**3GPP TSG-RAN WG2 Meeting #119bis R2-22xxxx**

**e-Meeting, 10-19 October 2022**

**Source: Apple Inc**

**Title: [DRAFT] Summary of email discussion [AT119bis-e][009][NR17] DC Location Reporting (Apple)**

**Document for: Decision**

**Agenda Item: 6.24.1**

# Introduction

This document provides a summary for the following email discussion.

* [AT119bis-e][009][NR17] DC Location Reporting (Apple)

Scope: Treat R2-2209334, R2-2210693, R2-2210694, R2-2210240, R2-2210778. Determine agreeable parts, Based on agreeable parts, progress CRs

Intended outcome: Report, Agreed-in-principle CRs

Deadline: In time for CB W2 Mon (if CB is needed),

# Discussion

Companies providing input to this email discussion are requested to leave contact information below.

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| **Company** | **PoC** | **Email** |
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* 1. Discussion on the RAN4 LS

**Question 1:** Do companies have any comments on the RAN4 LS [1]?

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| **Company** | **Any comments/suggestions?** |
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* 1. Discussion on the CRs related to the RAN4 LS

Two companies provided CRs [2] [3] taking into account the clarification provided by RAN4 in [1].

Both versions of the CR suggest clarifying the definition of the “edge” of the component carrier for the purpose of using this in the mathematical centre calculation for the DC location reporting. [3] in addition suggests some additional editorial corrections.

**Question 2:** Do companies agree with either of the CRs?

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| **Company** | **Agree to Nokia’s Version of the CR [2]?** | **Agree to Apple’s version of the CR [3]?** | **If yes to both, which one is preferred** | **Any comments/suggestions?** |
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* 1. Discussion on applicable SCS and component carrier

In [4], there are two issues raised. The first one is on which component carrier is referred in the field definition of *defaultDCLocationOption.*

The second one is on which SCS is to be used if there are more than one SCS in the current component carrier. The paper suggests that RAN2 confirm on which of the three options the paper proposes.

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| In the description of *defaultDCLocationOption*, it is stated that ‘The default Tx Direct Current is located at the mathematical center of the UE bandwidth, ..., rounded to the subcarrier grid defined for the component carrier on which the Tx Direct Current is located’.  It is unclear what ‘the component carrier’ refers to, UL or DL carrier, configured or active carrier? It is also unclear whether ‘the Tx Direct Current’ refers to the default DC location or the actual DC location? We think here refers to the default DC location since the actual DC location has not been obtained in the current step. In addition, when there are more SCSs in the current component carrier, it is unclear to use which SCS to determine the subcarrier grid. So we give the following three modification options about this sentence:  Option 1: ‘rounded to the subcarrier grid of the lowest SCS defined for the component carrier on which the default Tx Direct Current is located, where the component carrier only refers to the UL CC.’  Option 2: ‘rounded to the subcarrier grid of the lowest SCS defined for the component carrier on which the default Tx Direct Current is located, where the component carrier refers to the UL CC when the default DC location is located on both UL and DL CC for TDD, and refers to the located CC (may be UL CC or DL CC) for other cases.’  Option 3: Others. |

**Question 3:** Companies are requested to provide views on the below:

Which definition is to be used for the component carrier for *defaultDCLocationOption:*

**Option 1:** ‘rounded to the subcarrier grid of the lowest SCS defined for the component carrier on which the default Tx Direct Current is located, where the component carrier only refers to the UL CC.’

**Option 2:** ‘rounded to the subcarrier grid of the lowest SCS defined for the component carrier on which the default Tx Direct Current is located, where the component carrier refers to the UL CC when the default DC location is located on both UL and DL CC for TDD, and refers to the located CC (may be UL CC or DL CC) for other cases.’

**Option 3: Others?**

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| **Company** | **Option 1** | **Option 2** | **Option 3 (pls provide suggestion in this case)** | **Any other comments/suggestions?** |
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Similar suggestions were provided for which subcarrier grid is to be used in case of the calculation of the mathematical centre.

**Question 4:** Companies are requested to provide views on the below:

Which definition is to be used for the SCS of the component carrier for *defaultDCLocationOption:*

**Option 1:** ‘the subcarrier grid of the lowest SCS of the nearest lower frequency component carrier shall be extended to cover the frequency of the mathematical default Direct Current location, where the component carrier only refers to the UL CC.’

**Option 2:** ‘the subcarrier grid of the lowest SCS of the nearest lower frequency component carrier shall be extended to cover the frequency of the mathematical default Direct Current location, where the component carrier refers to the UL CC when both UL CC and DL CC meet the requirement (i.e. the nearest lower frequency) for TDD, and refers to the nearest lower frequency CC (may be UL CC or DL CC) for other cases.’

**Option 3:** Others.

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| **Company** | **Option 1** | **Option 2** | **Option 3 (pls provide suggestion in this case)** | **Any other comments/suggestions?** |
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* 1. Discussion correction of the field name

In [5], there is a suggestion to change the field name of *defaultDCLocationOption.* to *defaultDC-Location.* [5] also has an editorial correction.

**Question 5:** Do companies agree with the CR?

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| **Company** | **Agree** | **Do not agree** | **Any comments/suggestions?** |
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# Conclusion

To be filled

# References

[1] R2-2209334 LS on intra-band UL CA DC default location clarification

[2] R2-2210240 Clarification to intra-band UL CA DC default location clarification Nokia, Nokia Shanghai Bell CR

[3] R2-2210788 Clarification to intra-band UL CA DC default location clarification. Apple Inc

[4] R2-2210693 Discussion on default DC location ZTE Corporation, Sanechips discussion

[5] R2-2210694 38331\_CR\_Correction on DC location ZTE Corporation, Sanechips

# Annex: Main body of RAN4 LS [1]

The Rel-17 intra-band UL CA DC reporting framework has mostly been concluded in RAN4 #101e meeting and communicated to RAN2 via the LS R4-2119965. Unlike the Rel-15 and Rel-16 DC reporting mechanisms where UE would directly signal its UL DC location to the network, the Rel-17 method is composed of a default UL DC location in conjunction with a frequency offset relative to the default DC location chosen by the UE which can be communicated to the network.

The default UL DC location is defined as the “mathematical center of the UE bandwidth rounded to the subcarrier grid defined for the component carrier on which the DC is located”. If the mathematical center of the UE bandwidth lands on a frequency where there is no subcarrier grid defined, the subcarrier grid of the nearest lower frequency component carrier shall be extended to cover the frequency of the mathematical DC location. On the other hand, the UE bandwidth has been defined as the “frequencies between lower edge of lowest frequency component and upper edge of highest frequency component”. However, it remains unclear on the definition of “edge” of the component carrier which could be interpreted as the frequency at the edge sub-carrier, or the frequency at the edge sub-carrier boundary, as illustrated in Case (a) and Case (b) respectively in the figure below.



As the two interpretations for the “edge” of the component carrier may result in different default DC location when the two edge component carriers are with different numerologies, it is necessary to unify the definition to ensure that there is no ambiguity between UE and gNB when calculating the default UL DC location.

RAN4 has discussed and concluded that the “edge” of the component carrier shall be defined as the “edge sub-carrier boundary frequency” which is the Case (b) in the figure above.