**3GPP TSG-RAN WG4 Meeting # 111 R4-2410116**

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

**Agenda item:** 7.8.8

**Source:** Moderator (Nokia)

**Title:** Topic summary for [111][323] NR\_FR1\_lessthan\_5MHz\_BW\_demod

**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.*

RAN4#111 is thefinal meeting to discuss the demodulation performance requirements for Rel-18 **NR\_FR1\_lessthan\_5MHz\_BW WI**.

The WI description can be found in [RP-230186](https://www.3gpp.org/ftp/TSG_RAN/TSG_RAN/TSGR_99/Docs/RP-230186.zip).

This summary provides the overview and captures the open issues based on the TDoc submitted to RAN4#110 meeting into the following AIs**:**

* 7.8.7 Demodulation performance requirements
  + 7.8.7.1 UE demodulation performance and CSI requirements
  + 7.8.7.2 BS demodulation performance requirements

The previous agreements and open issues are captured in the following WFs:

* [R4-2406044](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2406044.zip), Way Forward for [110bis][323] NR\_FR1\_lessthan\_5MHz\_BW\_demod, RAN4#110-bis, Changsha, China, 15 April –19 April 2024.
* [R4-2402863](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402863.zip), WF on [110][318] NR\_FR1\_lessthan\_5MHz\_BW\_demod, Nokia, Nokia Shanghai Bell, RAN4#110, Athens, Greece, February 26 – March 1, 2024.
* [R4-2321064](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2321064.zip), WF on [109][322] NR\_FR1\_lessthan\_5MHz\_BW\_demod, Nokia, Nokia Shanghai Bell, RAN4#109, Chicago, USA, November 13 – November 17, 2023.
* [R4-2316924](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108bis/Docs/R4-2316924.zip), WF on NR\_FR1\_lessthan\_5MHz\_BW\_demod, Nokia. Nokia Shanghai Bell, RAN4#108bis, Xiamen, China, October 09 – October 13, 2023.

CR work splits agreed at RAN4#110 meeting:

* UE Demod:

|  |  |  |
| --- | --- | --- |
| **Section** | **Requirements** | **Company** |
| 5 Demodulation performance requirements  (Conducted requirements) | 5.1.1 Applicability of requirements | Apple |
| 5.3 PDCCH demodulation requirements | 5.3.2 2RX requirements,  5.3.2.1 FDD,  5.3.2.1.x Minimum requirements for less than 5 MHz CBW | QC |
| 5.3.3 4RX requirements  5.3.3.1 FDD,  5.3.3.1.x Minimum requirements for less than 5 MHz CBW |
| 5.4 PBCH demodulation requirements | 5.4.2 2RX requirements,  5.4.2.1 FDD,  Table 5.4.2.1-2: Minimum performance PBCH in case SS/PBCH block index is not known | MTK |
| 5.4.3 4RX requirements  5.4.3.1 FDD  Table 5.4.3.1-2: Minimum performance PBCH in case SS/PBCH block index is not known |
| A.3 DL reference measurement channels | A.3.3 Reference measurement channels for PDCCH performance  Requirements,  A.3.3.1 FDD,  A.3.3.1.1 Reference measurement channels for SCS 15 kHz FR1 | Huawei |
| **BigCR to 38.101-4** | | Nokia |

* BS Demod

|  |  |  |
| --- | --- | --- |
| **Section** | **Requirements** | **Company** |
| **BigCR to TS 38.104** | | Nokia |
| 8 Conducted performance requirements,  8.3 Performance requirements for PUCCH | 8.3.4 Performance requirements for PUCCH format 2 |
| **BigCR to TS 38.141-1** | | Ericsson |
| 8 Conducted performance characteristics  8.1.2 Applicability rule: | 8.1.2.2 Applicability of PUCCH performance requirements  8.1.2.3 Applicability of PRACH performance requirements | ZTE |
| 8 Conducted performance requirements,  8.3 Performance requirements for PUCCH | 8.3.3 Performance requirements for PUCCH format 2 | Ericsson |
| **BigCR to TS 38.141-2** | | Samsung |
| 8 Radiated performance requirements  8.1.2 Applicability rule | 8.1.2.2 Applicability of PUCCH performance requirements  8.1.2.3 Applicability of PRACH performance requirements | ZTE |
| 8 Radiated performance requirements  8.3 OTA performance requirements for PUCCH | 8.3.3 Performance requirements for PUCCH format 2 | Samsung |

Draft big CRs endorsed at the previous RAN4#110-bis meeting:

* [R4-2405252](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405252.zip), Big draftCR for 38.101-4 on Lessthan5MHz UE demod perf and CSI requirements, Nokia, RAN4#110-bis, Changsha, China, 15 April –19 April 2024.
* [R4-2405252](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405252.zip), Big draftCR for 38.101-4 on Lessthan5MHz UE demod perf and CSI requirements, Nokia, RAN4#110-bis, Changsha, China, 15 April –19 April 2024.
* [R4-2405863](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405863.zip), Draft big CR on performance requirements for PUCCH format 2 for TS 38.141-2, Samsung, RAN4#110-bis, Changsha, China, 15 April –19 April 2024.

# Topic #1: UE Demod

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

## Companies’ contributions summary

### Discussion papers and simulations results

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2407750](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2407750.zip) | Nokia | **On Lessthan5MHz UE demod perf and CSI requirements**   1. From a network perspective, we expect the UE to be able to utilize all provided information bits, hence Nokia’s simulation results provided in RAN4#110bis when demodulating the punctured PDCCH uses all 4 CCE defined in the agreed testcase. We do not expect the UE is aware of which bits are punctured, hence the UE will treat the 4 CCE similar as if none of the CCEs are punctured. |
| [R4-2407751](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2407751.zip) | Nokia | **On Lessthan5MHz UE demod perf and CSI requirements – Simulations**  This contribution contains Nokia’s simulation results for Lessthan5MHz topic. Based on the open discussion from RAN4#110bis on simulation for punctured PDCCH we have added results for PDCCH where only 3 of 4 CCEs are used.   1. Using 3CCE instead of 4 (where 3.5CCE of 4 contains valid data) results in an increase of SNR around 0.5dB for agreed test cases. |
| [R4-2408779](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2408779.zip) | Ericsson | **UE demodulation requirements for NR less than 5MHz**  **Proposal 1: Change REG bundles size to 6 for Table 5.3.2.1.7-1 and Table 5.3.3.1.6-1 in TS38.101-4, according to TS 38.211 7.3.2.2.**  The paper also contains simulation results. |
| [R4-2409089](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2409089.zip) | ZTE Corporation, Sanechips | **Simulation results for UE demodulation performance and CSI requirements for less than 5MHz**  In this contribution, we give some simulation results for less than 5MHz UE demodulation requirements. |
| [R4-2407341](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2407341.zip) | Samsung | **Discussion and simulation results for dedicated spectrum less than 5MHz**  **Observation 1:** CCE#4, #5, #6, and partial CCE#7, which consist of one transmitted PRB and one punctured PRB are used for PDCCH simulation results.  [Moderator]: Proposals 1 and 2 below can be treated in the simulation summary directly.  **Proposal 1: Consider following results for PDCCH requirements:**   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Bandwidth (MHz)** | **CORESET RB** | **CORESET duration** | **Aggregation level** | **Propagation Condition** | **Antenna configuration and correlation Matrix** | **Reference value** | | **Impairment SNR(dB)** | | **Pm-dsg (%)** | **SNR (dB)** | | **3** | **15** | **3** | **4** | **TDLA30-10** | **1x2 Low** | **1** | **5** | **7** | | **3** | **15** | **3** | **4** | **TDLC300-100** | **2x4 Low** | **1** | **-3.3** | **-1.3** |   **Proposal 2: Consider following results for PBCH requirements:**   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **Duplex** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **SSB/PBCH index** | **Propagation condition** | **Antenna configuration and correlation matrix** | **Reference value** | | **Impaired SNR(dB)** | | **Pm-bch (%)** | **SNR (dB)** | | **FDD** | **3 / 15** | **Unknown** | **TDLC300-100** | **1 x 2 Low,** | **1** | **-6** | **-4** | | **1x4 Low** | **1** | **-8.7** | **-6.7** | |
| [R4-2407015](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2407015.zip) | MediaTek inc. | **Simulation results on UE demodulation requirements for less than 5MHz**  In this contribution, we provide simulation results, including alignment and impairment results, on punctured PBCH and PDCCH for less than 5MHz WI. |
| [R4-2407401](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2407401.zip) | Qualcomm Incorporated | **Simulation Results for PDCCH with punctured CORESET0**  In this paper, we share our simulation results for the PDCCH test cases, based on the simulation assumptions agreed in the WF from RAN4 meeting #110 (R4-2402863) and the requirements table agreed in RAN4#111.  Table 2-1   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **TX** | **BW MHz** | **CORESET RB** | **CORESET duration** | **Aggregation level** | **Propagation Condition** | **Antenna configuration and correlation Matrix** | **Pm-dsg (%)** | **Alignment SNR [dB]** | **Impairment SNR [dB]** | | 1 | 3 | 15 | 3 | 4 | TDLA30-10 | 1x2 Low | 1 | 5.2 | **7.2** | | 2 | 3 | 15 | 3 | 4 | TDLC300-100 | 2x4 Low | 1 | -2.9 | **-0.9** |   **Observation 1:** PDCCH Impairment results in Table 2-1 assume no channel estimation on the partial REG bundle. |
| [R4-2409017](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2409017.zip) | Huawei,HiSilicon | **Discussion on UE performance requirements for FR1 spectrum less than 5MHz**  We can observe that the performance gap is quite limited, the reason is that the punctured REs is quite few compared to total number of PDCCH REs. Hence, we suggest to leave the algorithms to UE implementation.  **Proposal 1: Not to specify the algorithms for punctured CCE and leave it to UE implementation.** |

### CRs

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| --- | --- | --- | --- |
| **T-doc number** | **Company** | **Title** | **Moderator’s comment** |
| [R4-2407752](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2407752.zip) | Nokia | BigCR for 38.101-4 on Lessthan5MHz UE demod perf and CSI requirements | BigCR based on the bigDraft CR endorsed at RAN4#110-bis. Expected to revised, e.g., to reflect |
| [R4-2407400](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2407400.zip) | Qualcomm Incorporated | [NR\_FR1\_lessthan\_5MHz\_BW] draftCR for UE Demod PDCCH Requirements introduction | Need to check during the meeting whether there are any changes to the version from bigCR. |
| [R4-2409569](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2409569.zip) | Apple | draftCR on Applicability Rules for NR support for dedicated spectrum less than 5MHz for FR1 | Need to check during the meeting whether there are any changes to the version from bigCR. |

## Open issues summary

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

### Sub-topic 1-1: Punctured PDSCH requirement

*Sub-topic description:*

In this sub-topic the proposals related to the specification of punctured PDSCH requirements for less than 5Mhz CBW are summarized.

#### Issue 1-1-1: REB bundle size in test parameters

* Background
  + In the new PDCCH requirements for 3 MHz channel bandwidth, Test parameters tables contain REG bundle size equal to 2.
* Proposals and Observations:
  + Proposal 1 (Ericsson): Change REG bundles size to 6 for Table 5.3.2.1.7-1 and Table 5.3.3.1.6-1 in TS38.101-4, according to TS 38.211 7.3.2.2.
* Recommended WF
  + Check if the proposal is agreeable during the meeting.
  + If agreeable, need to reflect the proposal in the CR/bigCR.

#### Issue 1-1-2: Punctured PDCCH requirement alignment

* Background
  + Due to some difference in the assumptions and simulation result by different companies, WF from RAN4#110-bis captured the following:
    - Companies are encouraged to clarify further the requirement value selection and simulation results depending on how punctured CCE is treated.
  + Figure below from [R4-2408779] illustrates CCE to PDCCH mapping.  
    
  + Based on the initial evaluation of submitted simulation results, the span is around 1.9dB for the first test case (1x2 Low, TDLA30-10) and around 2.3 dB for the second test case (2x4 Low, TDLC300-100).
  + Some companies report insignificant difference in between the algorithms when punctured CC is consider or not, on the level of 0.5-0.2dB.
* Proposals and Observations:
  + Observation 1 (Nokia): Observation 1: From a network perspective, we expect the UE to be able to utilize all provided information bits, hence Nokia’s simulation results provided in RAN4#110bis when demodulating the punctured PDCCH uses all 4 CCE defined in the agreed testcase. We do not expect the UE is aware of which bits are punctured, hence the UE will treat the 4 CCE similar as if none of the CCEs are punctured.
  + Observation 2 (Nokia): Using 3CCE instead of 4 (where 3.5CCE of 4 contains valid data) results in an increase of SNR around 0.5dB for agreed test cases.
  + Observation 3 (Samsung): CCE#4, #5, #6, and partial CCE#7, which consist of one transmitted PRB and one punctured PRB are used for PDCCH simulation results.
  + Observation (Qualcomm): PDCCH Impairment results in Table 2-1 assume no channel estimation on the partial REG bundle.
  + Proposal 1 (Huawei): Not to specify the algorithms for punctured CCE and leave it to UE implementation.
* Candidate options / tentative agreements:
  + Tentative agreement: Not to specify the algorithms for punctured CCE and leave it to UE implementation.
* Recommended WF
  + Further discuss and agree on the value of the requirement based on submitted simulation results.

# Topic #2: BS Demod

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

## Companies’ contributions summary

### Discussion papers and simulation results

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2407127](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2407127.zip) | Nokia | **Discussion on BS Demodulation on Less than 5 MHz**  **Observation 1:** The statement “The largest PRB index – (Number of PRBs – 1)” implies that when the PRB allocation is 9 and the largest PRB index is 11, the first PRB will be 3, therefore this does not need to be explicitly stated.  **Observation 2**: To the observer of the specification, there may be ambiguity whether there is a 12 or 15 PRB allocation.  **Proposal 1: RAN4 shall include said note to identify the first PRB after frequency hopping as 3.**  Table 8.3.4.2.1-1: Test Parameters   |  |  | | --- | --- | | Parameter | Value | | Modulation order | QSPK | | First PRB prior to frequency hopping | 0 | | Intra-slot frequency hopping | enabled | | Frist PRB after frequency hopping | The largest PRB index – (Number of PRBs – 1) (Note 1) | | Number of PRBs | 9 | | Number of symbols | 2 | | The number of UCI information bits | 22 | | First symbol | 12 | | DM-RS sequence generation | *NID*0=0 | | Note 1 : For 3MHz, the first PRB after frequency hopping is 3. | |   **Proposal 2: RAN4 shall include the note in the test parameter table of TS 38.104 and 141 to identify the first PRB after frequency hopping as 3.** |
| [R4-2407129](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2407129.zip) | Nokia | **Supporting Simulations for BS Demodulation on Less than 5 MHz**  Within this contribution we discuss the demodulation requirements for BS Demodulation on Less than 5 MHz |
| [R4-2409090](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2409090.zip) | ZTE Corporation, Sanechips | **Simulation results for BS demodulation performance for less than 5MHz**  In this contribution, we give some simulation results on demodulation performance requirements for less than 5MHz BS demodulation requirements. |
| [R4-2409018](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2409018.zip) | Huawei,HiSilicon | **Discussion on BS performance requirements for FR1 spectrum less than 5MHz**  In this contribution we provide our simulation results for PF2 with 12PRB allocation |
| [R4-2408343](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2408343.zip) | Ericsson | **Discussion on NR less than 5MHz BS demodulation requirements**  **Proposal 1: Adding a note in parameters table to indicate the PRB number for 3MHz is 12.**   |  |  | | --- | --- | | **Parameter** | **Values** | | Modulation order | QPSK | | First PRB prior to frequency hopping | 0 | | Intra-slot frequency hopping | enabled | | First PRB after frequency hopping | The largest PRB index – (Number of PRBs - 1) (Note 1) | | Number of PRBs | 9 | | Number of symbols | 2 | | The number of UCI information bits | 22 | | First symbol | 12 | | DM-RS sequence generation | *NID*0=0 | | Note 1 : For 3MHz channel bandwidth, the largest PRB index is 11 and the first PRB index after frequency hopping is 3. | | |
| [R4-2409478](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2409478.zip) | Samsung | Discussion and simulation results for BS demodulation requirements for less than 5MHz  **Proposal 1: Appling the following AWGN power level setting for less than 3MHz BS conducted testing**   |  |  |  | | --- | --- | --- | | Sub-carrier spacing (kHz) | Channel bandwidth (MHz) | AWGN power level | |  | 3 | -88.7dBm / 2.7MHz | | 15 kHz | 5 | -86.5 dBm / 4.5MHz | |  | 10 | -83.3 dBm / 9.36MHz | |  | 20 | -80.2 dBm / 19.08MHz | |  | 10 | -83.6 dBm / 8.64MHz | | 30 kHz | 20 | -80.4 dBm / 18.36MHz | |  | 40 | -77.2 dBm / 38.16MHz | |  | 100 | -73.1 dBm / 98.28MHz | | NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |   **And the following AWGN power level setting for less than 3MHz BS OTA testing**   |  |  |  |  | | --- | --- | --- | --- | | BS type | Sub-carrier spacing (kHz) | Channel bandwidth (MHz) | AWGN power level | | BS type 1-O  (Note 4) | 15 | 3 | -88.7 - ΔOTAREFSENS dBm / 2.7 MHz | |  |  | 5 | -86.5 - ΔOTAREFSENS dBm / 4.5 MHz | |  |  | 10 | -83.3 - ΔOTAREFSENS dBm / 9.36 MHz | |  |  | 20 | -80.2 - ΔOTAREFSENS dBm / 19.08 MHz | |  | 30 | 10 | -83.6 - ΔOTAREFSENS dBm / 8.64 MHz | |  |  | 20 | -80.4 - ΔOTAREFSENS dBm / 18.36 MHz | |  |  | 40 | -77.2 - ΔOTAREFSENS dBm / 38.16 MHz | |  |  | 100 | -73.1 - ΔOTAREFSENS dBm / 98.28 MHz | |

### CRs

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **Company** | **Title** | **Moderator’s comment** |
| [R4-2407130](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2407130.zip) | Nokia | [NR\_FR1\_lessthan\_5MHz\_BW-Perf] draftCR for 38.104, update to PUCCH requirements | Endorsements of draft CR might not be needed because the bigCR below can be approved directly. |
| [R4-2407131](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2407131.zip) | Nokia | [NR\_FR1\_lessthan\_5MHz\_BW-Perf] BigCR on Demodulation requirements for less than 5MHz for TS 38.104 | A revision might be needed (Note int the parameters) depending on the agreement during the meeting. |
| [R4-2408344](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2408344.zip) | Ericsson | Draft CR for 38.141-1 on 3MHz PUCCH format 2 UCI BLER requirements | Also a big CR needs to be prepared by Ericsson during the meeting according to the split. |
| [R4-2409476](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2409476.zip) | Samsung | Big CR on performance requirements for PUCCH format 2 for TS 38.141-2 |  |
| [R4-2409477](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_111/Docs/R4-2409477.zip) | Samsung | Draft CR on performance requirements for PUCCH format 2 in TS 38.141-2 |  |

## Open issues summary

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

### Sub-topic 2-1: PUCCH requirements

*Sub-topic description:*

In this sub-topic the proposals related to the PUSCH requirements for less than 5Mhz CBW are summarized.

#### Issue 1-2-1: A note on frist PRB after frequency hopping

* Proposals and Observations:
  + Proposal 1 (Nokia): RAN4 shall include said note to identify the first PRB after frequency hopping as 3.

Table 8.3.4.2.1-1: Test Parameters

|  |  |
| --- | --- |
| Parameter | Value |
| Modulation order | QSPK |
| First PRB prior to frequency hopping | 0 |
| Intra-slot frequency hopping | enabled |
| Frist PRB after frequency hopping | The largest PRB index – (Number of PRBs – 1) (Note 1) |
| Number of PRBs | 9 |
| Number of symbols | 2 |
| The number of UCI information bits | 22 |
| First symbol | 12 |
| DM-RS sequence generation | *NID*0=0 |
| Note 1 : For 3MHz, the first PRB after frequency hopping is 3. | |

* + Proposal 2 (Nokia): RAN4 shall include the note in the test parameter table of TS 38.104 and 141 to identify the first PRB after frequency hopping as 3.
  + Proposal 3 (Ericsson): Adding a note in parameters table to indicate the PRB number for 3MHz is 12.

|  |  |
| --- | --- |
| **Parameter** | **Values** |
| Modulation order | QPSK |
| First PRB prior to frequency hopping | 0 |
| Intra-slot frequency hopping | enabled |
| First PRB after frequency hopping | The largest PRB index – (Number of PRBs - 1) (Note 1) |
| Number of PRBs | 9 |
| Number of symbols | 2 |
| The number of UCI information bits | 22 |
| First symbol | 12 |
| DM-RS sequence generation | *NID*0=0 |
| Note 1 : For 3MHz channel bandwidth, the largest PRB index is 11 and the first PRB index after frequency hopping is 3. | |

* Candidate options / tentative agreements:
  + Add a note to the First PRB after frequency hopping in Test Parameters for 3MHz channel bandwidth:
    - Option1: For 3MHz, the first PRB after frequency hopping is 3.
    - Option 2: For 3MHz channel bandwidth, the largest PRB index is 11 and the first PRB index after frequency hopping is 3.
* Recommended WF
  + Discuss the text of the note during the meeting.
  + Reflect the text of the note in the CRs during the meeting.

#### Issue 1-2-2: AWGN power level setting for less than 3MHz

* Proposals and Observations:
  + Proposal 1 (Samsung): Appling the following AWGN power level setting for less than 3MHz BS conducted testing

|  |  |  |
| --- | --- | --- |
| Sub-carrier spacing (kHz) | Channel bandwidth (MHz) | AWGN power level |
|  | 3 | -88.7dBm / 2.7MHz |
| 15 kHz | 5 | -86.5 dBm / 4.5MHz |
|  | 10 | -83.3 dBm / 9.36MHz |
|  | 20 | -80.2 dBm / 19.08MHz |
|  | 10 | -83.6 dBm / 8.64MHz |
| 30 kHz | 20 | -80.4 dBm / 18.36MHz |
|  | 40 | -77.2 dBm / 38.16MHz |
|  | 100 | -73.1 dBm / 98.28MHz |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |

And the following AWGN power level setting for less than 3MHz BS OTA testing

|  |  |  |  |
| --- | --- | --- | --- |
| BS type | Sub-carrier spacing (kHz) | Channel bandwidth (MHz) | AWGN power level |
| BS type 1-O  (Note 4) | 15 | 3 | -88.7 - ΔOTAREFSENS dBm / 2.7 MHz |
|  |  | 5 | -86.5 - ΔOTAREFSENS dBm / 4.5 MHz |
|  |  | 10 | -83.3 - ΔOTAREFSENS dBm / 9.36 MHz |
|  |  | 20 | -80.2 - ΔOTAREFSENS dBm / 19.08 MHz |
|  | 30 | 10 | -83.6 - ΔOTAREFSENS dBm / 8.64 MHz |
|  |  | 20 | -80.4 - ΔOTAREFSENS dBm / 18.36 MHz |
|  |  | 40 | -77.2 - ΔOTAREFSENS dBm / 38.16 MHz |
|  |  | 100 | -73.1 - ΔOTAREFSENS dBm / 98.28 MHz |

* Recommended WF
  + Discuss the addition of AWGN power level setting for less than 3MHz
  + If agreed, reflect the change in the CR.