**3GPP TSG-RAN** **WG2 Meeting #110-e R2-200xxxx**

**Electronic, June 1 – 12, 2020**

**Source: Qualcomm Incorporated**

**Title: Summary of email discussion [AT110e][021][NR15] UE cap Miscellaneous I**

**Document for: Decision**

**Agenda Item: 5.4.3.1**

# Introduction

This document summarizes the following email discussion.

* [AT110e][021][NR15] UE cap Miscellaneous I (Qualcomm)

Scope: Treat [R2-2005630](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2005630.zip), [R2-2005631](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2005631.zip), [R2-2005632](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2005632.zip), [R2-2005633](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2005633.zip), [R2-2004326](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2004326.zip), [R2-2005577](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2005577.zip), [R2-2005578](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2005578.zip), [R2-2004436](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2004436.zip), [R2-2004437](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2004437.zip) (proponents are responsible to explain and drive)

Part 1: Decision whether to make corrections or not, identify agreeable corrections. **Deadline: June 4, 0700 UTC.**

Part 2: For agreeable parts, continuation to agree CRs. **Deadline: June 10, 0700 UTC**

# Discussion: Part 1 (by June 4, 0700 UTC)

It is proposed to try to come to a set of agreeable proposals out of the documents listed above. For each set of CRs, companies are requested provide their views.

## UE Capability Enhancement for FR1 FR2 CA and DC ([R2-2005630](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2005630.zip), [R2-2005631](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2005631.zip), [R2-2005632](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2005632.zip), [R2-2005633](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2005633.zip))

These CRs propose to introduce the UE capabilities for support for PCell on FR1 FDD, FR1 TDD and/or FR2 in NR SA, EN-DC and NR-DC.

Separate capabilities are proposed for 4 types of CA within a CG.

1. FR1 TDD + FR1 FDD CA (2 bits)
2. FR2 + FR1 FDD CA (2 bits)
3. FR2 + FR1 TDD CA (2 bits)
4. FR1 TDD + FR1 FDD + FR2 CA (3 bits)

The above set of capabilities is introduced separately for:

1. NR SA (MCG of non-DC) and MCG of NR-DC
2. SCG of NR-DC
3. SCG of EN-DC

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| **Company name** | **Support / Not support** | **Comments** |
| Ericsson | yes | We **generally agree** that those different flavours of CA in a cell group are differ in terms of implementation and that IODT is likely not available for all at the same time. We **appreciate** that the new bits are proposed to be added **“per-UE”** and not inside all BCs!The signalling and field descriptions in the CRs are quite difficult to digest and decode/use. **We suggest using fields with well-defined names rather than a set of bitmaps**. And we propose to **group those fields in a new IE type** (**see below this table**). This type may then be instantiated several times if needed.We are not yet fully convinced that we have to distinguish those 9 cases in 3 different scenarios. Wouldn’t it be sufficient to **indicate those 9 cases just once in UE-NR-Capabilities**? If the UE indicates support for TDD/FDD CA it supports that in an NR MCG (NR-SA) and in an NR SCG used for EN-DC and in an NR SCG used for NR-DC (of course only if it supports NR-SA, EN-DC and NR-DC).Note that the current 38.306 misses the field descriptions for the EN-DC branch! But that is anyway not needed if we keep only the one branch for NR and apply it for all cases. |
| Nokia | Yes | Agree with the intention and support it for IODT purposes. Agree also that the solution for signalling should be simplified. |
| Huawei, HiSilicon |  | In LTE, there are very few cases that UE only supports PCell on FDD or TDD. In NR we don’t see the requirement for introducing such capability for the time being. Not sure if RAN2 can decide it directly, we need to ask RAN1/RAN4. |
| Samsung | Support | We agree to the intention of the CR and acknowledge that the proposed changes are aligned with LTE style. On the details for the changes, we tend to agree with Ericsson’s naming and structure. |
| NTT DOCOMO | Support | We also agree on the intention, whilst we prefer the details suggested by Ericsson. |
| OPPO | Support | We general agree to the intention of the CR. And we think Ericsson’s proposal on structure is simpler. But we also have some questions. For example, we are not sure why NGEN-DC and NE-DC are not covered here considering we are talking about a CA capability within a cell group? For NR-DC, so far only DC between FR1 and FR2 is supported, so we wonder how can this capability be applied to NR-DC? |
| vivo | Support | Using separate signaling fields (e.g. Ericsson’s proposal) is more succinct and straightforward. |

### [Ericsson] Alternative signalling structure and field descriptions

#### – *CarrierAggregationVariant*

The IE *CarrierAggregationVariant* informs the network about possible “placement” of the SpCell in an NR cell group.

*CarrierAggregationVariant* information element

-- ASN1START

-- TAG-CARRIERAGGREGATIONVARIANT-START

CarrierAggregationVariant ::= SEQUENCE {

 fr1fdd-FR1TDD-CA-SpCellOnFR1FDD ENUMERATED {supported} OPTIONAL,

 fr1fdd-FR1TDD-CA-SpCellOnFR1TDD ENUMERATED {supported} OPTIONAL,

 fr1fdd-FR2TDD-CA-SpCellOnFR1FDD ENUMERATED {supported} OPTIONAL,

 fr1fdd-FR2TDD-CA-SpCellOnFR2TDD ENUMERATED {supported} OPTIONAL,

 fr1tdd-FR2TDD-CA-SpCellOnFR1TDD ENUMERATED {supported} OPTIONAL,

 fr1tdd-FR2TDD-CA-SpCellOnFR2TDD ENUMERATED {supported} OPTIONAL,

 fr1fdd-FR1TDD-FR2TDD-CA-SpCellOnFR1FDD ENUMERATED {supported} OPTIONAL,

 fr1fdd-FR1TDD-FR2TDD-CA-SpCellOnFR1TDD ENUMERATED {supported} OPTIONAL,

 fr1fdd-FR1TDD-FR2TDD-CA-SpCellOnFR2TDD ENUMERATED {supported} OPTIONAL

}

-- TAG-CARRIERAGGREGATIONVARIANT-STOP

-- ASN1STOP

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| *CarrierAggregationVariant field descriptions* |
| ***fr1fdd-FR1TDD-CA-SpCellOnFR1FDD***Indicates whether the UE supports an FR1 FDD PCell/PSCell (and possibly SCells) when configured with an FR1 TDD SCell. |
| ***fr1fdd-FR1TDD-CA-SpCellOnFR1TDD***Indicates whether the UE supports an FR1 TDD PCell/PSCell (and possibly SCells) when configured with an FR1 FDD SCell. |
| ***fr1fdd-FR1TDD-FR2TDD-CA-SpCellOnFR1FDD***Indicates whether the UE supports an FR1 FDD PCell/PSCell (and possibly SCells) when configured with an FR1 TDD SCell and an FR2 TDD SCell. |
| ***fr1fdd-FR1TDD-FR2TDD-CA-SpCellOnFR1TDD***Indicates whether the UE supports an FR1 TDD PCell/PSCell (and possibly SCells) when configured with an FR1 FDD SCell and an FR2 TDD SCell. |
| ***fr1fdd-FR1TDD-FR2TDD-CA-SpCellOnFR2TDD***Indicates whether the UE supports an FR2 TDD PCell/PSCell (and possibly SCells) when configured with an FR1 FDD SCell and an FR1 TDD SCell. |
| ***fr1fdd-FR2TDD-CA-SpCellOnFR1FDD***Indicates whether the UE supports an FR1 FDD PCell/PSCell (and possibly SCells) when configured with an FR2 TDD SCell. |
| ***fr1fdd-FR2TDD-CA-SpCellOnFR2TDD***Indicates whether the UE supports an FR2 TDD PCell/PSCell (and possibly SCells) when configured with an FR1 FDD SCell. |
| ***fr1tdd-FR2TDD-CA-SpCellOnFR1TDD***Indicates whether the UE supports an FR1 TDD PCell/PSCell (and possibly SCells) when configured with an FR2 TDD SCell. |
| ***fr1tdd-FR2TDD-CA-SpCellOnFR2TDD***Indicates whether the UE supports an FR2 TDD PCell/PSCell (and possibly SCells) when configured with an FR1 TDD SCell. |

#### Instantiation of the new IE structure e.g. in Phy-ParametersCommon:

pCellPlacement CarrierAggregationVariant OPTIONAL

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| *Phy-ParametersCommon field descriptions* |
| ***pCellPlacement***Indicates whether the UE supports a PCell on FR1-FDD, FR1-TDD or FR2 depending on which additional SCells of other duplex modes are configured. |

#### and e.g. in Phy-ParametersMRDC (if needed there):

psCellPlacement CarrierAggregationVariant OPTIONAL

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| ***PHY-ParametersMRDC* field descriptions** |

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| ***psCellPlacement***Indicates whether the UE, when configured with EN-DC, supports a PSCell on FR1-FDD, FR1-TDD or FR2 depending on which additional SCells of other duplex modes are configured. |

## PDSCH RE mapping patterns ([R2-2004326](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2004326.zip), [R2-2005577](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2005577.zip), [R2-2005578](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2005578.zip))

In [R2-2004326](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2004326.zip), RAN1 indicates that they agreed on the following default values of the UE capability parameters:

- pdsch-RE-MappingFR1-PerSymbol: 10

- pdsch-RE-MappingFR1-PerSlot: 16

- pdsch-RE-MappingFR2-PerSymbol: 6

- pdsch-RE-MappingFR2-PerSlot: 16

The CRs, [R2-2005577](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2005577.zip), [R2-2005578](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2005578.zip), propose to capture the RAN1 agreement.

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| **Company name** | **Support / Not support** | **Comments** |
| Ericsson | yes | The CRs capture the RAN1 agreement and should as such be agreeable. Unfortunately, the RAN1 agreements contradicts RAN2’s general principle to avoid mixing rules with explicit signalling in capabilities. If there is a capability parameter, UEs shall set it if they support the feature. Therefore, it would be better to capture in 306 that ...“*The UE* ***shall set*** *the field to at least n10 for FR1 and n6 for FR2*” and “*The UE* ***shall set*** *the field to at least n16 for FR1 and FR2*” Only if there are known legacy UEs which do not set those fields but are confirmed to support those minimum values anyway, we should make an exception and specify also that “***In the exceptional*** *case that the UE does not include the fields, the* ***NW may anyway assume*** *that the UE supports the required minimum values*.”**Would other companies support/prefer that alternative as well?** |
| Nokia | Yes | Agree with Ericsson on the principle of capability signalling and would be good to align it. |
| Huawei, HiSilicon | Yes | Ok with description proposed by Ericsson, and prefer to also add the description for exceptional case to ensure backward compatibility. |
| CATT | Yes | We support this change. This is inline with ran1 guidance. |
| Samsung | Support | Fine for defining the default value if the fields are not signalled, it is safer way for all UEs which does not provide this capability in the field. |
| NTT DOCOMO | Yes | Agree to follow RAN2 principle, i.e. to signal the supported value explicitly rather than defining the implicit capability with a default value. |
| OPPO | Support  |  |
| vivo | Support | As these parameters are purely defined by RAN1, we can simply follow their agreements. |

## Signalling of NR-DC only band combination ([R2-2004436](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2004436.zip))

This document tries to obtain RAN2’s confirmation that the current UE capability signalling allows the UE to indicate band combinations supported with NR-DC, but not with NR CA:

***Proposal:*** *RAN2 to confirm that the current UE capability signalling allows the UE to declare band combinations where NR-DC is supported, but NR CA is not supported.*

The same document was discussed in the offline discussion [AT109bis-e][014][NR15] “UE Cap Miscellaneous I”. The discussion was postponed in the last meeting because one company wanted to check backward compatibility.

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| **Company name** | **Agree / Disagree** | **Comments** |
| Ericsson | Agree |  |
| Nokia | Agree |  |
| Huawei, HiSilicon |  | It is related to the offline 023, R2-2004972, prefer to discuss them together. |
| CATT |  | Ok with the intention, but does this require any change? |
| Samsung | Agree | We are fine for this proposal |
| OPPO | Agree |  |
| vivo | Agree |  |

## Clarification on supported NR-DC cell grouping ([R2-2004437](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_110-e/Docs/R2-2004437.zip))

This CR proposes to clarify the supported cell grouping for NR-DC in release-15.

* *a UE indicating support for NR-DC supports only configuration where all serving cells of the MCG are in FR1 and all serving cells of the SCG are in FR2.*

The same document was discussed in the offline discussion [AT109bis-e][014][NR15] “UE Cap Miscellaneous I”. The wording of the CR was improved during the offline discussion based on the comments received. The discussion was postponed because some companies indicated it may be already clear in specifications of other WGs. However no additional input was provided as to exactly where it is clarified.

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| **Company name** | **Support / Not support** | **Comments** |
| Ericsson | Agree |  |
| Nokia | Agree |  |
| Huawei, HiSilicon | Agree |  |
| Samsung | Agree |  |
| NTT DOCOMO | Agree |  |
| OPPO | Agree |  |
| vivo | Agree |  |

# Discussion: Part 2 (by June 10, 0700 UTC)

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# Conclusion

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# Reference

[1]