**3GPP TSG-RAN WG4 Meeting # 111**  **R4-240xxxx**

Fukuoka, Japan, 20th -24th May, 2024

**Agenda item:** 7.7.4

**Source:** Moderator (Samsung)

**Title:** Topic summary for [111][321] NR\_HST\_FR2\_enh\_Demod

**Document for:** Information

# Introduction

This contribution summarises the open issues and submitted draft CR on demodulation requirements for FR2 HST under 7.7.3. The topics with minor open issues are captured:

* Topic #1: CR drafting

# Topic #1: CR drafting

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2408063 | Nokia | Draft CR on PDSCH requirements with CA |
| R4-2408064 | Nokia | Observation 1: The simulation results from companies have been collected and they are well aligned; and it is not expected that there will be simulation result updates from any companies.  Observation 2: The SNR requirements of Rel-18 HST FR2 have been adapted to align with the SNR requirements of HST FR2 PDSCH with multi-Rx in terms of the additional margin for 64QAM.  Observation 3: RAN4#111 is the last meeting for RAN4 demodulation performance requirements of Rel-18 HST FR2 Enhanced.  Proposal 1: The SNR requirements of HST FR2 PDSCH with Carrier Aggregation shall be finalized in RAN4#111, and the square brackets in the corresponding draft CR and the final formal big CR shall be removed. |
| R4-2408065 | Nokia | Observation 1: The simulation results from companies have been updated in RAN4#110bis, and they are well aligned. Hence, it is not expected that there will be further simulation result updates from any companies on HST FR2 with multi-Rx.  Observation 2: RAN4#111 is the last meeting for RAN4 demodulation performance requirements of Rel-18 HST FR2 Enhanced.  Proposal 1: The SNR requirements for HST FR2 PDSCH with multi-Rx shall be finalized in RAN4#111, and the square brackets in the final formal big CR shall be removed.  Observation 3: It is not common to use the Reference Channel column in the requirements table in the specification for both the intended Reference Channel and other parameters.  Proposal 2: RAN4 to add another column for RRH number to avoid other parameters than Reference Channel to be placed in the Reference Channel column as below:  Observation 4: The Reference channels in the requirements table are still in square brackets although they are already fixed and stable.  Observation 5: The number of active PDSCH TCI states is still in square brackets although it is already fixed.  Proposal 3: The square brackets in Table 7.2.2.2.6-3 for the Reference channel and the Number of active PDSCH TCI states shall be removed. |
| R4-2408066 | Nokia | Observation 1: In the current structure of 38.101-4, FR2 HST-DPS Channel Profile is in Section B.3.4, which consist of two subsections B.3.4.1 and B.3.4.2.  Observation 2: Section B.3.4.2 in 38.101-4 is used for bidirectional deployment channel profile without multi-Rx.  Observation 3: The new channel profile to be introduced in 38.101-4 is for bidirectional deployment channel profile with multi-Rx chain reception.  Proposal 1: RAN4 to use Section B.3.4.3 in 38.101-4 for the newly introduced channel profile for bidirectional deployment with multi-Rx chain reception. Alternatively, Section B.3.4.2 in 38.101-4 is rearranged to have two subsections, namely, B.3.4.2.1 for bidirectional deployment without multi-Rx and B.3.4.2.2 for bidirectional deployment with multi-Rx. |
| R4-2408960 | Huawei, HiSilicon | Draft CR on PDSCH requirement with multi-Rx reception for FR2 HST (TS38.101-4, Rel-18) |
| R4-2409472 | Samsung | Big CR for TS 38.101-4 on Rel-18 FR2 HST demodulation requirements |

## Open issues summary

Last RAN4 meeting agreements in the WF R4-2406004

List of open issues

* Sub-topic 1-1: CR drafting

### Sub-topic 1-1: CR drafting

**Issue 1-1-1: SNR for PDSCH requirement for CA and multi-Rx reception**

* Observations
  + Observation 1 (Nokia):
    - The simulation results from companies have been collected and they are well aligned; and it is not expected that there will be simulation result updates from any companies.
    - The simulation results from companies have been updated in RAN4#110bis, and they are well aligned. Hence, it is not expected that there will be further simulation result updates from any companies on HST FR2 with multi-Rx.
    - The SNR requirements of Rel-18 HST FR2 have been adapted to align with the SNR requirements of HST FR2 PDSCH with multi-Rx in terms of the additional margin for 64QAM
    - RAN4#111 is the last meeting for RAN4 demodulation performance requirements of Rel-18 HST FR2 Enhanced.
* Proposals
  + Option 1 (Nokia)
    - The SNR requirements of HST FR2 PDSCH with CA and multi-Rx reception shall be finalized in RAN4#111, and the square brackets in the corresponding draft CR and the final formal big CR shall be removed
* Recommended WF
  + Moderator note: there is no updated simulation results provided
  + Finalize the SNR requirements for HST FR2 PDSCH with CA and multi-Rx reception. Remove the square brackets in corresponding draft CR and the final formal big CR.

**Issue 1-1-2: Square bracket removing for FRC and number of TCI states**

* Observations
  + Observation 1 (Nokia):
    - The Reference channels in the requirements table are still in square brackets although they are already fixed and stable.
    - The number of active PDSCH TCI states is still in square brackets although it is already fixed.
* Proposals
  + Option 1 (Nokia)
    - The square brackets in Table 7.2.2.2.6-3 for the Reference channel and the Number of active PDSCH TCI states shall be removed.
* Recommended WF
  + Remove the square brackets in corresponding draft CR and the final formal big CR.

**Issue 1-1-3: Minimum Performance Table format for multi-Rx reception under HST scenario**

* Observations
  + Observation 1 (Nokia):
    - It is not common to use the Reference Channel column in the requirements table in the specification for both the intended Reference Channel and other parameters.
* Proposals
  + Option 1 (Nokia)
    - RAN4 to add another column for RRH number to avoid other parameters than Reference Channel to be placed in the Reference Channel column as below:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test Number** | **RRH Number** | **Reference channel** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Modulation format and code rate** | **TDD UL-DL pattern** | **Propagation condition** | **Number of active PDSCH TCI states [Note 3]** | **Correlation matrix and antenna configuration** | **Reference value** | |
| **Fraction of maximum throughput (%)** | **SNR (dB)** |
| 1-1 | i | [R.PDSCH. 5-18.1 TDD] | 200 / 120 | 64QAM, 0.50 | FR2.120-1 | HST-DPS-FR2-BI-B1-MR | [2] | 2x2 | 70 | [15.0] |
| j | [R.PDSCH. 5-18.2 TDD] | 200 / 120 | 16QAM, 0.37 | FR2.120-1 | HST-DPS-FR2-BI-B1-MR | [2] | 2x2 | 70 | [8.2] |
| Note 1 : The RRH#i (i =-1,0,1,2…) and RRH#j (j=1,2,3,…) indicate the RRHs simultaneously transmitting PDSCH to the UE.  Note 2: Receive timing difference (RTD) of PDSCH data transmitted from RRH#i (i =-1,0,1,2…) and RRH#j (j=1,2,3,…) at the UE between two Rx chains is 0.88 us (1.5\*CP).  Note 3: Only 1 available active TCI state per RRH. | | | | | | | | | | |

* + Option 2
    - Existing table

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test num.** | **Reference channel** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Modulation format and code rate** | **TDD UL-DL pattern** | **Propagation condition** | **Number of active PDSCH TCI states [Note 3]** | **Correlation matrix and antenna configuration** | **Reference value** | |
| **Fraction of maximum throughput (%)** | **SNR (dB)** |
| 1-1 | [RRH#i] | 200 / 120 | 64QAM, 0.50 | FR2.120-1 | HST-DPS-FR2-BI-B1-MR | [2] | 2x2 | 70 | [15.0] |
| [R.PDSCH. 5-18.1 TDD] |
| [RRH#j] | 200 / 120 | 16QAM, 0.37 | FR2.120-1 | HST-DPS-FR2-BI-B1-MR | [2] | 2x2 | 70 | [8.2] |
| [R.PDSCH. 5-18.2 TDD] |
| Note 1 : The RRH#i (i =-1,0,1,2…) and RRH#j (j=1,2,3,…) indicate the RRHs simultaneously transmitting PDSCH to the UE.  Note 2: Receive timing difference (RTD) of PDSCH data transmitted from RRH#i (i =-1,0,1,2…) and RRH#j (j=1,2,3,…) at the UE between two Rx chains is 0.88 us (1.5\*CP).  Note 3: Only 1 available active TCI state per RRH. | | | | | | | | | |

* Recommended WF
  + Moderator note: Existing table is similar as PDSCH Multi-DCI based transmission scheme, considering two FRCs associated with different TRxP (RRH) are needed.
  + Companies can check whether option 1 is acceptable?

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Test num. | Reference channel | | Bandwidth (MHz) / Subcarrier spacing (kHz) | Modulation format and code rate | Propagation condition(Note 1) | Correlation matrix and antenna configuration(Note 2) | Reference value | |
| Fraction of maximum throughput (%) | SNR (dB)(Note 3) |
|  | TRxP #1 | TRxP #2 |  |  |  |  |  |  |
| 1-1 | R.PDSCH.1-3.3 FDD | R.PDSCH.1-3.4 FDD | 10 / 15 | 64QAM, 0.50 | TDLA30-10 | 2x2, ULA Low | 70 | 20.6 |
| Note 1: The propagation conditions apply to each of TRxP #1 and TRxP #2 and are statistically independent  Note 2: Correlation matrix and antenna configuration parameters apply to each of TRxP #1 and TRxP #2  Note 3: SNR corresponds to SNR of TRxP #1 and TRxP #2 as defined in 4.4.2 | | | | | | | | |

**Issue 1-1-4: Section number of channel model profile with multi-Rx Chain reception**

* Observations
  + Observation 1 (Nokia):
    - In the current structure of 38.101-4, FR2 HST-DPS Channel Profile is in Section B.3.4, which consist of two subsections B.3.4.1 and B.3.4.2.
    - Section B.3.4.2 in 38.101-4 is used for bidirectional deployment channel profile without multi-Rx.
    - The new channel profile to be introduced in 38.101-4 is for bidirectional deployment channel profile with multi-Rx chain reception.
* Proposals
  + Option 1 (Nokia):
    - RAN4 to use Section B.3.4.3 in 38.101-4 for the newly introduced channel profile for bidirectional deployment with multi-Rx chain reception. Alternatively, Section B.3.4.2 in 38.101-4 is rearranged to have two subsections, namely, B.3.4.2.1 for bidirectional deployment without multi-Rx and B.3.4.2.2 for bidirectional deployment with multi-Rx.
      * Option 1a:
        + B.3.4.2 Bidirectional Deployment Channel Profile
        + B.3.4.3 Bidirectional Deployment Channel Profile with Multi-Rx Chain Reception
      * Option 1b:
        + B.3.4.2 Bidirectional Deployment Channel Profile

B.3.4.2.1 Bidirectional Deployment Channel Profile without Multi-Rx Chain Reception

B.3.4.2.2 Bidirectional Deployment Channel Profile with Multi-Rx Chain Reception

* Recommended WF
  + Moderator note: Samsung is the corresponding CR company for channel model CR, no CR is reserved before meeting, new CR can be asked to update the section number or the section number can be updated in the formal CR
  + Further discuss in the CR drafting

1. Topic #2: Documents and suggested status

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| **TDoc** | **Suggest status** | **Comments** |
| R4-2408063 | Endorsed | Removing [] |
| R4-2408064 | Noted |  |
| R4-2408065 | Noted |  |
| R4-2408066 | Noted |  |
| R4-2408960 | Endorsed |  |
| R4-2409472 | Revised | For email approval |
| R4-240XXXX | New draft CR reserved |  |