**3GPP TSG-RAN WG4 Meeting # 104bis-e R4-22XXXXX**

**Electronic Meeting, October 10 – October 19 2022**

**Agenda item:** 4.3.8

**Source:** Moderator (Qualcomm)

**Title:** Email discussion summary for [104-e][204] NR\_ext\_to\_71GHz\_RRM\_2

**Document for:** Information

# Introduction

*This email discussion document focuses on RRM performance requirements for NR operation extension to 71GHz including test configurations, impact of LBT on RRM performance requirements etc.*

*Draft CRs are treated in this document.*

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

* 1st round
  + Test configurations
  + CCA aspects
  + Draft CRs
  + Test-cases and work-split
* 2nd round: TBA

It is appreciated that the delegates for this topic put their contact information in the table below.

Contact information

|  |  |  |
| --- | --- | --- |
| **Company** | **Name** | **Email address** |
|  |  |  |

Note:

1. Please add your contact information in above table once you make comments on this email thread.
2. If multiple delegates from the same company make comments on single email thread, please add you name as suffix after company name when make comments i.e. Company A (XX, XX)

# Topic #1: General

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2215417 | CATT | Proposal 1: In order to test the behavior of UE more thoroughly, it is suggested to use a fixed sequential mode to shift the SSB index.  For example, the unavailable SSB in the first 12 SSBs could be the first SSB, the unavailable SSB in the second 12 SSBs could be the second SSB, and so on. |
| R4-2216259 | Nokia | Observation 1: Timing requirements defined for FR2-2 are related to the subcarrier spacing, with more accurate requirements applied for larger SCS.  Observation 2: SCS have little impact on the RRSI measurement accuracy. Therefore it was agreed in RAN4 that the UE only needs to be tested for one of the supported test configurations.  Observation 3: The same conclusions from RSSI do not apply for other test cases, where the SCS have strong impact on the requirements.  Proposal 1: The test configurations in which the UE is required to be tested must be discussed for each test case.  Proposal 2: UE is required to be tested with the largest supported SCS for UL transmit timing test cases.  Proposal 3: UE is required to be tested with the largest supported SCS for timing advance accuracy test cases |
| R4-2216267 | Huawei | Proposal 1: Define CCA model as follows:   * Prior to each SSB/SMTC group which is consist of 12 SSB/SMTC, the test equipment shall determine whether the CCA attempt is successful based on probability PCCA\_DL. * If the CCA attempt is determined to be successful, then the test equipment shall transmit remaining transmissions for the SSB/SMTC group. * If the CCA attempt is determined to be unsuccessful, one of the SSB shall not be transmitted by the test equipment. The SSB within the SSB/SMTC group shall be randomly chosen from all SSBs within the group. The test equipment shall transmit rest transmissions for the SSB/SMTC group.   Proposal 2: Define PCCA\_DL = 0.9 in each test case, which is the probability that all SSBs are available within one SSB/SMTC group. |

## 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: Test configurations

*Sub-topic description*

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

**Issue 1-1-1: Test configurations - General**

* Proposal 1 (Nokia): The test configurations in which the UE is required to be tested must be discussed for each test case
* Recommended WF
  + Discuss the proposal

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| **Company** | **Comments** |
| XXX |  |

**Issue 1-1-2: Test configurations - Timing**

* Proposal 1 (Nokia): UE is required to be tested with the largest supported SCS for UL transmit timing test cases
* Proposal 2 (Nokia): UE is required to be tested with the largest supported SCS for timing advance accuracy test cases
* Recommended WF
  + Discuss the proposals

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| **Company** | **Comments** |
| XXX |  |

### Sub-topic 1-2: CCA aspects

*Sub-topic description: The following was agreed in the last meeting:*

*Agreement: For CCA model in test cases, an unavailable SSB/SMTC group can be modelled as that there is exactly one SSB not transmitted by TE in N consecutive SSB/SMTC occasions*

*• Shift SSB index in each N consecutive SSB/SMTC occasions rather than keeping one fixed SSB index*

*• FFS: Exact shifting pattern*

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

**Issue 1-5-1: CCA modelling in test cases**

* Proposal 1 (Huawei): Define CCA model as follows:
  + Prior to each SSB/SMTC group which is consist of 12 SSB/SMTC, the test equipment shall determine whether the CCA attempt is successful based on probability PCCA\_DL.
  + If the CCA attempt is determined to be successful, then the test equipment shall transmit remaining transmissions for the SSB/SMTC group.
  + If the CCA attempt is determined to be unsuccessful, one of the SSB shall not be transmitted by the test equipment. The SSB within the SSB/SMTC group shall be randomly chosen from all SSBs within the group. The test equipment shall transmit rest transmissions for the SSB/SMTC group
* Proposal 2 (Huawei): Define PCCA\_DL = 0.9 in each test case, which is the probability that all SSBs are available within one SSB/SMTC group
* Recommended WF
  + Discuss the proposal

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| **Company** | **Comments** |
| XXX |  |

**Issue 1-5-2: SSB index shift**

* Proposal 1 (CATT): In order to test the behaviour of UE more thoroughly, it is suggested to use a fixed sequential mode to shift the SSB index.
  + For example, the unavailable SSB in the first 12 SSBs could be the first SSB, the unavailable SSB in the second 12 SSBs could be the second SSB, and so on.
* Recommended WF
  + Discuss the proposal

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| **Company** | **Comments** |
| XXX |  |

## 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:* |

## Discussion on 2nd round (if applicable)

# Topic #2: Draft CRs for test cases

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2215418 | CATT | Draft CR on test cases for SA RRC Re-establishment for extending NR operation to 71GHz |
| R4-2215419 | CATT | Draft CR on test cases for Beam failure detection and link recovery for extending NR operation to 71GHz |
| R4-2215863 | Vivo | Draft CR on introduction of intra-frequency and inter-frequency measurement test cases without CCA for FR2-2 |
| R4-2216258 | Nokia | Draft CR random access test cases in FR2-2 |
| R4-2216260 | Nokia | Draft CR introducing BFD and TCI state switch test cases in FR2-2 |
| R4-2216268 | Huawei | CR on test cases for HO for FR2-2 |
| R4-2216501 | Ericsson | draft CR on Test Cases on RLM for SCell activation to 71GHz |

### 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** |
| R4-2215418 | Company A |
| Company B |
|  |
| R4-2215419 | Company A |
| Company B |
|  |
| R4-2215863 |  |
|  |
|  |
| R4-2216258 |  |
| R4-2216260 |  |
| R4-2216268 |  |
| R4-2216501 |  |

### 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)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Topic #3: Test cases & Work Split

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

### Sub-topic 3-1: Test cases for RRM performance requirements without CCA

*Sub-topic description: The table below lists the agreed set of test cases.* ***Companies are encouraged to volunteer for test cases and provide comments, if any, in the box below the table****.*

| Group of requirements | Test cases | Sub-test | 120 kHz SCS | 480/960 kHz SCS | Company |
| --- | --- | --- | --- | --- | --- |
| RRC\_IDLE, cell re-selection | FR2-2 -> FR2-2 | intra-frequency | Yes | Yes | Ericsson |
|  |  | inter-frequency | Yes | yes | Ericsson |
| HO (delay and interruptions) | FR2-2->FR2-2 | intra-frequency, unknown target cell | Yes | Yes | Huawei |
|  |  | inter-frequency, unknown target cell | Yes | Low priority | Huawei |
|  | FR1->FR2-2 | unknown target cell | Yes | Yes | Huawei |
| RRC Re-establishment | FR2-2->FR2-2 | intra frequency | Yes | Low priority |  |
|  |  | inter frequency | Yes | Yes |  |
|  |  | intra frequency without serving cell timing | Yes | Yes |  |
| Random access | 4-step RACH | Contention based | Reuse FR2-1 | Yes | Nokia |
|  |  | Non-contention based | Reuse FR2-1 | Yes | Nokia |
| RRC Connection Release with Redirection | FR2-2->FR2-2 |  | Yes | Low priority |  |
| Timing | UE Transmit Timing |  | Yes  FR2 configuration uses 240 kHz SSB, so new test is needed for 120 kHz SCS | Yes | Huawei |
|  | Timing advance adjustment accuracy |  | Yes  FR2 configuration uses 240 kHz SSB, so new test is needed for 120 kHz SCS | Yes | Huawei |
| Active BWP switch | DCI-based and timer-based active BWP switch | FR2-2->FR2-2 | Reuse FR2-1 | Yes | Huawei |
|  |  | FR1->FR2-2 | Reuse FR2-1 | Low priority |  |
|  |  | One FR2-2 cell | Reuse FR2-1 | Low priority |  |
|  | RRC-based active BWP switch |  | Reuse FR2-1 | Yes | Huawei |
|  | SCell dormancy switch | FR2-2->FR2-2 | Reuse FR2-1 | Low priority | Huawei |
|  |  | FR1->FR2-2 | Reuse FR2-1 | Low priority |  |
|  | RRC-based Active BWP Switch on multiple CCs |  | Reuse FR2-1 | Yes | Huawei |
| Radio link monitoring | FR2-2 PCell, SSB-based | Out-of-sync, in non-DRX | Yes | Yes | Ericsson |
|  |  | In-sync, in non-DRX mode | Yes | Low priority | Ericsson |
|  |  | Out-of-sync, in DRX mode | Yes | Low priority | Ericsson |
|  |  | In-sync, in DRX mode | Yes | Yes | Ericsson |
|  | FR2-2 PCell, CSI-RS-based | Out-of-sync, in non-DRX | Yes | Low priority | Ericsson |
|  |  | In-sync, in non-DRX mode | Yes | Yes | Ericsson |
|  |  | Out-of-sync, in DRX mode | Yes | Yes | Ericsson |
|  |  | In-sync, in DRX mode | Yes | Low priority | Ericsson |
|  | Scheduling restrictions |  | Yes | Yes | Ericsson |
| Beam failure detection and link recovery | FR2-2 PCell | SSB-based in non-DRX mode | Yes | Yes | Nokia |
|  |  | SSB-based in non-DRX mode | Yes | Low priority | Nokia |
|  |  | CSI-RS-based in non-DRX mode | Yes | Low priority |  |
|  |  | CSI-RS -based in non-DRX mode | Yes | Yes |  |
|  | Scheduling restrictions | SSB-based in non-DRX mode | Yes | Yes |  |
| SCell activation/deactivation delay | SCell in FR2 | intra-band in non-DRX | Yes | Yes | Ericsson |
|  |  | inter-band in non-DRX | Yes | Low priority | Ericsson |
|  | FR1+FR2 inter-band with target SCell in FR2 |  | Yes | Yes | Ericsson |
| PSCell addition and release delay | Known PSCell |  | Yes  FR2 configuration uses 240 kHz SSB, so new test is needed for 120 kHz SCS | No |  |
|  | Unknown PSCell |  | Yes  FR2 configuration uses 240 kHz SSB, so new test is needed for 120 kHz SCS | Yes |  |
| Active TCI state switching delay | MAC-CE based | PCell in FR2-2 | Reuse FR2-1 | Yes | Nokia |
|  | RRC based | PCell in FR2-2 | Reuse FR2-1 | Low priority | Nokia |
| Interruptions | during measurements on deactivated NR SCC in FR2-2 |  | Reuse FR2-1 | Yes |  |
| Intra-frequency measurement procedure | SA event triggered reporting test without gap | under non-DRX | Yes | Yes | vivo |
|  |  | under DRX | Yes | Low priority | vivo |
|  | SA event triggered reporting test with per-UE gap | under non-DRX | Yes | Low priority | vivo |
|  |  | under DRX | Yes | Yes | vivo |
| Inter-frequency measurement procedure | SA event triggered reporting tests For FR2 without SSB time index detection | PCell in FR2-2,  DRX is not used | Yes | Yes | vivo |
|  |  | PCell in FR2-2,  DRX is used | Yes | Low Priority | vivo |
|  |  | PCell in FR1,  DRX is not used | Yes | Low Priority | vivo |
|  |  | PCell in FR1,  DRX is used | Yes | Yes | vivo |
|  | SA event triggered reporting tests For FR2 with SSB time index detection | PCell in FR2-2,  DRX is not used | Yes | Low Priority | vivo |
|  |  | PCell in FR2-2,  DRX is used | Yes | Yes | vivo |
|  |  | PCell in FR1,  DRX is not used | Yes | Yes | vivo |
|  |  | PCell in FR1,  DRX is used | Yes | Low Priority | vivo |
| L1-RSRP measurement for beam reporting | SSB based | DRX not used | Yes | Low Priority |  |
|  |  | DRX is used | Yes | Yes |  |
|  | CSI-RS based | DRX not used | Yes | Yes |  |
|  |  | DRX is used | Yes | Low Priority |  |
| Accuracy for measurements | SS-RSRP | Intra-frequency FR2-2 serving and target cell | Yes | Yes |  |
|  |  | Inter frequency FR2-2 serving and target cell | Yes | Low Priority |  |
|  |  | Inter frequency FR1 serving and FR2-2 target cell | Yes | Yes |  |
|  | SS-RSRQ | Intra-frequency FR2-2 serving and target cell | Yes | Low Priority |  |
|  |  | Inter frequency FR2-2 serving and target cell | Yes | Yes |  |
|  | SS-SINR | Intra-frequency FR2-2 serving and target cell | Yes | Yes |  |
|  |  | Inter frequency FR2-2 serving and target cell | Yes | Low Priority |  |
|  | L1-RSRP | SSB based | Yes | Yes |  |
|  |  | CSI-RS based | Yes | Yes |  |

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| **Company** | **Comments** |
| XXX |  |

### Sub-topic 3-2: Test cases for RRM performance requirements with CCA

*Sub-topic description: The table below lists the agreed set of test cases****. Companies are encouraged to volunteer for test cases and provide comments, if any, in the box below the table.***

| Group of requirements | Test cases | Sub-test | Needed / Not needed | Company |
| --- | --- | --- | --- | --- |
| RRC\_IDLE, cell re-selection | FR2-2 -> FR2-2  (CCA) | intra-frequency | Yes, at least with 120 kHz and 480 kHz |  |
|  |  | inter-frequency | Yes, at least with 120 kHz and 480 kHz |  |
| HO (delay and interruptions) | FR2-2->FR2-2 (CCA) | intra-frequency, unknown target cell | Yes |  |
|  |  | inter-frequency, unknown target cell | Low priority |  |
|  | FR1->FR2-2 (CCA) | unknown target cell | Yes |  |
| RRC Re-establishment | FR2-2->FR2-2 (CCA) | intra frequency | Low priority |  |
|  |  | inter frequency | Yes |  |
|  |  | intra frequency without serving cell timing | Yes |  |
| Random access | 4-step RACH | Contention based | Yes |  |
|  |  | Non-contention based | Yes |  |
| RRC Connection Release with Redirection | FR2-2->FR2-2 (CCA) |  | Low priority |  |
| Timing | UE Transmit Timing |  | Yes |  |
|  | Timing advance adjustment accuracy |  | Yes |  |
| Active BWP switch | DCI-based and timer-based active BWP switch | FR2-2 ->FR2-2 (CCA) | Yes, but this test case can be same as the one defined for operation without CCA |  |
|  |  | FR1->FR2-2 (CCA) | Low priority |  |
|  |  | One FR2-2 (CCA) cell | Low priority |  |
|  | RRC-based active BWP switch |  | Yes, but this test case can be same as the one defined for operation without CCA |  |
|  | UL active BWP switch delay with consistent UL LBT failure on PCell subject to UL CCA | FR2-2 (CCA) | Yes |  |
|  |  | FR1->FR2-2 | Not needed |  |
| Radio link monitoring | FR2-2 Pcell (CCA), SSB-based | Out-of-sync, in non-DRX | Yes |  |
|  |  | In-sync, in non-DRX mode | Low priority |  |
|  |  | Out-of-sync, in DRX mode | Low priority |  |
|  |  | In-sync, in DRX mode | Yes |  |
|  | Scheduling restrictions |  | Yes, but this test case can be same as the one defined for operation without CCA |  |
| Beam failure detection and link recovery | FR2-2 PCell (CCA) | SSB-based in non-DRX mode | Yes |  |
|  |  | SSB-based in non-DRX mode | Low priority |  |
|  |  | CSI-RS-based in non-DRX mode | Low priority |  |
|  |  | CSI-RS -based in non-DRX mode | Yes |  |
|  | Scheduling restrictions | SSB-based in non-DRX mode | Yes, but this test case can be same as the one defined for operation without CCA |  |
| SCell activation/deactivation delay | SCell in FR2 (CCA) | intra-band in non-DRX | Yes |  |
|  |  | inter-band in non-DRX | Low priority |  |
|  | FR1+FR2 (CCA) inter-band with target SCell in FR2 |  | Yes |  |
| PSCell addition and release delay | Known PSCell |  | No |  |
|  | Unknown PSCell |  | Yes |  |
| Active TCI state switching delay | MAC-CE based | PCell in FR2-2 (CCA) | Yes |  |
|  | RRC based | PCell in FR2-2 (CCA) | Low priority |  |
| Interruptions | during measurements on deactivated NR SCC in FR2-2 |  | Yes |  |
| Intra-frequency measurement procedure | SA event triggered reporting test without gap | under non-DRX | Yes |  |
|  |  | under DRX | Low priority |  |
|  | SA event triggered reporting test with per-UE gap | under non-DRX | Low priority |  |
|  |  | under DRX | Yes |  |
| Inter-frequency measurement procedure | SA event triggered reporting tests For FR2 without SSB time index detection | PCell in FR2-2,  DRX is not used | Yes |  |
|  |  | PCell in FR2-2,  DRX is used | Low Priority |  |
|  |  | PCell in FR1,  DRX is not used | Low Priority |  |
|  |  | PCell in FR1,  DRX is used | Yes |  |
|  | SA event triggered reporting tests For FR2 with SSB time index detection | PCell in FR2-2,  DRX is not used | Low Priority |  |
|  |  | PCell in FR2-2,  DRX is used | Yes |  |
|  |  | PCell in FR1,  DRX is not used | Yes |  |
|  |  | PCell in FR1,  DRX is used | Low Priority |  |
| L1-RSRP measurement for beam reporting | SSB based | DRX not used | Low Priority |  |
|  |  | DRX is used | Yes |  |
| Accuracy for measurements | SS-RSRP | Intra-frequency FR2-2 serving and target cell | covered by the requirements without CCA |  |
|  |  | Inter frequency FR2-2 serving and target cell | covered by the requirements without CCA |  |
|  |  | Inter frequency FR1 serving and FR2-2 target cell | covered by the requirements without CCA |  |
|  | SS-RSRQ | Intra-frequency FR2-2 serving and target cell | covered by the requirements without CCA |  |
|  |  | Inter frequency FR2-2 serving and target cell | covered by the requirements without CCA |  |
|  | SS-SINR | Intra-frequency FR2-2 serving and target cell | covered by the requirements without CCA |  |
|  |  | Inter frequency FR2-2 serving and target cell | covered by the requirements without CCA |  |
|  | L1-RSRP | SSB based | covered by the requirements without CCA |  |
|  |  | CSI-RS based | covered by the requirements without CCA |  |
|  | RSSI | Intra-frequency | Needed in all SCS |  |
|  |  | Inter-frequency | Needed in all SCS |  |

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| **Company** | **Comments** |
| XXX |  |

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |  |
| --- | --- | --- | --- |
| **New Tdoc number** | **Title** | **Source** | **Comments** |
|  | WF on … | YYY |  |
|  | LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |  |

**Existing tdocs**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-22xxxxx |  | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-22xxxxx |  | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-22xxxxx |  | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-22xxxxx |  | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents