RAN1-106-e-NWM-NR-AI5-LSs-01 - Version 0.0.2

RAN1

1 Introduction

Per Chair's guidance, the following email discussion is allocated.

[106-e-NR-AI5-LSs-01] Reply LS to R1-2106434 (Reply LS on the intra-band and inter-band (NG)EN-DC or NE-DC Capabilities) – Xingguang (ZTE)

As part of the discussion, RAN1 to first determine whether a reply LS is needed or not by August 18. If reply LS is needed, finalize response by August 23.

Note that, during RAN1#105-e meeting, RAN2 sent an LS (**R1-2104162/R2-2104550**) to ask RAN1 and RAN4 to provide feedback for RAN1 and RAN4 related UE capabilities, respectively. We discussed the RAN1 related UE capabilities in RAN1#105-e meeting and decided to provide response to RAN2 until we receive RAN4 feedback so that we can have the same handling for both RAN1 and RAN4 related UE capabilities.

In this RAN1 meeting, we received RAN4's feedback to RAN2 (CC RAN1) for the RAN4 related UE capabilties (**R1-2106434**). The contribution from ZTE and vivo below are draft reply LS to the previous RAN2 LS (**R1-2104162/R2-2104550**) instead of this RAN4 LS, and they are to provide feedback to RAN2 for the RAN1 related UE capabilities. In this sense, it seems the issue is whether and how to reply the previous RAN2 LS (**R1-2104162/R2-2104550**) instead of the RAN4 LS (**R1-2106434**).

In this meeting, the following documents are submitted for this issue.

1. R1-2106727 Discussion on the Intra-band and Inter-band (NG)EN-DC NE-DC Capabilities ZTE
2. R1-2106728 [DRAFT] Reply LS on the Intra-band and Inter-band (NG)EN-DC NE-DC Capabilities ZTE
3. R1-2107967 Draft reply LS on the Intra-band and Inter-band (NG)EN-DC/NE-DC Capabilities vivo

This document is used to collect companies' views on whether and how to reply the corresponding LS.

2 Background

During RAN2 discussion, companies found that some UE capabilities are only applicable to intra-band EN-DC/NE-DC. However, the definition of intra-band EN-DC/NE-DC is not clear and hence RAN2 asked RAN1/RAN4 to provide feedback for the concerned UE capabilities related to intra-band and inter-band (NG) EN-DC/NE-DC [1].

Table 1: Questions listed in RAN2 LS R2-2104550

< ——————— Other parts are omitted ———————>
RAN2 sincerely requests RAN4/1 to provide answers of following questions for RAN2 future work:
Question 1: For which (NG)EN-DC/NE-DC BC types the above capabilities (*ul-TimingAlignmentEUTRA-NR/ pa-PhaseDiscontinuityImpacts /dualPA-Architecture/ /simultaneousRxTxInterBandENDC /asyncIntraBandENDC)* are applicable?
Question 2: If the capability *ul-TimingAlignmentEUTRA-NR/ pa-PhaseDiscontinuityImpacts /ul-dualPA-Architecture/ asyncIntraBandENDC* are applicable to the (NG)EN-DC/NE-DC BC Type 1/2/3, whether they are used to indicate the restriction to the intra-band (NG)EN-DC/NE-DC BC part?
2. Actions:
ACTION: RAN2 sincerely requests RAN4/1 to provide answers of above questions for RAN2 future work.

The following types of intra-band/inter-band EN-DC/NE-DC are listed in the RAN2 LS [1] (the **bolder part** denotes UL).

- Type 1: Intra-band (NG)EN-DC/NE-DC combination without additional inter-band NR and LTE CA component, e.g. DC **41A_n41A**
- Type 2: 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, e.g. *DC_25A_**41A_n41A***
- Type 3: 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, e.g. DC**_25A**_41A**_n41A**
- Type 4: Inter-band (NG)EN-DC/NE-DC combination without Intra-band component, in short we call it as Inter-band (NG)EN-DC/NE-DC combination.
- Type 5: Inter-band (NG)EN-DC combination configurations where the frequency range of the E-UTRA band is a subset of the frequency range of the NR band, e.g., DC_B42_n77 and DC_B42_n78.

To summarize, among the five different types,

- Type 1 and type 2 have intra-band UL carriers (NG)EN-DC/NE-DC.
- Type 1, type 2 and type 3 have intra-band DL carriers (NG)EN-DC/NE-DC.
- Type 5 is a bit different from other types because the band for LTE and NR are different however they are overlapping in frequency.

The following five UE capabilities are mentioned in the RAN2 LS [1].

During RAN1#105-e meeting, companies discussed this RAN2 LS and reached the following agreements. Companies prefer to have unified understanding for both RAN1 and RAN4 UE capabilities. Thus, RAN1 agreed to postpone the discussion until RAN4 feedback arrives [2].

Agreement:

Regarding questions mentioned in RAN2 LS R1-2104162/R2-2104550,

R1: 6-24	Applying the same UL timing between NR and LTE	***ul-TimingAlignmentEUTRA-NR*** Indicates whether to apply the same UL timing between NR and LTE for dynamic power sharing capable UE operating in a synchronous intra-band contiguous (NG)EN-DC. If this field is absent, UE shall be capable of handling a timing difference up to applicable MTTD requirements when operating in a synchronous intra-band contiguous (NG)EN-DC network, as specified in TS 38.133 [5]. If this capability is included in an inter-band (NG)EN-DC BC with an intra-band (NG)EN-DC BC part, this capability is used to indicate the restriction to the intra-band (NG)EN-DC BC part.
R1: 6-23	Incapability motivated by impacts of PA phase discontinuity with overlapping transmissions with non-aligned starting or ending times or hop boundaries across carriers for intra-band EN-DC, intra-band CA, and FDM based ULSUP	***pa-PhaseDiscontinuityImpacts*** Indicates incapability motivated by impacts of PA phase discontinuity with overlapping transmissions with non-aligned starting or ending times or hop boundaries across carriers for intra-band (NG)EN-DC/NE-DC, intra-band CA and FDM based ULSUP.
R4: 2-16	PA architectures for intra-band EN-DC	***dualPA-Architecture*** For an intra-band band combination, this field indicates the support of dual PAs. If absent in an intra-band band combination, the UE supports single PA for all the ULs in the intra-band band combination. For other band combinations, this field is not applicable.
R4:2-4	Simultaneous reception and transmission for inter-band EN-DC (TDD-TDD or TDD-FDD)	***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].
R4:2-6	Asynchronous FDD-FDD intra-band EN-DC DC	***asyncIntraBandENDC*** Indicates whether the UE supports asynchronous FDD-FDD intra-band (NG)EN-DC with MRTD and MTTD as specified in clause 7.5 and 7.6 of TS 38.133 [5]. If asynchronous FDD-FDD intra-band (NG)EN-DC is not supported, the UE supports only synchronous FDD-FDD intra-band (NG)EN-DC.

Figure 1:

- *• UE feature 6-24 (ul-TimingAlignmentEUTRA-NR) is applicable to Type 1 and Type 2 (NG)EN-DC BC types.*
- *• UE feature 6-23 (pa-PhaseDiscontinuityImpacts) is applicable to Type 1 and Type 2 (NG)EN-DC/NE-DC BC types.*
- *• Both 6-24 (ul-TimingAlignmentEUTRA-NR) and 6-23 (pa-PhaseDiscontinuityImpacts) are used to indicate the restriction to the intra-band (NG)EN-DC/NE-DC BC part.*
- *• RAN1 further discusses whether 6-24 (ul-TimingAlignmentEUTRA-NR) and 6-23 (pa-PhaseDiscontinuityImpacts) can be applicable to Type 5 (NG)EN-DC/NE-DC BC type by taking RAN4 discussion outcome into account.*

In RAN4#99-e meeting, RAN4 approved the reply LS [3]. In this RAN4 reply LS, RAN4 provided the following answers only for RAN4-related UE capabilities.

——————— RAN4 reply LS start ———————-

RAN4 kindly thanks RAN2 for the LS on the Intra-band and Inter-band (NG)EN-DC/NE-DC capabilities, and RAN4 reaches a common understanding on the three concerned RAN4 capability IEs, i.e., dualPA-Architecture, simultaneousRxTxInterBandENDC, and asyncIntraBandENDC, in the questions. The detailed answers to the RAN2 questions are shown below:

Question 1*: For which (NG)EN-DC/NE-DC BC types the above capabilities (ul-TimingAlignmentEUTRA-NR/*

pa-PhaseDiscontinuityImpacts /dualPA-Architecture/ /simultaneousRxTxInterBandENDC /asyncIntraBandENDC) are applicable?

***Answer**: From RAN4 perspective,*

- *dualPA-Architecture is applicable to (NG)EN-DC/NE-DC BC Type 1, Type 2 and Type 5,*
- *simultaneousRxTxInterBandENDC is applicable to (NG)EN-DC/NE-DC BC Type 2, Type 3 and Type 4,*
- *asyncIntraBandENDC is applicable to (NG)EN-DC/NE-DC BC Type 1, Type 2, Type 3 and Type 5.*

***Question 2**: If the capability ul-TimingAlignmentEUTRA-NR/ pa-PhaseDiscontinuityImpacts /dualPA-Architecture/ asyncIntraBandENDC are applicable to the (NG)EN-DC/NE-DC BC Type 1/2/3, whether they are used to indicate the restriction to the intra-band (NG)EN-DC/NE-DC BC part?*

***Answer:** Yes, dualPA-Architecture/ asyncIntraBandENDC are used to indicate the restriction to the intra-band (NG)EN-DC/NE-DC BC part.*

————————- RAN4 reply LS end ————————————

3 Company's view

RAN2 asked RAN1/RAN4 to provide feedback for the following five UE capabilities, i.e., ul-TimingAlignmentEUTRA-NR, pa-PhaseDiscontinuityImpacts, dualPA-Architecture, simultaneousRxTxInterBandENDC, asyncIntraBandENDC [1]. RAN4 provided feedback only for the RAN4-related UE capabilities, i.e., dualPA-Architecture, simultaneousRxTxInterBandENDC and asyncIntraBandENDC. From moderator's perspective, RAN1 needs to provide feedback for the RAN1-related UE capabilities, i.e., 6-24 (ul-TimingAlignmentEUTRA-NR) and 6-23 (pa-PhaseDiscontinuityImpacts).

3.1 Question#1 (Closed)

Considering that RAN2 asked RAN1/RAN4 to provide feedback for 5 UE capabilities in R1-2104162/R2-2104550 and RAN4 provided feedback only for the 3 RAN4-related UE capabilities in R1-2106434/R4-2107907, do you think RAN1 need to reply this RAN2 LS (R1-2104162/R2-2104550) to provide feedback for the RAN1-related UE capabilities (i.e., 6-24 (ul-TimingAlignmentEUTRA-NR) and 6-23 (pa-PhaseDiscontinuityImpacts))?

- Note that, from modertor's perspective, RAN1 doesn't need to reply to RAN4 LS (R1-2106434/R4-2107907). If you have a different view, you can also share your view below.
- If a reply LS is needed, we will discuss the contents of this reply LS in the 2nd round of discussion per Chair's guidance.

Feedback Form 1: Question#1

1 – vivo Communication Technology Yes, The RAN2 LS R1-2104162/R2-2104550 had explicit question about RAN1 related FGs thus should be replied. No need to reply the RAN4 LS in R1-2106434/R4-2107907.
2 – ZTE Corporation Yes, RAN1 needs to provide feedback for the RAN1-related capabilities mentioned in RAN2 LS R1-2104162/R2-2104550. Otherwise, RAN2 may not know how to clarify these RAN1-related UE capabilities in RAN2 spec.
3 – HUAWEI TECHNOLOGIES Co. Ltd. OK to discuss any reply to RAN2 LS R1-2104162. Not necessary to reply to RAN4 LS R1-2106434.
4 – CATT RAN1 should reply to RAN2 LS in R1-2104162 based on the conclusion in RAN1#105-e
5 – Ericsson Inc. Yes, RAN1 can reply to RAN2 LS R1-2104162(R2-2104550) reflecting the agreements from RAN1#105e and also taking into account the RAN4 input in R1-2106434(R4-2107907)
6 – QUALCOMM JAPAN LLC. We are OK to discuss a reply to the RAN2 LS (R1-2104162). Reply to the RAN4 LS (R1-2106434) is not necessary.
7 – Nokia Corporation We are fine discussion a reply to the RAN2 LS ('4162), taking into account the RAN4 LS ('6434). No need to specifically reply to the RAN4 LS.
8 – NTT DOCOMO INC. Yes, RAN1 should reply to RAN2 LS in R1-2104162 based on the agreements made in RAN1#105e with taking into account RAN4 LS in R1-2106434.
9 – Intel Belgium SA/NV Yes, RAN1 should reply to RAN2 LS in R1-2104162 taking into account RAN4 LS in R1-2106434. Reply to RAN4 LS is not needed

3.2 Question#2

Considering that RAN4 has replied that dualPA-Architecture and asyncIntraBandENDC are applicable to Type 5, from moderator's perspective, it is straightforward that the RAN1-related UE capabilities 6-24 (ul-TimingAlignmentEUTRA-NR) and 6-23 (pa-PhaseDiscontinuityImpacts) should also be applicable to Type 5 so that we can have consistent handling for both RAN1 and RAN4 UE capabilities.

The following draft LS is based on the above understanding. Please provide your comments on the following draft reply LS to RAN2.

Table 2: Draft reply LS to RAN2

1. Overall Description:
RAN1 would like to thank RAN2 for the LS (R1-2104162/R2-2104550) on the Intra-band and Inter-band (NG)EN-DC/NE-DC Capabilities. RAN1 discussed the two UE capabilities originated from RAN1. The answers from RAN1 perspective are as following.
Question 1: For which (NG)EN-DC/NE-DC BC types the above capabilities (*ul-TimingAlignmentEUTRA-NR/ pa-PhaseDiscontinuityImpacts /dualPA-Architecture/ /simultaneousRxTxInterBandENDC /asyncIntraBandENDC)* are applicable?
[RAN1 Answer]:

- UE feature 6-24 (ul-TimingAlignmentEUTRA-NR) is applicable to Type 1, Type 2 and Type 5 (NG)EN-DC BC types.
- UE feature 6-23 (pa-PhaseDiscontinuityImpacts) is applicable to Type 1, Type 2 and Type 5 (NG)EN-DC/NE-DC BC types.

Question 2: If the capability *ul-TimingAlignmentEUTRA-NR/ pa-PhaseDiscontinuityImpacts /ul-dualPA-Architecture/ asyncIntraBandENDC* are applicable to the (NG)EN-DC/NE-DC BC Type 1/2/3, whether they are used to indicate the restriction to the intra-band (NG)EN-DC/NE-DC BC part?
[RAN1 Answer]: Yes, UE capability 6-24 (*ul-TimingAlignmentEUTRA-NR*) and 6-23 (*pa-PhaseDiscontinuityImpacts*) are used to indicate the restriction to the intra-band (NG)EN-DC/NE-DC BC part.
2. Actions:
To RAN2 group.
ACTION: RAN1 respectfully asks RAN2 to take the above information into account.

Feedback Form 2: Comments on the draft reply LS to RAN2.

1 – vivo Communication Technology We are fine with the LS text above.
2 – NTT DOCOMO INC. We are fine with the draft reply LS.
3 – ZTE Corporation We support the above draft reply LS.
4 – QUALCOMM JAPAN LLC. We are OK with the draft reply LS.

4 Reference

1. R2-2104550, LS on the Intra-band and Inter-band (NG)EN-DC/NE-DC Capabilities, RAN2#113bis-e.
2. R1-2106180, Summary of Email Discussion [105-e-AI5-LS-02], RAN1#105-e, Moderator (ZTE).
3. R4-2107907, Reply LS on the Intra-band and Inter-band (NG)EN-DC/NE-DC Capabilities, RAN4#99-e.