3GPP TSG-RAN WG2 #114-e electronic R2-210xxxx

Electronic Meeting, 19th – 27th May, 2021

Agenda Item: 6.1.4.3

Source: Intel Corporation

Title: [AT114-e][023][NR16] Summary of UE Caps (Intel)

Document for: Discussion, Decision

# 1 Introduction

This contribution summarizes the following discussion:

* [AT114-e][023][NR16] UE capabilities (Intel)

Scope: Treat R2-2104716, R2-2104727, R2-2104884, R2-2104885, R2-2105177, R2-2105178, R2-2105063, R2-2105094, R2-2105095, R2-2105711, R2-2104916, R2-2104917, R2-2104722, R2-2105715, R2-2105247, R2-2105716, R2-2105717, R2-2106316, R2-2104829, R2-2105359, R2-2105360, R2-2105361, R2-2105362

Phase 1, determine agreeable parts, Phase 2, for agreeable parts Work on CRs.

Intended outcome: Report and Agreed CRs.

Deadline: Schedule A

§  Initial deadline for companies’ comments (Phase 1): **Friday May 21 1000 UTC**

§  Deadline for CR finalization (Phase 2): **Wednesday May 26 1200 UTC**

The following documents are treated in this discussion:

2 PUCCH capability

[1] R2-2104829 Left issue on two PUCCH capability OPPO discussion Rel-16 NR\_L1enh\_URLLC-Core

R1 and R4 feature list updates

[2] R2-2104884 Release-16 UE capabilities based on RAN1 and RAN4 feature lists Intel Corporation CR Rel-16 38.306 16.4.0 0573 - F NR\_eMIMO-Core, NR\_IIOT-Core, LTE\_NR\_DC\_CA\_enh-Core, NR\_L1enh\_URLLC-Core, NR\_HST-Core, TEI16

[3] R2-2104885 Release-16 UE capabilities based on RAN1 and RAN4 feature lists Intel Corporation CR Rel-16 38.331 16.4.1 2585 - F NR\_eMIMO-Core, NR\_HST-Core, TEI16

[4] R2-2105177 CR on the Updated RAN1/4 Features -38306 ZTE Corporation, Sanechips CR Rel-16 38.306 16.4.0 0579 - F TEI16

[5] R2-2105178 CR on the Updated RAN1/4 Features -38331 ZTE Corporation, Sanechips CR Rel-16 38.331 16.4.1 2606 - F TEI16

Tx Diversity capability

[6] R2-2104916 CR on 38.306 for the capability of supporting txDiversity vivo CR Rel-16 38.306 16.4.0 0574 - C TEI16

[7] R2-2104917 CR on 38.331 for the capability of supporting txDiversity vivo CR Rel-16 38.331 16.4.1 2589 - C TEI16

[8] R2-2105711 Discussion on signalling design for TxD capability Huawei, HiSilicon discussion Rel-16 TEI16

NR-u corrections

[9] R2-2105063 Corrections on the Shared Spectrum Channel Access Parameters CATT CR Rel-16 38.306 16.4.0 0577 - F NR\_unlic-Core

New HST capabilities

[10] R2-2105094 Introduction of the intra-NR and inter-RAT HST Capabilities Apple, OPPO, CATT, Nokia, Nokia Shanghai Bell, Ericsson CR Rel-16 38.306 16.4.0 0578 - F NR\_HST-Core

[11] R2-2105095 Introduction of the intra-NR and inter-RAT HST Capabilities and Configuration Apple, OPPO, CATT, Nokia, Nokia Shanghai Bell, Ericsson CR Rel-16 38.331 16.4.1 2599 - F NR\_HST-Core

Capability support of one-octet eLCID for IAB MT

[12] R2-2105359 Capability of supporting one-octet eLCID in IAB vivo discussion

[13] R2-2105360 Capability of supporting one-octet eLCID in IAB - Option A vivo CR Rel-16 38.306 16.4.0 0583 - F NR\_IAB-Core

[14] R2-2105361 Capability of supporting one-octet eLCID in IAB - Option B vivo CR Rel-16 38.306 16.4.0 0584 - F NR\_IAB-Core

[15] R2-2105362 Capability of supporting one-octet eLCID in IAB - Option B vivo CR Rel-16 38.331 16.4.1 2620 - F NR\_IAB-Core

New frequency separation classes

[16] R2-2105715 Discussion on introduction of new frequency separation classes Huawei, HiSilicon discussion Rel-16 TEI16

[17] R2-2105716 CR on introduction of new frequency separation classes Huawei, HiSilicon CR Rel-16 38.306 16.4.0 0591 - F TEI16

[18] R2-2105717 CR on introduction of new frequency separation classes Huawei, HiSilicon CR Rel-16 38.331 16.4.1 2643 - F TEI16

[19] R2-2105247 Adding 400 Mhz and 600 MHz frequency separation classes Ericsson, Nokia, Nokia Shanghai Bell, Qualcomm Incorporated CR Rel-16 38.331 16.4.1 2609 - C NR\_RF\_FR2\_req\_enh2

TPMI group signalling correction

[20] R2-2106316 Correction on TPMI group signaling for UL full power transmission Samsung CR Rel-16 38.306 16.4.0 0602 - F NR\_eMIMO-Core

Updated Rel-16 feature list

[21] R2-2104890 UE Feature list for NR Rel-16 Intel Corporation CR Rel-16 38.822 15.0.1 0004 2 B TEI16 R2-2104554

Contact person(s) for each participating company:

|  |  |
| --- | --- |
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# 2 Discussion

## 2.1 Phase 1: Intended to determine agreeable parts

### 2.1.1 Leftover issue on 2 PUCCH capability

In RAN1 LS (R1-2104121), RAN1 ask RAN2 to check if following sentences (highlighted red) in TS38.306 in current places are appropriate considering restriction on FG 11-4c/4d/4f/4h is for for two codebooks where one of the two is sub-slot based codebook, and the other is slot-based codebook. If not appropriate, RAN2 can consider editing sentences.

***twoPUCCH-Type5-r16***

Indicates whether the UE supports two PUCCH of format 0 or 2 for two HARQ-ACK codebooks with one 7\*2-symbol subslot based HARQ-ACK codebook. When simultaneously configured with two slot-based HARQ-ACK codebooks, the capability for each HARQ-ACK codebook is subjected to the capability reported by *twoPUCCH-F0-2-ConsecSymbols.*

***twoPUCCH-Type6-r16***

Indicates whether the UE supports two PUCCH of format 0 or 2 in consecutive symbols for two HARQ-ACK codebooks with one 2\*7-symbol subslot based HARQ-ACK codebook. When simultaneously configured with two slot-based HARQ-ACK codebooks, the capability for each HARQ-ACK codebook is subjected to the capability reported by twoPUCCH-F0-2-ConsecSymbols.

***twoPUCCH-Type8-r16***

Indicates whether the UE supports one PUCCH format 0 or 2 and one PUCCH format 1, 3 or 4 in the same subslot for HARQ-ACK codebooks with one 2\*7-symbol subslot based HARQ-ACK codebook. When simultaneously configured with two slot-based HARQ-ACK codebooks, the capability for each HARQ-ACK codebook is subjected to the capability reported by onePUCCH-LongAndShortFormat.

***twoPUCCH-Type10-r16***

Indicates whether the UE supports two PUCCH transmissions in the same subslot for two HARQ-ACK codebooks with one 2\*7-symbol subslot which are not covered by *twoPUCCH-Type5-r16* and *twoPUCCH-Type7-r16*. When simultaneously configured with two slot-based HARQ-ACK codebooks, the capability for each HARQ-ACK codebook is subjected to the capability reported by *twoPUCCH-AnyOthersInSlot.*

3 alternatives are disucssed in R2-2104829:

Alt-1: keep the sentence in the original place, which means that the related behaviour (i.e., two A/N-related slot-based PUCCHs in the same slot) is covered by twoPUCCH-TypeX-r16 (X=5,6,8,10).

Alt-2: By introducing new capability bit, the related capability can be separated from the FG 11-4c, FG11-4d, FG 11-4f and FG 11-4h

Alt-3: relocate the sentences all into the following capability:

| ***twoHARQ-ACK-Codebook-type1-r16***  Indicates whether the UE supports two HARQ-ACK codebooks with up to one subslot based HARQ-ACK codebook (i.e. slot-based + slot-based, or slot-based + subslot based) simultaneously constructed for supporting HARQ-ACK codebooks with different priorities at a UE. The capability signalling comprises the following parameters:  - *sub-SlotConfig-NCP-r16* indicates the maximum number of actual PUCCH transmissions for HARQ-ACK within a slot for NCP with 2-symbol\*7 sub-slot configuration;  - *sub-SlotConfig-ECP-r16* indicates the maximum number of actual PUCCH transmissions for HARQ-ACK within a slot for ECP with 2-symbol\*6 sub-slot configuration;  For the 7-symbol\*2 sub-slot configuration of NCP or the 6-symbol\*2 sub-slot configuration of ECP, the value of the maximum number of actual PUCCH transmissions for HARQ-ACK within a slot is {2}.  NOTE: If a UE reports both *multiPUCCH-r16* and *twoHARQ-ACK-Codebook-type1-r16*, it can support two slot-based HARQ-ACK codebooks, and one slot-based and one-sub-slot-based HARQ-ACK codebooks. If a UE reports *twoHARQ-ACK-Codebook-type1-r16* but does not report *multiPUCCH-r16*, it can only support two slot-based HARQ-ACK codebooks. | FS | No | N/A | N/A |
| --- | --- | --- | --- | --- |

**Q1.1 Do companies see a need to change TS38.306 for the above (i.e. “No” means ‘to go with Alt-1’)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Intel | No (not strong view) |  |
| Qualcomm Incorporated | Need clarification | The existing text is already confusing, in particular the part which says “when simultaneously configured”. The UE capabilities above are related to being configured for one sub-slot based codebook, and one slot based codebook. How can they be configured simultaneously with two slot based HARQ-ACK codebooks? |
| Ericsson | No (no strong view) | The mentioned parts could also be removed, but we are okay to follow the majority view to make it crystal clear. |
| Apple | No strong view | If current wording is to be kept, then atleast a better wording than " the capability for each HARQ-ACK codebook is subjected“ can be made, like the capability for each HARQ-ACK codebook is bounded by“ |
| ZTE | Need clarification | We agree with the observation 3 that   1. If keep the sentence in the place as it is, UE cannot report capability of supporting “one PUCCH format 0/2 + one PUCCH format 1/3/ 4”, or for “two format 0/2 PUCCH in non-consecutive symbols ” for slot+slot case, if the UE does not support 2\*7 symbol based subslot case. |

**Q1.2 If yes, which alternative should we adopt (i.e. Alt-2, Alt-3 or others)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Alt2/Alt3/Others** | **Comments** |
| Intel | No Alt2 | Alt-2 is already discussed in RAN1 and is thought not needed. Hence Alt2 should not be considered by RAN2. |
| Ericsson | Alt 3 | Alt-2 is ruled out by RAN1 |
| Apple | Alt 3 |  |
| ZTE | Alt 3 | Alt 3 can be taken as baseline |
|  |  |  |

**Q1.3 Do companies see a need to send a reply LS to RAN1 for confirmation regardless of the outcome?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Ericsson | No | We don’t see a strict need, since it is clarfied in the LS that “RAN2 can consider editing sentences“. Additionally, the above highlight red colored sentences were introduced by RAN2, and so RAN2 can decide what to do with them. |
| Apple | No harm is replying back with what RAN2 has done… but no strong view either. |  |
| ZTE | No strong view |  |
|  |  |  |
|  |  |  |

### 2.1.2 CRs based on updated R1 and R4 feature lists

The following CRs are related to the updated R1 and R4 feature lists (R1-2104120 and R4-2105854):

1. R2-2104884 Release-16 UE capabilities based on RAN1 and RAN4 feature lists Intel Corporation CR Rel-16 38.306 16.4.0 0573 - F NR\_eMIMO-Core, NR\_IIOT-Core, LTE\_NR\_DC\_CA\_enh-Core, NR\_L1enh\_URLLC-Core, NR\_HST-Core, TEI16
2. R2-2104885 Release-16 UE capabilities based on RAN1 and RAN4 feature lists Intel Corporation CR Rel-16 38.331 16.4.1 2585 - F NR\_eMIMO-Core, NR\_HST-Core, TEI16
3. R2-2105177 CR on the Updated RAN1/4 Features -38306 ZTE Corporation, Sanechips CR Rel-16 38.306 16.4.0 0579 - F TEI16
4. R2-2105178 CR on the Updated RAN1/4 Features -38331 ZTE Corporation, Sanechips CR Rel-16 38.331 16.4.1 2606 - F TEI16

The differences between (1)&(2) and (3)&(4) are as follow:

1. (1) also includes the following notes that RAN1 LS for the updated R1 feature list ask RAN2 to add to the field descriptions for 22-5c/5d:

“For simultaneously Ant.Sw . + Ant.Sw SRS in intra-band CA, or in inter-band CAs with bands whose UL are switched together according to the reported UE capability, the UE expects the same configuration of xTyR across the different CCs and the SRS resources overlapped in time domain from UE perspective are from the same UE antenna ports.”

1. (3) also includes the frequency class separation change as requested by R4 in a separate LS

In view that the CRs are intended for updated R1 and R4 feature lists, rapporteur tends to think that (1)&(2) are more aligned. There are also CRs related to update the frequency class separation and hence there is no need to treat this as part of the feature list upda2tes. Both have new HST capability added as well, but this can be decided whether to remove or update them based on the outcome of the HST discussion in Section 2.1.6.

**Q2.1 Do companies agree to the intention of the changes in (1)&(2) or (3)&(4)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **(1)&(2) or (3)&(4)** | **Comments** |
| Intel | (1)&(2) | There is a separate discussion on frequency class separation in Section 2.1.8 |
| Qualcomm Incorporated | (1)&(2) | OK to discuss frequency separation class spearately. |
| Ericsson | (1)&(2) | Agree that frequency class should be discussed separetly. |
| Apple | (1)&(2) |  |
| ZTE | (1)&(2) or (3)&(4) | In (1)(2) It includes R1 and R4 feature lists updates  In (3)(4), it includes R1 and R4 feature lists together with RAN4’s LS on frequency class separation. |

**Q2.2 For companies agreeing to the proposed changes in either (1)&(2) or (3)&(4), please also comment on the contents of the CRs, if any.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Intel | No to (1)&(2) | Proponent of (1)&(2) |
| Ericsson | (1)&(2) | The changes related to HST contains:  UE shall only indicate support of this feature only if measurementEnhancement-r16 is not reported.  This seems a bit confusing. As indicated by the rapporteur, this can be discussed in section 2.1.5 – where the CR in [10] provides a clearer wording. |
| Apple | (1)&(2) | Apple also has a CR for this in R2-2105094. Same comments as Ericsson on the wording. |
| ZTE |  | To (1)(2) modification on HST, it shall be finally determined based on the the discussion result on 2.1.5 |
|  |  |  |

### 2.1.3 TX Diversity capability

In [6] and [7], it thinks that RAN2 can already introduced the Rel-16 capability with release independent for Rel-15 by including the CRs in the release independent table.

:

In RAN4#98e meeting, an LS on signalling scheme of transparent TxD was agreed and sent to RAN2 in R2-2102646. In RAN2#113bis-e meeting, the corresponding capability was discussion, and it was agreed that:

=> RAN2 to capture RAN4 conclusion to introduce a new per-band capability signaling for FR1 UEs supporting transparent TxD in Rel-16.

=> RAN2 can support Rel ind for R15, by early impl CR.

=> It is possible to only apply the change for PC2 UEs for R15 (possibly this may mean signalling of two ind FFS).

Thus, RAN2 should introduce the corresponding capability according to RAN4 and RAN2 conclusions.

As on [8], it is discussing the signalling design of the capability with the release independent depending on whether the release independent is for all power classes or just for PC2. If the release independent is applied to all power classes, then it is just adding the CRs to the release independent table in TS38.331. And if only PC2, 2 options are proposed

Since RAN2 has sent a LS on the following to RAN4, rapporteur wonders whether we should wait for RAN4 reply before discussing the CRs

* It is possible to only apply the change for this new capability for PC2 UEs for Rel-15, but RAN2 would like to understand whether the Rel-16 capability signalling applies for all PCs, while Rel-15 capability signalling applies for just PC2 (as this difference in Rel-15 and Rel-16 capability might impact the signalling design)?
* RAN2 would also like to confirm whether this new capability has any dependencies with other capabilities that should be captured by RAN2 (since the capability is intended as release independent, RAN2 may need to capture such pre-requisites explicitly).

**Q3.1 Do companies agree RAN2 should wait for the reply from RAN4 related to release independent and pre-requisites?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Intel | Wait for RAN4 reply LS |  |
| Qualcomm Incorporated | Yes | Early implementation aspect should be sorted out together. |
| Ericsson | Wait for RAN4 reply LS |  |
| Apple | Yes |  |
| ZTE | Wait for RAN4 reply LS |  |

**Q3.2 If no, do companies agree with the proposed changes in the CRs? For companies agreeing to the proposed changes, please also comment on the contents of the CR, if any (e.g. how to include restriction to the release independent to PC2 if it is RAN4 intention etc. e.g. based on [8]).**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
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### 2.1.4 NR-u corrections

The CR R2-2105063 [9] has the following reason for change and the changes are to indicate that those capabilities are only for shared spectrum channel access:

:

In RAN1 feature list (R1-2102006), the following capabilities are only applies to shared spectrum channel access. However, in the field description of the corresponing capabilities, there lacks such restrictions.

For UE capability ***ssb-AndCSI-RS-RLM-r16***

|  |  |  |
| --- | --- | --- |
| 10-26e | RLM based on a mix of SS block and CSI-RS signals within active BWP for operation with shared spectrum channel access | RLM based on a mix of SS block and CSI-RS signals within active BWP for operation with shared spectrum channel access |

For UE capability ***pdsch-RepetitionMultiSlots-r16***

|  |  |  |
| --- | --- | --- |
| 10-40a | PDSCH repetitions over multiple slots for unlicensed spectrum | K = 2, 4, 8 times repetitions for unlicensed spectrum |

For UE capability ***sp-CSI-ReportPUSCH-r16***

|  |  |  |
| --- | --- | --- |
| 10-33a | Semi-persistent CSI report on PUSCH for unlicensed spectrum | Support semi-persistent CSI report on PUSCH for unlicensed spectrum |

Consequently, Multi-PUSCH UL grant should be considered as also applicable to frequency bands that do not require shared spectrum access, since it does not contain any restriction in each description in RAN1 feature list (R1-2102006).

Since the changes are quite editorial and if agreed, it can be merged with the rapporteur miscellaneous correction CR (R2-2104887) if agreeable.

**Q4.1 Do companies agree with the proposed changes in the CRs? For companies agreeing to the proposed changes, please also comment on the contents of the CR, if any. Also should it be merged with rapporteur miscellaneous correction CR?**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Yes/No** | **Merged with Rapp’s misc correction CRs** | **Comments** |
| Intel | Yes | Yes |  |
| Qualcomm Incorporated | Yes | Yes |  |
| Ericsson | Partly | Yes | The first change is not needed as the capability does not contain the magic sentence “This capability is also applicable to frequency band that does not require shared spectrum access“: |
| Lenovo | Yes | Yes | Minor editorial corrections since the applicability of the concerned capabilities is implied by ASN.1 (as they can be signalled only in IE SharedSpectrumChAccessParamsPerBand or  Phy-ParametersSharedSpectrumChAccess). |
| Apple | Yes | Yes |  |
| ZTE | Yes | Yes |  |

### 2.1.5 New HST capabilities and configuration

In the R4 LS (R4-2105855), RAN4 asks RAN2 to include 2 new capabilities:

* 10-4) Support of intra-NR HST RRM measurement with speed up to 500km/h
* 10-5) Support of NR-LTE inter-RAT RRM measurement with speed up to 500km/h

[10] and [11] introduces the above capabilities. [11] also introduces new configurations corresponding to the new capabilities.

**Q5.1 Do companies agree to the proposed changes in the 306 CR and 331 CR? For companies agreeing to the proposed changes, please also comment on the contents of the CR, if any.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Agree to TS38.306 CR** | **Agree to TS38.331 CR** | **Comments** |
| Intel | Yes | Yes | With the split capability for intra-NR and inter-RAT EUTRAN measurement, the network should be able to indicate which configuration is expected on the UE. Hence we are fine with adding configuration IE in addition to the newly added capabilities |
| Qualcomm Incorporated | Yes | Yes |  |
| Ericsson | Yes (proponent) | Yes (proponent) |  |
| Lenovo | May need to be revised | May need to be revised | Shouldn’t the category of the CRs be cat B instead of cat F?  On the 38.331 CR:   * Not clear why IE HighSpeedParametersExt-r16 has been defined as CHOICE type. RAN4 feature list does not say that the UE is allowed to indicate only one capability and not both. * Furthermore, the new HST capabilities can be introduced as R16 NCE of highSpeedParameters-r16 instead of introducing new R16 field highSpeedParametersExt-r16. * In HighSpeedConfig field descriptions the suffices „-r16“ can be removed. |
| Apple | Yes(proponent) | Yes(proponent) | To Lenovo’s comments:  Since this is not a new feature, but rather a correction, 'F‘ reflects the category better?  Agree on the correction from CHOICE to SEQUENCE. Will have a revision.  For the comments on extending from highSpeedParameters-r16, it is not extensible as there is no extension marker…? Hope we are not missing anything. |
| ZTE | Yes | Yes |  |

### 2.1.6 Capability support of one-octet eLCID for IAB MT

In [12], it discusses whether the capability of supporting one-octet eLCID in IAB is optional or mandatory. 2 solutions are provided:

* Option A): this capability is mandatory, and the capability should be added in **TS 38.306** **4.2.15.1 Mandatory IAB-MT features**. This solution is given in the companion CR R2-2105360 [2].
* Option B): this capability is optional and should be added in **TS 38.306** **4.2.15.6 MAC Parameters**, support of the capability should be introduced in TS 38.331 ASN.1 code. Besides, further clarifications on the following parameters are also needed, where one should state that the IAB-MT must be capable of the one-octet eLCID functionality so that the corresponding feature can be well-supported (this solution is given in the companion CR R2-2105361 [3] and R2-2105362 [4]):
* *preEmptiveBSR-r16*
* *guardSymbolReportReception-IAB-r16*
* *t-DeltaReceptionSupport-IAB-r16*

In the last RAN2 meeting, based on the outcome of the discussion in R2-2104555, it is agreed to make the capability support of one-octet eLCID for UE to conditionally mandatory and the change is in R2-2104887 (in principled agreed CR). It is unclear to the rapporteur whether the same can also be applied to the support of one-octet eLCID for IAB MT?

* Option C): this capability of supporting one-octet eLCID in IAB is conditionally mandatory

Like in the CR R2-2104887, a new section in sub-section in 4.2.15 includes the table as follow:

| **Features** | **Condition** |
| --- | --- |
| MAC subheaders with one-octet eLCID field | It is mandatory to support MAC subheaders with one-octet eLCID field for UEs supporting MAC CEs using extended LCID values as specified in TS 38.321 [8]. |

**Q6.1 Do companies agree with Option A) or B) or C)? Please also provide further comments on the changes proposed for Option A) or B) or C)**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option A) or B) or C)** | **Comments** |
| Intel | Option C | The same understanding as normal UE can be applied for IAB-MT. No further change is needed for IAB MT (i.e. what is in R2-2104887 IPA CR also applied to IAB MT). |
| Qualcomm Incorporated | Option C | Agree with Intel. |
| Ericsson | Option C | We agree with Rapporteur. The issue was already resolved last meeting. |
| Lenovo | Option C | The agreement we made in last meeting is generic for all features which are required to support one-octet eLCID. |
|  |  |  |

### 2.1.7 New frequency separation class

RAN4 LS (R4-2104402) request RAN2 to introduce 2 new frequency separation class.

|  |
| --- |
| RAN4 has introduced two new frequency separation classes into Table 5.3A.4-2 in TS 38.101-2. Values in that table correspond to IE *FreqSeparationClass.* New values are 400 and 600 MHz. |

[16-18] propose to introduce new *intraBandFreqSeparationDL/UL-v16xy* (corresponds to new *FreqSeparationClassDL/UL-v16xy*) to include the new frequency separation classes 400 and 600 MHz. This option is the same as when *intraBandFreqSeparationDL/UL-v1620* is introduced. The difference is, as explained in [16], *FreqSeparationClassDL/UL-v1620* was introduced to include some new frequency separation classes but still allow the UE to set the Rel-15 *FreqSeparationClassDL/UL* so that the Rel-15 gNB can validate the field *intraBandFreqSeparationDL/UL* (without suffix) while UE can also provide *intraBandFreqSeparationDL/UL-v1620* for Rel-16 gNB. The reason this can be done is because the frequency separation classes introduced in *FreqSeparationClassDL/UL-v1620* are all larger than the ones in *FreqSeparationClassDL/UL*. However, the 2 new frequency separation classes (400MHz and 600MHz) introduced by RAN4 this time are all smaller than the ones in Rel-15 (i.e. *FreqSeparationClassDL/UL*). To introduce new *intraBandFreqSeparationDL/UL-v16xy* (corresponds to new *FreqSeparationClassDL/UL-v16xy*), [16] proposes the following constraints to be added to TS38.306 [17]:

**Proposal 1: If the UE sets the new field *intraBandFreqSeparationDL/UL-v16xy* with 400 MHz and 600 MHz, it shall not set *intraBandFreqSeparationDL/UL* (without suffix).**

**Proposal 2: The network ignores the intra-band non-contiguous CA band combination if the *intraBandFreqSeparationDL/UL* (with/without suffix) is not present.**

An alternative to include *intraBandFreqSeparationDL/UL-v16xy* (with corresponding new *FreqSeparationClassDL/UL-v16xy*) is to include the new frequency separation classes after the ellipsis as provided in CR 38.331 [19]:

From the above, there are 2 ways to introduce the new frequency separation class:

Option 1: Introduce a new NCE IE *intraBandFreqSeparationDL/UL-v16xy* with corresponding new *FreqSeparationClassDL/UL-v16xy* to include the new frequency separation class as follow (based on [18]:

DL:

FeatureSetDownlink-v16xy ::= SEQUENCE {

intraBandFreqSeparationDL-v16xy FreqSeparationClassDL-v16xy OPTIONAL

}

UL:

FeatureSetUplink-v16xy ::= SEQUENCE {

intraBandFreqSeparationUL-v16xy FreqSeparationClassUL-v16xy OPTIONAL

}

FreqSeparationClassDL-v16xy ::= ENUMERATED {mhz400, mhz600}

FreqSeparationClassUL-v16xy ::= ENUMERATED {mhz400, mhz600}

Option 2: Introduce the new frequency separation classes in *FreqSeparationClass* as follow (based on [19]:

FreqSeparationClass ::= ENUMERATED { mhz800, mhz1200, mhz1400, …, mhz400-v16xy, mhz600-v16xy}

**Q7.1 Do companies agree to introducing the new frequency separation classes using Option 1 [18] or Option 2 [19])?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Intel | Option 2 | Option 2 is simpler and it seems to meet the requirement from RAN4 without the need to change the field description in TS38.306. |
| Qualcomm Incorporated | Option 2 (Proponent) |  |
| Ericsson | Option 2. | When we (Ericsson, Nokia and QC) wrote the CRs for option 2, we did consider option 1. We discarded that approach though. Because:  When we added earlier added the extension of, for example 1000 MHz, we used a NCE (v1620) because a UE should inidcate the "next lower value" in the legacy field. This would make sure a gNB not implementing the CR to still be able to serve the UE (even though not using the full capabilities of the UE w.r.t. freq separation classes).  But now, we add values which are smaller than any existing values, hence it is not possible to indicate a "next smaller value" in legacy signalling. Hence we can simply extend as per option 2. |
| Lenovo | Option 2 | Option 2 looks sufficient. |
| Apple | Op2 |  |
| ZTE |  | Both option 1 and 2 can be accepted to us |

**Q7.2 For the option chosen, do companies see a need to update the corresponding field description in TS38.306 CR ? If yes,, please comment on the changes needed.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Intel | No | With Option 2, there is no need for Proposal 1 as suggested in [17]. Also, there is no need of Proposal 2 since the legacy network will know that UE has reported the *intraBandFreqSeparationDL/UL*(without suffix) with value that is not comprehensible . Anyway, we do not specify network behaviour. |
| Ericsson | No | As described in the inter-operability-wording in the CRs for Option 2:  *If the UE has implemented this change but the NW has not, the UE may signal the newly defined frequency separation values (400 and 600) but network not comprehending them will assume that this UE does not support intra-band non-contiguous CA according to this FeatureSet and will not configure UE to use the FeatureSet, so there are no inter-operability issues.*  Usually we dont capture this type of NW behaviour in the specification. |
| Apple | No |  |
| ZTE | No |  |
|  |  |  |

### 2.1.8 Corrections on TPMI grouping

The CR R2-2106315 [20] has the following reason for change:

:

The 38.306 NOTE 2 in the field description for *ul-FullPwrMode2-TPMIGroup-r16* needs some clarification.

NOTE 2: For 4 port partial-coherent or full-coherent UE, UE can report: 2-port {2-bit bitmap} and one of 4-port non-coherent {G0~G3} and one of 4-port partial-coherent {G0~G6}

For 4 port non-coherent UE, UE can report: 2-port {2-bit bitmap} and one of 4-port non-coherent {G0~G3}

For 2 port UE, UE can report: 2-port {2-bit bitmap}

1. For 4 port non-coherent UE, the note says that “UE can report: 2-port {2-bit bitmap} and one of 4-port non-coherent {G0~G3}.” Due to the text “the UE can report…” in the beginning, there could be the following misunderstanding.

* First, it is not clear from the text that the a non-coherent UE is not allowed to report 4-port partial-coherent {G0~G6}.
* Second, whether the UE can report 2-port {2-bit bitmap} only or one of 4-port non-coherent {G0~G3} only needs to be clarified.

1. The second misunderstanding above exists also for the 4 port partial-coherent UE.
2. Based on 38.331, *fourPortsNonCoherent-r16* and *fourPortspartialCoherent-r16* can indicate only one TPMI group from g0 through g6. However, their description in 38.306 implies that the UE indicates a set of multiple groups {g0-g3} for non-coherent and {g0-g6} for partial-coherent.
3. The 38.331 uses lowercase g0-g6 for the TPMI groups, but 38.306 uses uppercase G0-G6. For consistency, it should be aligned the capitalization.

**Q8.1 Do companies agree with the proposed changes in the CRs? For companies agreeing to the proposed changes, please also comment on the contents of the CR, if any. Also should it be merged with rapporteur miscellaneous correction CR?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Intel | No | For Change #1 and #2, the Note 2 is as from the R1 feature list and we do not see a need to change any part of the Note 2. In fact, the modification of the note changes the meaning of the RAN 1 agreement. With the adding of ‘/or’, it creates the possibility that 4-port partial coherent UE can do full power with non-coherent TPMI, but it can’t do full power with partial coherent TPMI. The original text prevents this case. The added ‘only‘ is also confusing.  OK with the changes #3 and #4 in the reason for change. However, they are quite editorial and we do not see a need to make these changes via CR. If needed, it can be included in the misc CR R2-2104887. |
| Qualcomm Incorporated | No | Agree with Intel that we should react based on RAN1 input. |
| Ericsson |  | In general the changes seem not critical. For change #1 and #2, if we could converge on a wording we would be fine to capture it, a suggestion is:  NOTE 1:     When a full coherent UE operates in mode 2, it reports TPMIs the same as a partial-coherent UE.  NOTE 2:     For 4 port partial-coherent or full-coherent UE, UE can report: 2-port {2-bit bitmap} and/or one of 4-port non-coherent {G0~G3} and/or one of 4-port partial-coherent {G0~G6}  For 4 port non-coherent UE, UE can report: 2-port {2-bit bitmap} and/or one of 4-port non-coherent {G0~G3}, but not any of 4-port partial-coherent {G0~G6}  For change #3 and #4, fine to merge to another CR if companies see a need for the updates. |
|  |  |  |
| Apple | No | Same view as Intel |
| ZTE | No | Same view as Intel |

### 2.1.9 Updated Rel-16 feature list

R2-2104890 [21] contains the Rel-16 UE feature from RAN1, RAN2 and RAN4. It incorporated the latest updated Ran1 feature list (R1-2104120) as well as the latest RAN4 feature list (R4-2105854).

It is rapporteur’s understanding that the CR will be updated further based on the outcome from this meeting.

**Q9 Do companies agree to the proposed changes in the CR?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Intel | Yes (Proponent) |  |
| Qualcomm Incorporated | Yes |  |
| Ericsson | Yes | It is also our understanding that further (and final) updates would follow based on the outcome of this meeting. |
| Apple | Yes |  |
| ZTE | Yes |  |

**For companies agreeing to the proposed changes, please also comment on the contents of the CR, if any.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Company** | **Feature no.** | **Comment raised** | **Proposals** | **Rapporteur’s resolution** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

## 2.2 Phase 2: Intended to progress discussion on agreeable parts

- To be updated after discussion on Phase 1 -

# 3 Conclusion

- To be updated after discussion on Phase 1 -