**3GPP TSG-RAN** **WG2 Meeting #112-e R2-200xxxx**

**Electronic, 2nd – 13rd November 2020**

**Agenda Item: 5.4.3**

**Source: Huawei, HiSilicon**

**Title: Summary of offline 013 Rel-15 UE caps III**

**Document for: Discussion and decision**

# Introduction

This document summarizes the following offline discussion for Rel-15 UE capability corrections.

* [AT112-e][013][NR15] UE caps III (Huawei)

Treat R2-2009480, R2-2008734, R2-2008770, R2-2008771, R2-2010241, R2-2010242, R2-2009392, R2-2009393, R2-2010239, R2-2010240, R2-2010545, R2-2010546, R2-2010561, R2-2010562

Intended outcome: Intermediate: Determine agreeable parts. Final: For agreeable parts, agreed CRs.

Deadline: Intermediate deadline(s) by Rapporteur, Final: Discussion stop at Wed Nov 11, 1200 UTC

# Contact from companies

|  |  |
| --- | --- |
| Company | Email |
| Qualcomm Incorporated | Masato Kitazoe <mkitazoe [at] qti.qualcomm.com> |
| Intel Corporation | Seau Sian Lim <seau.s.lim@intel.com |
| MediaTek Inc. | Nathan Tenny <nathan.tenny@mediatek.com> |
| OPPO | Qianxi Lu <qianxi.lu@oppo.com> |
| CATT | Erlin Zeng (erlin.zeng@catt.cn) |
| Ericsson | Lian Araujo <lian.araujo@ericsson.com> |
| Nokia | Amaanat (amaanat.ali@nokia.com) |
| ZTE | Wenting Li [<li.wenting@zte.com.cn>](mailto:%3cli.wenting@zte.com.cn%3e) Jing Liu <liu.jing30@zte.com.cn> |
| Apple | Ralf Rossbach (rrossbach[at]apple[dot]com) |
| Samsung | SK (kimsh23@samsung.com) |

# Discussion

## Part 1 discussion: to achieve agreeable principle

Part 1 discussion is focusing on reaching conclusion whether the proposals/CRs can be agreed in principle, and Part 2 discussion would then focus on detailed changes for those agreeable contributions.

*Note: Regarding R2-2010561, R2-2010562, as it was already discussed on Monday GTW, the current discussion did not cover these two contributions.*

### 3.1.1 Clarification on the capability of supportedNumberTAG

Discussion is in [1]. The intention is to indicate the support of 2TAGs in a subset of the band combination,and the following 2 options are proposed:

* **Option 1:** UE is required to support the different TAGs in the different bands if the TAG number < band entry number;
* **Option 2:** Introduce the association between the TAG and the band entries, e.g. via the cell grouping;

**Proposal 1: Adopt Option 1 or Option 2 for the *supportedNumberTAG*** **capability** **indication in the mix intra/inter-band BC.**

**Q1-1 Do companies agree with P1?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm Incorporated | Yes |  |
| Huawei, HiSilicon | No | Originally the capability is associated with the band entry, and in our understanding the network interprets the applicability of TAG for each added SCell of different band entry (regardless whether it is from the different or same bands), and the SCells added later will use same TAG as PCell. So with such a change, it is NBC for interpreting the capability especially for Rel-15. |
| MediaTek | Yes |  |
| OPPO | Yes |  |
| CATT | See comments | We first would like to understand whether this CR intends to change the current behaviour? If as Huawei commented this is NBC then we need further checking.  Then we think the concerned scenario is mainly when you have intra-band non continuous entries and or inter band entries in a BC, but UE only report a supported TAG number that is less than the number of band \* entries per band. This might only be a corner case, so no over specification is needed. |
| Ericsson | No | A UE setting supportedNumberTAG to something larger than 1 must support any set of contiguous carriers in any group. The reasoning in Rel-15 was that UEs would anyway serve each group of contiguous carriers by one RF chain and, if it supports several sets of contiguous UL carriers, it should also be able to handle those with different TAGs. There should be no difference between intra-band non-contiguous and inter-band non-contiguous, hence the change would be NBC. |
| Nokia | No | Which release this is for Rel-15 starting or just Rel-16? There is no real issue identified nor a clear problem statement of why this clarification is needed.  As this looks NBC change, we need time to check and cannot agree on this now. |
| ZTE(Wenting) | Yes | We think Apple ask a good question, we need some clarification for this case to avoid different understandings. |
| Apple | Yes | Proponent  If a UE is required to report the same TAG number as the number of band entries in one BC, a UE that supports multi-TA in inter-band only cannot indicate its multi TA capability in the mix intra/inter-band BC and the UE capability will be degraded. |
| Samsung | No | The text is inherited from LTE which was designed for 2 UL CA case. We tend to agree some change might be needed for more UL CA scenarios. However, it should be general to cover all important cases. We better have more time and discussion before agreeing on any change |
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**Q1-2 If companies agree with P1, which option is preferred and which release is expected to start the changes?**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Option 1/2** | **Release** | **Comments** |
| Qualcomm Incorporated | Option 1 and maybe Option 2 | Release-15 for Option 1. | Some clarification like option 1 is needed anyway even if we are to introduce an enhancement like option 2.  We understand the option 1 to mean that band entries from the same band (intra-band non-contiguous) shall be assigned into the same TAG. This looks to support typical deployment scenarios. Option 2 can be considered when companies (especially infra-vendors and operators) expect intra-band non-collocated topology to be important scenario. |
| Huawei, HiSilicon |  |  | As we stated above, this change seems NBC. If we want to use cell grouping to associate with different TAGs, it still needs to be first confirmed what is the default behaviour when such association is absent. |
| MediaTek | Option 1 | Rel-15 | We understand that if there is a mix of intra- and inter-bands in a BC, multiple TAGs should apply to inter-band only. So option 1 is a useful clarification. For option 2, it is a further enhancement and could be discussed if really needed. |
| OPPO | 1 | R15 | Option-2 is not feasible to interpret R15 UE behaviour, yet Option-1 requires further clarification if the number of TAG is larger than the number of inter-band entries in a BC (considering intra-band non-contiguous BC), i.e., whether that is not to happen or if that can happen, how to interpret the applicability for the TAG to the blocks in a same band. |
| Ericsson |  |  | The change would be NBC, see comments above. |
| ZTE(Wenting) | Option 1 | Release-15 | We think option 1 is acceptable if the UE vendors have the same understanding. |
| Apple | Option 1 and maybe Option 2 | Rel-15 for Option 1 | Option 2 can cover all cases, but it is not appropriate for Rel-15. We can use option 1 in Rel-15 and consider option 2 in Rel-16. |
| Samsung |  |  | For option 1, we should discuss it with whole picture rather than focusing only on a specific case. For option 2, we are not sure whether applying cell grouping concept here is the best way to go. |
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### 3.1.2 Clarification on RAN4 features of NE-DC

The corresponding LS and CRs are in [2]-[6]. The main intention is to clarify the applicability of some features for NE-DC. The two sets of the CRs are quite similar and the major differences are whether to also have changes for some MR-DC parameters. So it could be discussed first and then decide which set of CRs is used as the baseline.

**Q2-1 Do companies agree *syncIntraBandENDC*, *intraBandENDC-Support* and *UL-TimingAlignmentEUTRA-NR* are applied to NE-DC as proposed in [3][4]?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm Incorporated | Yes | Proponent |
| Huawei, HiSilicon | No | We understand the reply from RAN4 is corresponding to the context of SupportedBandwidthCombinationSet, and thus we are not sure whether the reply from RAN4 is actually expanded to all features defined in RAN4. In addition there seems ongoing discussion in RAN4 on further clarifying intraBandENDC-Support, and we think it is safer to wait to see RAN4 agreement first. |
| MediaTek | No | We have the same understanding as Huawei that the RAN4 reply is about the supportedBandwidthCombinationSet; we didn’t ask them about the other parameters. The change may be right but it seems premature to make it without further clarification. |
| OPPO | Yes | Proponent |
| CATT | No | We agree with Huawei and MTK. |
| Ericsson |  | We agree with the intention of the CR, but we would be fine to wait for RAN4. |
| Nokia | No | Agree with HW, MTK and Ericsson. Wait for RAN4 to progress and not speculate in RAN2. |
| ZTE(Wenting) |  | We agree with the intention, maybe it’s a safer way to wait for RAN4 as other company suggested. |
| Apple | No | We also think it is better to confine the set of capabilities to those indicated in the RAN4 LS at this point in time. |
| Samsung | No | We tend to agree with the intention of the CR, but also agree that the decision shall be made after RAN4 discussion is concluded. |
|  |  |  |

**Q2-2 Do companies agree with other changes for BandCombinationList and CA-ParametersEUTRA listed in [3][4][5][6]?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm Incorporated | Yes | Proponent |
| Huawei, HiSilicon | Yes | Proponent |
| MediaTek | Yes | This seems in line with the RAN4 reply. |
| OPPO | Yes | Proponent |
| CATT | Yes |  |
| Ericsson | Yes |  |
| ZTE(Wenting) | Yes |  |
| Apple | Yes |  |
| Samsung | Yes |  |
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**Q2-3 Please indicate which release to start adopting the changes if companies support in general to have the above changes?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Release** | **Comments** |
| Qualcomm Incorporated | Release-15 | Proponent |
| Huawei, HiSilicon | Release-15 |  |
| MediaTek | Rel-15 |  |
| OPPO | R15 | Proponent |
| CATT | R15 |  |
| Ericsson | Rel-15 |  |
| ZTE(Wenting) | Rel-15 |  |
| Apple | Rel-15 |  |
| Samsung | R15 |  |
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### 3.1.3 Correction on PDCP duplication capability for NR-DC

The CRs are in [7][8], and the intention is to add duplication related capabilities specifically for NR-DC.

**Q3 Do companies agree with the major principle of the CRs? If yes, please indicate the starting release for the changes.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Yes/No** | **Release** | **Comments** |
| Qualcomm Incorporated | Yes | Release-15 |  |
| Huawei, HiSilicon | Yes | Release-15 | Proponent |
| Intel | Yes | Rel-15 |  |
| MediaTek | Yes | Rel-15 |  |
| OPPO | Yes | R15 |  |
| CATT | Yes | R15 |  |
| Ericsson | Yes | Rel-15 |  |
| Nokia | Yes | Rel-15 |  |
| ZTE(Wenting) | Yes | Rel-15 |  |
| Apple | Yes | Rel-15 |  |
| Samsung | Yes | R15 |  |

### 3.1.4 Clarification on handover capability

The CRs are in [9][10], and the main intention is to clarify how to interpret the FDD/TDD and FR1/FR2 differentiation.

**Q4 Do companies agree with the major principle of the CRs? If yes, please indicate the starting release for the changes.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Yes/No** | **Release** | **Comments** |
| Qualcomm Incorporated | Yes | Release-15 | Our understanding has been that the handoverInterF indicates the UE capability “within” duplex mode or “within” frequency range. But we can accept the changes as proposed in the CRs, since we see some UE implementations may benefit from it. |
| Huawei, HiSilicon | Yes | Release-15 | Proponent  We understand FDD-TDD or FR1-FR2 handover capabilities are special cases for inter-frequency handover, and thus handoverInterF has to be supported. Actually in the agreed CR R2-1819056 it was already clarified that when the UE includes inter-frequency handover capability in UE-NR-CapabilityAddXDD-Mode or in UE-NR-CapabilityAddFRX-Mode, the duplex mode or the frequency range corresponds to that of the source cell. So we understood consequently there is no limitation on the target cell and thus it is in line with our proposal. |
| Intel | Yes for the Rel-15 CR | Rel-15 | The rel-16 CR is not purely a shadow as it contains changes to rel-16 capability on CHO. We would prefer this part to be discussed in Rel-16 eMOB. |
| MediaTek | Yes | Rel-15 | We understand the capabilities refer to the duplexing mode/frequency range of the source cell, so the CR doesn’t seem to make a functional change; but OK to have it as a clarification. |
| OPPO | Yes | Rel-15 | Same view as MTK. |
| CATT | Yes | Rel-15 | We also understand that these changes do not intend to change the current behaviour, so OK. Regarding Intel comment on R16 CR, it seems cat F, not A. |
| Ericsson | Yes | Rel-15 | Same view as Huawei. |
| Nokia | No | - | Maybe it is logically correct that HO FDD-TDD or HO FR1-FR2 is supported when the UE also supports HO for inter frequency. But does it have to be said explicitly in the descriptions?  For Rel-15 this really seems non-essential correction and if anything we can merge this to miscellaneous corrections. |
| ZTE(Jing Liu) | No | N/A | The definition of handoverFDD-TDD says: ”indicates whether the UE supports HO between FDD and TDD”, so when UE reports the capability, it implies the UE supports bidirectional handover (i.e. FDD to TDD, and TDD to FDD).  Now what proposed in the CR changes the meaning of the capability, which is NBC to network implementation. For handoverInterF capability, RAN2 clarified it is based on the duplex mode of serving cell, but RAN2 never clarifies handoverFDD-TDD refers to the duplex mode of serving cell, because it is meant to support both directions.  We understand what proposed in the CR provides more flexibility to the supported handover scenario. Such as a UE supports “intra-FDD handover” and does not support “intra-TDD handover”, can still support “handover from FDD to TDD”. However, in our view, the necessity of supporting such scenario is questioned. Like network can move UE from FDD to TDD, but after, the UE can never be moved back, or even do inter-freq handover within TDD.  So in short, we think the CR changes current behaviour, and it causes NBC issue. |
| Apple | Yes, with comment | Rel-15 | According to our understanding the first change in the CR allows for another differentiation between inter-frequency and FR1-FR2 respectively FDD-TDD handover. That looks ok; however, the case is not immediately clear from the table B.1 in annex B. We find the updated parameter definition of *handoverInterF* can be improved for that.  Would the following be acceptable?  ***handoverInterF***  Indicates whether the UE supports inter-frequency HO. It indicates the support for inter-frequency HO from the corresponding duplex mode and frequency range indicated to be supported if this capability is included in any combination of *fdd-Add-UE-NR-Capabilities,* *tdd-Add-UE-NR-Capabilities*, *fr1-Add-UE-NR-Capabilities, fr2-Add-UE-NR-*Capabilities as described in Annex B. This field only applies to NR SA/NR-DC/NE-DC (e.g. PCell handover). For PSCell change when (NG)EN-DC/NR-DC is configured, this feature is mandatory supported.  The second change in the CR is fine as is. |
| Samsung | Yes | R15 | Wording can be improved.  from the corresponding duplex mode and frequency range for which *handoverInterF* is supported. |

### 3.1.5 Clarification on xDD differentiation

The CRs are in [11][12]. The main intention is to clarify how FDD/TDD differentiation applies to rsrqMeasWidebandEUTRA.

**Q5 Do companies agree with the major principle of the CRs? If yes, please indicate the starting release for the changes.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Yes/No** | **Release** | **Comments** |
| Qualcomm Incorporated | Yes | Release-15 | Release-16 CR (Cat.F) deals with other UE capabilities. We are fine with those other changes as well. |
| Huawei, HiSilicon | Yes | Release-15 |  |
| Intel | Yes | Rel-15 |  |
| MediaTek | Yes | Rel-15 |  |
| OPPO | Yes | R15 |  |
| CATT | Yes | R15 |  |
| Ericsson | Yes | Rel-15 |  |
| Nokia | Yes | Rel-15 |  |
| ZTE(Wenting) | Yes | Rel-15 |  |
| Apple | Yes | Rel-15 |  |
| Samsung | Yes | R15 |  |

## Part 1 discussion summary

### 3.2.1 Clarification on the capability of supportedNumberTAG

10 companies joined the discussion. 5 companies support the change, 4 companies think the change is NBC and 3 companies want more time to check. There is no clear majority on which direction to go and seems companies need more time to check inter-operability. It is then suggested to postpone the CR and allow companies to check further.

Proposal 1: [R2-2009480](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2009480.zip) is postponed to allow companies to check further.

### 3.2.2 Clarification on RAN4 features of NE-DC

9 companies joined the discussion. 2 companies supported to have changes on syncIntraBandENDC, intraBandENDC-Support and UL-TimingAlignmentEUTRA-NR and 5 companies assume the context of the LS from RAN4 is for SupportedBandwidthCombinationSet and better to get confirmation with RAN4 before having the change. 2 companies are fine with the intention but also fine to wait for RAN4. As no consensus, it is suggested not to have this change at this RAN2 meeting, and companies can check RAN4 status further.

All companies agree with the other changes in [3][4][5][6] and also agree to have the changes since Rel-15. As CRs in [5][6] did not include the above controversial part, it is therefore proposed to use CRs in [5][6] as the baseline for further checking the changes.

Proposal 2: [R2-2010241](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2010241.zip)and [R2-201024](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2010241.zip)2 are pursued assuming changes are from Rel-15. Detailed comments to the CRs, if any, can be discussed in Part 2.

### 3.2.3 Correction on PDCP duplication capability for NR-DC

11 companies joined the discussion and all agree with the principle of the CRs, and all agree to change from Rel-15.

Proposal 3: [R2-2009392](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2009392.zip) and [R2-200939](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2009392.zip)3 are pursued assuming changes are from Rel-15. Detailed comments to the CRs, if any, can be discussed in Part 2.

### 3.2.4 Clarification on handover capability

11 companies joined the discussion, 9 companies support the change and there are some detailed wording comments which can be addressed later. 1 company think the logic is right but not necessarily to be clarified, and 1 company think it is NBC. 1 company think Rel-16 changes might need to take CHO into account. As only one company has real different views, it seems having chance to converge and thus it is suggested to continue the discussion, aiming to reach consensus.

Proposal 4: to online decide whether to pursue [R2-2010239](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2010239.zip) and [R2-20102](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2010239.zip)40.

### 3.2.5 Clarification on xDD differentiation

11 companies joined the discussion and all agree the change in principle. In addition all companies agree this change should be started from Rel-15.

Proposal 5: [R2-2010545](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2010545.zip) and R2-2010546 are pursued assuming changes are from Rel-15. Detailed comments to the CRs, if any, can be discussed in Part 2.

## Part 2 discussion and Summary: CR details review Phase

### 3.3.4 Clarification on handover capability (further discussion)

[R2-2010239](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2010239.zip) Clarification on the inter-frequency handover capability Huawei, HiSilicon, Ericsson CR Rel-15 38.306 15.11.0 0438 - F NR\_newRAT-Core

DISCUSSION On-LIne

- ZTE think this is NBC, as the previous text says “between” i.e. double direction. ZTE are wondering if these scenarios are really supported by UEs, if not there is no reason to change. Huawei indicate that all others support this change, but agrees that it depends how the UE reports this.

- Ericsson think the correction is correct.

- MTK see this as a clarification.

- Nokia wonder if we can have time to check.

- Ericsson think maybe with some clarifications, common UE cap may be compatible with the previous text.

* CB Thursday, time to check.

[R2-2010240](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2010240.zip) Clarification on the inter-frequency handover capability Huawei, HiSilicon, Ericsson CR Rel-16 38.306 16.2.0 0439 - F NR\_newRAT-Core

Based on the online discussion, below the potential reporting, taking XDD as an example, is listed. Based on the feedback we can proceed forward.

So currently we have two understanding:

Understanding 1 (from the majority of companies): handoverFDD-TDD is from FDD or from TDD

Understanding 2 (from ZTE): handoverFDD-TDD means both directions

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| --- | --- | --- | --- | --- |
|  | **handoverInterF** | **HandoverFDD-TDD** | **Interpretation for Understanding 1** | **Interpretation for Understanding 2** |
| Case 1 | No support | No support | No support of handover within NR | No support of handover within NR |
| Case 2 | No support | Support | Not a valid case | Not a valid case |
| Case 3 | Support FDD | No support | Only inter-frequency handover within FDD is supported | Only inter-frequency handover within FDD is supported |
| Case 4 | Support FDD | Support | Inter-frequency handover from FDD mode is supported  FDD->TDD handover is supported | Not a valid case |
| Case 5 | Support TDD | No Support | Only inter-frequency handover within TDD is supported | Only inter-frequency handover within TDD is supported |
| Case 6 | Support FDD | Support | Inter-frequency handover from TDD mode is supported  TDD->FDD handover is supported | Not a valid case |
| Case 7 | Support FDD&TDD | No support | inter-frequency handover within FDD is supported  inter-frequency handover within TDD is supported | inter-frequency handover within FDD is supported  inter-frequency handover within TDD is supported |
| Case 8 | Support FDD&TDD | Support | All kinds of handover within NR is supported | All kinds of handover within NR is supported |

**Please companies provide feedback on the above table, especially from UE perspective, whether Case 4 and Case 6 is a possible reporting. If this is assumed as a possible reporting, we have to deal with these two cases.**

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| **Company** | **Yes/No** | **Comments** |
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# Reference

1. [R2-2009480](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2009480.zip) Clarification on the capability of supportedNumberTAG Apple
2. [R2-2008734](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2008734.zip) Reply LS on Clarification on RAN4 features of NE-DC (R4-2011688; contact: Samsung)
3. [R2-2008770](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2008770.zip) Correction for RAN4 features of NE-DC OPPO, Qualcomm Incorporated CR
4. [R2-2008771](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2008771.zip) Correction for RAN4 features of NE-DC OPPO, Qualcomm Incorporated CR
5. [R2-2010241](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2010241.zip) Clarification on NE-DC for bandwidth combination set Huawei, HiSilicon, Samsung
6. [R2-2010242](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2010242.zip) Clarification on NE-DC for bandwidth combination set Huawei, HiSilicon, Samsung
7. [R2-2009392](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2009392.zip) Corrections on PDCP duplication capability for NR-DC Huawei, HiSilicon
8. [R2-2009393](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2009393.zip) Corrections on PDCP duplication capability for NR-DC Huawei, HiSilicon
9. [R2-2010239](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2010239.zip) Clarification on the inter-frequency handover capability Huawei, HiSilicon, Ericsson
10. [R2-2010240](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2010240.zip) Clarification on the inter-frequency handover capability Huawei, HiSilicon, Ericsson
11. [R2-2010545](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2010545.zip) Clarification on UE capabilities with FDD/TDD differentiation Ericsson, ZTE Corporation, Sanechips
12. [R2-2010546](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_112-e\Docs\R2-2010546.zip) Clarification on UE capabilities with FDD/TDD differentiation Ericsson, ZTE Corporation, Sanechips