3GPP TSG-RAN WG2 #113b-e R2-210xxxx

Electronic Meeting, 12th Apr – 20th Apr 2021

**Agenda item: 5.4.2**

**Source: Nokia**

**Title: Summary of [Post113-e][008][NR15] 4-layer MIMO in EN-DC for Cat5 UEs (Nokia)**

**WID/SID: NR\_newRAT-Core**

**Document for: Discussion and Decision**

# 1 Introduction

This document is the report of the following email discussion:

5.4.2 LTE changes related to NR

* [Post113-e][008][NR15] 4-layer MIMO in EN-DC for Cat5 UEs (Nokia)

 Scope: Handling of 4-layer MIMO in EN-DC for Cat5 UEs, baseline is [AT113-e][008] [R2-2100946](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2100946.zip), collect opinions to decide way forward. Can also discuss

 Intended outcome: Report

 Deadline: Long

During the RAN2#113-e meeting, the following was input contribution for this IoDT issue

[R2-2100946](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2100946.zip) Handling of 4-layer MIMO in EN-DC for Cat5 UEs Nokia, Nokia Shanghai Bell discussion Rel-15 NR\_newRAT-Core

An email discussion was held with the summary in [R2-2102444](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2102444.zip) for the discussion

* [Offline-008][NR15] LTE changes (Nokia)

# 2 **Discussion**

Based on the discussion during RAN2#113-e, the following proposal requires further discussion:

**Proposal 1**: RAN2 to clarify what is the correct interpretation on LTE RI bit width for Cat5 UEs in EN-DC out of the following options:

* Option 1) The UE always used 2-bit RI bit width (even if it only supports 2-layer MIMO in EN-DC mode)
* Option 2) The used RI bit width depend on the maximum support MIMO layers, i.e. if UE only supports 2 layers in EN-DC, it will use 1-bit RI bit width in EN-DC mode (and it uses 2-bit RI in LTE-only mode).

**Question 1**: Do companies agree to the Proposal 1? Please explain your reasoning as well.

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| Answers to Question 1 |
| Company | Yes/No | Comments |
| Samsung | - | From our understanding, something similar to Option 1–but not exactly same as in Option 1–is the correct interpretation.According to TS 36.212 v15.4.0,

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| --- |
| 5.2.2.6 Channel coding of control information…For rank indication (RI) (RI only, joint report of RI and i1, joint report of CRI and RI, joint report of CRI, RI and i1, joint report of CRI, RI, and PTI, joint report of RI and i1,p-2, and joint report of RI and PTI) or CRI - …- The corresponding bit widths for RI feedback for PDSCH transmissions are given by Tables 5.2.2.6.1-2, 5.2.2.6.1-2B, 5.2.2.6.1-2D, 5.2.2.6.1-2E, 5.2.2.6.1-2F, 5.2.2.6.2-3, 5.2.2.6.2-3B, 5.2.2.6.2-3D, 5.2.2.6.2-3E, 5.2.2.6.2-3F, 5.2.2.6.3-3, 5.2.2.6.3-3B, 5.2.2.6.3-3D, 5.2.2.6.3-3E, 5.2.2.6.3-3F, 5.2.3.3.1-3, 5.2.3.3.1-3A, 5.2.3.3.1-3B, 5.2.3.3.1-3B-1, 5.2.3.3.1-3C, 5.2.3.3.1-3D, 5.2.3.3.1-3F, 5.2.3.3.1-3G, 5.2.3.3.1-3I, 5.2.3.3.1-3J, 5.2.3.3.1-5, 5.2.3.3.2-4, 5.2.3.3.2-4A, 5.2.3.3.2-4B, 5.2.3.3.2-4C, 5.2.3.3.2-4D, 5.2.3.3.2-4F, 5.2.3.3.2-4G and 5.2.3.3.2-4I which are determined assuming the maximum number of layers as follows: - If the *maxLayersMIMO-r10* is configured for the DL cell, the maximum number of layers for subframe operation is determined according to *maxLayersMIMO-r10* for the DL cell.- …- Else,- …- Otherwise the maximum number of layers is determined according to the minimum of the number of PBCH antenna ports and *ue-Category* (without suffix).… |

From our understanding, RI bit width is not dependent on the *fourLayerTM3-TM4*, but is only based on the text above, as in legacy LTE. Hence, for determination of the RI bit width, UE follows *maxLayersMIMO-r10* if configured, but otherwise it depends on the number of PBCH antenna ports and *ue-Category*. That is, if the number of CRS port is four, then two bits (as in Option 1), but if not, it is one bit.Hence, we can simply confirm that RI bit width for EN-DC is determined according to TS 36.212 subclause 5.2.2.6 as in legacy LTE only mode, and no specification changes are needed.  |
| MediaTek | - | We believe that rank indication is designed by RAN1 and also the quoted text by Samsung is from RAN1 SPEC. Therefore, we would suggest to discuss this in RAN1 instead of RAN2. At least request RAN1 to confirm our assumption. |
| CATT |  | We agree that this is mainly R1 topic to clarify. So we’d prefer that any potential conclusion in R2 should base on R1 input. So it is better that this discussion is initiated in R1. |
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# 3 Conclusion

Always echo the list of observations and proposals.

# Annex A – Contact Points

Respondents to the email discussion are kindly asked to fill in the following table.

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| --- | --- | --- |
| Company | Name | Email Address |
| Nokia | Amaanat | amaanat.ali@nokia.com |
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| MediaTek | Felix Tsai | Chun-fan.tsai@mediatek.com |
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