059 | Nokia | [***Observation 1:*** With the change from evenly distributed to the proportionally distributed according to the number of subchannels in each carrier, wasteful allocation of PSFCH resources in a situation when there is an imbalance number of subchannels among the carriers can be minimized.](#_Toc166499191)  [***Proposal 1:*** RAN4 to agree on having proportionally distribution of PSFCH resources according to the number of subchannels in each carrier in SL-CA PSCCH decoding capability test.](#_Toc166499192)  [***Proposal 2:*** For consistency of the use of variables, “xi = min(yk , Nk)” should be replaced by “xk = min(yk , Nk)”](#_Toc166499193)  [***Proposal 3:*** RAN4 to remove the square-bracket from the test procedure of SL-CA PSFCH decoding capability test in the formal big CR of Rel-18 Sidelink Evolution to be agreed in RAN4#111, and to finalize the PSFCH decoding capability test for 38.101-4.](#_Toc166499194) |
| R4-2409011 | Huawei | **Proposal 1: Consider following description for PSCCH decoding capability test setup:**   |  | | --- | | **For component carrier *k***  **- *Nk* UEs transmit PSCCHs and corresponding PSSCHs to the tested UE per slot with each UE occupying one subchannel.**  **- *xk* UEs transmit PSCCHs and corresponding PSSCHs with high priority level on *xk* subchannels that are randomly selected from *Nk* subchannels per slot and *Nk*-*xk* UEs transmit PSCCHs and corresponding PSSCHs with low priority level on the remaining subchannels. The indication of priority level specified in Clause 5.4.3.3 of TS 23.287 [12] and Clause 5.22.1.3.1 of TS 38.321 [8] is included in PSCCH.**  ***-* Where *Nk* = floor (*NRB,k* /10), *NRB,k* is the number of RBs defined per channel bandwidth of carrier *k* by RAN4 in 38.101-1 Table 5.3.2-1 for FR1. *xk*=min(floor(*X/Y)*, *Nk*). *X* is number of PSFCHs UE can transmit in CA and *Y* is number of component carriers** |   **Proposal 2: Consider following description for PSFCH decoding capability test setup:**   |  | | --- | | **For component carrier *k***   * **In each slot, a group of UEs transmits PSFCHs to the tested UE. Information transmitted in each PSFCH is randomly selected from Option A, Option B and Option C with probability of 50%, 25% and 25% respectively. Transmitted PSFCHs are related to one PSSCH which is transmitted by tested UE and occupies all the subchannels.**   **- Option A: All the UEs in the group transmit ACKs**  **- Option B: One UE transmits NACK and the rest of UEs transmit ACKs. The PSFCH resource index with NACK is random per slot**  **- Option C: One UE transmits nothing (i.e.DTX) and the rest of UEs transmit ACKs. The PSFCH resource index of the DTX is random per slot.**  **The number of UEs in the group *N*=min(floor(*X/Y)*, *Zk*), where *X* is number of PSFCHs UE can receive in CA , *Y* is number of component carriers, *Zk* is number of PSFCH resources in carrier *k.***  **PSFCH resource allocation: *N* UEs transmit PSFCH to tested UE in ascending order of RB index firstly and in ascending order of CS pair index secondly.**  **The minimum requirements are specified in Table 11.1.9.1.1-2 with the test parameters specified in Table 11.1.9.1.1-1** | |
| R4-2409012 | Huawei | Draft CR Introduction of PSSCH demodulation requirements for SL-U  Capture PSSCH requirements, Applicability rules, RMC and corresponding transmission burst model |

## Open issues summary

### Sub-topic 1-1: NR sidelink CA scenario

*This sub-topic is for NR sidelink CA scenario*

*Open issues and candidate options before meeting:*

PSCCH decoding capability test

**Issue 1-1-1: Test setup for PSCCH decoding capability test**

* Background

For the PSCCH decoding capability test, the TE check the performance by receiving PSFCH feedback. So, the PSFCH capability can impact to the PSCCH decoding capability test. Regarding the PSFCH capability, during the previous meeting, the distribution rule of PSFCH per carrier was discussed. Temporary evenly distribution rule was selected. RAN4 need to discuss more about this issue.

* Proposals
  + Option 1: Distribute the PSFCHs across all carriers proportionally to the number of subchannels in each carrier.

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| Where *Nk* is the number of subchannels in the bandwidth defined in the test; the number *xk* is derived by first ~~evenly~~ distributing the number of PSFCH(s) resources that the tested UE can transmit in a slot (i.e. [IE *psfch-TxNumber*] specified in clause 4.2.16.1.6 of  TS 38.306 [14]) across all carriers proportionally to the number of subchannels in each carrier, and carrier *k* gets *yk*, then *xi* = min(*yk* , *Nk*). Note that summation of yk is [psfch-TxNumber]. |

* + Option 2: Option 1 including carrier index alignment

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| Where *Nk* is the number of subchannels in the bandwidth defined in the test; the number *xk* is derived by first ~~evenly~~ distributing the number of PSFCH(s) resources that the tested UE can transmit in a slot (i.e. [IE *psfch-TxNumber*] specified in clause 4.2.16.1.6 of  TS 38.306 [14]) across all carriers proportionally to the number of subchannels in each carrier, and carrier *k* gets *yk*, then *xk* = min(*yk* , *Nk*). |

* + Option 3: Consider following description

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| --- |
| **For component carrier *k***  **- *Nk* UEs transmit PSCCHs and corresponding PSSCHs to the tested UE per slot with each UE occupying one subchannel.**  **- *xk* UEs transmit PSCCHs and corresponding PSSCHs with high priority level on *xk* subchannels that are randomly selected from *Nk* subchannels per slot and *Nk*-*xk* UEs transmit PSCCHs and corresponding PSSCHs with low priority level on the remaining subchannels. The indication of priority level specified in Clause 5.4.3.3 of TS 23.287 [12] and Clause 5.22.1.3.1 of TS 38.321 [8] is included in PSCCH.**  **- Where Nk = floor (NRB,k /10), NRB,k is the number of RBs defined per channel bandwidth of carrier k by RAN4 in 38.101-1 Table 5.3.2-1 for FR1. xk=min(floor(X/Y), Nk). X is number of PSFCHs UE can transmit in CA and Y is number of component carriers** |

* + Option 4: Combination of the options and other modification is not precluded

e.g.

1. “as proportionally as possible” instead of “proportionally”

2. At the end of the sentence additional note that *xk* should be larger than or equal to 1.

* Recommended WF
  + Moderator’s view: Need further discussion.

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| --- |
| Where *Nk* is the number of subchannels in the bandwidth defined in the test; the number *xk* is derived by first ~~evenly~~ distributing the number of PSFCH(s) resources that the tested UE can transmit in a slot (i.e. [IE *psfch-TxNumber*] specified in clause 4.2.16.1.6 of  TS 38.306 [14]) across all carriers as proportionally as possible to the number of subchannels in each carrier, and carrier *k* gets *yk*, then *xk* = min(*yk* , *Nk*). Note that summation of yk is [psfch-TxNumber] and *xk* should be larger than or equal to 1. |

PSFCH decoding capability test

**Issue 1-1-2: Test setup for PSFCH decoding capability test**

* Background

For the PSFCH decoding capability test, the distribution rule of PSFCH per carrier is necessary. Temporary evenly distribution rule was selected. RAN4 need to discuss more about this issue.

* Proposals
  + Option 1:
    - Support evenly distribution as current description in the endorsed draft big CR.
  + Option 2:
    - Support proportional distribution
  + Option 3: Consider following description

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| **For component carrier *k***   * **In each slot, a group of UEs transmits PSFCHs to the tested UE. Information transmitted in each PSFCH is randomly selected from Option A, Option B and Option C with probability of 50%, 25% and 25% respectively. Transmitted PSFCHs are related to one PSSCH which is transmitted by tested UE and occupies all the subchannels.**   **- Option A: All the UEs in the group transmit ACKs**  **- Option B: One UE transmits NACK and the rest of UEs transmit ACKs. The PSFCH resource index with NACK is random per slot**  **- Option C: One UE transmits nothing (i.e.DTX) and the rest of UEs transmit ACKs. The PSFCH resource index of the DTX is random per slot.**  **The number of UEs in the group *N*=min(floor(*X/Y)*, *Zk*), where *X* is number of PSFCHs UE can receive in CA , *Y* is number of component carriers, *Zk* is number of PSFCH resources in carrier *k.***  **PSFCH resource allocation: *N* UEs transmit PSFCH to tested UE in ascending order of RB index firstly and in ascending order of CS pair index secondly.**  **The minimum requirements are specified in Table 11.1.9.1.1-2 with the test parameters specified in Table 11.1.9.1.1-1** |

* + Option 4: Combination of the options and other modification is not precluded

e.g.

1. “as evenly as possible” instead of “evenly”

* Recommended WF
  + Moderator’s view: Need further discussion.

|  |
| --- |
| The minimum requirements are specified in Table 11.1.9A.1.1-2 with the test parameters specified in Table 11.1.9A.1.1-1 ~~[~~and the test procedure specified as follows for each carrier with index *k*:  - Based on the selected Option, the UEs transmit PSFCHs to the tested UE per slot on *xk* PSFCH resources in each carrier index *k*.  Where the number *xk* is derived by as evenly as possible distributing the number of PSFCH(s) resources that the tested UE can receive in a slot (i.e. [IE psfch-RxNumber] specified in clause 4.2.16.1.6 of TS 38.306 [14]) across all carriers.~~]~~ |

### Sub-topic 1-2: CR works

**Issue 1-2-1: Draft Big CR to TS38.101-4 on Sidelink enhancement demod performance**

* Proposals
  + R4-2407328
    - Remove square bracket in PSFCH decoding capability test for CA
    - Remove square bracket and modify the contents in PSCCH decoding capability test for CA
    - Correct some number of subchannels of PSCCH
* Recommended WF
  + Moderator’s view: Need further discussion

**Issue 1-2-2: Big CR to TS38.101-4 on Sidelink enhancement demod performance**

* Proposals
  + R4-2407329 Formal Big CR
* Recommended WF
  + Moderator’s view: Can be revised based on the discussion

**Issue 1-2-3: Draft CR on PSFCH Decoding Capability for Sidelink CA**

* Proposals
  + R4-2408058
    - Removing square brackets from the yellow-highlighted sentences based on the endorsed draft CR R4-2406049 in RAN4#110bis.
* Recommended WF
  + Moderator’s view: Can be follow the issue 1-1-2 results

**Issue 1-2-4: Draft CR Introduction of PSSCH demodulation requirements for SL-U**

* Proposals
  + R4-2409012 TDB values int the endorsed draft CR R4-2406048 in RAN4#110bis are updated.
* Recommended WF
  + Moderator’s view: Need further discussion

# Topic #2: Disposition of tdocs

**Agenda 7.20.4**

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| **T-doc number** | **Suggested status** | **Comments** |
| R4-2407327 | Noted |  |
| R4-2407328 | Endorsed | This is Draft CR. Can be revised based on the discussion |
| R4-2407329 | Agreed | This is formal big CR. Can be revised based on the discussion |
| R4-2407332 | Noted |  |
| R4-2408058 | Endorsed | This is Draft CR. Can be revised based on the discussion |
| R4-2408059 | Noted |  |
| R4-2409011 | Noted |  |
| R4-2409012 | Endorsed | This is Draft CR. Can be revised based on the discussion |