1st round summary_with Tdoc number
Variant of [101-e][213] NR_RF_FR1_enh_RRM_NWM Version 0.0.2
RAN4

3GPP TSG-RAN WG4 Meeting # 101-e **R4-2120208**

Electronic Meeting, November 01-12, 2021

Agenda item: 8.3.3

Source: Moderator (Huawei, HiSilicon)

Title: Email discussion summary for [101-e][213] NR_RF_FR1_enh_RRM_NWM

Document for: Information

1 Introduction

This email thread discusses the RRM part of NR FR1 RF enhancement in Rel-17[RP-202088] in agenda 9.3.3. This email discussion aims to discuss the DL interruption requirements due to R17 Tx switching.

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

2 RRM impacts due to R17 Tx switching

2.1 Companies' contributions summary

Table 1:

T-doc number	Company	Proposals / Observations

R4-2117191	China Telecom	**Proposal 1:** R17 Tx switching scenarios need to be considered – Consider the following Tx switching scenarios to specify DL interruption requirements: ○ 2Tx-2Tx switching between two uplink carriers for TDD+FDD UL CA and TDD+TDD UL CA ○ 1Tx-2Tx and 2Tx-2Tx switching between 1 carrier on band A and 2 contiguous aggregated carriers on band B for TDD+FDD UL CA and TDD+TDD UL CA ▪ In above two bullets, TDD+TDD UL CA is the scenario with different UL-DL configurations or interCA-NonAlignedFrame-r16 – ~~FFS:~~ No DL interruption for SUL related scenario No DL interruption for sync TDD+TDD CA with the same UL-DL configuration and without interCA-NonAlignedFrame-r16
2117709	CMCC	Proposal: No DL interruption for SUL related scenario.
R4-2118039	Intel Corporation	Proposal 1: Specify the DL interruption applicability in the same way as in Rel-16. Proposal 2: Define DL interruption requirements in the spec as shown in this paper.

R4-2118812	Huawei, Hisilicon	Draft CR
R4-2119466	Ericsson	Observation 1: UL intra-band CA is supported in RF specifications since Rel-16. Observation 2: RRM requirements in EN-DC according to clause 3.6.2.2 are not applicable if the UE is configured with 1 UL CC in the same band as of the PS-Cell's CC. Observation 3: In other multi-carrier scenarios (SA, NE-DC and NR-DC) the RRM requirements are applicable also if the UE is configured with UL CC along with the CC of the sPCell (PCell or PS-Cell). Proposal #1: In addition to the existing serving carriers on EN-DC in clause 3.6.2.2, further include that the UE can support CC of the PSCell and up to 1 UL CC of the UL SCell in the same FR
R4-2119467	Ericsson	Draft CR

2.2 Open issues summary

2.2.1 Open issues

Issue 1: DL interruption for SUL related scenario

*Background: The following SUL related agreements in RF session (highlight with Font Bold) are duplicated [*R4-2017815*]:*

WF on 2Tx-2Tx switching between two carriers

- *Applicability of DL interruption*
  - *Reuse the Rel-16 agreement:*
    - ***For SUL+TDD and TDD+TDD CA with the same UL-DL pattern, DL interruption is not required.***
    - *For the other duplex mode combinations, define different capabilities for UEs with and without DL interruption.*
      - *UE capability is defined as per band per band combination for each band pair supporting UL Tx switching.*

WF on 1Tx-2Tx and 2Tx-2Tx switching between band A and band B

- *Applicability of DL interruption*
  - *The same agreements are applied for the scenarios with either one carrier or two contiguous aggregated carriers on band B*
    - ***For SUL+TDD and TDD+TDD CA with the same UL-DL pattern, DL interruption is not required.***
  - *For the other duplex mode combinations, define different capabilities for UEs with and without DL interruption.*
    - *UE capability is defined as per band per band combination for each band pair supporting UL Tx switching.*

- Proposals
  - Option 1(China Telecom, CMCC): No DL interruption for SUL related scenario
- Recommended WF
  Is Option 1 agreeable?

Feedback Form 1: Comments collection for Issue 1

1 – China Telecommunications Support option 1.
2 – MediaTek Inc. OK with Option 1
3 – China Mobile Com. Corporation Option1
4 – Apple AB Moderator's proposal is OK
5 – Nokia Korea Option 1 is agreeable.
6 – Huawei Technologies France support option 1.
7 – Intel We are OK with the recommended WF.

Issue 2: UE capability of UL intra-band in ENDC

- Proposals
  - Option 1(Ericsson): In addition to the existing serving carriers on EN-DC in clause 3.6.2.2, further include that the UE can support CC of the PSCell and up to 1 UL CC of the UL SCell in the same FR
- Recommended WF
  - Further discussion

Feedback Form 2: Comments collection for Issue 2

1 – China Telecommunications It looks the option 1 is reasonable, since there is UL EN-DC configuration of DC_8A_n79C in the latest version of TS 38.101-3. But it might be not suitable to discuss the option 1 is this thread, given that the Rel-17 3CC switching only applies to inter-band CA and SUL, but not to EN-DC.
2 – MediaTek Inc. Technically fine. But we are not clear about the relation between this proposal and this WI. Maybe we should treat this in TEI?
3 – Ericsson LM This should have been done in Rel-16 under Rel-16 WI on RF enhancement in FR1 (NR_RF_FR1: WID in RP 193200). The reason is that intra-band UL CA for PC3 was introduced in R16 under NR_RF_FR1. Please see below the objectives. Rel-17 WI is continuation of Rel-16 FR1 WI defining HPUE and MIMO for UL intra-band CA so we have proposed it under R17 WI. If companies are OK technically with the proposal then we can have R16 CR under NR_RF_FR-Core. The objectives for Rel-16 RF requirement continuation work for FR1 include: · ..... · UE requirements Intra-band contiguous UL CA for FR1 power class 3 · UE requirements Intra-band non-contiguous UL CA for FR1 power class 3
4 – China Mobile Com. Corporation The proposal makes sense since corresponding EN-DC combinations are introduced. The RF spec should also be updated in order to support the Tx switching. Maybe it is more suitable to discuss this in the main session. And if RAN4 agrees to do this, revision on WID is needed.
5 – Apple AB A clarification question is if there is any example band combination introduced, i.e. intra-band UL CA in EN-DC? If yes, we can consider to include this work subject to WID revision.

6 – QUALCOMM JAPAN LLC.

Do we need a WID clarification for this? It would be useful if this is brought up first in the RF session since they worked on this feature and defined the actual switching requirements. The interruptions defined in 133 are just a consequence of the RF specs

7 – Nokia Korea

The proposal sounds reasonable. Either the WID needs to be revised adding the scenario, or probably this can be discussed in TEI16.

8 – Huawei Technologies France

We are not sure whether RF group has specified the band combination of UL intra-band CA in ENDC. Could Ericssson provide more information about this?

In addition, we'd like to understand more about the intention of the proposal. Does it aim to clarify the applicability of number of the serving cells or make further moditification on the TX switching requirements?

In R17 FR1 WI, ENDC scenario is not included. Any revision on the WI would be discussed in RAN plenary.

2.2.2 CRs/TPs comments collection

Please provide comments on the following draft CRs and TP:

R4-2118039 (Intel): TP for DL interruption requirements

Feedback Form 3: Comments collection for TP in R4-2118039

1 – MediaTek Inc.

- Not sure if we can directly re-use the IEs "*uplinkTxSwitchingPeriod*" and "*uplinkTxSwitching-DL-Interruption*". Suggest to add [].
- Table 8.2.2.2.10A-1 and 8.2.2.2.10B-1 are created but not cited.
- There are 2 Table 8.2.2.2.10B-1. In the table caption, it should be "DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink ~~carriers~~bands"

2 – China Telecommunications

In general the CR/TP structure looks good, our minor comments to the TP and the CR in R4-2118812:

1) Might not need to cover all the 3 scenarios in both of the two papers.

2) Capability name: RAN2 CRs have been endorsed, so we are ok to have the capability name in RAN4 spec either with or without []. The capability name for 2CC and 3CC 2T-2T switching is uplinkTxSwitchingPeriod2T2T-r17, and the capability name for 3CC 1T-2T switching is uplinkTxSwitchingPeriod-r16.

3) Table: to align whether one new table is needed for each section, or only add one table for 2T-2T switching (regardless of whether 2CC or 3CC).

4) Section numbering: need to be aligned.

3 – Intel

Thank you for all the comments. We suggest that we revise the existing draftCR and take into all the comments.

R4-2118812 (Huawei): Draft CR for DL interruption requirements

Feedback Form 4: Comments collection for Draft CR R4-2118812

1 – MediaTek Inc.

- Similar comments as those for 8039
- The clause in TS38.214 may need [ ] at this moment
- Typo in Section 8.2.2.2.x1: The DL interruption lengths of X are defined in Table 8.2.2.2.~~10~~X1-1.
- Typo in Section 8.2.2.2.x2: The DL interruption lengths of X are defined in ~~Table~~ Table 8.2.2.2.X1-1

2 – Intel

Let's revise this CR and merge our TP and all the comments.

R4-2119467 (Ericsson): Draft CR for Requirements on UL CCs in intra-band UL CA in 38.133

Feedback Form 5: Comments collection for Draft CR R4-2119467

1 – MediaTek Inc. Technically fine. But not sure if we should agree this CR in this WI.
2 – Ericsson LM As commented above we are Ok to have this CR in R16 under NR_RF_FR1.
3 – QUALCOMM JAPAN LLC. We also agree that the WI should be changed since it doesn't belong here
4 – Huawei Technologies France We are not sure whether RF group has specified the band combination of UL intra-band CA in ENDC. Could Ericssson provide more information about this? We think this CR shall not be discussed in this R17 WI.

2.3 Summary for 1st round

2.3.1 Open issues

2.3.1.1 Sub-topic 1: DL interruption requirements

Issue 1: DL interruption for SUL related scenario

All companies support option1.

Tentative agreements

No DL interruption for SUL related scenario

Recommendations for 2nd round: No further discussion.

Issue 2: UE capability of UL intra-band in ENDC

8 companies discussed the issue. All companies have the common understanding that current R17 FR1 WI doesn't include ENDC. Companies proposed several questions which need to be further clarified. Moderator suggest to further discuss these questions in 2nd round discussion.

Issue 2-1: Is there any example band combination introduced, i.e. intra-band UL CA in EN-DC?

If yes, please provide specific BC of intra-band UL CA in ENDC.

Option 1: Yes (Ericsson).

Issue 2-2: The impact if the proposal is agreeable

Option 1: only clarify the applicability of number of the serving cells, i.e., clause 3.6 in TS38.133

Option 2: specify the TX switching related requirements, i.e., UL Tx switching between Band A (LTE) and Band B (NR) for EN-DC with intra-band UL CA where two CCs are configured on band B

Issue 2-3: If option 1 in issue 2-1 is agreeable, how to handle the CR?

Option 1: R16 TEI

Option 2: R16 maintenance for basket WI where the EN-DC with intra-band UL CA was introduced

Option 3: Revision on R17 FR1 WI to enable UL Tx switching between Band A (LTE) and Band B (NR) for EN-DC with intra-band UL CA where two CCs are configured on band B.

Recommendations for 2nd round: Further discussion

2.3.2 CRs/TPs

2.4 Discussion on 2nd round (if applicable)

3 Recommendations for Tdocs

3.1 1st round

New tdocs

Table 2:

Title	Source	Comments
WF on R17 NR FR1 RF enhancement RRM	Huawei, HiSilicon	

Existing tdocs

Table 3:

Tdoc number	Title	Source	Recommendation
R4-2118812	Draft CR on DL interruption due to Rel-17 Tx switching enhancements	Huawei, Intel	Revised
R4-2119467	Requirements on UL CCs in intra-band UL CA	Ericsson	Revised

3.2 2nd round

Feedback Form 6: