**3GPP TSG-RAN WG4 Meeting # 97-e R4-20XXXXX**

**Electronic Meeting, Nov 2 – 13, 2020**

**Agenda item:** 7.11.2, 7.11.3

**Source:** Moderator (Huawei, HiSilicon)

**Title:** Email discussion summary for [97e][217] NR\_RF\_FR1\_RRM

**Document for:** Information

# Introduction

This email thread discusses the RRM core part/ performance part for Tx switching between two uplink carriers in agenda 7.11.2/3.

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

* 1st round: Invite companies to review the recommended WF in each sub-topic, and provide comments.
* 2nd round: TBA

# Topic #1: Core part

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014505 | China Telecom | (for TS 38.133)Indicate that for some EN-DC and UL CA configurations, DL interruption is not allowed. |
| R4-2014506 | China Telecom | (for TS 36.133)Indicate that for some EN-DC and UL CA configurations, DL interruption is not allowed. |
| R4-2015488 | Huawei, HiSilicon | 1. Correct the reference section of TS 38.214;2. The interruption length on 120Khz victim cell in NR SA for 210us uplink switching period shall be 14. |

## Open issues summary

N/A

## Companies views’ collection for 1st round

### Open issues

N/A

### 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.*

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| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2014505(China Telecom) | MTK: OK |
| Section 5.2A.2 does not say anything about interruptions, it just lists the supported combos. This addition is very confusing, what is the intention? |
| Huawei: ok |
| China Telecom: Reply to QC: In our companion CRs to 38.101-1/3 submitted in this meeting (in R4-2015195/6), we propose to add a note to the band combinations with no DL interruption. |
| Nokia: We understood how RAN4 RF specs capture which band combinations can deal with Tx switching and which combinations are allowed DL interruption is still under discussion in RF session. We can come to this CR when there is any conclusion in RF. |
| R4-2014506(China Telecom) | MTK: OK |
| Qualcomm: same comment as for 14505, the proposed addition is confusing because it is not clear which bands we are talking about. |
| Huawei: ok |
| China Telecom: Reply to QC: Same reply as to 4505. |
| Nokia: Same comments as to 4505.  |
| R4-2015488(Huawei, HiSilicon) | MTK: OK |
| China Telecom: OK |
| Qualcomm: ok |
| Huawei: ok |

## 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.*

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| --- | --- |
|  | **Status summary**  |
| **Sub-topic#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 |  |  |

### CRs/TPs

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

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

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #2: Test case

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014503 | China Telecom | Proposal: To verify the symbol-level DL interruption in test:* Interruption location happens from symbol #[14-(Interruption length+2)] to the end of last GP symbol assuming 2 symbols for SRS transmission in special slot.
* Not consider MRTD in the test.
* Two options can be considered for PDCCH/PDSCH scheduling in the special slot:
	+ Option 1: PDCCH is scheduled on the symbol right before the DL interruption
	+ Option 2: PDCCH is scheduled in the first OFDM symbol, and PDSCH with mapping type A is scheduled from the second OFDM symbol to the symbol right before the DL interruption.
 |
| R4-2014504 | China Telecom | Define test case for DL interruptions at UE switching between NR uplink carrier 1 and NR uplink carrier 2 in FDD+TDD inter-band uplink CA case. |
| R4-2014733 | CMCC | Proposal : The test case for TX switching between NR carrier #1(TDD 30kHz) and NR carrier#2 (TDD 30kHz) in SA scenario:- Carrier#1 TDD UL/DL pattern is 3D1S4U, S = 10DL: 2GP: 2UL;- Carrier#2 TDD UL/DL pattern is 1D1S2U, S = 10DL: 2GP: 2UL;- SRS configuration:* resourceMappingstartPosition: 0
* resourceMappingnrofSymbols: n2

- Tx switching between carrier 1 and carrier 2 happens immediately before SRS transmission in special slot* DL interruption length shall not exceed the value defined in Table 8.2.2.2.10-1 depending on UE capability
* The test verifies whether UE correctly receive the PDCCH scheduled on the symbol which is right before the DL interruption in special slot on carrier#1 amd 2nd special slot of every 8 slots on carrier#2, so that it sends ACK/NACK correctly.
* No MRTD is set in the test.
* The test case is only applicable to UE which supports pdcch-MonitoringAnyOccasions or pdcch-MonitoringAnyOccasionsWithSpanGap.
 |
| R4-2014734 | CMCC | Define test case for DL interruptions at UE switching between NR uplink carrier 1 and NR uplink carrier 2 in TDD+TDD inter-band uplink CA case. |
| R4-2015486 | Huawei, HiSilicon | Proposal 1: The test case for TX switching between NR carrier #1(FDD 15kHz) and NR carrier#2 (TDD 30kHz) in SA scenario:- Carrier#2 TDD UL/DL pattern is 3D1S4U, S = 6DL: 4GP: 4UL;- SRS configuration:* resourceMappingstartPosition: 0
* resourceMappingnrofSymbols: n2

- Tx switching between carrier 1 and carrier 2 happens immediately before SRS transmission in special slot* DL interruption length shall not exceed the value defined in Table 8.2.2.2.10-1 depending on UE capability
* The test verifies whether UE correctly receive the PDCCH scheduled on the symbol which is right before the DL interruption in slot#1 on carrier#1, so that it sends ACK/NACK correctly.
* No MRTD is set in the test.
* The test case is only applicable to UE which supports pdcch-MonitoringAnyOccasions or pdcch-MonitoringAnyOccasionsWithSpanGap.

Proposal 2: Test case for DL Interruptions at UE switching between LTE 1Tx carrier and NR 2Tx carrier in inter-band ENDC can refer to NR SA test case, except:- Carrier#2 TDD UL/DL pattern is 3D1S4U, S = 10DL: 2GP: 2UL;* The test verifies whether UE correctly receive the PDCCH scheduled on the symbol which is right before the DL interruption in special slot on carrier#2, so that it sends ACK/NACK correctly.
 |
| R4-2015487 | Huawei, HiSilicon | Define test case for DL Interruptions at UE switching between LTE 1Tx carrier and NR 2Tx carrier in inter-band ENDC. |

## Open issues summary

### Sub-topic 2-1: Principle and general parameters for test case

**Issue 2-1-1: How to verify the symbol-level DL interruption in test**

* Proposals
	+ Option 1(Huawei, CMCC): PDCCH is scheduled on the symbol right before the DL interruption. UE supports *pdcch-MonitoringAnyOccasions* or *pdcch*-*MonitoringAnyOccasionsWithSpanGap*.
	+ Option 2(China Telecom): PDCCH is scheduled in the first OFDM symbol, and PDSCH with mapping type A is scheduled from the second OFDM symbol to the symbol right before the DL interruption.
* Recommended WF
	+ Further discussion

**Issue 2-1-2: Whether MRTD is considered in test cases\**

* Proposals
	+ Option 1(China Telecom, CMCC, Huawei): No
* Recommended WF
	+ No MRTD is set in the test.

**Issue 2-1-3: SRS configuration in the special slot**

* Proposals
	+ Option 1(Huawei, China Telecom, CMCC): SRS configuration refers to SRSConf.1 in Table A.4.4.1.1.1-3 in TS 38.133 except that:

• resourceMappingstartPosition: 0

• resourceMappingnrofSymbols: n2

* Recommended WF
	+ SRS configuration refers to SRSConf.1 in Table A.4.4.1.1.1-3 in TS 38.133 except that:

• resourceMappingstartPosition: 0

• resourceMappingnrofSymbols: n2

### Sub-topic 2-2: Specific parameters for DL Interruptions at UE switching between LTE 1Tx carrier and NR 2Tx carrier in inter-band ENDC

**Issue 2-2-1: TDD configuration**

* Proposals
	+ Option 1 (Huawei): Carrier#2 TDD UL/DL pattern is 3D1S4U, S = 10DL: 2GP: 2UL
* Recommended WF
	+ Is option 1 agreeable?

**Issue 2-2-2: Which symbol to be verified?**

* Proposals
	+ Option 1:
		- symbol #4 or symbol#5 or symbol #8 on the special slot on NR TDD carrier depending on UE capability *uplinkTxSwitchingPeriod*
		- symbol level DL interruption can’t be verified in LTE



* Recommended WF
	+ Is option 1 agreeable?

### Sub-topic 2-3: Specific parameters for DL interruptions at switching between two uplink carriers in FDD-TDD CA (SA)

**Issue 2-3-1: TDD configuration**

* Proposals
	+ Option 1 (China Telecom): Carrier#2 TDD UL/DL pattern is 3D1S4U, S = 10DL: 2GP: 2UL
* Recommended WF
	+ Is option 1 agreeable?

**Issue 2-3-2: Which symbol to be verified?**

* Proposals
	+ Option 1(China Telecom):
		- For NR FDD carrier (Cell 1), this test verifies that the UE correctly receive the PDCCH scheduled on the symbol #8 or symbol #9 or symbol #10 in the second slot of every 4 slots (i.e., the slot overlapping with the special slot of the NR TDD carrier) depending on UE capability *uplinkTxSwitchingPeriod*
		- For NR TDD carrier (Cell 2), this test verifies that the UE correctly receive the PDCCH scheduled on the symbol #4 or symbol #5 or symbol #8 on the special slot depending on UE capability *uplinkTxSwitchingPeriod*
* Recommended WF
	+ Is option 1 agreeable?

### Sub-topic 2-4: Specific parameters for DL interruptions at switching between two uplink carriers in TDD-TDD CA (SA)

**Issue 2-4-1: TDD configuration**

* Proposals
	+ Option 1 (CMCC):

- Carrier#1 TDD UL/DL pattern is 3D1S4U, S = 10DL: 2GP: 2UL;

- Carrier#2 TDD UL/DL pattern is 1D1S2U, S = 10DL: 2GP: 2UL

* Recommended WF
	+ Is option 1 agreeable?

**Issue 2-4-2: Which symbol to be verified?**

* Proposals
	+ Option 1(CMCC):
		- For NR TDD PCell (Cell 1), this test verifies that the UE correctly receive the PDCCH scheduled on the symbol #4 or symbol #5 or symbol #8 on the special slot depending on UE capability uplinkTxSwitchingPeriod.
		- For NR TDD SCell (Cell 2), this test verifies that the UE correctly receive the PDCCH scheduled on the symbol #4 or symbol #5 or symbol #8 on the 2nd special slot of every 8 slots depending on UE capability uplinkTxSwitchingPeriod.



* Recommended WF
	+ Is option 1 agreeable?

## Companies views’ collection for 1st round

### Open issues

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| --- | --- |
| **Company** | **Comments** |
| MTK | **Issue 2-1-1: How to verify the symbol-level DL interruption in test**We try to bring a new alternative (Option 3): Triggering an aperiodic CSI-RS L1-RSRP reporting with CSI-RS resources (with boosted power) on the OFDM symbol right before the interruption. On Option 1, we share the same view as China Telecom that we should try to avoid testing this feature only on those UEs supporting some optional features in Rel-15.On Option 2, in principle it is OK. But we need to be carefully in deciding the MCS according to the SNR level and the remaining REs. Otherwise, some UE may still pass the test by skipping more than the interrupted symbols. However, the length of interruption depending on both UE capability and the SCS’s of carriers. It may take a long time to conclude the MCS and SNR for different cases. **Issue 2-1-2: Whether MRTD is considered in test cases**Support Option 1, in which MRTD = 0us**Issue 2-4-2: Which symbol to be verified?**One question for clarification.According to the figure provided in R4-2014733, when interruption occurs on the UL symbols of the victim cell. Is it the intention to test interruption to UL? |
| China Telecom | **Sub-topic 2-1: Principle and general parameters for test case**Issue 2-1-1: How to verify the symbol-level DL interruption in testRegarding the MCS and SNR for option 2, we can configure high SNR (e.g., 30 dB) and high code rate (e.g., MCS 28 in MCS table 1 with 64QAM and code rate of 0.93). Based on the current test setup, max 10 OFDM symbols can be used for PDSCH transmission (including data and DMRS REs). If 1 out of the 10 OFDM symbols is interrupted, data channel based on the remaining 9 symbols (with code rate > 1) cannot be correctly decoded. The situation is worse for PDSCH with less than 10 OFDM symbols.The option 3 from MTK is also ok to us.Issue 2-1-2: Whether MRTD is considered in test casesOK with theRecommended WF.Issue 2-1-3: SRS configuration in the special slotOK with theRecommended WF.**Sub-topic 2-2: Inter-band ENDC**Issue 2-2-1: TDD configurationOK with theRecommended WF. To reduce the spec impact, for 30kHz, ok to reuse the existing TDD pattern in 38.133.Issue 2-2-2: Which symbol to be verified?Can discuss together with Issue 2-1-1.**Sub-topic 2-3: FDD-TDD CA (SA)****Issue 2-3-1: TDD configuration**OK with theRecommended WF. To reduce the spec impact, for 30kHz, ok to reuse the existing TDD pattern in 38.133.**Issue 2-3-2: Which symbol to be verified?**Can discuss together with Issue 2-1-1.**Sub-topic 2-4: TDD-TDD CA (SA)****Issue 2-4-1: TDD configuration**OK with theRecommended WF. One more TDD pattern is needed for carrier 2.**Issue 2-4-2: Which symbol to be verified?**Can discuss together with Issue 2-1-1. |
| CMCC | **Issue 2-1-1: How to verify the symbol-level DL interruption in test**In order to avoid that UE does not support *pdcch-MonitoringAnyOccasions* or *pdcch*-*MonitoringAnyOccasionsWithSpanGap,* we are fine to consider other options. Option 2 and option 3 are in principle OK. **Issue 2-1-2: Whether MRTD is considered in test cases**Support the recommended WF.**Issue 2-1-3: SRS configuration in the special slot**Support the recommended WF.**Issue 2-2-1: TDD configuration**OK to reuse existing TDD configuration**Issue 2-2-2: Which symbol to be verified?**OK with option 1**Issue 2-3-1: TDD configuration**OK with option 1**Issue 2-3-2: Which symbol to be verified?**OK with option 1**Issue 2-4-1: TDD configuration**Support the recommended WF**Issue 2-4-2: Which symbol to be verified?**To MTK: The DL interruption occurs in the DL symbols in NR TDD PCell or NR TDD SCell. We will not test the interruption to UL.  |
| Qualcomm | **Issue 2-1-1:** we believe we should avoid using any optional feature to define this test. Option 2 seems better. If the issue is not urgent maybe we can have just a tentative agreement on Option 2 and leave the option of coming back in next meeting if a better solution is found.**Issue 2-1-2**: MRTD=0 is much easier to test.**Issue 2-1-3**: Ok with the proposal**Issue 2-2-1**: Option 1 is ok.**Issue 2-2-2**: Option 1 is ok.**Issue 2-3-1**: Option 1 is ok.**Issue 2-3-2**: Option 1 is ok**Issue 2-4-2**: This needs further discussion. Should be clarified that this can only apply to combinations assuming simultaneous Rx-Tx. |
| Huawei | **Issue 2-1-1: How to verify the symbol-level DL interruption in test**In general, option 1 is used to verify the scheduling restriction in R15. No issues are identified.For option2, if the actual interruption length exceeds the specified requirements, what we want to see is that the OFDM symbol allocated right before the interruption is impacted and TE can know this sensitively. Whether UE will report NACK with Option 2 depends on MCS and the remaining RE numbers, if the MCS is low (i.e., QPSK commonly used in RRM) or the RE number is large, UE may still report ACK even if the PDSCH allocated right before the interruption is impacted. In addition, the interruption lengths are different according to UE capability (35us, 140us, 210us) and different configurations (15KHz, 30KHz, 120KHz), then parameter setting for option2 is complex for the case combination.For the new option3 proposed by MTK, we are open to discuss it. We need time to further check the feasibility.As it is the last meeting for the performance part of the WI, hope we could come to a conclusion at this meeting.**Issue 2-1-2: Whether MRTD is considered in test cases**Support the recommended WF.**Issue 2-1-3: SRS configuration in the special slot**Support the recommended WF.**Issue 2-2-1: TDD configuration**support option 1.**Issue 2-2-2: Which symbol to be verified?**support option1.**Issue 2-3-1: TDD configuration**Option 1 is ok.**Issue 2-3-2: Which symbol to be verified?**Option 1 is ok.**Issue 2-4-1: TDD configuration**Option 1 is ok.**Issue 2-4-2: Which symbol to be verified?**Option 1 is ok. |

### 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.*

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| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2014504(China Telecom) | Huawei: depending on the outcome of the first issue. Besides the new text case shall be with change marks. |
| Ericsson: The section number (A.6.5.7) is also used in another SA test for CCBW change in R4-2016169. This needs to be resolved if both CRs are being agreed (see also comments on R4-2014734).  |
|  |
| R4-2014734 (CMCC) | Huawei: depending on the outcome of the first issue. |
| Ericsson: The top level section starts with A.6.5.8 but later sections with A.6.5.7.1 and so on. This conflicts with the above CR on FDD-TDD in R4-2014504 and on CBW on R4-2016169. The conflict on section numbers needs to be resolved in the 3 CRs.  |
|  |
| R4-2015487 (Huawei, HiSilicon) | Huawei: depending on the outcome of the first issue. |
| Company B |
|  |

## 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.*

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|  | **Status summary**  |
| **Sub-topic#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

*Recommendations on WF/LS assignment*

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| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 |  |  |

### CRs/TPs

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

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

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |