**3GPP TSG-RAN WG2 Meeting #110-e R2-20xxxxx**

**Electronic, 20 April – 30 April 2020**

**Agenda Item:** 5.4.3

**Source:** Huawei, HiSilicon

**Title:** [Post109bis-e][923][NR15] clarification on codebook parameters for 2-32 (Huawei)

**WI code(s):** NR\_newRAT-Core

**Document for:** Discussion and Decision

## 1 Introduction

This document is to kick off the below offline discussion:

* [Post109bis-e][923][NR15] clarification on codebook parameters for 2-32 (Huawei)

      Scope: Continue discussion from AT109bis-e [013], pave the way for agreements.
Intended outcome: Report
Deadline: Next meeting

## 2 Discussion

### 2.1 Rel-15 CR

The updated CR is in the draft folder. The current wording in the CR is as below. Please note the below wording is already a compromise considering under-reporting issue in Rel-15.

 *a UE shall support a minimum value of 4 for codebook type I single panel in FR1 in the case of a single active CSI-resource across all ccs;*

 *a UE shall support a minimum value of 8 in case of wideband CSI report for codebook type I single panel in FR1 in the case of a single active CSI-resource across all ccs;*

 *a UE shall support a minimum value of 2 for codebook type I single panel in FR2 in the case of a single active CSI-resource across all ccs.*

And Qualcomm commented below:

*Release-15 CR:*

*We understand “across all CCs” in the added text means across all configured CCs within the configured band combination in case of CA. The confusion comes from the fact that the UE capability parameter maxNumberTxPortsPerResource is a per-band UE capability and “across all CCs” can be understood to mean across all CCs within the band. Instead, the minimum requirement for the case where we have a single active CSI resource per-UE.*

To address Qualcomm’s comment, the moderator suggests the wording as below.

*A UE shall support a minimum value of 4 for codebook type I single panel in FR1 in the case of a single active CSI-resources within a cell group*

Q1: Do companies agree with the proposal updated from the moderator? If not, please provide clearly your suggested wording.

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Suggested wording |
| Huawei | Yes |  |
| NTT DOCOMO | No | Not sure if “within a cell group” can express the intended configuration. Instead, the following wording is precise.“in the case where a single active CSI resource is configured across all bands in a band combination.” |
| China Unicom | Yes |  |
| Qualcomm Incorporated | No | The suggested wording results in requiring different capabilities between NR standalone (without Dual Connectivity) and NR-DC.Agree to DOCOMO’s suggestion above. |
| Nokia | No | Okay to follow Docomo’s suggestion to avoid ambiguity of whether single cell group v/s multiple cell groups are implied. |
| OPPO | No | We also agree with DOCOMO’s suggestion |
| CMCC |  | Docomo’s suggestion looks fine. |
| CTC | Yes, and | The moderator’s wording is correct and Docomo’s suggestion is more clear |
| Orange |  | DOCOMO suggestion is acceptable. |
| Vodafone  | Yes  |  |
| Telecom Italia | No | We prefer DOCOMO wording (no risk to misunderstand whether this is applicable to DC-based architectures only or not) |
| Deutsche Telekom | No | We are ok with DOCOMO’s suggestion |
| Ericsson | No | We would like to further understand what would prevent the actual report of the triplet. We agree the RAN1 requirement is applicable for a single active CSI resource, even for CA case. But this would not prevent the UE from reporting the according triplet since it can also limit the per BC value of total number of resources. |

In the discussion, Qualcomm also raised a comment as below:

*It looks better to decouple the minimum requirement from the specific UE capability parameter maxNumberTxPortsPerResource. The text can be something like “across all CCs within MCG, and SCG in case of NR-DC”.*

To address Qualcomm’s comment, the moderator suggests to move the clarification under *supportedCSI-RS-ResourceList* for codebook capabilities.

Q2: Do companies agree the proposal above by the moderator? If not, please indicate clearly which place you prefer to add this clarification in the “Comments” column.

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei |  | We actually do not see much difference on where to capture it, the intention is to simply reflect the mandated requirement and thus either way is OK to us. |
| NTT DOCOMO | No | See comment to Q1. The suggestion in Q1 is applicable to NR-DC, since anyway, the scenario is where only a single active CSI resource is present in one band and there is not any other active CSI resources in the other band in a band combination. |
| China Unicom | Yes | Same view as the HUAWEI. |
| Qualcomm Incorporated | Yes | Resolution of Q1 is more important. Placement of the minimum requirement is secondary issue. |
| Nokia | No strong opinion | It is important to have the right alignment of what is the minimum requirement from TR 38.822. |
| OPPO | No strong opinion |  |
| CMCC | Yes |  |
| CTC | No strong view |  |
| Orange | No strong opinion |  |
| Vodafone  | No Strong Opinion  | agree with Huawei’s comments  |
| Telecom Italia | No strong view |  |
| Deutsche Telekom | No strong view |  |
| Ericsson | No strong view |  |

### 2.2 Rel-16 CR

The moderator provides two alternatives in the draft folder.

Alt1: to clarify the definition of the limit for reported values for 2-36.

Alt2: to simply inroduce the minimum requirement defined in 2-32.

Alt3: a shadow CR of R15 CR

Q3: which Alternative companies prefer?

|  |  |  |
| --- | --- | --- |
| Company | Alt1/Alt2 | Comments |
| Huawei | Alt 1 | For Rel-15 we compromised to use the above wording is because the under-reporting issue would be solved in Rel-16. So in Rel-16 we think Alt 1 is clearer on the required reported values. |
| NTT DOCOMO | Alt.2 | We believe that the definition of basic CSI capabilities (2-32) has not been changed even from Rel-16. In that sense, the same clarification as in Rel-15 should be applied for Rel-16 and onwards. |
| China Unicom | Alt 1 | We think For Rel-16 under reporting is not an issue and we should have the clear limits on the value reported for 2-36. |
| Qualcomm Incorporated | Alt 1, but | As already commented, there is difference between FG2-32 and 2-36.* The minimum requirement 2-32 mandates 8 ports for FR1 only when configured as wideband CSI report.
* The UE capability signalling defined for 2-36 cannot differentiate between subband and wideband reporting.

This means that Alt.1 results in mandating more than the minimum requirement as defined by 2-32. RAN2 should confirm this understanding in making agreement. |
| Nokia | Alt 2 | Agree with Docomo. If we want to stick to the current Rel-15 mandatory capability (case 1), we need to clarify that a UE that does not report 8 as min Tx ports in 2-36, still supports (8,1,8) in wideband mode only. If instead, we are fine with changing the UE mandatory capability from Rel-16 (case 2), then we should clearly say a UE shall report a minimum value of 8 in 2-36. We guess this is the main aspect for the discussion. We have a proposal to capture this which would still be aligned with Rel-15 but allows a UE to match the sub-band to the wide-band reporting:- UE shall support at least 8 ports when configured in wideband PMI reporting with a single active CSI-resource for FR1 regardless of what it reports in supportedCSI-RS-ResourceList with maxNumberTxPortsPerResource. |
| OPPO | ALT3 | We agree with NTT DOCOMO’s comment and hence R16 CR should be a shadow CR of R15 CR. In the RAN1 LS R2-2004253-R1-2002900 RAN1’s answers to Q1 mention that “Rel.15 gNBs follow the legacy Rel.15 per band capability with conservative numbers.Rel.16 gNBs may follow the new per band capability with aggressive numbers and the new per BC capability jointly. Alternatively, the Rel.16 gNB may follow the legacy Rel.15 per band signaling”. To us it means R16 gNB will interpret the existing per band signaling exactly the same as legacy R15 gNB.Apart from the problem pointed out by QC for alt1, there is also problem when network configure FR1 and FR2 band combination. In that case, following alt1 network can configure 2 ports for FR2 and 8 ports for FR1. Following alt2 network can configure 2 ports for FR2 and 4 ports for FR1. For both potential configuration, they are beyond current UE’s mandatory capability. |
| CMCC | Alt1 |  |
| CTC | Alt 1 |  |
| Orange | Alt1 | Alt. 1 is the cleanest, the simplest from a spec. perspective. Now we need to agree on the minimum value 8 (for both subband and wideband reporting). If it is not the case the compromise could be based on Nokia proposal “-UE shall support at least 8 ports when configured in wideband PMI reporting with a single active CSI-resource for FR1 regardless of what it reports in supportedCSI-RS-ResourceList with maxNumberTxPortsPerResource. “together with “-UE shall report at least one triplet in supportedCSI-RS-ResourceList with maxNumberTxPortsPerResource greater than or equal to 4 for FR1”. |
| Vodafone  | Alt 1 | Alt 1 offers an elegant and simple solution  |
| Telecom Italia | Alt 1 | Together with Orange addition“-UE shall report at least one triplet in supportedCSI-RS-ResourceList with maxNumberTxPortsPerResource greater than or equal to 4 for FR1”. |
| Deutsche Telekom | Alt.1 |  |
| Ericsson | Alt1 | Actually, we think Alt1 can be used for both Rel-16 and Rel15. We would like to further understand what would prevent the UE from reporting the triplet for Rel-15 case – see comments on Q1. |

Q4: Do companies agree the wording for your preferred alternative? If not, please provide clearly your suggested wording.

|  |  |  |
| --- | --- | --- |
| Company | Alt1/Alt2 | Suggested wording |
| Huawei | Yes |  |
| NTT DOCOMO | Yes with comment to Q1 | Agree if the comment to Q1 is reflected. |
| China Unicom | Yes |  |
| Qualcomm Incorporated |  | Not sure which wording this question is referring to. See our input to Q1. |
| Nokia |  | If we want to stick to the current Rel-15 mandatory capability (case 1), we need to clarify that a UE that does not report 8 as min Tx ports in 2-36, still supports (8,1,8) in wideband mode only. If instead, we are fine with changing the UE mandatory capability from Rel-16 (case 2), then we should clearly say a UE shall report a minimum value of 8 in 2-36. We guess this is the main aspect for the discussion. We have a proposal to capture this which would still be aligned with Rel-15 but allows a UE to match the sub-band to the wide-band reporting:- UE shall support at least 8 ports when configured in wideband PMI reporting with a single active CSI-resource for FR1 regardless of what it reports in supportedCSI-RS-ResourceList with maxNumberTxPortsPerResource. |
| OPPO |  | A shadow CR is sufficient |
| CMCC | Yes |  |
| CTC | Yes |  |
| Orange | Yes | If companies cannot agree on the minimum value 8 but 4 for alternative 1, we need to include the sentence of Nokia:- UE shall support at least 8 ports when configured in wideband PMI reporting with a single active CSI-resource for FR1 regardless of what it reports in supportedCSI-RS-ResourceList with maxNumberTxPortsPerResource. |
| Vodafone  | Yes  | Also agree with clarification offered by Orange |
| Telecom Italia | Yes | Same view as Orange |
| Deutsche Telekom | Yes |  |
| Ericsson | Yes |  |

Irrespective which alternative to go, as Qualcomm commented below where to add this clarification is also related to the under reporting email discussion #962.

The moderator suggests we take #962 progress into account, and currently to introduce *supportedCSI-RS-ResourceListAlt* seems a common understanding. So the moderator suggests to move the clarification under *supportedCSI-RS-ResourceListAlt* Unless #962 offline discussion changes this part.

Q5: Do companies agree the proposal from the moderator? If not, please indicate clearly which place you prefer to capture the clarification in the “Comments” column.

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei | Yes |  |
| NTT DOCOMO | No | Any clarification patched by this CR is supposed to be applied for the legacy list and alternative list. As long as it is clear from the spec, it doesn’t matter where the new clarification is placed. |
| China Unicom | Yes | We think the change for Rel-16 only applies to the Alt list, and the legacy list has the limitation defined for Rel-15 CR. |
| Qualcomm Incorporated | Yes |  |
| Nokia | Yes | We think it is fair to capture the understanding properly so that we have reduced chances of revisiting the discussion in the future. |
| OPPO | No | We prefer to wait for the progress of 962 a bit |
| CMCC | Yes  |  |
| CTC | Yes |  |
| Orange | Yes | We agree that Alt. 1 Rel. 16 CR has to take into account the email discussion #962. |
| Vodafone  | Yes  |  |
| Telecom Italia | Yes |  |
| Deutsche Telekom | Yes |  |
| Ericsson | No | As long as what to change is defined, as asked in Q4, we think we can sort it out where exactly to include the change when #962 is done. |

## 3 Conclusions

[To be updated]