3GPP TSG-RAN WG2 #121-e R2-2302208

Athens, Greece, 27 February – 03 March 2023

Agenda Item: 5.1.3.2

Source: Ericsson

Title: [AT121][009][R1516] Simultaneous RxTx (Ericsson)

Document for: Discussion, Decision

# 1 Introduction

The following document is to collect input on way forward related to the following offline discussion:

* Offline 009 (Ericsson), to find agreeable reply to RAN4 LS, and make a report. can use TP to illustrate R2 impacts. Can also address P2 from Nokia tdoc.

Chair’s notes, see Annex

# 2 Contact information

|  |  |  |
| --- | --- | --- |
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## 2 Discussion

## 2.1 On inter-operability concerns and feasibility

In their LS in [R2-2300048](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_121/Docs//R2-2300048.zip), RAN4 asked

* RAN4 would like to ask RAN2 if the above changes could simplify and reduce capability transfer for band combinations and if these changes are feasible and backwards compatible.

Main point is to consolidate the RAN2 view on the inter-op aspects of the RAN4-proposed changes. Some companies expressed in online discussion to go with the RAN4 solution, while others did not.

Generally, modifications of existing UE capability definitions are avoided, since there is a risk for inter-operability problems between UEs and networks that have implemented different interpretations of the UE capability. But in this case, no inter-operability issues are expected in practice since:

* No UEs support simultaneous Rx-Tx for overlapping TDD bands
* Existing networks configure synchronized and coordinated U/D patterns for overlapping TDD bands*.*

This was also indicated in the inter-operability analysis in draft CR in [R2-2301450](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_121/Docs//R2-2301450.zip).

The rapporteur therefore proposes to indicate the following in response LS to RAN4

* RAN2 does not see any incompatibility issues by modifying the capabilities as proposed by RAN4.
The changes proposed by RAN4 are feasible.

**Q1. Do you agree to indicate this in response LS to RAN4 (Yes/No)?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments/Motivation |
| Qualcomm Incorporated | Yes | We do not know if “no UEs” supports simultaneous Rx-Tx for overlapping TDD bands, but the proposed response to RAN4 is fine from our perspective. |
| Huawei, HiSilicon | No | According to RAN4’s LS, the UE can indicate support of simultaneousRxTx for overlapping TDD band pairs through the per band pair capability. Anyway, a finer granularity capability has been introduced for advanced flexibility, we don’t see the need to exclude some types of inter-band band pairs when reporting the perBC capability with the risk of NBC.  |
| MediaTek Inc. | No | We understand that whether the UE supports simultaneousRx-Tx depends on if there is shared RF component for the concerned TDD band pair. However, we think the proposed response is acceptable with removing the first sentence. |
| Samsung | Yes | In technical aspect, inter-operability issue may happen due to the definition change, because the concerned field can be included by excluding the exceptional case, i.e. (partially) overlapping bands.On the other hand, as mentioned above, in practice, the network may have already identified the situation for the specific bands. It means less risk for the inter-operability issue. |
| ZTE | Yes | We also want to confirm which version shall be taken as start, R15 or R16. |
| Intel |  | If network vendors think such simplification is necessary to split out the overlapping TDD bands from the legacy capability and companies also have the general understanding that there is no NBC risk of such changes, then maybe we can go with RAN4 proposal.  |

**Summary:** RAN2 consensus could not be reached, though there is support among a slight majority of the responding companies to go with RAN4 proposal. Final decision need to be taken in main session.

1. RAN2 to decide whether to respond to RAN4 LS as follows:
“RAN2 does not see any incompatibility issues with existing UEs or networks by modifying the capabilities as proposed by RAN4. The changes proposed by RAN4 are feasible.”

If not agreed, RAN2 should respond negatively:
“RAN2 expects incompatibility issues with existing UEs or networks by modifying the capabilities as proposed by RAN4. The changes proposed by RAN4 are not feasible.”

## 2.2 On TS 38.306 wording proposal

During online discussion, concerns were raised that the text proposed by RAN4 was difficult to understand. E.g. not clear for which (parent) BCs the capabilities are applicable.

The Rapp indicated in online discussion that also if RAN4 proposal is not agreed, clarifications are needed.

**Q2: Does concern on wording difficulties need to be communicated to RAN4 (“Yes”), or can this be resolved by RAN2 in the design of CR to 38.306 (“No”)?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm Incorporated | No | We think the RAN4 text is difficult to understand, e.g. “UE capability is included if xxxx, unless yyyy…”.We believe the specification text can focus on the applicability / scope of the UE capability parameter, instead of describing the conditions when the UE capability shall be included. |
| Huawei, HiSilicon | See comments | We agree that the wording from RAN4’s LS is difficult to understand, but we think the intention of RAN4 is NBC from RAN2 perspective.  |
| MediaTek Inc. | See comments | The CR must clarifies that appliable BCs are only these containing “intra-band TDD and inter-band TDD-TDD band pairs of overlapping or partially overlapping TDD bands”, and simplifies the conditions. Otherwise such a NBC change is not agreeable. |
| Samsung | No | We assume RAN2 has understood the intention of the RAN4 LS. Thus, RAN2 could update the wording. |
| ZTE | No | The wording is difficult to understand, however, about the intention of this LS, it seems that RAN2 companies are on the same page. Thus RAN2 could update it (but for the EN-DC part, some confirmation maybe needed as discussed in the next question) |
| Intel | No | We think RAN2 understand the intention of the RAN 4 proposal and the wording can be resolved by RAN2, if RAN2 agree to implement the RAN4 proposal. |

Summary: The wording of the RAN4 proposal is difficult to understand, companies assume RAN2 understands RAN4 intention, and can improve the wording, e.g. by indicating for which BCs the capability is applicable.

1. If Proposal 1 is agreed, RAN4 proposal need better wording, but can be handled by RAN2.

## 2.3 Conflicting text for EN-DC

In [R2-2301718](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_121/Docs//R2-2301718.zip), it was pointed out that the following text (highlighted, introduced based on RAN4 LS in [R4-2107907](http://www.3gpp.org/ftp//tsg_ran/WG4_Radio/TSGR4_99-e/Docs//R4-2107907.zip)) is in conflict with the RAN4 proposal.

| ***simultaneousRxTxInterBandENDC***Indicates whether the UE supports simultaneous transmission and reception in TDD-TDD and TDD-FDD inter-band (NG)EN-DC/NE-DC. It is mandatory for certain TDD-FDD and TDD-TDD band combinations defined in TS 38.101-3 [4].This capability applies to:- TDD-TDD and TDD-FDD Intra-band (NG)EN-DC/NE-DC combination supporting both UL and DL intra-band (NG)EN-DC/NE-DC parts with additional inter-band NR/LTE CA component;- TDD-TDD and TDD-FDD Intra-band (NG)EN-DC/NE-DC combination without supporting UL in both the bands of the intra-band (NG)EN-DC/NE-DC UL part;- TDD-TDD and TDD-FDD Inter-band (NG)EN-DC/NE-DC combination without Intra-band component.This capability is not applicable to the inter-band (NG)EN-DC/NE-DC combination, where the frequency range of the E-UTRA band is a subset of the frequency range of the NR band (as specified in Table 5.5B.4.1-1 of TS 38.101-3 [4]). | BC | CY | N/A | N/A |
| --- | --- | --- | --- | --- |

The rapporteur understands RAN4 missed in their LS to target this particular text. The rapporteur assumes highlighted text should be deleted, if the RAN4 proposal is implemented.

The rapporteur also notes that the highlighted sentence cover the case “the frequency range of the E-UTRA band is a subset of the frequency range of the NR band” but not the case “the frequency range of the NR band is a subset of the frequency range of the E-UTRA band”.

**Q3: If there is “Yes” on Q1, should RAN2 ask RAN4 about this conflicting text (“Yes”) or could RAN2 take care of tis during CR design (“No”)**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm Incorporated | Yes | Looks safer to confirm. |
| Huawei, HiSilicon | Yes |  |
| MediaTek Inc. | Yes | We think what RAN2 can do is to check the applicability of the different BC types listed in the field description because these “BC types” are from R2 language. However, we need to reconfirm with RAN4 for the removal of the last section. |
| Samsung | Yes | We have same understanding with the rapporteur.According to the RAN4 intention, the yellow-highlighted text should be removed.On the other hand, for safety, RAN2 may confirm it with RAN4. |
| ZTE | Yes | The last sentence is based on the RAN4’s previous LS, and now it conflicts with the new LS. Based on the new LS, the last sentence can be removed, however we agree with Samsung that some confirmation with RAN4 is needed for safety.  |
| Intel | Yes | It is better to check with RAN4. |

Summary: Companies think RAN2 should inform RAN4 of the conflicting wording in description of simultaneousRxTxInterBandENDC.

1. If Proposal 1 is agreed, RAN2 should inform RAN4 of the conflicting wording in description of simultaneousRxTxInterBandENDC.

## 2.4 UL CA and simultaneousRxTxInterBandCA

In [R2-2300553](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_121/Docs//R2-2300553.zip), RAN2 is proposed to confirm whether “it is possible (from specification viewpoint) for UE to support UL CA for FDD-TDD carrier if UE doesn’t support simultaneousRxTxInterBandCA”.

The Rapp assumes it is clear that UE has to support this capability to support UL CA for FDD-TDD band pair.

The view from other companies is invited.

**Q4. Do you agree that UE need to support simultaneousRxTxInterBandCA to support UL CA for FDD/TDD band pair?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm Incorporated | No | We would like to ask RAN4 to be sure. |
| Huawei, HiSilicon | No | In current spec, there is no such limitation that the UE supporting UL CA shall indicate support of simultaneousRxTxInterBandCA. It depends on UE capability. We understand, whether to configure UL CA or not should be left to NW implementation. |
| MediaTek Inc. | No | It depends on if the RF component is shared for FDD-TDD band pair or not. If the UE doesn’t support it, the network anyway needs to do proper configuration/scheduling. |
| Samsung | No | We prefer RAN4 confirms it |
| ZTE | See comments | We understand the intention of the proponent company is that if the UE doesn’t support simultaneousRxTxInterBandCA for the UA CA case with FDD/TDD band pair, the scheduling at the network side would be much complex.However, we agree with Huawei that there is no such kind of restriction in the current RAN2 spec and whether to configure UL CA can be left to NW implementation. |
| Intel | No | There is currently the following statement for certain band combination:It is mandatory for certain TDD-FDD and TDD-TDD band combinations defined in TS 38.101-1 [2], TS 38.101-2 [3] and TS 38.101-3 [4].But it does not mandate for all band combinations. it would be good to check with RAN4. |

**Summary:** Given the comments by several companies, Rapp now understands that whether to configure UE with UL CA in band pair where UE does not support simultaneous Rx/Tx should be left to Nw implementation. Rapp does not see any need to check with RAN2.

1. RAN2 agrees that UE need not support simultaneous Rx/Tx to support UL CA for FDD/TDD or TDD/TDD band pair.

# Conclusion

The following is proposed as outcome of this email disucssion:

Proposal 1 RAN2 to decide whether to respond to RAN4 LS as follows:
“RAN2 does not see any incompatibility issues with existing UEs or networks by modifying the capabilities as proposed by RAN4. The changes proposed by RAN4 are feasible.”

If not agreed, RAN2 should respond negatively:
“RAN2 expects incompatibility issues with existing UEs or networks by modifying the capabilities as proposed by RAN4. The changes proposed by RAN4 are not feasible.”

**Proposal 2 If Proposal 1 is agreed, RAN4 proposal need better wording, but can be handled by RAN2.**

**Proposal 3 If Proposal 1 is agreed, RAN2 should inform RAN4 of the conflicting wording in description of simultaneousRxTxInterBandENDC.**

**Proposal 4 RAN2 agrees that UE need not support simultaneous Rx/Tx to support UL CA for FDD/TDD or TDD/TDD band pair.**

# Appendix

From Chair’s notes

Simultaneous Rx-Tx

[R2-2300048](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_121/Docs//R2-2300048.zip) LS to RAN2 on simultaneous Rx-Tx for band pairs of an advertised BC ([R4-2220520](http://www.3gpp.org/ftp//tsg_ran/WG4_Radio/TSGR4_105/Docs//R4-2220520.zip); contact: Ericsson) RAN4 LS in Rel-16 NR\_newRAT

[R2-2301450](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_121/Docs//R2-2301450.zip) On modified UE capabilities for simultaneous Rx/Tx Ericsson discussion Rel-16 NR\_newRAT-Core

[R2-2301612](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_121/Docs//R2-2301612.zip) Discussion on simultaneousRxTx capability Huawei, HiSilicon discussion TEI17

Moved from 6.1.2

Observation 1: The simultaneous Rx-Tx capability is only specified for inter-band band pairs, intra-band overlapping TDD band has been excluded when reporting the per BC level simultaneous Rx-Tx capability, i.e. *simultaneousRxTxInterBandCA, simultaneousRxTxSUL,* and *simultaneousRxTxInterBandENDC*.

Observation 2: It is non-backward compatible to exclude inter-band overlapping TDD-TDD band pairs when reporting the per BC level simultaneous Rx-Tx capability, i.e. *simultaneousRxTxInterBandCA, simultaneousRxTxSUL,* and *simultaneousRxTxInterBandENDC*.

Observation 3: The simultaneous Rx-Tx capability on overlapping inter-band TDD-TDD band pairs can be indicated through the per BC per band pair capability, i.e. *simultaneousRxTxInterBandCAPerBandPair, simultaneousRxTxSULPerBandPair,* and *simultaneousRxTxInterBandENDCPerBandPair*.

Proposal 1: Inform RAN4 the above observations. No RAN2 spec change is needed.

[R2-2300553](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_121/Docs//R2-2300553.zip) Clarification on simultaneous Rx-Tx Nokia, Nokia Shanghai Bell discussion Rel-16 NR\_newRAT-Core, TEI16

Proposal 1: Reply to RAN4 that from RAN2 perspective, a new per-BC capability is needed to accomplish what RAN4 is asking.

Proposal 2: RAN2 to confirm whether it is possible (from specification viewpoint) for UE to support UL CA for FDD-TDD carrier if UE doesn’t support simultaneousRxTxInterBandCA.

[R2-2301718](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_121/Docs//R2-2301718.zip) Consideration on the Simultaneous Rx-Tx ZTE Corporation, Sanechips discussion Rel-15 NR\_newRAT-Core

- Think R4 proposal is ok for CA but not for EN-DC, conflicts. Would also be ok with Huawei proposal

DISCUSSION

- QC are ok to go with the R4 solution, but doesn’t like the R4 text, which is difficult to understand.

- Intel think the main question is whether we need the optimized way that R4 proposes. As Huawei states, the system can work anyway.

- Ericsson think we should not add separate capabilities, as Nokia proposes, would give even worse situation

- Ericsson think that current text anyway need correction, even if not agrees.

- Chair asks if we can go the RAN4 way: ZTE could be ok for CA. HW agree with ZTE that in such case we should ask RAN4. Samsung think yes we can attempt to follow R4 suggestion.

- Nokia point out that RAN4 are just asking questions.

* Offline 009 (Ericsson), to find agreeable reply to RAN4 LS, and make a report. can use TP to illustrate R2 impacts. Can also address P2 from Nokia tdoc.

[R2-2301715](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_121/Docs//R2-2301715.zip) CR on Simultaneous Rx-Tx for Band Pairs\_R15 ZTE Corporation, Sanechips CR Rel-15 38.306 15.19.0 0874 - F NR\_newRAT-Core

[R2-2301716](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_121/Docs//R2-2301716.zip) CR on Simultaneous Rx-Tx for Band Pairs\_R16 ZTE Corporation, Sanechips CR Rel-16 38.306 16.11.0 0875 - A NR\_newRAT-Core

[R2-2301717](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_121/Docs//R2-2301717.zip) CR on Simultaneous Rx-Tx for Band Pairs\_R17 ZTE Corporation, Sanechips CR Rel-17 38.306 17.3.0 0876 - A NR\_newRAT-Core