**3GPP TSG-RAN WG4 Meeting # 104-e R4-2214119**

**Electronic Meeting, 15– 26 August 2022**

**Agenda item:** 7.2

**Source:** Moderator (CMCC)

**Title:** Email Discussion Summary for [104-e][141] R17\_feature\_list

**Document for:** Information

# Introduction

This email discussion focuses on Rel-17 UE feature list discussion (agenda 7). The feature list agreed in last meeting is R4-2210436 and R4-2211189. According to the meeting arrangement, the plan of UE feature list discussion in this meeting is:

* Submission and treatment of tdocs for the feature list
  + The technical consensus should be reached before capturing a capability in the list.
  + For a proposed feature group related to on-going WIs, please submit one brief tdoc under agenda 7 so that a placeholder could be set for it in the updated feature list, and another tdoc with detailed technique analysis under UE/BS RF, RRM, or demod agendas of the corresponding WIs.
  + For the feature which is not related to on-going WI, please directly submit a paper with all information under AI 7.
  + One dedicated email thread for feature list will be set in main session, where the feature groups for UE RF will be discussed in details. For RRM, demod, or BS RF related feature groups, the technique discussions will be handled in the individual session.
  + On the last day, the feature list will be treated in the GTW of main session. All the stable feature groups will be captured in the feature list without [ ] or FFS. The potential feature groups, for which no consensus is reached, they will be captured in [ ] or with FFS.
* Plan for approval of feature list for RAN4-lead features
  + It is expected to send LS to RAN2 by August 19 (Friday in the first round).
  + Guidance RP-211582 was endorsed in RAN#92-e for the timeline for Rel-17 UE feature list, and the conclusions in RAN#96 are as follows
    - *REL-17 ASN.1 freeze will be declared in June 22*
    - *June 22 version may not be fully implementable and we will target Sep.22 to make sure that is fully implementable*
  + To make the feature list implementable, RAN4 is supposed to provide the necessary input of feature list in August meeting.
    - RAN2 would not capture any feature or feature group if there is FFS or [].

It is appreciated that the delegates for this topic put their contact information in the table below.

Contact information

|  |  |  |
| --- | --- | --- |
| **Company** | **Name** | **Email address** |
| Samsung | Yuanyuan(Tina) Zhang | Tina55.zhang@samsung.com |
| Nokia | Hiromasa Umeda | hiromasa.umeda@nokia.com |
| vivo | Ruixin Wang | ruixin.wang@vivo.com |
| Apple | Steven Chen | steven.x.chen AT apple.com |

Note:

1. Please add your contact information in above table once you make comments on this email thread.
2. If multiple delegates from the same company make comments on single email thread, please add you name as suffix after company name when make comments i.e. Company A (XX, XX)

# Topic #1: NR\_RF\_FR1\_enh

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2213371](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213371.zip) | Huawei, HiSilicon | On UE power class per band per band combination |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 1-1: On UE power class per band per band combination

**Agreements in RAN4#103e:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type**  **(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 16. NR\_RF\_FR1\_enh | 16-8 | UE power class per band per band combination | Per band per band combination power class |  | Yes | N/A | Per band power class inconsistent | Per band per BC | No | FR1 only | N/A | [It is not applicable to the case when UL-MIMO and intra-band UL CA are in operation at the same time.] | Optional with capability signalling |

**Proposal in RAN#104-e**

Removing the note from description of UE feature of Power class per band per band combination.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type**  **(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 16. NR\_RF\_FR1\_enh | 16-8 | UE power class per band per band combination | Per band per band combination power class |  | Yes | N/A | Per band power class inconsistent | Per band per BC | No | FR1 only | N/A | ~~[It is not applicable to the case when UL-MIMO and intra-band UL CA are in operation at the same time.]~~ | Optional with capability signalling |

* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

Sub-topic 1-1: On UE power class per band per band combination

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Samsung | We support to remove the note.  With two related CRs approved in last meeting, more than 10 companies identify, recognize and are willing to resolve the power ambiguity issue. As we commented in last meeting, the power ambiguity issue does not exist in Intra-band UL CA scenario, UL MIMO scenario, and Intra-band ULCA+ UL MIMO scenario, specifically exclude one scenario is inappropriate. While power ambiguity issue was identified in inter-band CA scenario, and this new signaling exactly targets to resolve the ambiguity issue in inter-band CA which is reflected in the agreed CRs R4-2210764(Huawei) and R4-2210767(Qualcomm).  With above, we see no reason to keep the note. |
| Nokia(HU) | In the end, what is the exact meaning of per band per band combination? Does the capability apply to “single CC” or “intra band CA” per band per band combination as *powerClassNRPart-r16*? Some clarification is needed at least. |
| vivo | We support to remove the note in square bracket. |
| ZTE | Without this note, we are introducing new ambiguity issue when eliminating the old ambiguity issue, i.e., there is an ambiguity between two cases: (1) single band (1CC) + UL-MIMO (2) single band(2CCs) + UL-MIMO. This may originate from the RAN2 signaling design.  Another possible way out to remove this new ambiguity issue is to specify that the same power class are applicable for both cases above, i.e., another note is still needed. |
| OPPO | Remove is ok. But if companies think this capability is not needed for intra-band CA with/without UL MIMO, and only apply to inter-band CA, then probably replace the note as “only apply to inter-band combination” |
| HW | To Nokia  Thanks for the comment. Our understanding is either 1 CC or 2 CC on 1 band, the power class for the cell(s) are determined by [powerClassPerBand] for the given band, which is similar as *powerClassNRPart-r16.*  To ZTE:  Thanks for further clarifying your concern. The both cases you mentioned consist only 1 band, but the capability is intended for inter-band combinations. Not sure why UE would report this capability for the single band case given the capability is optional.  We share the similar view with Samsung, many more scenarios are not applicable. Maybe we could consider OPPO’s suggestion, and replace the note with ‘The capability applies to inter-band CA.’ |
| Apple | We are OK to remove the note. For clarity, we can add a note to clarify this feature group applies to in inter-band CA only or change the name of the feature group to “UE power class per band per band combination in inter-band CA.” |
| Samsung | Ok to add note “It is applicable to inter-band CA” . |
| Ericsson | The note/restriction can be removed (but further consideration in the second round recommended to ensure that removal of the restriction does not open up for relaxations of UL-MIMO power-class requirements). |
| Nokia(HU) | To: Huawei and all,  We think that applicable to “inter-band CA” only would create even more ambiguity, though it’s not wrong in an aspect.  The new IE is signalled per inter band CA. In this aspect, applicable to inter band CA is OK.  What we commented is the content of the IE.  BandCombination-v17xxx::= SEQUENCE { 🡨 per inter band combination is the side condition  powerClassXXXX-r17 ENUMERATED {pc1, pc2, pc3, pc5} OPTIONAL,  }  If a UE supports CA\_nXA-nYB (YC whatever), we are asking when one of the power class colored in yellow is reported, this also applies to intra band UL CA within an inter band CA or not.  If the answer is YES, that needs to be clarified. In RAN2 language, per band could be interpreted as single CC. |
| HW | To Nokia:  Our understanding is [powerClass….] would apply to nYB if UE reports that capability.  Currently the IE ue-PowerClassPerBandPerBC-r17 is included in FeatureSetUplink rather than FeatueSetUplinkPerCC as per TS 38.331. My understanding is RAN2 interpretation is aligned with RAN4 understanding. |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic #1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |
| Sub-topic 1-1: On UE power class per band per band combination | Recommendations for 2nd round:  Continue to discuss the following note in 2nd round:  [It is not applicable to the case when UL-MIMO and intra-band UL CA are in operation at the same time.]  [It is applicable to uplink inter-band CA.] |

## Discussion on 2nd round (if applicable)

Sub-topic 1-1: On UE power class per band per band combination

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type**  **(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 16. NR\_RF\_FR1\_enh | 16-8 | UE power class per band per band combination | Per band per band combination power class |  | Yes | N/A | Per band power class inconsistent | Per band per BC | No | FR1 only | N/A | [It is not applicable to the case when UL-MIMO and intra-band UL CA are in operation at the same time.]  [It is applicable to uplink inter-band CA.] | Optional with capability signalling |

Recommended WF:

Continue to discuss the note in 2nd round.

### Companies views’ collection for 2nd round

Sub-topic 1-1: On UE power class per band per band combination

|  |  |
| --- | --- |
| **Company** | **Comments** |
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# Topic #2: NR\_ext\_to\_71GHz

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2212118 | Intel Corporation | Adopt the UE feature listed in Table 1 for NR\_ext\_to\_71GHz. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 2-1: Improved ON/ON transient period

**Proposal in RAN#104-e:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | Consequence if the feature is not supported by the UE | Type | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 15-x | [Improved ON/ON transient period] | 1) Support of improved ON/ON transient period of [2us] | FFS | Yes | No | UE does not support improved ON/ON transient period and support 5us transient period | Per UE | N/A | Applicable to FR2-2 only | N/A | Further RAN4 discussion is required on whether to support improved ON/ON transient period and X value | Optional with capability signalling |

* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

Sub-topic 2-1: Improved ON/ON transient period

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| --- | --- |
| **Company** | **Comments** |
| Huawei | Pending discussion in thread [111] |
| Apple | Based on the discussion so far, we believe there is no consensus to have this feature in R17. It perhaps can be discussed in R18. |
| AT&T | We continue to support to include this optional capability in Rel-17. We had a compromise proposal in thread [111] that if we do not include in Rel-17, it should be clear that ON/ON transient period improvements can be considered in Rel-18 NR RF requirements enhancement for frequency range 2 (FR2) Phase 3 WID as companies have expressed in the past that they were willing to consider in Rel-18. |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic #1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |
| Sub-topic 2-1: Improved ON/ON transient period | Recommendations for 2nd round:  Continue to discuss in email thread [111]. No more discussion in this email thread in 2nd round. |

## Discussion on 2nd round (if applicable)

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |  |
| --- | --- | --- | --- |
| **New Tdoc number** | **Title** | **Source** | **Comments** |
|  | WF on … | YYY |  |
|  | LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  | Rel-17 RAN4 UE feature list for NR | *CMCC* |  |
|  | LS on Rel-17 RAN4 UE feature list for NR | *CMCC* | *To: RAN2; Cc:RAN1s* |

**Existing tdocs**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-22xxxxx |  | CR on … | XXX | s |  |
|  |  |  |  |  |  |
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Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-22xxxxx |  | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-22xxxxx |  | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-22xxxxx |  | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents