**3GPP TSG-RAN WG4 Meeting #109R4-232xxxx**

**Chicago, US, November 13 – 17, 2023**

**Agenda item:** 8.11.5

**Source:** Moderator (Huawei)

**Title:** Topic summary for [109][213] NonCol\_intraB\_ENDC\_NR\_CA

**Document for:** Information

# Introduction

This document is the RRM discussion summary for support of intra-band non-collocated EN-DC/NR-CA deployment (AI 8.11.2, 8.11.3).

# Topic #1: RRM core part

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2318635 | Apple | **Intra-band non-collocated NR CA** A new IE*nonCollocatedTypeNR-CA-r18* will be introduced to send the network indication on collocation condition for type 2 UE to configure/reconfigure its Rx chain and apply the corresponding requirements. Three potential options are possible:  **Option 1:**  The default behavior for type 2 UE is type 1 requirement for collocated condition, the network indication is only associated with non-collocated condition.  **Option 2:**  The default behavior for type 2 UE is type 2 requirement for non-collocated condition, the network indication is only associated with collocated condition.  **Option 3:**  Do not define default behavior for type 2 UE, the network indication will be sent for both collocated condition and non-collocated condition. **Inter-band non-collocated EN-DC with overlapping DL frequency** In Rel-18 specification, there will be 2 kinds of EN-DC type 2 UE.   * One is the legacy UE only supporting *interBandMRDC-WithOverlapDL-Bands-r16.*   + This kind of UE only needs to satisfy type 2 requirement. * The other one is R18 onward UE supporting both *interBandMRDC-WithOverlapDL-Bands-r16* and *requirementTypeIndication-r18*.   + This kind of UE needs to satisfy both type 1 requirement and type 2 requirement, of which type 2 requirement is the default behaviour.   + Type 1 requirement apply if nonCollocatedTypeMRDC-r18 is provided. |
| R4-2318636 | Apple | CR on RRM core requirement for NonCol\_intraB |
| R4-2319013 | Nokia, Nokia Shanghai Bell | **Observation #1:** In RRM, the UE type has been considered as UE capability and RRM requirements are defined based on the UE capability indication.  **Observation #2:** From RAN#101 conclusion, a Type 2 UE indicating the capability of *[intraBandNRCA-NonCollocated-r18]* may operate either Type 1 or Type 2 based on the new BS signaling.  **Proposal 1: The MRTD/MTTD requirements need to be adapted based on if Type 1 or Type 2 capability requirement is to be applied as indicated by the new BS signaling.**  **Proposal 2: Interruption requirements need to be adapted based on if Type 1 or Type 2 capability requirement is to be applied as indicated by the new BS signaling.** |
| R4-2319014 | Nokia, Nokia Shanghai Bell | draftCR on MRTD and interruption requirements due to BS signaling |
| R4-2319958 | Huawei, HiSilicon | ***Observation 1: For inter-band EN-DC with overlapping DL bands, there is no impact due to new BS signalling on Type 1/2 capability RRM requirements in Rel-15/16/17.***  ***Proposal 1: For inter-band EN-DC with overlapping DL bands, the applicability rules of Type 1/2 RRM requirements in Rel-18 are defined as follows:***   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **UE Type** | **UE capability on *interBandMRDC-WithOverlapDL-Bands-R16*** | **UE capability onnew BS signaling** | **Network indication on new BS signaling** | **RRM requirements** | | Rel-18 UE | Not support | N/A | N/A | Type 1 capability | | Support | Not Support | N/A | Type 2 capability | | Support | Support | Not indicated | Type 2 capability | | Support | Support | Indicated | Type 1 capability |   ***Proposal 2: For TDD-TDD intra-band NR-CA, the applicability rules of Type 1/2 RRM requirements in Rel-18 are defined as follows:***   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **UE Type** | **UE capability on *intraBandNRCA-NonCollocated-r18*** | **UE capability onnew BS signaling** | **Network indication on new BS signaling** | **RRM requirements** | | Rel-18 UE | Not support | N/A | N/A | Type 1 capability | | Support | Mandatory to support | Not indicated | Type 2 capability | | Support | Mandatory to support | Indicated | Type 1 capability | |
| R4-2319959 | Huawei, HiSilicon | DraftCR on maintaining Type 1/2 RRM requirements for inter-band EN-DC with overlapping DL bands R18 |
| R4-2319960 | Huawei, HiSilicon | DraftCR on maintaining Type 1/2 RRM requirements for intra-band non-collocated NR-CA R18 |
| R4-2320612 | Samsung | **Proposal 1: For NR CA, the below change is proposed for the newly introduced BS signaling for relevant RRM requirement clauses for Rel-18 introduced Type-2 UE (taking MTTD requirement as example):**   * For FR1 intra-band non-contiguous NR carrier aggregation, the UE shall be capable of handling at least a relative transmission timing difference as shown in Table 7.5.4-1, between slot timing of all FR1 pairs of TAGs provided that UE indicates that it is capable of [*intraBandNRCA-NonCollocated-r18*] and [when new BS signaling [xxx] is provided].   **Proposal 2: For EN-DC, the below change is proposed for the newly introduced BS signaling for relevant RRM requirement clauses for Rel-16 introduced Type-2 UE (taking MTTD requirement as example):**   * For E-UTRA TDD-NR TDD inter-band EN-DC with overlapping or partially overlapping DL bands, only synchronized operation is assumed. The UE shall be capable of handling a maximum uplink transmission timing difference between E-UTRA PCell and PSCell as shown in Table 7.5.2.1-1 provided that UE indicates that it is capable of interBandMRDC-WithOverlapDL-Bands-r16 and [when new BS signaling [xxx] is indicated], and in Table 7.5.3-1 provided that   + it is not capable of interBandMRDC-WithOverlapDL-Bands-r16 or   + it is capable of interBandMRDC-WithOverlapDL-Bands-r16 and [when new BS signaling [yyy] is indicated]. |
| R4-2320471 | Nokia, Nokia Shanghai Bell | **Proposal 1: The MRTD/MTTD requirements need to be adapted based on if Type 1 or Type 2 capability requirement is to be applied as indicated by the new BS signaling.**  **Proposal 2: Interruption requirements need to be adapted based on if Type 1 or Type 2 capability requirement is to be applied as indicated by the new BS signaling.**  **Observation #1:** From RAN2#123bis agreement, a UE needs to additionally indicate the support of the new BS signaling in order to operation Type 1 or Type 2 based on the new BS signaling.  **Proposal 3: For inter-band EN-DC with overlapping bands, the RRM requirements need to be adapted based on the new BS signaling only if UE indicates both the capability *interBandMRDC-WithOverlapDL-Bands-r16 and additionally [SupportNewBSsignaling].*** |

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

**Issue 1-1: how to implement new RRC signalling into RRM requirement for UE** **supporting [*intraBandNRCA-NonCollocated-r18*]**

* Option 1: (Apple, Nokia)
  + If the new BS signalling is not provided, Type 1 capability requirements are applied as default.
  + If the new BS signalling is provided, Type 2 capability requirements are applied.
* Option 2: (Huawei)
  + If the new BS signalling is not provided, Type 2 capability requirements are applied as default.
  + If the new BS signalling is provided, Type 1 capability requirements are applied.
* Option 3: (Samsung)
  + If the new BS signalling is indicated as [xxx], Type 2 capability requirements are applied.
  + If the new BS signalling is indicated as [yyy], Type 1 capability requirements are applied.
* Recommended WF
  + Continue discussion.

**Issue 1-2: how to implement** **new RRC signalling into RRM requirement for R18 UE supporting *interBandMRDC-WithOverlapDL-Bands-r16***

* Option 1: (Apple, Huawei)
  + If UE does not support the new RRC signalling, Type 2 capability requirements are applied.
  + If UE supports the new RRC signalling and the new RRC signalling is not provided by network, Type 2 capability requirements are applied.
  + If UE supports the new RRC signalling and the new RRC signalling is provided by network, Type 1 capability requirements are applied.
* Option 2: (Samsung)
  + If the new BS signalling is indicated as [xxx], Type 2 capability requirements are applied.
  + If the new BS signalling is indicated as [yyy], Type 1 capability requirements are applied.
* Option 3: (Nokia)
  + the RRM requirements need to be adapted based on the new BS signaling only if UE indicates both the capability *interBandMRDC-WithOverlapDL-Bands-r16* and additionally [*SupportNewBSsignaling*].
* Recommended WF
  + Continue discussion.

**Issue 1-3: the impacted RRM requirement for UE supporting [*intraBandNRCA-NonCollocated-r18*] due to new BS signalling**

* Option 1: (Apple R4-2318636)
  + MRTD/MTTD, interruption, SCell activation delay, BFD/CBD, scheduling restrictions and measurement restrictions requirements.
* Option 2: (Nokia)
  + MRTD/MTTD and interruption requirements.
* Option 3: (Huawei R4-2319960)
  + MRTD/MTTD, interruption, SCell activation delay, BFD/CBD requirements.
* Recommended WF
  + Continue discussion.

**Issue 1-4: the impacted RRM requirement for R18 UE supporting *interBandMRDC-WithOverlapDL-Bands-r16* due to new BS signalling**

* Option 1: (Nokia, Huawei R4-2319959)
  + MRTD/MTTD and interruption requirements.
* Recommended WF
  + Continue discussion.

# Topic #2: RRM performance part

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2318637 | Apple | ***Observation 1: For interruptions during measurement on deactivated NR SCC, the test setting in A.6.5.2.1 can be reused. Test requirements need to be updated to cover CA type 2 UE in intra-band non-collocated CA case.***  ***Proposal 1: clarify the test requirements in A.6.5.2.1.2 to cover testing for CA type 2 UE as below:***  For UE indicating [*nonCollocatedTypeNR-CA-r18*]   * if [*nonCollocatedTypeNR-CA-r18*] is provided, the UE is only allowed to cause interruption on NR PCell immediately before and immediately after a SMTC. Each interruption on NR PCell shall not exceed the value defined in Table A.6.5.2.1.2-1. * if [*nonCollocatedTypeNR-CA-r18*] is not provided, the UE is only allowed to casue an interruption on PCell no earlier than 1 slot before an SMTC and no later than 1 slot after the SMTC. the interruption on NR PCell shall not exceed the value defined in Table A.6.5.2.1.2-2. |
| R4-2319961 | Huawei, HiSilicon | ***Proposal 1: In current test on interruptions during measurements on deactivated NR SCC in FR1, it needs to be clarified that the interruption duration verified for Type 2 capability UE in intra-band CA scenario shall be same as that for inter-band CA scenario.*** |
| R4-2319962 | Huawei, HiSilicon | DraftCR on updating interruption test cases for FR1 NR intra-band CA |
| R4-2320475 | Nokia, Nokia Shanghai Bell | 1. Modify the existing interruption test case of interruption during measurements on deactivated NR SCC in FR1 in A.6.5.2.1 for non-collocated FR1 intra-band NRCA to consider UE capability of type2 and the new RRC signaling for UE capable of type 2. |
| R4-2320968 | Apple | CR on Interruption test case for intra-band non-collcoated NR CA |

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

**Issue 2-1: Impacts on existing test for interruptions during measurements on deactivated NR SCC in FR1 (A.6.5.2.1)**

* Option 1a: (Apple)
  + clarify the test requirements in A.6.5.2.1.2 to cover testing for CA type 2 UE as below:

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| For UE indicating [*nonCollocatedTypeNR-CA-r18*]   * if [*nonCollocatedTypeNR-CA-r18*] is provided, the UE is only allowed to cause interruption on NR PCell immediately before and immediately after a SMTC. Each interruption on NR PCell shall not exceed the value defined in Table A.6.5.2.1.2-1. * if [*nonCollocatedTypeNR-CA-r18*] is not provided, the UE is only allowed to casue an interruption on PCell no earlier than 1 slot before an SMTC and no later than 1 slot after the SMTC. the interruption on NR PCell shall not exceed the value defined in Table A.6.5.2.1.2-2. |

* Option 1b: (Huawei)
  + In current test on interruptions during measurements on deactivated NR SCC in FR1, it needs to be clarified that the interruption duration verified for Type 2 capability UE in intra-band CA scenario shall be same as that for inter-band CA scenario.

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| * If the NR PCell is in the same band as the deactivated SCell, the UE not capable of [*intraBandNRCA-NonCollocated-r18*] or the UE capable of [*intraBandNRCA-NonCollocated-r18*] and configured with [new BS signalling] is only allowed to cause an interruption on PCell no earlier than 1 slot before an SMTC and no later than 1 slot after the SMTC, and each interruption on NR PCell shall not exceed the value defined in Table A.6.5.2.1.2-2. The UE capable of [*intraBandNRCA-NonCollocated-r18*] and not configured with [new BS signalling] is only allowed to cause interruptions on NR PCell immediately before and immediately after an SMTC, and each interruption on NR PCell shall not exceed the value defined in Table A.6.5.2.1.2-1. |

* Option 1c: (Nokia)
  + Proposal 1: Modify the existing interruption test case of interruption during measurements on deactivated NR SCC in FR1 in A.6.5.2.1 for non-collocated FR1 intra-band NRCA to consider UE capability of type2 and the new RRC signalling for UE capable of type 2.
* Recommended WF
  + Most companies agree to update the test requirements for interruptions during measurements on deactivated NR SCC in FR1 in A.6.5.2.1.2, to cover testing for CA type 2 UE. But the wording may depend on the discussion on Issue 1-1.