**3GPP TSG RAN WG1 #105-e R1-210xxxx**

**e-Meeting, May 10th – 27th, 2021**

**Source: Moderator (ZTE)**

**Title: Summary of Email Discussion [105-e-AI5-LS-02]**

**Agenda item: 5**

**Document for:** **Discussion/Decision**

# Introduction

Per Chairman’s guidance, the following email discussion is allocated to discuss and finalize the reply LS for R2-2104550.

[105-e-AI5-LS-02] A reply LS to [R1-2104162](file:///C:\Users\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_105\Docs\R1-2104162.zip) is necessary – email discussion/approval till 5/25 (Xingguang Wei, ZTE)

In this meeting, five contributions are submitted to discuss the issues raised in this LS [2, 3, 4, 5 and 6].

This summary is generated to collect companies’ views for the questions raised in RAN2 LS R2-2104550 and try to reach consensus among companies.

# Discussion

During RAN2#113bis-e meeting, RAN2 sent an LS to RAN1 and RAN4 to seek information for five UE capabilities related to intra-band and inter-band (NG) EN-DC/NE-DC [1]. In this contribution, we provide our analysis for two RAN1 UE capabilities.

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.

The following five UE capabilities are mentioned in the RAN2 LS [2]. Among them, **6-24 (*ul-TimingAlignmentEUTRA-NR*)** and **6-23 (*pa-PhaseDiscontinuityImpacts*)** are originated from RAN1. Thus, in this contribution, we focus on them.

| **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. |
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| **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. |

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 1and 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.

Companies are invited to answer the following questions.

## Question#1

Question#1: For **6-24 (*ul-TimingAlignmentEUTRA-NR*)** and **6-23 (*pa-PhaseDiscontinuityImpacts*)**, which type(s) of (NG)EN-DC/NE-DC are they applicable to?

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| **Company** | **View** |
| ZTE | **Type1, Type2 and Type5**  Both of these two UE capabilities are only related to intra-band UL carriers. Thus, from our perspective, it is clear that 6-24 (*ul-TimingAlignmentEUTRA-NR*) and 6-23 (*pa-PhaseDiscontinuityImpacts*) are applicable to type 1 and type 2.  Regarding whether the two UE capabilities can be applied to type 5. From our perspective, for the type 5 band combination, UE may encounter the same timing issue and PA phase discontinuity issue, thus they are also applicable to type 5 (NG)EN-DC/NE-DC. However, we are open to hear other companies’ views on this. |
| vivo | Type 1, Type 2 and Type 5 |
| MTK | **Type1, Type2 and Type5**  The two capabilities should only apply to the cases with multiple intra-band UL carriers or overlapped UL frequency in NR and LTE UL carriers as moderator suggested. |
| Ericsson | Type 1, Type 2.  In our understanding, applicability for Type 5 would not be aligned with previous agreements and would need more discussion. |
| CATT | Type 1 and Type 2 |

## Question#2

Question#2:For **6-24 (*ul-TimingAlignmentEUTRA-NR*)** and **6-23 (*pa-PhaseDiscontinuityImpacts*)**, are they used to indicate the restriction to the intra-band (NG)EN-DC/NE-DC BC part if they are applicable to Type1/2/3?

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| **Company** | **View** |
| ZTE | **Yes.**  They are only applicable to the intra-band (NG)EN-DC/NE-DC BC part. |
| Vivo | Yes |
| MTK | Yes |
| Ericsson | Generally OK but for this it is good to have common handling for all the RAN1/4 capabilities under discussion. |
| CATT | Yes |

**Any other comments?**

Do you have any other question/comments? If yes, please put them in the table below.

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| **Company** | **View** |
| Ericsson | It would be good to have common handling for all the RAN1/4 capabilities under discussion as much as possible and we prefer to check status of RAN4 discussion before finalizing the LS in RAN1. |
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# Conclusion

# Reference

1. R2-2104550, LS on the Intra-band and Inter-band (NG)EN-DC/NE-DC Capabilities, RAN2#113bis-e.
2. R1-2104319, Discussion on the Intra-band and Inter-band (NG)EN-DC NE-DC Capabilities, ZTE, RAN1#105-e.
3. R1-2104320 , [DRAFT] Reply LS on the Intra-band and Inter-band (NG)EN-DC NE-DC Capabilities, ZTE, RAN1#105-e.
4. R1-2104466 , Discussion on the Intra-band and Inter-band (NG)EN-DC/NE-DC Capabilities, CATT, RAN1#105-e.
5. R1-2105451, Draft reply LS on the Intra-band and Inter-band (NG)EN-DC/NE-DC Capabilities, vivo, RAN1#105-e.
6. R1-2105932 , Discussion on EN-DC/NE-DC UE capabilities, Huawei, HiSilicon, RAN1#105-e.