**3GPP TSG-RAN WG4 Meeting #113 R4-2418261**

**Orlando, USA, 18th – 22nd November, 2024**

**Agenda item:** 5.1.2

**Source:** Moderator (Apple)

**Title:** Topic summary for [113][203] Maintenance\_R18

**Document for:** Information

# Introduction

*Briefly introduce background, the scope of this email discussion (e.g. list of treated agenda items) and provide some guidelines for email discussion if necessary.*

In this section, the following topics are included

* 5.8.3 NR\_FR1\_lessthan\_5MHz\_BW
* 5.18.2 NR\_MC\_enh

# Topic #1: NR\_FR1\_lessthan\_5MHz\_BW

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

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **Title** | **Company** | **Proposals / Observations** |
| [**R4-2418386**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2418386.zip) | CR introducing test case for Radio Link Monitoring In-sync Test for FR1 PCell with 3MHz Channel Bandwidth configured with SSB-based RLM RS in DRX mode | Nokia |   |
| [**R4-2419123**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2419123.zip) | Discussion on remaining issues in R18 less than 5MHz | Huawei, HiSilicon | **Proposal: Introduce HST enhancements to SSB index detection requirements for 12 PRB SSB.** |
| [**R4-2419124**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2419124.zip) | CR on RRM core requirements for less than 5MHz BW | Huawei, HiSilicon |   |
| [**R4-2419125**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2419125.zip) | CR on test configurations for less than 5MHz BW | Huawei, HiSilicon |   |
| [**R4-2419293**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2419293.zip) | Disucssion on SNR levels for RLM/BFD test cases | Ericsson | 1. For RLM and BFD test cases, for TDL-C 100 Hz channel model, RAN4 to agree margin1 = 3 dB and margin2 = 2 dB
2. SNR levels for Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS for 15 PRB Coreset are given by following table

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
|  |  | **T1** | **T2** | **T3** |
| SNR on RLM RS | Config 1 | dB | 1 | -6 | -12 |

1. SNR levels for Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS for 12 PRB Coreset are given by following table

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
|  |  | **T1** | **T2** | **T3** | **T4** | **T5** |
| SNR on RLM RS | Config 1 | dB | 5 | -4 | -10 | 1 | 5 |

1. SNR levels for Radio Link Monitoring In-sync Test for FR1 PCell with 3MHz Channel Bandwidth configured with SSB-based RLM RS in non-DRX mode

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
|  |  | **T1** | **T2** | **T3** | **T4** | **T5** |
| SNR on RLM RS | Config1 | dB | 1 | -6 | -12 | -3 | 1 |
| Config 2 | dB | 5 | -4 | -10 | 1 | 5 |

1. SNR level of SSB for q0 and q1 are given by following

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
|  |  | **T1** | **T2** | **T3** | **T4** | **T5** |
| SNR\_SSB of set q0 | Config 1 | dB | 1 | -6 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | Config 1 | dB | -10 | -10 | 10 | 10 | 10 |
| SSB\_RP of set q1 | Config 1 | dBm/SCS kHz | -108 | -108 | -88 | -88 | -88 |

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| [**R4-2419294**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2419294.zip) | Maintenance CR of SNR levels for RLM/BFD test cases | Ericsson |   |
| [**R4-2419763**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2419763.zip) | CR for Rel-18 Less Than 5MHz Performance part | Nokia |   |

## Open Issues

**Issue 1: HST**

**Proposal (Huawei):** Introduce HST enhancements to SSB index detection requirements for 12 PRB SSB.

**Issue 2: RLM test case (E///)**

1. For RLM and BFD test cases, for TDL-C 100 Hz channel model, RAN4 to agree margin1 = 3 dB and margin2 = 2 dB
2. SNR levels for Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS for 15 PRB Coreset are given by following table

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Test 1 |
|  |  | T1 | T2 | T3 |
| SNR on RLM RS | Config 1 | dB | 1 | -6 | -12 |

1. SNR levels for Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS for 12 PRB Coreset are given by following table

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
|  |  | **T1** | **T2** | **T3** | **T4** | **T5** |
| SNR on RLM RS | Config 1 | dB | 5 | -4 | -10 | 1 | 5 |

1. SNR levels for Radio Link Monitoring In-sync Test for FR1 PCell with 3MHz Channel Bandwidth configured with SSB-based RLM RS in non-DRX mode

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
|  |  | **T1** | **T2** | **T3** | **T4** | **T5** |
| SNR on RLM RS | Config1 | dB | 1 | -6 | -12 | -3 | 1 |
| Config 2 | dB | 5 | -4 | -10 | 1 | 5 |

1. SNR level of SSB for q0 and q1 are given by following

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Test 1 |
|  |  | T1 | T2 | T3 | T4 | T5 |
| SNR\_SSB of set q0 | Config 1 | dB | 1 | -6 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | Config 1 | dB | -10 | -10 | 10 | 10 | 10 |
| SSB\_RP of set q1 | Config 1 | dBm/SCS kHz | -108 | -108 | -88 | -88 | -88 |

# Topic #2: NR\_MC\_enh

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

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** |  **Title** | **Company** | **Proposals / Observations** |
| [**R4-2418509**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2418509.zip) | Discussion on RRM requirements for multi-carrier enhancements | ZTE Corporation, Sanechips | **Proposal: perfer not to do any change in the existing requirement and the same vlaue of D for the Rel-18 capability and the legacy capability.** |
| [**R4-2418665**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2418665.zip) | Discussion on incremental BWP switch delay for multi-carrier enhancements | Huawei, HiSilicon | **Proposal 1: The different value D can be assumed for** ***bwp-SwitchingMultiCCs-r16* for switching between non-dormant BWPs,*****bwp-Switchin*gMultiDormancyCCs-r16 for switching between non-dormant and dormant BWPs,*****bwp-SwitchingMultiDormancyCC-DCI-0-3-And-1-3-r18* for switching between non-dormant and dormant BWPs.****Proposal 2: Simultaneous DCI based BWP switch delay on multiple CCs would be updated as:****TMultipleBWPswitchDelay = TBWPswitchDelay +** $\sum\_{i=1}^{N-1}D\_{i}$**Where D*i* is the incremental delay for *i*th additional CC involved in simultaneous BWP switch.****Proposal 3: Update legacy requirements for simultaneous DCI based BWP switch delay on multiple CCs from R16.** |
| [**R4-2418666**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2418666.zip) | CR on incremental BWP switch delay for multi-carrier enhancements | Huawei, HiSilicon |  |
| [**R4-2418761**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2418761.zip) | Further discussion on UE capability and requirements for multi-carrier enhancements | vivo | ***Proposal 1: The same value D is assumed in the requirements between RAN4 features FG 6-3 and FG 38-9******Proposal 2: Different incremental values are assumed in the requirements between RAN4 features FG 9-1 and FG 38-9.******Proposal 3: Different incremental values are assumed in the requirements between RAN4 features FG 9-1 and FG 6-3. The requirements update is made from Rel-16.*** |
| [**R4-2418762**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2418762.zip) | CR on BWP switching requirements for multi-carrier enhancements | vivo |  |

## Open Issues

**Background (from approved WF R4-2416878 in RAN4#112bis)**

UE capability for switching between non-dormant and dormant BWPs triggered by the new DCI format 0-3 and 1-3 was introduced. The conclusion was informed to RAN4

|  |
| --- |
| RAN2 discussed the two options and concluded to down-select approach 2 because Approach 1 is a non-backward compatible change from RAN2 perspective.RAN2 introduced a field *bwp-SwitchingMultiDormancyCC-DCI-0-3-And-1-3-r18* corresponding to RAN4 feature 38-9, and a field *scellDormancyWithinActiveTime-DCI-0-3-And-1-3-r18* corresponding to its prerequisite feature (RAN1 feature 49-9). It is up to RAN4 whether the UE shall report the same value between RAN4 features 6-3 and 38-9.  |

After discussion, the original issue can be separated into two issues, the one is related to UE capability value (the original issue) and new issue about incremental delay for each additional CC involved in simultaneous BWP switch is raised. The current specification for simultaneous DCI based BWP switch delay on multiple CCs is copied as follows:

|  |
| --- |
| […]UE shall finish BWP switch within the time duration TMultipleBWPswitchDelay + Y, which is defined as: TMultipleBWPswitchDelay = TBWPswitchDelay + D\*(N-1)Where:- TBWPswitchDelay is the BWP switching delay on single CC defined in Table 8.6.2-1 depending on UE capability *bwp-SwitchingDelay* [2]. TBWPswitchDelay shall be based on the smallest SCS among SCS of all involved CCs before and after BWP switch. If the BWP switch on multiple CCs results in the change of the SCS on any CC among involved CCs, TBWPswitchDelay shall be based on the smallest SCS among all SCS values of all involved CCs.- D is the incremental delay for each additional CC involved in simultaneous BWP switch and depends on UE capability *bwp-SwitchingMultiCCs-r16* [TS 38.306, 14] for switching between non-dormant BWPs, and *bwp-SwitchingMultiDormancyCCs-r16* or *bwp-SwitchingMultiDormancyCC-DCI-0-3-And-1-3-r18* for switching between non-dormant and dormant BWPs.[…] |

For BWP switch from one non-dormant BWP to another non-dormant BWP, the incremental value D depends on UE capability *bwp-SwitchingMultiCCs-r16*, and for BWP switch from dormant BWP to non-dormant BWP, the incremental value D depends on UE capability *bwp-SwitchingMultiDormancyCC-DCI-0-3-And-1-3-r18*.

If there are multiple types of BWP (non-dormant BWP and dormant BWP) to switch, which is allowed by using DCI 0-3/1-3, it is ambiguous which value shall be applied to calculate BWP switching delay.

* **Topic #1: UE capability value for multi-carrier enhancements**

**Issue 1-1: Report value for FG6-3 and FG38-9**

<Way forward in RAN4#112bis>

* Option 1: The same value D is assumed in the requirements between RAN4 features 6-3 and 38-9.
* Option 2: The different value D is assumed in the requirements between RAN4 features 6-3 and 38-9.

**<new proposals in RAN4#113>**

* **Proposal (ZTE):** perfer not to do any change in the existing requirement and the same vlaue of D for the Rel-18 capability and the legacy capability.
* **Proposal (vivo):** The same value D is assumed in the requirements between RAN4 features FG 6-3 and FG 38-9. Different incremental values are assumed in the requirements between RAN4 features FG 9-1 and FG 38-9.
* **Proposal (HW):** The different value D can be assumed for
	+ *bwp-SwitchingMultiCCs-r16* for switching between non-dormant BWPs,
	+ *bwp-Switchin*gMultiDormancyCCs-r16 for switching between non-dormant and dormant BWPs,
	+ *bwp-SwitchingMultiDormancyCC-DCI-0-3-And-1-3-r18* for switching between non-dormant and dormant BWPs.
* **Topic #2: Incremental BWP switch delay definition**

**Issue 2-1: Requirements for DCI based BWP switch delay on multiple CCs**

<Way forward>

* Option 1: Keep current requirements.
* Option 2: Update is needed, e.g., different increment value for different UE capabilities is used in the requirements, and will be discussed under Rel-18 maintenance.
* Option 3: Further discuss whether update on D is needed for simultaneous switching between non-dormant BWPs and switching between non-dormant and dormant BWPs by using DCI 0-1/1-1/2-6.

**<new proposals in RAN4#113>**

* **Proposal (ZTE):** perfer not to do any change in the existing requirement and the same vlaue of D for the Rel-18 capability and the legacy capability.
* **Proposal (HW):** Simultaneous DCI based BWP switch delay on multiple CCs would be updated as:

TMultipleBWPswitchDelay = TBWPswitchDelay + $\sum\_{i=1}^{N-1}D\_{i}$

Where D*i* is the incremental delay for *i*th additional CC involved in simultaneous BWP switch.

* **Proposal (HW):** Update legacy requirements for simultaneous DCI based BWP switch delay on multiple CCs from R16.
* **Proposal (vivo):** Different incremental values are assumed in the requirements between RAN4 features FG 9-1 and FG 6-3. The requirements update is made from Rel-16.