**3GPP TSG-RAN WG4 Meeting # 100-e R4-210XXXX**

**Electronic Meeting, 16th – 27th August 2021**

**Agenda item:** 9.16.7.4, 9.16.7.5

**Source:** Moderator (Intel)

**Title:** Email discussion summary for [100-e][231] NR\_ext\_to\_71GHz\_RRM\_2

**Document for:** Information

# Introduction

In RAN #89e meeting a new WI on Extending current NR operation to 71GHz was approved. During the RAN4 #99 the initial scope of RRM work for NR\_ext\_to\_71GHz WI was defined and captured in the way forward R4-2108354. A number of topics which need the new requirements definition due to higher data/SSB SCS were defined. Among them there were Active BWP switching delay requirements and MG interruption requirements. These two topics corresponding to agenda items 9.16.7.4 and 9.16.7.5 are the subject of current email discussion.

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

* 1st round: Companies are expected to provide views and/or comments on the listed open issues.
* 2nd round: TBA

For the Email discussion guidelines please refer to the [Meeting Arrangements](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_100-e/Inbox/Meeting_Arrangements/R4-21xxxxx%20RAN4%23100-e%20meeting%20arrangements%20and%20guidelines%20v4_final.zip) document provided by RAN4 chair before the meeting.

# Topic #1: Active BWP switching

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2112136**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112136.zip) | Apple | ***Proposal 1: Use the values in brackets below for 480/960kHz SCS as a starting point:***

|  |  |  |
| --- | --- | --- |
|  | NR Slot length  | BWP switch delay TBWPswitchDelay (slots) |
|  | (ms) | Type 1Note 1 | Type 2Note 1 |
| 0 | 1 | 1 | 3 |
| 1 | 0.5 | 2 | 5 |
| 2 | 0.25 | 3 | 9 |
| 3 | 0.125 | 6 | 18 |
| 5 | 0.03125 | [20] | [72] |
| 6 | 0.015625 | [39] | [144] |
| Note 1: Depends on UE capability.Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch. |

 |
| [**R4-2112561**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112561.zip) | vivo | **Proposal 1: Depending on UE capability, UE shall finish BWP switch within the time duration TBWPswitchDelay defined in Table 3.****Table 3: BWP switch delay**

|  |  |  |
| --- | --- | --- |
|  | NR Slot length  | BWP switch delay TBWPswitchDelay (slots) |
|  | (ms) | Type 1Note 1 | Type 2Note 1 |
| 0 | 1 | 1 | 3 |
| 1 | 0.5 | 2 | 5 |
| 2 | 0.25 | 3 | 9 |
| 3 | 0.125 | 6 | 18 |
| 5 | 0.03125 | 20 | 65 |
| 6 | 0.015625 | 39 | 129 |
| Note 1: Depends on UE capability.Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch. |

**Observation 1: RAN4 should study if shorter BWP switch time can be considered for 52.6G-71GHz.** |
| [**R4-2113223**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113223.zip) | Nokia, Nokia Shanghai Bell | **Observation 1:** BWP switching delay requirements are defined based on a minimum UE delay of 600 us for Type 1 UEs and 2000 us for Type 2 UEs. **Observation 2:** If we keep the same BWP delay in ms for 480 kHz and 960 kHz SCS, the BWP delay would be 64 and 128 slots for Type 2 UEs. **Proposal 1: RAN4 to study if BWP delay reduction for Type 2 UEs is possible for the operation on 480 and 960 kHz SCS.** **Proposal 2: Adopt the following values for DCI and timer based BWP switch delay as baseline**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **BWP switch delay TBWPswitchDelay (slots)** | **BWP switch delay in ms** |
|  | **NR Slot length (ms)** | **Type 1** | **Type 2** | **Type 1** | **Type 2** |
| 5 | 0.03125 | 20 | 64 | 0.625 | 2.0 |
| 6 | 0.015625 | 39 | 128 | 0.609375 | 2.0 |

 |
| [**R4-2113335**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113335.zip) | Ericsson | **Proposal 1: Active BWP switch delay for 52.6-71GHz still follows 600us for type 1 UE and 200us for type 2 UE.** **Proposal 2: Table of Active BWP switch delay is updated with higher SCS’s following assumption in Proposal1.** Table 8.6.2-1: BWP switch delay

|  |  |  |
| --- | --- | --- |
|  | NR Slot length  | BWP switch delay TBWPswitchDelay (slots) |
|  | (ms) | Type 1Note 1 | Type 2Note 1 |
| 0 | 1 | 1 | 3 |
| 1 | 0.5 | 2 | 5 |
| 2 | 0.25 | 3 | 9 |
| 3 | 0.125 | 6 | 18 |
| 4 | 0.03125 | [20] | [65] |
| 5 | 0.015625 | [39] | [129] |
| Note 1: Depends on UE capability.Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch. |

 |
| [**R4-2114145**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114145.zip) | Huawei, Hisilicon | **Proposal 1: To define the BWP switching requirements for 480 kHz and 960 kHz as follows**Table 8.6.2-1: BWP switch delay

|  |  |  |
| --- | --- | --- |
|  | NR Slot length  | BWP switch delay TBWPswitchDelay (slots) |
|  | (ms) | Type 1Note 1 | Type 2Note 1 |
| 0 | 1 | 1 | 3 |
| 1 | 0.5 | 2 | 5 |
| 2 | 0.25 | 3 | 9 |
| 3 | 0.125 | 6 | 18 |
| **5** | **0.03125** | **24** | **72** |
| **6** | **0.015625** | **48** | **144** |
| Note 1: Depends on UE capability.Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch. |

**Proposal 2: Reuse the existing requirements for RRC-based BWP switch.** |
| [**R4-2114191**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114191.zip) | Intel Corporation | **Proposal 1: RAN4 to use the same assumptions for FR2-2 BWP switching delay definition as in Rel-15, i.e.** **600us and 2000us switching delay for Type 1 and Type 2 respectively plus 3 OFDM symbols carrying DCI.** **Proposal 2: For new SCSs RAN4 to define BWP switching delay (Table 8.6.2-1) as shown in Table 1.**Table 1: BWP switch delay

|  |  |  |
| --- | --- | --- |
|  | NR Slot length  | BWP switch delay TBWPswitchDelay (slots) |
|  | (ms) | Type 1Note 1 | Type 2Note 1 |
| 0 | 1 | 1 | 3 |
| 1 | 0.5 | 2 | 5 |
| 2 | 0.25 | 3 | 9 |
| 3 | 0.125 | 6 | 18 |
| 5 | 0.03125 | 20 | 65 |
| 6 | 0.015625 | 39 | 129 |
| Note 1: Depends on UE capability.Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch. |

**Proposal 3: The existing requirements for BWP Switching on Multiple CCs can be applied for new SCSs** |

## Open issues summary

### Sub-topic 1-1. Active BWP switching delay requirements

*Sub-topic description:* This sub-topic discusses Active BWP switching delay and corresponding requirements for new SCSs 480 kHz and 960 kHz

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

**Issue 1-1-1: BWP switching delay for FR2-2**

* Proposals
	+ Proposal 1 (Ericsson, Intel): Follow 600us and 2000us switching delay for Type 1 and Type 2 respectively
	+ Proposal 2 (vivo): RAN4 to study if shorter BWP can be considered for 52.6G-71GHz.
	+ Proposal 2a (Nokia): RAN4 to study if BWP delay reduction for Type 2 UEs is possible for the operation on 480 and 960 kHz SCS.
* Recommended WF
	+ Continue the discussion in the 1st round.

Companies views’ collection for 1st round:

|  |  |
| --- | --- |
| Company | Comments |
| Ericsson | To our understanding, it is rational to keep 600us and 2000us switching delay for Type 1 and Type 2 unless BWP switching delay is unacceptable.  |
| MTK | Prefer to Option 1 to keep existing 600us and 2000us. |
| ZZZ |  |

**Issue 1-1-2: Number of slots for DCI and timer based BWP switch delay for Type 1 UEs for 480kHz and 960kHz respectively**

* Proposals
	+ Option 1 (Apple, vivo, Nokia, Ericsson, Intel): 20 and 39
	+ Option 2 (Huawei): 24 and 48
* Recommended WF
	+ Continue the discussion in the 1st round.

Companies views’ collection for 1st round:

|  |  |
| --- | --- |
| Company | Comments |
| Ericsson | We followed the same mathematical procedure as before. |
| YYY |  |
| ZZZ |  |

**Issue 1-1-3: Number of slots for DCI and timer based BWP switch delay for Type 2 UEs for 480kHz and 960kHz respectively**

* Proposals
	+ Option 1 (Apple, Huawei): 72 and 144
	+ Option 2 (vivo, Ericsson, Intel): 65 and 129
	+ Option 3 (Nokia): 64 and 128
* Recommended WF
	+ Continue the discussion in the 1st round.

Companies views’ collection for 1st round:

|  |  |
| --- | --- |
| Company | Comments |
| Ericsson | Support Option 2. We believe the difference of 1 from Nokia is related to the rounding up/rounding operation that was used. If that's the case, we believe rounding up is the better option. |
| YYY |  |
| ZZZ |  |

**Issue 1-1-4: RRC-based BWP switch**

* Proposals
	+ Proposal 1 (Huawei): Reuse the existing requirements for RRC-based BWP switch
* Recommended WF
	+ Discuss the proposal

Companies views’ collection for 1st round:

|  |  |
| --- | --- |
| Company | Comments |
| Ericsson | Agree with proposal 1. |
| YYY |  |
| ZZZ |  |

**Issue 1-1-5: BWP Switching on Multiple CCs**

* Proposals
	+ Proposal 1 (Intel): The existing requirements for BWP Switching on Multiple CCs can be applied for new SCSs
* Recommended WF
	+ Discuss the proposal

Companies views’ collection for 1st round:

|  |  |
| --- | --- |
| Company | Comments |
| Ericsson | Agree with proposal 1. |
| MTK | Suggest to focus on one BWP first |
| ZZZ |  |

## 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:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| **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)

# Topic #2: Measurement gaps and measurement gap interruption requirements

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2112562**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112562.zip) | vivo | **Proposal 1: RAN4 should reuse 0.25ms as MG timing advance for 52.6-71GHz.****Proposal 2: RAN4 should modify NOTE 2 for the case with per-UE gap or per-FR gap for FR1 from 52.6GHz to 71GHz.****Proposal 3: Measurement gap interruption requirements shall be shown as Table 1-3 to support 480kHz and 960kHz.**Table 1: Total number of interrupted slots on all serving cells during MGL for Synchronous EN-DC, NR standalone operation (with single carrier, NR CA and synchronous NR-DC configuration) and NE-DC, and on all serving cells in MCG for NR standalone operation (with asynchronous NR-DC configuration) with per-UE measurement gap or per-FR measurement gap for FR1

|  |  |
| --- | --- |
| NR  | Total number of interrupted slots on serving cells |
| SCS | When MG timing advance of 0ms is applied | When MG timing advance of 0.5ms is applied |
| (kHz) | MGL=20ms | MGL=10ms | MGL=6ms | MGL=4ms | MGL=3ms | MGL=20ms | MGL=10ms | MGL=6ms | MGL=4ms | MGL=3ms |
| 15 | 20 | 10 | 6 | 4 | 3 | 21Note3 | 11Note3 | 7Note3 | 5Note3 | 4Note3 |
| 30 | 40 | 20 | 12 | 8 | 6 | 40 | 20 | 12 | 8 | 6 |
| 60 | 80 | 40 | 24 | 16 | 12 | 80 | 40 | 24 | 16 | 12 |
| 120 | 160 | 80 | 48 | 32 | 24 | 160 | 80 | 48 | 32 | 24 |
| 480 | 640 | 320 | 192 | 128 | 96 | 640 | 320 | 192 | 128 | 96 |
| 960 | 1280 | 640 | 384 | 256 | 192 | 1280 | 640 | 384 | 256 | 192 |
| NOTE 1: For Gap Pattern ID 0, 1, 2 and 3, total number of interrupted subframes on MCG is MGL subframes when MG timing advance of 0ms is applied, and (MGL+1) subframes when MG timing advance of 0.5ms is applied.NOTE 2: NR SCS of 120 kHz ,480 kHz and 960 kHz is only applicable to the case with per-UE measurement gap.NOTE 3: Non-overlapped half-slots occur before and after the measurement gap. Whether a Rel-15 UE can receive and/or transmit in those half-slots is up to UE implementation. |

Table 2: Total number of interrupted slots on serving cells during MGL for Asynchronous EN-DC, and on all serving cells in SCG for NR standalone operation (with asynchronous NR-DC configuration) with per-UE measurement gap or per-FR measurement gap for FR1

|  |  |
| --- | --- |
| NR  | Total number of interrupted slots on serving cells |
| SCS | When MG timing advance of 0ms is applied | When MG timing advance of 0.5ms is applied |
| (kHz) | MGL=20ms | MGL=10ms | MGL=6ms | MGL=4ms | MGL=3ms | MGL=20ms | MGL=10ms | MGL=6ms | MGL=4ms | MGL=3ms |
| 15 | 21 | 11 | 7 | 5 | 4 | 21 | 11 | 7 | 5 | 4 |
| 30 | 41 | 21 | 13 | 9 | 7 | 41 | 21 | 13 | 9 | 7 |
| 60 | 81 | 41 | 25 | 17 | 13 | 81 | 41 | 25 | 17 | 13 |
| 120 | 161 | 81 | 49 | 33 | 25 | 161 | 81 | 49 | 33 | 25 |
| 480 | 641 | 321 | 193 | 129 | 97 | 641 | 321 | 193 | 129 | 97 |
| 960 | 1281 | 641 | 385 | 257 | 193 | 1281 | 641 | 385 | 257 | 193 |
| NOTE 1: For Gap Pattern ID 0, 1, 2 and 3, total number of interrupted subframes on MCG is MGL subframes when MG timing advance of 0ms is applied, and (MGL+1) subframes when MG timing advance of 0.5ms is applied.NOTE 2: NR SCS of 120 kHz ,480 kHz and 960 kHz is only applicable to the case with per-UE measurement gap. |

**Table 3: Total number of interrupted slots on FR2 serving cells during MGL for EN-DC, NR standalone operation (with single carrier, NR CA and NR-DC configuration) and NE-DC with per-UE measurement gap or per-FR measurement gap for FR2**

|  |  |
| --- | --- |
| NR  | Total number of interrupted slots on FR2 serving cells |
| SCS | When MG timing advance of 0ms is applied | When MG timing advance of 0.25ms is applied |
| (kHz) | MGL=20ms | MGL=10ms | MGL=5.5ms | MGL=3.5ms | MGL=1.5ms | MGL=20ms | MGL=10ms | MGL=5.5ms | MGL=3.5ms | MGL=1.5ms |
| 60 | 80 | 40 | 22 | 14 | 6 | 80 | 40 | 22 | 14 | 6 |
| 120 | 160 | 80 | 44 | 28 | 12 | 160 | 80 | 44 | 28 | 12 |
| 480 | 640 | 320 | 176 | 112 | 48 | 640 | 320 | 176 | 112 | 48 |
| 960 | 1280 | 640 | 352 | 224 | 96 | 1280 | 640 | 352 | 224 | 96 |
| NOTE 1: The total number of interrupted slots is based on that SFN and subframe reference for per-FR gap in FR2 indicated by high layer parameter *refServCellIndicator* is an FR2 serving cell.NOTE 2: Slot occurs before or after the measurement gap may be interrupted additionally if SFN and subframe reference for per-FR gap in FR2 indicated by high layer parameter refServCellIndicator is an FR1 serving cell. |

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| [**R4-2113224**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113224.zip) | Nokia, Nokia Shanghai Bell | **Observation 1:** When considering measurement gaps, it is not clear whether the per-FR gaps should consider FR2-1 and FR2-2 as independent bands. **Proposal 1: RAN4 to study if per-FR measurement gaps for FR2-1 and FR2-2 should be defined independently.** |
| [**R4-2113337**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113337.zip) | Ericsson | ***Proposal 1: There are 26 different measurement gap patterns (ID # 0 to # 25). Some of these gap patterns (ID #12 to # 23) are applicable to only FR2. While the existing gaps are also feasible for higher SCS (e.g., 480 kHz and 960 kHz) applicable for 52.6 – 71 GHz.******Proposal 2: For per-FR measurement gap capable UE in NR standalone operation (with single carrier, NR CA and NR-DC configuration), for per-FR gap-based measurement, when there is no serving cell in a particular FR, where measurement objects are configured, regardless if explicit per-FR measurement gap is configured in this FR, the effective MGRP in this FR is used to determine requirements:******- 20 ms for FR2 NR measurements also is applicable for 52.6 – 71 GHz.******Proposal 3:*** ***Table 9.1.2-4, Table 9.1.2-4a and Table 9.1.2-4b need to include higher SCS’s for 52.6 – 71 GHz.***Table 9.1.2-4: Total number of interrupted slots on all serving cells during MGL for Synchronous EN-DC, NR standalone operation (with single carrier, NR CA and synchronous NR-DC configuration) and NE-DC, and on all serving cells in MCG for NR standalone operation (with asynchronous NR-DC configuration) with per-UE measurement gap or per-FR measurement gap for FR1

|  |  |
| --- | --- |
| NR  | Total number of interrupted slots on serving cells |
| SCS | When MG timing advance of 0ms is applied | When MG timing advance of 0.5ms is applied |
| (kHz) | MGL=20ms | MGL=10ms | MGL=6ms | MGL=4ms | MGL=3ms | MGL=20ms | MGL=10ms | MGL=6ms | MGL=4ms | MGL=3ms |
| 15 | 20 | 10 | 6 | 4 | 3 | 21Note3 | 11Note3 | 7Note3 | 5Note3 | 4Note3 |
| 30 | 40 | 20 | 12 | 8 | 6 | 40 | 20 | 12 | 8 | 6 |
| 60 | 80 | 40 | 24 | 16 | 12 | 80 | 40 | 24 | 16 | 12 |
| 120 | 160 | 80 | 48 | 32 | 24 | 160 | 80 | 48 | 32 | 24 |
| 480 | 640 | 320 | 192 | 128 | 96 | 640 | 320 | 192 | 128 | 96 |
| 960 | 1280 | 640 | 384 | 256 | 192 | 1280 | 640 | 384 | 256 | 192 |
| NOTE 1: For Gap Pattern ID 0, 1, 2 and 3, total number of interrupted subframes on MCG is MGL subframes when MG timing advance of 0ms is applied, and (MGL+1) subframes when MG timing advance of 0.5ms is applied.NOTE 2: NR SCS of 120 kHz is only applicable to the case with per-UE measurement gap.NOTE 3: Non-overlapped half-slots occur before and after the measurement gap. Whether a Rel-15 UE can receive and/or transmit in those half-slots is up to UE implementation. |

Table 9.1.2-4a: Total number of interrupted slots on serving cells during MGL for Asynchronous EN-DC, and on all serving cells in SCG for NR standalone operation (with asynchronous NR-DC configuration) with per-UE measurement gap or per-FR measurement gap for FR1

|  |  |
| --- | --- |
| NR  | Total number of interrupted slots on serving cells |
| SCS | When MG timing advance of 0ms is applied | When MG timing advance of 0.5ms is applied |
| (kHz) | MGL=20ms | MGL=10ms | MGL=6ms | MGL=4ms | MGL=3ms | MGL=20ms | MGL=10ms | MGL=6ms | MGL=4ms | MGL=3ms |
| 15 | 21 | 11 | 7 | 5 | 4 | 21 | 11 | 7 | 5 | 4 |
| 30 | 41 | 21 | 13 | 9 | 7 | 41 | 21 | 13 | 9 | 7 |
| 60 | 81 | 41 | 25 | 17 | 13 | 81 | 41 | 25 | 17 | 13 |
| 120 | 161 | 81 | 49 | 33 | 25 | 161 | 81 | 49 | 33 | 25 |
| 480 | 641 | 321 | 193 | 129 | 97 | 641 | 321 | 193 | 129 | 97 |
| 960 | 1281 | 641 | 385 | 257 | 193 | 1281 | 641 | 385 | 257 | 193 |
| NOTE 1: For Gap Pattern ID 0, 1, 2 and 3, total number of interrupted subframes on MCG is MGL subframes when MG timing advance of 0ms is applied, and (MGL+1) subframes when MG timing advance of 0.5ms is applied.NOTE 2: NR SCS of 120 kHz is only applicable to the case with per-UE measurement gap. |

**Table 9.1.2-4b: Total number of interrupted slots on FR2 serving cells during MGL for EN-DC, NR standalone operation (with single carrier, NR CA and NR-DC configuration) and NE-DC with per-UE measurement gap or per-FR measurement gap for FR2**

|  |  |
| --- | --- |
| NR  | Total number of interrupted slots on FR2 serving cells |
| SCS | When MG timing advance of 0ms is applied | When MG timing advance of 0.25ms is applied |
| (kHz) | MGL=20ms | MGL=10ms | MGL=5.5ms | MGL=3.5ms | MGL=1.5ms | MGL=20ms | MGL=10ms | MGL=5.5ms | MGL=3.5ms | MGL=1.5ms |
| 60 | 80 | 40 | 22 | 14 | 6 | 80 | 40 | 22 | 14 | 6 |
| 120 | 160 | 80 | 44 | 28 | 12 | 160 | 80 | 44 | 28 | 12 |
| 480 | 640 | 320 | 176 | 112 | 48 | 640 | 320 | 176 | 112 | 48 |
| 960 | 1280 | 640 | 352 | 224 | 96 | 1280 | 640 | 352 | 224 | 96 |
| NOTE 1: The total number of interrupted slots is based on that SFN and subframe reference for per-FR gap in FR2 indicated by high layer parameter *refServCellIndicator* is an FR2 serving cell.NOTE 2: Slot occurs before or after the measurement gap may be interrupted additionally if SFN and subframe reference for per-FR gap in FR2 indicated by high layer parameter refServCellIndicator is an FR1 serving cell. |

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| [**R4-2114146**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114146.zip) | Huawei, Hisilicon | **Observation 1: The length of SSB bursts could be much shorted for SCS of 480 kHz and 960 kHz.****Proposal 1: The switching time for FR2-2 is assumed be same as FR2-1 as 0.25 ms.****Proposal 2:** **RAN4 to discuss whether to have new gap pattern with more RAN1 conclusion on SSB distribution.****Proposal 3: The impact of MRTD should be considered when defining the requirements for gap interruptions.** |
| [**R4-2112488**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112488.zip) | MediaTek Inc. | ***Proposal 5:*** *The existing FR2-1 measurement gap patterns can be reused for FR2-2.* ***Proposal 6:*** *RAN4 further to discuss whether to introduce independent gap for FR2-2.*  |

## 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 2-1: Measurement gaps applicability

*Sub-topic description:* This sub-topic discusses the measurement gaps applicability for FR2-2

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

**Issue 2-1-1: Existing measurement gap patterns applicability**

* Proposals
	+ Option 1 (Ericsson, MediaTek): The existing gaps are also feasible for higher SCS
	+ Option 2 (Huawei): RAN4 to discuss whether to have new gap pattern with more RAN1 conclusion on SSB distribution.
* Recommended WF
	+ Continue the discussion in the 1st round.

Companies views’ collection for 1st round:

|  |  |
| --- | --- |
| Company | Comments |
| Ericsson | Support Option 1. Discussion on symbols of SSB indexes in RAN1 doesn’t impact half-frame structure of SSB which is relevant to MGL. |
| MTK | Support option 1. |
| ZZZ |  |

**Issue 2-1-2: Per-FR measurement gaps for FR2-1 and FR2-2**

* Proposals
	+ Option 1 (Nokia, MediaTek): RAN4 to study if per-FR measurement gaps for FR2-1 and FR2-2 should be defined independently.
* Recommended WF
	+ Discuss the proposal

Companies views’ collection for 1st round:

|  |  |
| --- | --- |
| Company | Comments |
| Ericsson | Support Option 1. We can discuss it further if it’s really necessary.  |
| MTK | Support option 1. |
| ZZZ |  |

**Issue 2-1-3: Effective MGRP used to determine requirements**

* Proposals
	+ Option 1 (Ericsson): For per-FR measurement gap capable UE in NR standalone operation, for per-FR gap-based measurement, when there is no serving cell in a particular FR, where measurement objects are configured, regardless if explicit per-FR measurement gap is configured in this FR, reuse value for FR2 NR measurements – 20ms
* Recommended WF
	+ Discuss the proposal

Companies views’ collection for 1st round:

|  |  |
| --- | --- |
| Company | Comments |
| Ericsson | Our intention is to retain the same requirements for FR2. |
| YYY |  |
| ZZZ |  |

### Sub-topic 2-2: Measurement gap interruption requirements for FR2-2

*Sub-topic description:* This sub-topic discusses the aspects related to measurement gap interruption requirements definition for FR2-2

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

**Issue 2-2-1: MG timing advance for FR2-2**

* Proposals
	+ Option 1 (vivo, Huawei): 0.25ms
* Recommended WF
	+ Discuss the proposal

Companies views’ collection for 1st round:

|  |  |
| --- | --- |
| Company | Comments |
| Ericsson | Agree with Option 1, it reuses requirement for FR2. |
| YYY |  |
| ZZZ |  |

**Issue 2-2-2: High SCS in the case with per-UE gap or per-FR gap for FR1**

* Proposals
	+ Option 1 (vivo): RAN4 should modify NOTE 2 in Table 9.1.2-4 and Table 9.1.2-4a to capture that 480 kHz and 960 kHz are only applicable to the case with per-UE measurement gap
* Recommended WF
	+ Discuss the proposal

Companies views’ collection for 1st round:

|  |  |
| --- | --- |
| Company | Comments |
| Ericsson | Agree with option 1.  |
| YYY |  |
| ZZZ |  |

**Issue 2-2-3: MRTD impact on gap interruptions**

* Proposals
	+ Option 1 (Huawei): The impact of MRTD should be considered when defining the requirements for gap interruptions
* Recommended WF
	+ Discuss the proposal

Companies views’ collection for 1st round:

|  |  |
| --- | --- |
| Company | Comments |
| Ericsson | We can check MRTD’s impact after its conclusion for FR2-2 in RRM\_1 thread. |
| YYY |  |
| ZZZ |  |

**Issue 2-2-4: Measurement gap interruption requirements**

* Proposals
	+ Option 1 (vivo, Ericsson): Table 9.1.2-4, Table 9.1.2-4a and Table 9.1.2-4b to include higher SCS’s for 52.6 – 71 GHz as shown below

Table 9.1.2-4: Total number of interrupted slots on all serving cells during MGL for Synchronous EN-DC, NR standalone operation (with single carrier, NR CA and synchronous NR-DC configuration) and NE-DC, and on all serving cells in MCG for NR standalone operation (with asynchronous NR-DC configuration) with per-UE measurement gap or per-FR measurement gap for FR1

|  |  |
| --- | --- |
| NR  | Total number of interrupted slots on serving cells |
| SCS | When MG timing advance of 0ms is applied | When MG timing advance of 0.5ms is applied |
| (kHz) | MGL=20ms | MGL=10ms | MGL=6ms | MGL=4ms | MGL=3ms | MGL=20ms | MGL=10ms | MGL=6ms | MGL=4ms | MGL=3ms |
| 15 | 20 | 10 | 6 | 4 | 3 | 21Note3 | 11Note3 | 7Note3 | 5Note3 | 4Note3 |
| 30 | 40 | 20 | 12 | 8 | 6 | 40 | 20 | 12 | 8 | 6 |
| 60 | 80 | 40 | 24 | 16 | 12 | 80 | 40 | 24 | 16 | 12 |
| 120 | 160 | 80 | 48 | 32 | 24 | 160 | 80 | 48 | 32 | 24 |
| 480 | 640 | 320 | 192 | 128 | 96 | 640 | 320 | 192 | 128 | 96 |
| 960 | 1280 | 640 | 384 | 256 | 192 | 1280 | 640 | 384 | 256 | 192 |
| NOTE 1: For Gap Pattern ID 0, 1, 2 and 3, total number of interrupted subframes on MCG is MGL subframes when MG timing advance of 0ms is applied, and (MGL+1) subframes when MG timing advance of 0.5ms is applied.NOTE 2: NR SCS of 120 kHz ,480 kHz and 960 kHz is only applicable to the case with per-UE measurement gap.NOTE 3: Non-overlapped half-slots occur before and after the measurement gap. Whether a Rel-15 UE can receive and/or transmit in those half-slots is up to UE implementation. |

Table 9.1.2-4a: Total number of interrupted slots on serving cells during MGL for Asynchronous EN-DC, and on all serving cells in SCG for NR standalone operation (with asynchronous NR-DC configuration) with per-UE measurement gap or per-FR measurement gap for FR1

|  |  |
| --- | --- |
| NR  | Total number of interrupted slots on serving cells |
| SCS | When MG timing advance of 0ms is applied | When MG timing advance of 0.5ms is applied |
| (kHz) | MGL=20ms | MGL=10ms | MGL=6ms | MGL=4ms | MGL=3ms | MGL=20ms | MGL=10ms | MGL=6ms | MGL=4ms | MGL=3ms |
| 15 | 21 | 11 | 7 | 5 | 4 | 21 | 11 | 7 | 5 | 4 |
| 30 | 41 | 21 | 13 | 9 | 7 | 41 | 21 | 13 | 9 | 7 |
| 60 | 81 | 41 | 25 | 17 | 13 | 81 | 41 | 25 | 17 | 13 |
| 120 | 161 | 81 | 49 | 33 | 25 | 161 | 81 | 49 | 33 | 25 |
| 480 | 641 | 321 | 193 | 129 | 97 | 641 | 321 | 193 | 129 | 97 |
| 960 | 1281 | 641 | 385 | 257 | 193 | 1281 | 641 | 385 | 257 | 193 |
| NOTE 1: For Gap Pattern ID 0, 1, 2 and 3, total number of interrupted subframes on MCG is MGL subframes when MG timing advance of 0ms is applied, and (MGL+1) subframes when MG timing advance of 0.5ms is applied.NOTE 2: NR SCS of 120 kHz ,480 kHz and 960 kHz is only applicable to the case with per-UE measurement gap. |

**Table 9.1.2-4b: Total number of interrupted slots on FR2 serving cells during MGL for EN-DC, NR standalone operation (with single carrier, NR CA and NR-DC configuration) and NE-DC with per-UE measurement gap or per-FR measurement gap for FR2**

|  |  |
| --- | --- |
| NR  | Total number of interrupted slots on FR2 serving cells |
| SCS | When MG timing advance of 0ms is applied | When MG timing advance of 0.25ms is applied |
| (kHz) | MGL=20ms | MGL=10ms | MGL=5.5ms | MGL=3.5ms | MGL=1.5ms | MGL=20ms | MGL=10ms | MGL=5.5ms | MGL=3.5ms | MGL=1.5ms |
| 60 | 80 | 40 | 22 | 14 | 6 | 80 | 40 | 22 | 14 | 6 |
| 120 | 160 | 80 | 44 | 28 | 12 | 160 | 80 | 44 | 28 | 12 |
| 480 | 640 | 320 | 176 | 112 | 48 | 640 | 320 | 176 | 112 | 48 |
| 960 | 1280 | 640 | 352 | 224 | 96 | 1280 | 640 | 352 | 224 | 96 |
| NOTE 1: The total number of interrupted slots is based on that SFN and subframe reference for per-FR gap in FR2 indicated by high layer parameter *refServCellIndicator* is an FR2 serving cell.NOTE 2: Slot occurs before or after the measurement gap may be interrupted additionally if SFN and subframe reference for per-FR gap in FR2 indicated by high layer parameter refServCellIndicator is an FR1 serving cell. |

* Recommended WF
	+ Discuss the proposal

Companies views’ collection for 1st round:

|  |  |
| --- | --- |
| Company | Comments |
| Ericsson | Support Option1, we extended the tables with 480KHz and 960Khz. |
| YYY |  |
| ZZZ |  |

## 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:* |

### 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”.*

# Recommendations for Tdocs

## 1st round

**New tdocs**

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

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-210xxxx | 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** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-210xxxx | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-210xxxx | 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

# Annex

Contact information

|  |  |  |
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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)