**3GPP TSG RAN WG1 #110bis-e R1-22xxxxx**

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

Agenda Item: 7.1

Source: Moderator (Apple Inc.)

Title: Summary of [110bis-e-NR-R15-06] Discussion on alignment of understanding for BM across multiple cells with different SCS

Document for: Discussion/Decision

# Introduction

This document provides summary on the following email discussion;

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| [110bis-e-NR-R15-06] Discussion on alignment of understanding for BM across multiple cells with different SCS by Oct 14 – Haitong (Apple) |

To collect companies’ views on the issue, this document is structured as the following

* Section 2 is used to provide background
* Section 3 is used to collect companies’ views.
* Section 4 is used to summarize the outcome of the email discussion

Please provide your first round comments in Section 3 by **11th Oct 23:59 UTC** (1st check point).

# Background

## RAN1 Status

In Rel-15, UE FG2-24, i.e., *beamManagementSSB-CSI-RS* was introduced for the support of L1-RSRP measurement, in which two components, *maxNumberSSB-CSI-RS-ResourceOneTx* and *maxNumberCSI-RS-ResourceTwoTx* are defined “within a slot and across all serving cells”. For NR CA operation with different SCS, the reference slot for the calculation of *maxNumberSSB-CSI-RS-ResourceOneTx* and *maxNumberCSI-RS-ResourceTwoTx* is ambiguous.

In RAN1#101-e, RAN1 agreed to clarify the resource counting for L1-RSRP measurement, i.e., *maxNumberSSB-CSI-RS-ResourceOneTx* and *maxNumberCSI-RS-ResourceTwoTx* in feature group *beamManagementSSB-CSI-RS* when measurement is performed across multiple cells with different SCS, the following conclusion was reached and captured in the Chairman note [1]

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| **Conclusion**  For UE features maxNumberSSB-CSI-RS-ResourceOneTx and maxNumberCSI-RS-ResourceTwoTx in feature group beamManagementSSB-CSI-RS,   * the total number of resources within a slot and across serving cells in FR1 is determined by x within 1 slot of subcarrier spacing of 15kHz * the total number of resources within a slot and across serving cells in FR2 is determined by y within 1 slot of the smallest subcarrier spacing configured for PDSCH in FR2 * the total number of resources within a slot and across FR1 and FR2 serving cells is determined by max (x, z\*y) within 1 slot of subcarrier spacing of 15 kHz,   + where x is the reported value in FR1 and y is the reported value in FR2 and z is the ratio of the smallest subcarrier spacing configured in FR2 and 15kHz. |

## RAN2 Status

In the latest RAN2 #119e meeting, CR R2-2207331was proposed to capture the above conclusion in TS38.306. However, RAN2 cannot reach consensus and requires RAN1 input [2].

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| R2-2207331   Correction on beamManagementSSB-CSI-RS       Qualcomm Incorporated CR   Rel-16  38.306  16.9.0   0765     -           F          TEI16  R2-2207332   Correction on beamManagementSSB-CSI-RS       Qualcomm Incorporated CR   Rel-17  38.306  17.1.0   0766     -           A          TEI16  -     [012] Rap Ph1 outcome: P4: RAN2 to discuss whether to send LS to RAN1 to clarify the original intention of the capability beamManagementSSB-CSI-RS, and to discuss what is current interpretation based on existing text.      **[012] Both postponed**      **[012] Definition correction on *beamManagementSSB-CSI-RS* CR**[**R2-2207331**](file:///C:/Users/mtk65284/Documents/3GPP/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2207331.zip)**is postponed since RAN2 would requires RAN1 input. Interested companies can submit their contributions to RAN1.** |

## Summary of company contributions

In RAN1#110b-e meeting, Apple and MTK submitted contributions for the above-mentioned issue.

In Apple contributions, R1-2209555 and R1-2209556 [3,4], Apple proposed for RAN1 to send LS to RAN2 to inform RAN2 about the conclusion RAN1 agreed in RAN1#101-e meeting with the draft LS provided in R1-2209556.

In MediaTek contribution, R1-2209515 [5], MediaTek proposed to revert the conclusion RAN1 agreed in RAN1#101-e meeting, and raised two issues about the interpretation of the conclusion

* (FR1) How the x resources for one 15kHz slot are distributed among the multiple slots for 30kHz or higher SCS?
* (FR2) When UE reports the capability beamManagementSSB-CSI-RS, “the smallest subcarrier spacing configured for PDSCH in FR2” is still unknown. How could UE report a capability based on an unknown configuration?

# Email Discussion

## First Round

We have the following three questions to collect companies’ view

### Question #1

**Question #1: In general, do you agree that conclusions agreed and captured in Chairman note shall be respected. Specifically, the conclusion reached and captured in Chairman note in RAN1#101-e meeting regarding the interpretation of *maxNumberSSB-CSI-RS-ResourceOneTx* and *maxNumberCSI-RS-ResourceTwoTx* shall be respected, subject to further maintenance driven by company contribution**

* **If you do not agree, please further explain your view on how to treat the conclusions reached so far in RAN1 on various topics.**

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| **Company** | **Yes/No** | **View** |
| Samsung | Yes | Is the above about the Chairman’s note in RAN1#101-e? If so, yes. We think without such conclusion, it is not clear how the gNB interprets the reported capability. |
| Ericsson | Yes | We assume that the question refers to the conclusion captured in the Chair notes from RAN1#101-e, and not RAN1#110b-e. |
| Mod |  | Apologize for the typo. Yes, it is the conclusion in RAN1#101-e. I made the modification with track change on. |
| QC | Yes | The conclusion shall be respected and is critical to align implementations |
| MTK | Yes, but … | We agree under the condition that the conclusion is well-defined, as would be discussed in Question 2. After the clarification of Question 2, companies can discuss which revisions can be adopted in legacy release, and which should be adopted in next release (at least for the part which is newly formed in this or future meetings). |
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### Question #2

**Question #2: For the following two issues MediaTek raised about the interpretation of the conclusion, do you agree with the proposed understanding**

* (FR1) How the x resources for one 15kHz slot are distributed among the multiple slots for 30kHz or higher SCS?
  + Proposed understanding: There is no restriction on the distribution of the x resources within one 15kHz slot.
* (FR2) When UE reports the capability beamManagementSSB-CSI-RS, “the smallest subcarrier spacing configured for PDSCH in FR2” is still unknown. How could UE report a capability based on an unknown configuration?
  + Proposed understanding: UE is required to report the capability so that UE can support all the possible SCS(s) that NW can configure. The SCS(s) that NW can configure subjects to other UE capability reporting related to the UE supported SCS.
* **If you disagree, please provide your understanding**

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| **Company** | **Yes/No** | **View** |
| Samsung | Yes |  |
| Ericsson | Yes |  |
| QC | Yes |  |
| MTK |  | -- FR1: Generally agree; would like to hear more companies’ view  -- FR2: We think the “configured” word in the sentence is kind of erroneous. Hence, maybe keeping only “the smallest subcarrier spacing ~~configured~~ for PDSCH in FR2” make more sense, which would then be a fixed number, say 60kHz. |
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### Question #3

**Question #3: If you replied Yes to Question #1, i.e., you think RAN1 conclusion shall be respected, do you agree the proposal that RAN1 sends LS to RAN2 to inform RAN2 about the conclusion RAN1 agreed in RAN1#101-e meeting.**

* **Please also provide your comments, if there is any, regarding the draft LS provided in R1-2209556**

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| **Company** | **Yes/No** | **View** |
| Samsung | Yes. |  |
| Ericsson | Yes |  |
| QC | Yes |  |
| MTK |  | We think RAN1 should achieve a common understanding on the conclusion before sending an LS. The LS contents can be discussed when Question 2 is settled down.  Besides, in current specification, the number of CSI-RS resources is reported per FR, and it is not reasonable to squeeze z\*y resources in a 15kHz slot for an **FR1 CG**.  Hence, the following contents in the original conclusion need further discussion and we think it may have NBC issue to current spec:   * The total number of resources within a slot and across FR1 and FR2 serving cells is determined by max (x, z\*y) within 1 slot of subcarrier spacing of 15 kHz |
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# Outcome of the Email discussion

To be updated

# Reference

1. RAN1 Chairman’s Notes, 3GPP TSG RAN WG1 Meeting #101-e e-Meeting, May 25th – June 5th, 2020
2. R2-2207331, Correction on beamManagementSSB-CSI-RS, 3GPP TSG-RAN WG2 Meeting #119 e-Meeting, 17-26 August 2022
3. R1-2209555, On alignment of understanding for BM across multiple cells with different SCS, October 10th – 19th, 2022
4. R1-2209556, Draft LS on beamManagementSSB-CSI-RS, 3GPP TSG RAN WG1 #110bis-e e-Meeting, October 10th – 19th, 2022
5. R1-2209515, On maximum supported CSI-RS Resource in beamManagementSSB-CSI-RS, October 10th – 19th, 2022