**3GPP T****SG-RAN WG4 Meeting#111**

**Fukuoka, Japan, 20 – 24 May 2024**

**Agenda item:** 12.3

**Source:** Moderator (Skyworks Solution Inc.)

**Title:** OfflineCommentTopic7&8 R19 baskets [110][105] NR\_Baskets\_Part\_1

**Document for:** Offline comments

# Introduction

AI 12.3 RAN4 basket WI work plan (according to WF R4-2403721)

* AI 12.3 Topic 1: Templates and guidelines
* AI 12.3 Topic 2: work plan and baskets

# AI 6.1 Topic #1: Band combination with intra-band ULCA

# Topic #2: Discussion on MSD test point for band combination with intra-band ULCA

# AI 6.1 Topic 3: Band combination with close proximity issues

# AI 6.1 Topic 4: Harmonic mixing

# AI 6.1 Topic 5: CR requiring attention from experts

# AI 6.1 Topic 6: Place holder: contributions transferred from block approval.

# AI 12.3 Topic #1: Templates and guidelines

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **Title** | **Company** | **Proposals / Observations** |
| **[R4-2408359](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408359.zip)** | Improved R19 TR templates for PC3 xUL/2DL inter-band NR CA/DC | ZTE Corporation, Sanechips | **Proposal: To approve the** **improved MSD table templates in Table 2.1, Table 2.2, Table 2.3 and Table 2.4 for R19 PC3 TR for 2 bands DL with x bands UL (x=1,2) inter-band NR CA/DC TR.****Proposal 2: To include the band group range table in the Annex part in the TR.**

|  |
| --- |
| FR1 band group range |
| Name | **FR1-a** | **FR1-b** | **FR1-c** | **FR1-d** | **FR1-e** |
| Range (MHz) | 600-1000 | 1400-2200 | 2300-2700 | 3300-5000 | 5150-7125 |
| Duplex mode | Mostly FDD | Mostly FDD | FDD and TDD | TDD only | TDD only |

**Proposal 3: Keep delta T/R part in the TR.****Proposal 4: To endorse the proposed R19 TR template in the section 5.****Moderator: some editorial changes to the R4#110b approved templates, changes may be merged with Skyworks, Nokia Templates for 2 bands and 3 bands** |
| **[R4-2407231](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407231.zip)** | Template for 2 band DL 1or2 band UL inter-band combination TR and TP | Skyworks Solutions Inc., Nokia | Proposed enhancements for 2DL/1or2UL bands block approval TP template for Release 19:• Addition at the end of section “5.XX.1.2 Channel bandwidths per operating band for CA” of:o A question related to the support of SimRx/Tx, or otherwise for TDD/TDD cases.o A table that sorts the applicable UL configuration and their related MSD studies• For the 2DL/1UL section:o The addition of a specific section for “Co-existence studies for 1UL band with 1CC” UL harmonic and harmonic mixing tables are updated in a matrix form with additional guidelines as approved in [2] A new calculation table for cross-band isolation MSD is added, as approved in [3]o The addition of a specific section for “Co-existence studies for 1UL band with 2CC intra-band” The IMD range table is updated and simplified as discussed in [4]• For this meeting, the delta T/R, REFSENS and OOB exception sections are not covered. However, these may be part of further guidelines/proposals on how to design MSD test points.• For the 2DL/2UL section:o Slightly updated 2DL 2UL with 1CC/band IMD table, with an analysis and note sectiono Added section “5.XX.2.2.1 Co-existence studies for 2UL band with 3CC (2CC intra-band in one band)”, with a calculation table that includes an analysis and note section, as discussed in [5]• The band group table used in [3] and [5], is added in Annex A (note that the last band group had an error as the starting frequency is 5150MHz and not 5250MHz).• The valid UL configurations up to Release 18 are listed in Annex B.**Moderator: some editorial changes to the R4#110b approved templates, changes may be merged with ZTE input** |
| [**R4-2407232**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407232.zip) | Template for 3 band DL 2 band UL inter-band combination TR and TP | Skyworks Solutions Inc., Nokia | Proposed enhancements for 3DL/2UL bands block approval TP template for Release 19:• Addition at the end of section “5.XX.1.2 Channel bandwidths per operating band for CA” of:o A table that sorts the applicable UL configuration and their related MSD studies• For this meeting, the delta T/R and REFSENS sections are not covered. However, these sections may be part of further guidelines/proposals on how to design MSD test points.• For the 2DL/2UL section:o Slightly updated 3DL 2UL with 1CC/band IMD table, including an analysis and note sectiono Added section “5.XX.2.2.1 Co-existence studies for 2UL band with 3CC (2CC intra-band in one band)”, with a calculation table that includes an analysis and note section, as discussed in [2]• The band group table used in [2], is added in Annex A (note that the highest band group had an error, as the starting frequency is 5150MHz and not 5250MHz).• The valid UL configurations up to Release 18 are listed in Annex B.**Moderator: 3DL band template based on the R4#110b approved templates, changes may be merged with ZTE input** |
| [**R4-2407394**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407394.zip) | On introducing a TP template for FDD intra-band CA with 1-2ULCC | Skyworks Solutions Inc. | Proposal on block approval template for FDD intra-band DLCA with 1 or 2 UL CC MSD:• Specification framework should mature further to enable a template that can be used in the block approval process.o For example, in terms of ACLR or IMD range to be considered, CBW to be used for PCC/SCC and related RB allocation placement.• The development of such template for block approval is however recommended to pursue in Release 19 with the following goals:o Detect potential MSD issues to PCC/SCC for FDD intra-band ULCA with one or two UL CCs. Both contiguous and non-contiguous DLCA are in scope.o The proponent can design the MSD test point to be evaluated based on restricted guidelines on PCC/SCC CBW and RB allocation placement.o The evaluation of the MSD value can then be proposed or evaluated within the “Not for block approval” AI by experts.• It is not proposed that A-MPR issues resulting from intra-band ULCA are treated by block approval and it should be noted that this applies to both FDD and TDD. |
| [**R4-2407443**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407443.zip) | MSD test point guidelines for 2 and 3 band DL TP | Skyworks Solutions Inc. | Proposal for two band DL TP templates to be developed in Release 19:• MSD test point templates are added in the relevant REFSENS sections for one UL band and two UL band of the two band DL TPs based on the specification format. This will cover:o UL harmonic, harmonic mixing and cross-band MSB table templates for 1UL band with one CCo Related IMD MSD table template for 1UL band with two CCo Related IMD MSD table template for 2UL band with one CC/bando Related IMD MSD table template for 2UL band with three CC• MSD test point templates are added in the REFSENS section for two UL band of the three band DL TPs based on the specification format. This will cover third band MSD for:o Related IMD MSD table template for 2UL band with one CC/bando Related IMD MSD table template for 2UL band with three CC• These tables will be followed by notes for the MSD test point design covering:o UL and DL CBWo UL LCRBo UL and DL channel location o UL RBstarto Those notes will not be needed in the submitted TP, but will allow that consistent MSD test points are proposed. |
| [**R4-2409318**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409318.zip) | Discussion on TR template for band combination basket WI | Huawei, HiSilicon | ***Proposal 1: To include RF reference architecture, assumptions for RF components and MSD analysis procedure into Rel-19 basket TR report.******Proposal 2: To introduce the following notes for distinguishing mandatory/non-mandatory cases in order to avoid specifying unnecessary cases.***Table 1: UL/DL harmonics collision table

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **UL/DLharmonics** | **nX** | **UL13** | **UL2** | **UL32** | **UL4** | **UL5** | **MSD type** |
| **fLow** | fULlow | 2\*fULlow | 3\*fULlow | 4\*fULlow | 5\*fULlow |
| **nY** | **fLow** | **fHigh** | fULhigh | 2\*fULhigh | 3\*fULhigh | 4\*fULhigh | 5\*fULhigh |
| **DL1** | fDLlow | fDLhigh | N/A |  |  |  |  | **UL harmonic** |
| **DL22** | 2\*fDLlow | 2\*fDLhigh |  | N/A |  | N/A | N/A | **Harmonic mixing** |
| **DL33** | 3\*fDLlow | 3\*fDLhigh |  |  | N/A |  | N/A |
| **DL4** | 4\*fDLlow | 4\*fDLhigh |  | N/A | N/A | N/A | N/A |
| **DL53** | 5\*fDLlow | 5\*fDLhigh |  |  | N/A | N/A | N/A |
| **Analysis** | text |
| **UL/DLharmonics** | **nY** | **UL13** | **UL2** | **UL32** | **UL4** | **UL5** | **MSD type** |
| **fLow** | fULlow | 2\*fULlow | 3\*fULlow | 4\*fULlow | 5\*fULlow |
| **nX** | **fLow** | **fHigh** | fULhigh | 2\*fULhigh | 3\*fULhigh | 4\*fULhigh | 5\*fULhigh |
| **DL1** | fDLlow | fDLhigh | N/A |  |  |  |  | **UL harmonic** |
| **DL22** | 2\*fDLlow | 2\*fDLhigh |  | N/A |  | N/A | N/A | **Harmonic mixing** |
| **DL33** | 3\*fDLlow | 3\*fDLhigh |  |  | N/A |  | N/A |
| **DL4** | 4\*fDLlow | 4\*fDLhigh |  | N/A | N/A | N/A | N/A |
| **DL53** | 5\*fDLlow | 5\*fDLhigh |  |  | N/A | N/A | N/A |
| **Analysis** | text |
| Note 1: When a collision is detected with an overlap >0Hz between the UL(X) with DL(Y) frequency ranges, the UL(X)/DL(Y) cell is marked “D” for direct hit. When the gap between UL(X) and DL(Y) frequency range is from 0Hz to X\*MinULCBW, the UL(X)/DL(Y) cell is marked “N” for Near miss.Note 2: UL3/DL2 harmonic mixing direct hit case for PC3/5 only apply for DL>3GHzNote 3: For harmonic mixing, near-miss cases only apply for UL1 and odd DL orders.Note 4: For Red parts, it is mandatory to specify MSD test configuration based on the previous practice in RAN4. For Yellow parts, whether to specify MSD test configuration depends on technical analysis and conditions, e.g. UL Power Class, components performance and frequency range. |

Table 3: Cross-band isolation analysis of CA\_nXA-nYA with nX and nY UL

|  |  |  |
| --- | --- | --- |
| **Bands3** | **nX** | **nY** |
| **Frequency limit** | **fx\_low / min** | **fx\_high / max** | **fy\_low / min** | **fy\_high / max** |
| **fUL (MHz)** |  |  |  |  |
| **fDL (MHz)** |  |  |  |  |
| **CBW (MHz)2** |  |  |  |  |
| **ACLR1 range** | fxULlow-maxULCBWx | fxULhigh+maxULCBWx | fyULlow-maxULCBWy | fyULhigh+maxULCBWy |
| **ACLR1 (MHz)** |  |  |  |  |
| **ACLR2 range** | fxULlow-2\*maxULCBWx | fxULhigh+2\*maxULCBWx | fyULlow-2\*maxULCBWy | fyULhigh+2\*maxULCBWy |
| **ACLR2 (MHz)** |  |  |  |  |
| **ACLR3 range** | fxULlow-3\*maxULCBWx | fxULhigh+3\*maxULCBWx | fyULlow-3\*maxULCBWy | fyULhigh+3\*maxULCBWy |
| **ACLR3 (MHz)** |  |  |  |  |
| **ACLR4 range** | fxULlow-4\*maxULCBWx | fxULhigh+4\*maxULCBWx | fyULlow-4\*maxULCBWy | fyULhigh+4\*maxULCBWy |
| **ACLR4 (MHz)** |  |  |  |  |
| **ACLR5 range1** | fxULlow-5\*maxULCBWx | fxULhigh+5\*maxULCBWx | fyULlow-5\*maxULCBWy | fyULhigh+5\*maxULCBWy |
| **ACLR5 (MHz)** |  |  |  |  |
| **Analysis** |  |  |
| NOTE 1: For Red parts, it is mandatory to specify MSD test configuration based on the previous practice in RAN4. For Yellow parts, whether to specify MSD test configuration depends on technical analysis and conditions, e.g. UL Power Class, filter performance and PA linearity performance. |

***Proposal 3: To consider the following template.*****Moderator: some recommendation changes to the R4#110b approved templates, changes may be merged with Skyworks, Nokia , ZTE Templates for 2 bands and 3 bands** |

## Open issues summary

### Sub-topic 7-1 Template for FDD intra-band DL CA with 1 or 2 UL CCs

**Issue 7-1:**

* Proposals: Proposal on block approval template for FDD intra-band DLCA with 1 or 2 UL CC MSD:

• Specification framework should mature further to enable a template that can be used in the block approval process.

o For example, in terms of ACLR or IMD range to be considered, CBW to be used for PCC/SCC and related RB allocation placement.

• The development of such template for block approval is however recommended to pursue in Release 19 with the following goals:

o Detect potential MSD issues to PCC/SCC for FDD intra-band ULCA with one or two UL CCs. Both contiguous and non-contiguous DLCA are in scope.

o The proponent can design the MSD test point to be evaluated based on restricted guidelines on PCC/SCC CBW and RB allocation placement.

o The evaluation of the MSD value can then be proposed or evaluated within the “Not for block approval” AI by experts.

* Recommended WF: Companies discuss whether intra-band FDD combination could be subject to block approval at least up to test point proposal and then MSD values may be discussed in not for block approval AI to get experts inputs.
	+ Discuss if template should be developed in R19
	+ Discussion is done offline and companies can provide their input in table below

Offline discussion comments

|  |  |
| --- | --- |
| **Company/Delegate** | **Comment** |
| Skyworks/Dominique | **We are interested to get feedback from the group if it makes sense to develop a TP to TR for FDD intra-band cases with 1/2 ULCC such that at least the issues are identified by proponent and possibly the associated test point parameters. The MSD value could still be left for discussion/expert input within the not for block approval AI. We believe that we could develop such a template by end of 2024.** |
| Qualcomm | We are not against this, but the amount of such combinations could be pretty limited. |
|  |  |
|  |  |
|  |  |

### Sub-topic 7-2 Template for 2DL band inter-band DL CA with 1 or 2 UL bands and up to 3CCs

**Issue7-2:**

* Proposals:

• **Skyworks Solutions Inc., Nokia.** Proposes in R4-2407231 a slightly updated (editorial only) TP template based on per MSD type templates approved in R4#110b

• **ZTE Corporation, Sanechips** proposes in R4-2408359 some editorial improvements to the per MSD type templates approved in R4#110b

• **Huawei, HiSilicon,** proposes in R4-2409318 some improvement to the per MSD type templates approved in R4#110b by adding mandatory/optional on harmonic and cross band related MSD orders

* Recommended WF:
* Inputs are very similar and does not revisit the technical aspects so it should be feasible to merge inputs after discussion,
* agreement can be captured captured in a revision of the overall template for 2 band DL from Skyworks, Nokia and co-signing as wished.
* Alternatively some agreements can be captured in a way forward
	+ Both can be led by ZTE as rapporteur
* Companies discuss the notion of MSD orders mandatory/optional to specify versus MSD orders to be considered (means needs to be analyzed and if necessary specified)
* Discussion is done offline and companies can provide their input in table below

Offline discussion comments

|  |  |
| --- | --- |
| **Company/Delegate** | **Comment** |
| Skyworks/Dominique | **We are fine with the proposals for the tables in ZTE R4-2408359. And are also OK to discuss if MSD orders should be defined as considered (ie specified if MSD value is not negligible) versus Mandatory/optional as proposed by Huawei (this is under the understanding that a company can flag a TP if it thinks an optional MSD should have been specified). Our preference would be to revise R4-2407231 or have a WF with the same similar content to capture all the changes and have a complete template.** |
| Qualcomm | We not see point and do not agree with dividing some requirements as mandatory/optional.  |
|  |  |
|  |  |
|  |  |

### Sub-topic 7-3 Template for 3DL band inter-band DL CA with 2 UL bands and up to 3CCs

**Issue7-3:**

* Proposals:

• **Skyworks Solutions Inc., Nokia.** Proposes in R4-2407232 a 3 band TP template based on relevant 2 band per MSD type templates approved in R4#110b

• Some proposals from **ZTE Corporation, Sanechips** **may be relevant for 3 band DL**

* Recommended WF:
* After discussion, agreement can be captured in a revision of the overall template for 3 band DL from Skyworks, Nokia and co-signing as wished.
* Alternatively some agreements can be captured in a way forward
	+ Both can be led by ZTE as rapporteur or Skyworks
* Discussion is done offline and companies can provide their input in table below

Offline discussion comments

|  |  |
| --- | --- |
| **Company/Delegate** | **Comment** |
| Skyworks/Dominique | **We believe that it is useful to have such a 3 band TP template and are open to revise based on further inputs and also further check valid triple beat tones for MSD in a third band.** |
| Qualcomm | This is beneficial |
|  |  |
|  |  |
|  |  |

### Sub-topic 7-4 Addition of guidelines on MSD test points for 2 and 3 DL band TPs.

**Issue 7-4:**

* Proposals: Proposal for two band DL TP templates to be developed in Release 19:

• MSD test point templates are added in the relevant REFSENS sections for one UL band and two UL band of the two band DL TPs based on the specification format. This will cover:

o UL harmonic, harmonic mixing and cross-band MSB table templates for 1UL band with one CC

o Related IMD MSD table template for 1UL band with two CC

o Related IMD MSD table template for 2UL band with one CC/band

o Related IMD MSD table template for 2UL band with three CC

• MSD test point templates are added in the REFSENS section for two UL band of the three band DL TPs based on the specification format. This will cover third band MSD for:

o Related IMD MSD table template for 2UL band with one CC/band

o Related IMD MSD table template for 2UL band with three CC

• These tables will be followed by notes for the MSD test point design covering:

o UL and DL CBW

o UL LCRB

o UL and DL channel location

o UL RBstart

o Those notes will not be needed in the submitted TP, but will allow that consistent MSD test points are proposed.

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* Recommended WF: Companies discuss whether MSD guidelines and templates should be added to 2 and 3 DL band TPs.
	+ Discuss if template should be developed in R19
	+ Discussion is done offline and companies can provide their input in table below

Offline discussion comments

|  |  |
| --- | --- |
| **Company/Delegate** | **Comment** |
| Skyworks/Dominique | **With current agreements, the template have tables for the detection of issues but no guidelines for the test point design. We think it would be beneficial to add those and we are sorry if we could not make this happen in time for the beginning of R19 baskets but we think we should be able to add those by end of 2024.** |
| Qualcomm | Ideally, this would be good but in practice may turn out to be challenging define especially MSD guidelines |
|  |  |
|  |  |
|  |  |

# Topic #2: work plan and baskets

## Companies’ contributions summary

Moderator: the detailled work plan for R19 can only be decided in next RAN plenary. The below documents are thus for discussion on whether RAN4 may have recommendations on the work plan. It is poroposed to discuss these offline between interested companies in a specific thread and check with Chiarman on how to capture potential RAN4 recommendations.

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **Title** | **Company** | **Proposals / Observations** |
| [**R4-2407545**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407545.zip) | Further discussion on RAN4 basket WI work plan | CATT | **Proposal 1: RAN4 to separate work items (WIs) that require non-block approval and those necessitating block approval. For instance,** **establish a dedicated low-low band combination, which falls under the non-block approval process.****Proposal 2: RAN4 to arrange a preliminary preparation teleconference just before RAN#104, specifically focused on the spectrum-related work items for Rel-19.** |
| [**R4-2407707**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2407707.zip) | Proposal for FDD+FDD Inter-band PC2 | T-Mobile USA | Proposal: Include FDD+FDD PC2 inter-band UL CA for FDD in the Release-19 inter-band CA-DC WID. |
| [**R4-2408450**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408450.zip) | Rel-19 WID Intra-band | Ericsson | Moderator: propose a WI for intra-band DL/UL CA for LTE with up to 3CC UL but say NRCA. Scope should be better clarified: Intra-band CA for NR or LTE? Number of DL and UL CCs in each case. |
| [**R4-2408451**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2408451.zip) | Rel-19 WID HPUE EN-DC | Ericsson | Moderator: propose a WI for HPUE\_FR1\_DC\_LTE\_NR\_R19 High power UE (power class m with 1<m<3) for a single FR1 band in UL of Dual Connectivity (DC) combinations of x bands (x=1,2,3, 4 for y=1 or x=1, 2 for y=2) LTE inter-band CA (xDL/1UL) and y bands NR inter-band CA (yDL/1UL)May need to clarify if intra-band ULCA is allowed as on of UL band UL configuration or not, also which BC and per band power class are covered |
| [**R4-2409191**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409191.zip) | On RAN4 basket WI work planning | Nokia | Proposal 1: The current LTE basket which contains all types of band combinations with only LTE bands should continue in Rel-19.Proposal 2: RAN4 shall consider the proposal for Rel-19 MR-DC baskets presented in Table 2.

|  |  |  |
| --- | --- | --- |
| **Current Rel-18 MR-DC Baskets:** | **New Rel-19 MR-DC Baskets:** | **TR?** |
| DC\_R18\_1BLTE\_1BNR\_2DL2UL | **DC\_1BLTE\_1BNR\_2DL2UL\_R19** | Yes |
| DC\_R18\_2BLTE\_1BNR\_3DL2ULDC\_R18\_xBLTE\_2BNR\_yDL2UL | **DC\_xBLTE\_yBNR\_3DL2UL\_R19**x + y = 3 | Yes |
| DC\_R18\_xBLTE\_1BNR\_yDL2ULDC\_R18\_xBLTE\_2BNR\_yDL2ULDC\_R18\_xBLTE\_yBNR\_zDL2ULDC\_R18\_xBLTE\_yBNR\_zDL3UL | **DC\_xBLTE\_yBNR\_zDLqUL\_R19**x + y > 33 ≤ z ≤ 62 ≤ q ≤ 3 (1BLTE\_1or2BNR) | No |

Proposal 3: RAN4 shall consider the NR CA/DC baskets as shown in Table 3.

|  |  |  |
| --- | --- | --- |
| **Current Rel-18 NR CA/DC Baskets:** | **New Rel-19 NR CA/DC Baskets:** | **TR?** |
| NR\_CA\_R18\_intra | **CA\_NR\_intra\_R19** | Yes |
| NR\_CADC\_R18\_2BDL\_xBUL | **CADC\_NR\_ 2BDL\_xBUL\_R19** | Yes |
| NR\_CADC\_R18\_3BDL\_xBUL | **CADC\_NR\_ 3BDL\_xBUL\_R19** | Yes |
| NR\_CADC\_R18\_yBDL\_xBUL | **CADC\_NR\_ yBDL\_xBUL\_R19**y > 3 | No |

Proposal 4: Rel-19 basket WIs should be power class agnostic.Proposal 5: RAN4 shall consider the HPUE baskets as shown in Table 4 as new and merge the remaining HPUE combinations into the other Rel-19 baskets.

|  |  |  |  |
| --- | --- | --- | --- |
| **Current Rel-18 HPUE Baskets:** | **New Rel-19 Baskets:** | **PC added to Rel-19 Basket(s)** | **PCs** |
| LTE\_NR\_HPUE\_FWVM\_REL18 | **HPUE\_FWVM\_LTE\_NR\_R19** |  | PC1 |
| HPUE\_NR\_FR1\_TDD\_R18 HPUE\_NR\_FR1\_FDD\_R18 | **HPUE\_FR1\_NR\_R19** |  | PC2 and PC1.5 |
| HPUE\_FR1\_TDD\_DC\_LTE\_NR\_R18 | No independent basket | **DC\_1BLTE\_1BNR\_2DL2UL\_R19****DC\_xBLTE\_yBNR\_3DL2UL\_R19****DC\_xBLTE\_yBNR\_zDLqUL\_R19** | PC2 and PC1.5 |
| HPUE\_NR\_FR1\_TDD\_intra\_CA\_R18 | No independent basket | **CA\_NR\_intra\_R19** | PC2 and PC1.5 |
| HPUE\_FR1\_TDD\_NR\_CADC\_SUL\_R18 HPUE\_FR1\_FDD\_NR\_CADC\_R18 | No independent basket | **CADC\_NR\_ 2BDL\_xBUL\_R19****CADC\_NR\_ 3BDL\_xBUL\_R19****CADC\_NR\_ yBDL\_xBUL\_R19** | PC2 and PC1.5 |

Table 4 – HPUE Basket Rel-19 proposal |
| [**R4-2409364**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_111/Docs/R4-2409364.zip) | Rel-19 WID NR Inter-band CA/DC for y bands DL with x bands UL (y=4,5,6, x=1,2) | Ericsson | Moderator: propose a WI for Rel-19 NR Inter-band CADC for y bands DL with x bands UL (y=4,5,6, x=1,2). The new part is 6 bands DL? |

## Open issues summary

### Sub-topic 8-1 need for baskets or combination types ”not for block approval”

**Issue 8-1:**

* Proposals 1: **CATT**:
* establish a dedicated low-low band combination, which falls under the non-block approval process.
* RAN4 to arrange a preliminary preparation teleconference just before RAN#104, specifically focused on the spectrum-related work items for Rel-19.
* Recommended WF
* Discuss if some combination types (including LBLB) need a separate WI with a “not for block approval” process.
	+ LBLB
	+ Others…?
	+ Uses block approval instead?

Offline discussion comments

|  |  |
| --- | --- |
| **Company/Delegate** | **Comment** |
| Skyworks/Dominique | **We do not have a strong opinion whether a dedicated WI is still needed but we still thank the LBLBand LBLBLB combinations requires the attention of experts and especially discuss the architecture and implementation aspects, at least for the cases for 2UL bands or intra-band CA in one UL.** |
|  |  |
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|  |  |
|  |  |

### Sub-topic 8-2 power class agnostic baslkets

**Issue 8-1:**

* Proposals 1: **Nokia**: Rel-19 basket WIs should be power class agnostic.
* Proposals 2: **Ericsson**: WI for HPUE\_FR1\_DC\_LTE\_NR\_R19
* High power UE (power class m with 1<m<3) for a single FR1 band in UL of Dual Connectivity (DC) combinations of x bands (x=1,2,3, 4 for y=1 or x=1, 2 for y=2) LTE inter-band CA (xDL/1UL) and y bands NR inter-band CA (yDL/1UL).
	+ Moderator: May need to clarify if intra-band ULCA is allowed as one of UL band UL configuration or not, also which BC and per band power class are covered
* Proposals 3: **TMO US**:
* Include FDD+FDD PC2 inter-band UL CA for FDD in the Release-19 inter-band CA-DC WID.
* Recommended WF
* Discuss if HPUE band combinations can be power class agnostic or have dedicated baskets
	+ Which cases are covered for HPUE? Which cases have general requirements covered?
	+ How are power class requested? Per BC + per band per BC?
	+ How is the sequence done and enforced?

Offline discussion comments

|  |  |
| --- | --- |
| **Company/Delegate** | **Comment** |
| Skyworks/Dominique | **In our view it depends on what the group decides on simplification of the HPUE MSDs. Also we still think the the PC3 part should be finalized before higher power classes are added so we are not sure how this may be enforced if everything get to block approval.** |
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### Sub-topic 8-3 baskets for R19

**Issue 8-1:**

* Proposals 1: **Ericsson**:
* WI for intra-band DL/UL CA for LTE with up to 3CC UL. Also include NRCA
	+ Moderator: Scope should be better clarified: Intra-band CA for NR or LTE? Number of DL and UL CCs in each case.
* WI for Rel-19 NR Inter-band CADC for y bands DL with x bands UL (y=4,5,6, x=1,2).
	+ Moderator: The new part is 6 bands DL?
* Proposals 2: **Nokia**:
* Proposal 1: The current LTE basket which contains all types of band combinations with only LTE bands should continue in Rel-19.
* Proposal 2: RAN4 shall consider the proposal for Rel-19 MR-DC baskets presented in Table 2.

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| --- | --- | --- |
| **Current Rel-18 MR-DC Baskets:** | **New Rel-19 MR-DC Baskets:** | **TR?** |
| DC\_R18\_1BLTE\_1BNR\_2DL2UL | **DC\_1BLTE\_1BNR\_2DL2UL\_R19** | Yes |
| DC\_R18\_2BLTE\_1BNR\_3DL2ULDC\_R18\_xBLTE\_2BNR\_yDL2UL | **DC\_xBLTE\_yBNR\_3DL2UL\_R19**x + y = 3 | Yes |
| DC\_R18\_xBLTE\_1BNR\_yDL2ULDC\_R18\_xBLTE\_2BNR\_yDL2ULDC\_R18\_xBLTE\_yBNR\_zDL2ULDC\_R18\_xBLTE\_yBNR\_zDL3UL | **DC\_xBLTE\_yBNR\_zDLqUL\_R19**x + y > 33 ≤ z ≤ 62 ≤ q ≤ 3 (1BLTE\_1or2BNR) | No |

* Proposal 3: RAN4 shall consider the NR CA/DC baskets as shown in Table 3.

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| **Current Rel-18 NR CA/DC Baskets:** | **New Rel-19 NR CA/DC Baskets:** | **TR?** |
| NR\_CA\_R18\_intra | **CA\_NR\_intra\_R19** | Yes |
| NR\_CADC\_R18\_2BDL\_xBUL | **CADC\_NR\_ 2BDL\_xBUL\_R19** | Yes |
| NR\_CADC\_R18\_3BDL\_xBUL | **CADC\_NR\_ 3BDL\_xBUL\_R19** | Yes |
| NR\_CADC\_R18\_yBDL\_xBUL | **CADC\_NR\_ yBDL\_xBUL\_R19**y > 3 | No |

* Proposal 5: RAN4 shall consider the HPUE baskets as shown in Table 4 as new and merge the remaining HPUE combinations into the other Rel-19 baskets.

|  |  |  |  |
| --- | --- | --- | --- |
| **Current Rel-18 HPUE Baskets:** | **New Rel-19 Baskets:** | **PC added to Rel-19 Basket(s)** | **PCs** |
| LTE\_NR\_HPUE\_FWVM\_REL18 | **HPUE\_FWVM\_LTE\_NR\_R19** |  | PC1 |
| HPUE\_NR\_FR1\_TDD\_R18 HPUE\_NR\_FR1\_FDD\_R18 | **HPUE\_FR1\_NR\_R19** |  | PC2 and PC1.5 |
| HPUE\_FR1\_TDD\_DC\_LTE\_NR\_R18 | No independent basket | **DC\_1BLTE\_1BNR\_2DL2UL\_R19****DC\_xBLTE\_yBNR\_3DL2UL\_R19****DC\_xBLTE\_yBNR\_zDLqUL\_R19** | PC2 and PC1.5 |
| HPUE\_NR\_FR1\_TDD\_intra\_CA\_R18 | No independent basket | **CA\_NR\_intra\_R19** | PC2 and PC1.5 |
| HPUE\_FR1\_TDD\_NR\_CADC\_SUL\_R18 HPUE\_FR1\_FDD\_NR\_CADC\_R18 | No independent basket | **CADC\_NR\_ 2BDL\_xBUL\_R19****CADC\_NR\_ 3BDL\_xBUL\_R19****CADC\_NR\_ yBDL\_xBUL\_R19** | PC2 and PC1.5 |

* Recommended WF
* Discuss WI types and number with an overall list first
	+ Should clarify number of DL bands for HPUE
		- only 1, 2 and 3? How many UL bands, how many UL CCs….
		- higher order covered by default?
		- Which sequence
	+ Which HPUE cases are ready for R19 in terms of general requirement?
	+ Are they all for block approval
	+ Which needs TR
	+ LTE as in R18
* Capture the overall RAN4 recommendation in a WF if agreeable

Offline discussion comments

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| --- | --- |
| **Company/Delegate** | **Comment** |
| Skyworks/Dominique | **We do not have a strong view on the number of baskets but we think the there two criteria that should drive this:****First Whether a band combination requires A-MPR MSD/coex studies and thus also need a sequence of specifying and other cases which only have DeltaT/R but no MSD study.** **Second load balancing in terms of TP/CR work for rapporteurs.****With this we believe that any >3DL band could be a single basket and CR work shared in a proper way. In this case no TP would be required, just draft CRs. For combinations that only require an entry to the spec and derivative of FR1 NRCA or ENDC (FR1+FR2,NRDC…) this could be a single basket with CRs created directly from the request.** |
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