3GPP TSG-RAN WG2 #113bis-e R2-21xxxxx

Electronic Meeting, 12th – 20th April 2021

Agenda Item: 8.17

Source: ZTE Corporation

Title: Report of [AT113bis-e][025][NR17] R4 related I

Document for: Discussion, Decision

# 1 Introduction

This document is to kick off the following email discussion:

* **[AT113bis-e][025][NR17] R4 related I (ZTE)**

 Scope: Treat Handover with PSCell and 35MHz 45MHz Bandwidth R2-2102652, R2-2103032, R2-2103340, R2-2103862, R2-2103863, R2-2104133, R2-2104155, R2-2103033, R2-2103034, R2-2104156, R2-2104249, R2-2104250, R2-2104251

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

 Intended outcome: Report and Agreed-in-principle CRs, Approved LS out, if applicable

 Deadline: Schedule A

* Phase 1: collect companies’ view, by Wednesday April 14 1000 UTC

# Contact Information

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| --- | --- | --- |
| Company | Contact | Email |
| ZTE | LiuJing | liu.jing30@zte.com.cn |
| Wenting Li  | li.wenting@sanechips.com.cn |
| Qualcomm  | Peng Cheng  | chengp@qti.qualcomm.com  |
| Masato Kitazoe  | mkitazoe@qti.qualcomm.com |
| Huawei, HiSilicon | Yang Zhao | zhaoyang@huawei.com |
| OPPO | Shukun Wang | wangshukun@oppo.com |
| MediaTek | Felix Tsai | Chun-fan.tsai@mediatek.com |
| Apple | Fangli XU | fangli\_xu@apple.com |
| Samsung | Sangyeob Jung | sy0123.jung@samsung.com |
| Ericsson | Håkan Palm | hakan.l.palm@ericsson.com |
| vivo | Yangxiaodong  | Yangxiaodong5g@vivo.com |

# 2 Discussion

Companies are requested to add their comments for each of the treated CRs of this email discussion in the boxes below.

## 2.1 Handover with PSCell

*LS from RAN4:*

[R2-2102652](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113bis-e%5CDocs%5CR2-2102652.zip) LS on handover with PSCell (R4-2103674; contact: Apple) RAN4 LS in Rel-17 NR\_RRM\_enh2-Core To:RAN2 Cc:-

*Discussion papers and LS including company views:*

[R2-2103032](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113bis-e%5CDocs%5CR2-2103032.zip) Discussion on handover with PSCell ZTE Corporation, Sanechips discussion Rel-17 NR\_RRM\_enh2-Core

[R2-2103340](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113bis-e%5CDocs%5CR2-2103340.zip) Response LS to RAN4 on HO with PSCell requirements Nokia, Nokia Shanghai Bell LS out Rel-17 NR\_RRM\_enh2-Core To:RAN4

[R2-2103862](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113bis-e%5CDocs%5CR2-2103862.zip) Clarification on handover with PSCell Apple discussion Rel-17 NR\_RRM\_enh2-Core

[R2-2104133](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113bis-e%5CDocs%5CR2-2104133.zip) Discussion on RAN4 LS on handover with PSCell Huawei, HiSilicon discussion Rel-17 NR\_RRM\_enh2

[R2-2104155](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113bis-e%5CDocs%5CR2-2104155.zip) Discussion of LS on Handover with PSCell from RAN4 CATT discussion Rel-17 NR\_RRM\_enh2-Core

### 2.1.1 RRC processing delay

RAN4 asks RAN2 about the RRC processing delay for several combined scenarios. In this section, we will discuss them one by one.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Scenario | Source PCell | Target PCell | Target PSCell | RRC procedure delay for HO with PSCell |
| NR SA to EN-DC | NR (incl. FR1 and FR2) | LTE | NR (incl. FR1 and FR2) | ?  |
| EN-DC to EN-DC | LTE | LTE | NR (incl. FR1 and FR2) | ? |
| NE-DC to NE-DC | NR FR1 | NR FR1 | LTE | ? |
| NR-DC to NR-DC | NR FR1 | NR FR1 | NR FR2 | ? |

*Case 1: NR SA to EN-DC*

Company proposals are summarized as below:

* Option 1: 50ms, same as for inter-RAT handover from NR to E-UTRAN. ----ZTE;
* Option 2: 70ms, “NR to LTE HO (50ms)” plus “NR PSCell addition (20ms)”. ---Apple;
* Option 3: 20ms, same as NR SCG establishment/modification/release. ---CATT;
* Option 4: 16ms, no need to differentiate those cases. ---Nokia;
* Option 5: up to RAN4 to decide. ---HW.

Note: RRC segmentation is not considered.

Different values of RRC processing delay are proposed. Based on current RAN4 spec, the RRC processing delay of inter-RAT handover (without adding PSCell) is defined by RAN4, so rapporteur agree this scenario can also be captured in RAN4 spec. However, based on RAN4’s LS, we can see RAN4 is uncertain about the processing delay for handover from NR SA to EN-DC, and they are expecting some inputs from RAN2. So from RAN2 point of view, rapporteur thinks we can provide some guidance instead of completely leave it to RAN4.

Considering RRC processing delay of inter-RAT handover from NR to E-UTRAN is 50ms. Rapporteur understands the delay of this procedure cannot be smaller than 50ms. But companies are invited to show your views.

**Q1.1: Which option do you support for the RRC processing delay for “NR to EN-DC”?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option ½/3/4/5?** | **Comments** |
| ZTE | Option 1 (Proponent) | In LTE, the same RRC processing delay (20ms) is defined for “SN setup/change” and “intra-LTE mobility with SN setup/change”. So we think the same principle can also be applied here. E.g. to adopt the same RRC processing delay (50ms) for “inter-RAT handover from NR to E-UTRAN” and “NR to EN-DC”. We can inform RAN4 this value, and asks RAN4 to capture it in TS 38.133.  |
| Qualcomm | Option 1 | We also think 50ms for inter-RAT HO defined in 36.133 can be reused for NR SA to EN-DC.Same view as ZTE that we inform RAN4 the suggested value and they can further discuss (if needed). Because it is RAN4 to ask RAN2 the question, we prefer at least provide a suggested value to RAN4. |
| Huawei, HiSilicon | Option5 | For RRC processing delay happens only within one RAT, we agree RAN2 can decide. But for inter-RAT, the HO procedure also involves cross RAT handling (e.g. the source RAT RRC message sent to UE contains target RAT HO command, the target RAT may need some time to start up), that is why for inter-RAT HO there is no explicit value of RRC processing delay requirement captured in LTE RRC spec but to refer to RAN4 spec.In addition, here the “50ms for HO from NR to LTE” is decided by RAN4 and comes from RAN4 spec, we do not see the need that RAN2 re-confirm to reuse this value for “HO from NR to EN-DC” to RAN4. |
| OPPO | Option 5 | The RRC processing delay for inter-RAT HO in LTE is defined in RAN4 spec, so the inter-RAT HO with SCG in LTE should also be defined by RAN4. The value should not smaller than 50ms.====copy from 36.331=====6.1.2.1.2 Handover delayWhen the UE receives a RRC message implying handover to E-UTRAN the UE shall be ready to start the transmission of the uplink PRACH channel in E-UTRA within Dhandover ms from the end of the last TTI containing the RRC command. Dhandover is defined as Dhandover = TRRC\_procedure\_delay + TinterruptWhere:TRRC\_procedure\_delay: it is the RRC procedure delay, which is 50ms |
| MediaTek | Option 5 or option 1 | This 50ms is defined by RAN4, so we think RAN4 can make this decision also inter-RAT handover to EN-DC. We assume that same 50ms could be used.  |
| Apple | Option1, Option2 | 50ms delay is defined in RAN4 spec (38.133) for the NR->LTE SA inter-RAT HO. So at least for the delay of NR->EN-DC HO should be equal to or larger than 50ms. About the NR->EN-DC HO, it can be regarded as the NR->LTE inter-RAT HO plus NR PSCell addition. NR->EN-DC HO = inter-RAT HO + NR PSCell addition in LTE.Therefore, the delay can be regarded as the sum of the two part, i.e. 50+20=70ms. |
| Samsung | Option 1 with some comments | We also think 50ms can be baseline. For intra LTE mobility delay is 15ms without SCG and 20ms with NR SCG, so at most it would add 5ms additionally, if required.  |
| Ericsson | Option 1 | We also think 50ms for inter-RAT HO defined in 36.133 can be reused for NR SA to EN-DC. |
| Intel | Option 5 or option 1 | The 50ms for Inter RAT HO was defined in RAN4, so we could rely on RAN4 or assume same value for NR to EN-DC.  |
| Nokia | Option 4 or Option 5 | If the question was only about processing delay, then we thought Option 4 is OK. However, regarding the overall delay of the RRC procedure, we think this shall be checked in .133 specifications (thus Option 5). |

**Summary:**

Company inputs are summarized in below table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Option 1 | Option 2 | Option 3 | Option 4 | Option 5 |
| 7 | 1 | 0 | 1 | 5 |

10 companies provided inputs, and some companies selected two options.

Based on the feedback, although most companies tend to agree the current defined RRC processing delay (50ms) can be applicable to NR to EN-DC handover, 5 companies think it can also be decided by RAN4.

Rapporteur understands RAN4 clearly knows the RRC processing delay of inter-RAT handover was defined by RAN4, but still they are asking RAN2 about the RRC processing delay for NR->EN-DC, so we cannot simply kick the ball back to RAN4.

To move forward, Rapporteur suggest to give 50ms as an information, but still highlight in reply LS that it is up to RAN4 to make a final decision.

**Proposal 1: [7/10] Inform RAN4 that RAN2 understands the RRC processing delay (50ms) (defined for inter-RAT handover from NR to E-UTRAN) can be applicable to “NR to EN-DC”, but the final decision is up to RAN4.**

*Case 2: EN-DC to EN-DC*

Company proposals are summarized as below:

* Option 1: 20ms. ----ZTE, Apple, HW, CATT;
* Option 2: 16ms. ---Nokia;

Note: RRC segmentation is not considered.

20ms and 16ms were proposed by companies. But in current TS 36.331, the following cases already defined. And the second case should already cover “EN-DC to EN-DC” mobility.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RRC connection reconfiguration (NR SCG establishment/ /modification/release) | *RRCConnectionReconfiguration* | *RRCConnectionReconfigurationComplete* | 20 |  |
| RRC connection re-configuration (intra-LTE mobility with NR SCG establishment/ /modification/release) | *RRCConnectionReconfiguration* | *RRCConnectionReconfigurationComplete* | 20 |  |

Companies are invited to show your views.

**Q1.2: Do companies agree the RRC processing delay for “EN-DC to EN-DC” is 20ms (as already defined in TS 36.331)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree or Disagree** | **Comments** |
| ZTE | Agree | Proponent. |
| Qualcomm  | Agree | Align with 36.331 |
| Huawei, HiSilicon | Agree | It is clear according to TS 36.331. |
| OPPO | Agree  |  |
| MediaTek | Agree | Current 36.331 implies that it is 20ms |
| Apple | Agree |  |
| Samsung | Agree |  |
| Ericsson | Agree | According to 36.331. |
| Intel | Agree |  |
| Nokia | Agree | The value from LTE RRC shall be taken. |

**Summary:**

All companies agree the RRC processing delay for “EN-DC to EN-DC” is 20ms according to TS 36.331.

**Proposal 2: Reply to RAN4, the RRC processing delay for “EN-DC to EN-DC” is 20ms.**

*Case 3: NE-DC to NE-DC, NR-DC to NR-DC*

Company proposals are summarized as below:

* Option 1: 16ms. ---ZTE, Nokia, Apple, CATT;
* Option 2: 20ms. ---HW.

Note: RRC segmentation is not considered.

16ms and 20ms were proposed by companies. In current TS 38.331, following case is defined. The proponent of 16ms is to apply the same value for intra-NR mobility together with SCG establishment/modification. While the proponent of 20ms thinks 16ms may not be sufficient, because UE needs to do additional handover.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RRC reconfiguration (SCG establishment/ modification/ release) | *RRCReconfiguration* | *RRCReconfigurationComplete* | 16 |  |

Based on LTE spec, the same RRC processing delay is defined no matter SCG establishment happens with or without intra-MN mobility. So rapporteur understands the same principle can be applied to NR spec. Companies are invited to show your views.

**Q1.3: Which option do you support for the RRC processing delay for “NE-DC to NE-DC” and “NR-DC to NR-DC”?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option ½** | **Comments** |
| ZTE | Option 1 | Proponent. |
| Qualcomm | Option 1 | Align with 38.331 |
| Huawei, HiSilicon | Option 2 | For HO from NE-DC to NE-DC, we feel what a UE needs to do is quite similar to HO From EN-DC to EN-DC, e. g. processing both of LTE and NR parts configuration, so we propose to align the processing delay for the two cases.For HO from NR-DC to NR-DC, we consider this is the case SCG on FR2, so processing delay could be extended since FR2 configuration and UE handling maybe a bit more complicated than FR1. This is the main reason that we feel a bit longer timing is required for NE-DC handover. |
| OPPO | Option 1 |  |
| MediaTek | Option 1 or Option 2 | We think that current 38.331 implies option 1 (16ms). But option 2 is acceptable if some companies think more time is needed.  |
| Apple | Option 1 or Option 2 |  |
| Samsung | Option 1 |  |
| Ericsson | Option 1 | According to 38.331. |
| Intel | Option 1 |  |
| Nokia | Option 1 |  |

**Summary:**

Company inputs are summarized in below table:

|  |  |
| --- | --- |
| Option 1 | Option 2 |
| 9 | 3 |

9 of 10 companies thinks the RRC processing delay of “NE-DC to NE-DC” and “NR-DC to NR-DC” is 16ms. 1 company also expressed this should already be indicated in current spec. 1 company expressed that 16ms may not enough in case SCG is operating on FR2 frequencies, therefore 20ms may be needed.

However, according to current specification, for both legacy NR handover and NR SCG addition procedures, the processing delays are defined the same for FR1 and FR2. So it is not convincing why differentiation is needed for this specific case.

Considering the large amount support of 16ms, rapporteur suggests:

**Proposal 3: [9/10] Reply to RAN4, the RRC processing delay for “NE-DC to NE-DC” and “NR-DC to NR-DC” is 16ms.**

In R2-2103862, for case 1&2, it suggests to inform RAN4 about the different RRC processing delay based on whether RRC segmentation is applied. See below table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Scenario | Source PCell | Target Pcell | Target PSCell | RRC procedure delay for HO with PSCell |
| NR SA to EN-DC | NR (incl. FR1 and FR2) | LTE | NR (incl. FR1 and FR2) | 70ms |
| EN-DC to EN-DC | LTE | LTE | NR (incl. FR1 and FR2) | 20ms (in case of the HO command without segmentation transmission)60ms(in case of the HO command with segmentation) |
| NE-DC to NE-DC | NR FR1 | NR FR1 | LTE | 16ms (in case of the HO command without segmentation transmission)56ms (in case of the HO command with segmentation) |
| NR-DC to NR-DC | NR FR1 | NR FR1 | NR FR2 | 16ms (in case of the HO command without segmentation transmission)56ms (in case of the HO command with segmentation) |

From rapporteur point of view, the RRC processing delay when RRC segmentation is defined in RAN2 spec.

*TS 36.331:*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RRC connection re-configuration | *DLDedicatedMessageSegment* | *RRCConnectionReconfigurationComplete* | 20+( Nseg-1)\*10 | Nseg is number of RRC segments |

*TS 38.331:*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RRC reconfiguration  | *DLDedicatedMessageSegment* | *RRCReconfigurationComplete* | 16+( Nseg-1)\*10 | Nsegis number of RRC segments |

And RRC segmentation is not supported for inter-RAT handover command (e.g. MobilityFromNRCommand). For case 2&3, RAN4 spec just refers to the values defined in RAN2 spec. So there seems no need to highlight this difference to RAN4. But companies are invited to show your views.

**Q1.4: Do companies think we need to inform RAN4 about the RRC processing delay when RRC segmentation is applied for Case 2&3?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree or Disagree** | **Comments** |
| ZTE | Prefer Disagree | We agree with the motivation, but we understand there is no difference in RAN4’s future work. RRC segmentation is not supported for inter-RAT HO case, so they don’t have to capture different values in TS 38.133. And for other cases, they are just referring to RAN2 spec.  |
| Qualcomm | No | Same view as ZTE. We don’t intend to preclude the possibility of using segmentation for HO cmd because it may be needed in case of full configuration. But we also think no need to specify processing delay as it is not a typical case. |
| Huawei, HiSilicon | Disagree | These HO scenarios are supported since Rel-15 when there is no segmentation. So we prefer not to consider segmentation for RRC processing delay during HO.  |
| OPPO | Disagree  | RRC segmentation is introduced in R16. I am not sure how to consider R15 and R16, two separate value are defined? |
| MediaTek | Prefer Disagree | We prefer not to consider segmentation for this case. Assuming the RAN4 is discussing the R15 behavior where the DL segmentation is not supported. |
| Apple | Agree | If RRC segmentation can be used for the handover case, but companies prefer NOT to consider it for the HO delay requirement, we should make it clear and clarify that the segmentation case is not taken into account.  |
| Samsung | Disagree | Similar view as others though we think it seems never discussed in RAN2 for RRC segmentation in this case. But probably RRC segmentation is not likely as smaller size is preferable in HO region. |
| Ericsson | Disagree | There does not seem to be any need for it. |
| Intel | Disagree | We tend to agree with others that RRC segmentation during HO might not be a typical case.  |
| Nokia | Disagree | Same view as expressed by preceding companies. They are discussing R15 behavior. |

**Summary:**

9 of 10 companies agree there is no need to mention RRC segmentation in the reply LS. Some companies also think it is not typical case to use RRC segmentation during handover, because it impacts the handover performance (i.e. delay). However, rapporteur thinks there is no need to add any restriction in the specification, we can leave it to network implementation.

**Proposal 4: No need to mention RRC segmentation in the reply LS.**

In addition, to avoid misunderstanding, R2-2103032 suggests to update RAN2 spec to capture the RRC processing delay of missing scenarios.

**Proposal 3: Update TS 38.331 and TS 36. 331 to capture the RRC processing delay of missing scenarios, and the correction should be adopted since Rel-15. Agree CRs in [2][3].**

Since case 2&3 are supported since Rel-15, it is proposed to make update to both Rel-15 and Rel-16 specs.

Note: The correction to TS 36.331 may be quite simple, just add NR to below bullet, see example:

|  |
| --- |
| **Inter RAT mobility** |
| Handover to E-UTRA | *RRCConnectionReconfiguration (sent by other RAT)* | *RRCConnectionReconfigurationComplete* | NA | The performance of this procedure is specified in TS 45.010 [50] in case of handover from GSM and TS 25.133 [29], TS 25.123 [30] in case of handover from UTRA and TS 38.133 [84] in case of handover from NR. |

**Q1.5: Do companies agree to capture the RRC processing delay of Case 1~3 to both Rel-15 and Rel-16 SPEC (e.g. TS 38.331)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree or Disagree** | **Comments** |
| ZTE | Agree | Proponent.It is better to make our SPEC clear, otherwise, people may ask similar questions in the future.  |
| Qualcomm | Agree |  |
| Huawei, HiSilicon | Agree | We think some clarification for case1 could be captured in TS 36.331 and TS 38.331, while for case3/4 the processing delay should be captured in TS 38.331.  |
| OPPO | Agree  |  |
| MediaTek | Agree | Agree to clarify once we concluded the processing time. |
| Apple | Agree |  |
| Samsung | Agree |  |
| Ericsson | Agree |  |
| Intel | Agree |  |
| Nokia | OK |  |

Following CRs are provided by companies.

[R2-2103033](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113bis-e%5CDocs%5CR2-2103033.zip) CR on RRC processing delay ZTE Corporation, Sanechips CR Rel-15 38.331 15.13.0 2495 - F NR\_newRAT-Core

[R2-2103034](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113bis-e%5CDocs%5CR2-2103034.zip) CR on RRC processing delay ZTE Corporation, Sanechips CR Rel-16 38.331 16.4.1 2496 - F NR\_newRAT-Core

[R2-2104156](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113bis-e%5CDocs%5CR2-2104156.zip) Correction on RRC Processing Delay for Handover from NR to E-UTRA CATT draftCR Rel-17 38.331 16.4.1 F NR\_RRM\_enh2-Core

In general, R2-2104156 is covered by R2-2103033/3034.

Change 1 (from R2-2103033/3034)



Change 2 (from R2-2103033/3034, R2-2104156)



If companies agree the SPEC can be updated, please provide your comments to the CRs.

**Q1.6: Do companies agree with above Change 1 and 2? Any other comments to the CRs?**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| ZTE | Proponent of R2-2103033/3034.Agree with change 1 and 2.  |
| Qualcomm | Agree both changes. Change 2 can also be updated with 50ms if it can be agreed in this discussion |
| Huawei, HiSilicon | Change 2 is fine, and this is missing for general NR to LTE HO. For change 1, we think the value is pending to the conclusion of Q1.3. |
| OPPO | The text is ok if RAN2 agree the value. |
| MediaTek | Change 2 is fine.The newly added row in Change 1 is not needed. As long as there is LTE/NR SCG configuration, the processing delay is increased from 10ms to 16ms. Whether there is intra-RAT mobility or not does not change the delay from RAN2 perspective. For intra-RAT mobility (i.e. PCell change), there will be additional delay in cell search/sync and RACH, which is defined in RAN4. |
| Apple | Change 2 is fine. For change 1, the value need to be updated according to the discussion.  |
| Samsung | Agree |
| Ericsson | Agree with both changes. For the second change, perhaps the chapter (6.1.2.1.2) could be added also for better clarity. |
| Intel | The changes are ok. |

**Summary:**

For Question 1.5, all companies agree both Rel-15 and Rel-16 RAN2 specs (TS 38.331 and TS 36.331) should be updated to reflect the conclusion.

Regarding the CRs, based on response to Question 1.6, most companies agree with both Change 1&2, but also indicated the detail value in CR can be updated based on the conclusion. Considering R2-2103033 and R2-2103034 covers both changes, they can be updated for phase 2 discussion.

**Proposal 5: Update TS 38.331 CRs R2-2103033 and R2-2103034, provide TS 36.331 CRs. Continue discussing the CRs in phase II.**

*Reply LS will be updated based on the outcome of above questions.*

### 2.1.2 Clarification of UE behaviour

RAN4’s LS also includes the following question:

|  |
| --- |
| * Question 2: Regarding HO with PSCell triggered by single RRC HO command, which of following options is in line with RAN2 definition when UE fails to synchronize to the expected PSCell?
	+ Option 1: UE performs conventional Rel-15 HO procedure and PSCell addition separately, i.e., UE can handover to the new PCell without PSCell addition
	+ Option 2: UE tries to synchronize another SCG which is the most likely to connect successfully (assumes that the target Pcell configures multiple SCGs), i.e., UE can handover to the new Pcell with a different PSCell addition
	+ Option 3: UE won’t handover to new Pcell upon PSCell addition failure, i.e., UE will treat it as conventional Rel-15 HO failure
	+ Option 4: RAN2 is welcomed to share additional failure cases if any.
 |

Based on contributions, companies all agree the answer is Option 1. Which means

**Q1.7: Do companies agree to answer Option 1 to RAN4? (I.e. in case of handover with PSCell change, when UE fails to synchronize the target PSCell but succeeds in Pcell handover. The UE will trigger SCG failure, and send SCG failure report to MN)**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree or Disagree** | **Comments** |
| ZTE | Agree |  |
| Qualcomm | Agree | It is aligned with 37.340 |
| Huawei, HiSilicon | Agree | For clarification, the UE could response SCG reconfiguration complete contained in HO complete message before PSCell RACH success/failure. |
| OPPO | Agree  |  |
| MediaTek | Option 1 from RAN4 should clarify | We think that option 1 is still ambiguous. What does “handover to the new PCell **without PSCell addition**” means? Does it imply that the UE release the PSCell configuration automatically?We should clarify with RAN4 that in this case, the PCell change (handover) is still completed. The SCG configuration (including the configuration for PSCell) is kept but all SCG transmission are suspended. UE will inform the NW that PSCell addition failure via RRC message. The NW will then reconfigure the UE. |
| Apple | Agree |  |
| Samsung | Agree |  |
| Ericsson | Agree |  |
| Intel | Agree  |  |
| Nokia | Agree | Option 1 is the correct behavior. |
| vivo | Agree |  |

**Summary:**

All companies agree the answer to Q2 of RAN4’s LS is “Option 1”. Some companies also suggest to clarify the detailed UE behaviour in reply LS (because the original wording provided by RAN4 is a bit misleading).

**Proposal 6: Reply to RAN4 the answer to Q2 is Option1, and add more details in reply LS to clarify the detailed UE behaviour. The draft LS will be discussed in phase II.**

## 2.2 35MHz and 45MHz bandwidth

[R2-2104249](file://D://__%E4%BC%9A%E8%AE%AE%5C2021%5C202104_RAN2%5CTSGR2_113bis-e%5CDocs%5CR2-2104249.zip) Further Clarification on the 35M/45M supporting ZTE Corporation, Sanechips discussion Rel-17 NR\_FR1\_35MHz\_45MHz\_BW-Core

[R2-2104250](file://D://__%E4%BC%9A%E8%AE%AE%5C2021%5C202104_RAN2%5CTSGR2_113bis-e%5CDocs%5CR2-2104250.zip) CR on the 35M/45M supporting-R15 ZTE Corporation, Sanechips CR Rel-15 38.306 15.13.0 0567 - F NR\_FR1\_35MHz\_45MHz\_BW-Core

[R2-2104251](file://D://__%E4%BC%9A%E8%AE%AE%5C2021%5C202104_RAN2%5CTSGR2_113bis-e%5CDocs%5CR2-2104251.zip) CR on the 35M/45M supporting-R16 ZTE Corporation, Sanechips CR Rel-16 38.306 16.4.0 0568 - A NR\_FR1\_35MHz\_45MHz\_BW-Core

In the current spec, the 35M/45M bandwidth has been introduced to the *channelBW\_UL/DL.* However, the 35M/45M bandwidth hasn’t been included in the current Asn.1 coding of the SupportedBandwidth, thus, to indicate supporting of 35M/45M, the UE has to report a *supportedBandwidthDL/UL*that larger than 35M/45M.

Furthermore, for some bands that support 35M/45M, the 35M/45M would be the widest band in Table 5.3.5-1 of TS 38.101-1, e.g. for the band 8/71, the widest bandwidth is 35M, for the band 3/25/66, the widest bandwidth is 45M.To report a wider band than 35M/45M also means that the UE shall be allowed to report a bandwidth that not included in the Table 5.3.5-1 of TS 38.101-1.

However, in the current spec, it has been clearly said that the *supportedBandwidthDL/UL* shall be defined in Table 5.3.5-1 in TS 38.101-1 for FR1 and Table 5.3.5-1 in TS 38.101-2 for FR2.

|  |
| --- |
| ***supportedBandwidthDL***Indicates maximum DL channel bandwidth supported for a given SCS that UE supports within a single CC (and in case of intra-frequency DAPS handover for the source and target cells), which is defined in Table 5.3.5-1 in TS 38.101-1 [2] for FR1 and Table 5.3.5-1 in TS 38.101-2 [3] for FR2.For FR1, all the bandwidths listed in TS38.101-1 Table 5.3.5-1 for each band shall be mandatory with a single CC unless indicated optional. For FR2, the set of mandatory CBW is 50, 100, 200 MHz. When this field is included in a band combination with a single band entry and a single CC entry (i.e. non-CA band combination), the UE shall indicate the maximum channel bandwidth for the band according to TS 38.101-1 [2] and TS 38.101-2 [3]. |

To solve this problem, two options were discussed in [11],

* Option 1: Have some clarifications to the current field description of supportedBandwidthDL

E.g. (May only for the BC with a band that supports 35M/45M bandwidth) Allow the UE to indicate a bandwidth in the supportedBandwidthDL/UL wider than channelBW\_UL/DL, this supportedBandwidthDL/UL may even not be included in the Table 5.3.5-1 of TS 38.101-1/TS 38.101-2 for the corresponding band.

* Option 2: Add new FeatureSetUplinkPerCC-v15xy to indicate newly added 35M/45M, e.g. add FeatureSetUplinkPerCC-v15xy to the lateNonCriticalExtension of UE-NR-Capability

However considering the complexity to the option 2, the option 1 was selected and further discussed in [11], if companies have comments/preference on the option 2, please add the comments to the question Q2.3.

**Q2.1: Which option do companies prefer?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option 1 or 2** | **Comments** |
| ZTE | Option 1 | We think the option 1 is simple, we don’t want to introduce additional capability elements. |
| Qualcomm | Option 1 | Option 1 can work, so option 2 is not necessary to avoid ASN.1 impact |
| Huawei, HiSilicon | Option 1 | Option 1 is simple, the maximum BW value in FeatureSetperCC does not need to be restricted by RAN4 table. |
| OPPO | Option 1 |  |
| MediaTek | Option 1 | As this is Rel-15, maybe no ASN.1 change is better. |
| Apple | Option 1, but | We raised a similar issue in the meeting where the 35/45MHz CR was introduced and companies thought that UE can use a wider BW, but there is no need to capture anything. We are now open to companies views. |
| Samsung | See comments | We see the point from the discussion paper, and either option would work. However, before adding such NOTE like in Option 1, should we first check with RAN4 that to report such wider (non-listed) values is an acceptable solution? We are not sure whether RAN2 alone can decide it. [ZTE-Wenting] Thanks for the comments. From the RAN2 signaling perspective, the network will determine the final bandwidth based on the *channelBW\_UL/DL, S*upportedBandwidthDL/UL and BCS, so even in the *S*upportedBandwidthDL/UL, the UE report a wider bandwidth, it would be not used finally and it will not affect RAN4.The reason to take a wider value is that in the current signaling, the 35M/45M was not included in the *S*upportedBandwidthDL/UL. So reporting a wider value just a signaling method to reduce the impact on the current spec, it doesn’t mean that the network would configure this wider bandwidth to the UE. That is also why we hope to limit it only for the band that supporting 35M/45M |
| Ericsson | Option 1 |  |
| Intel  | See comments | We have a sympathy with Samsung. We are not sure what is implication of not having 35MHz/45MHz in Table 5.3.5-1 as well as what is the consequence if we allow UE to indicate BW wider than the actual support. We prefer to wait until RAN4 agree the CR to introduce 35MHz/45MHz to 38.101-1. We understand that RAN4 will discuss it in this meeting and the proposed CR include 35MHz/45MHz in Table 5.3.5-1. If this CR is agreed, option 2 might be more clean solution and future-proof. [ZTE-Wenting] Thanks for the comments. Yes, before the meeting, we are also not sure which solution is better, we slightly prefer option 1 for that it’s quite simple. So we hope to see other companies’ views.Back to this issue, in the RAN4 LS R2-R2-2102259, it said that *RAN4 would like to point out that for some of the bands that 35 or 45 MHz will be applied to,* ***35 or 45 MHz will be the widest channel bandwidth*** *for the band, in case that is of any significance to RAN2.*Thus, we need to consider the solution for the case that “***35 or 45 MHz is the widest channel bandwidth for a band***”.We also want to say, regardless of option 1 and option 2, once a new bandwidth was added, some spec change are needed, e.g. for the option 2, it also need to add new bandwidth to the Asn.1 coding. So hope that the option 1 can be accepted. |
| Nokia | See comments | We agree with Apple that before going with option 1, we need to check with RAN4 whether there are implications to them.[ZTE-Wenting] Thanks for the comments, similar to above, from the RAN2 signaling perspective, the network will determine the final bandwidth based on the *channelBW\_UL/DL, S*upportedBandwidthDL/UL and BCS, so even in the *S*upportedBandwidthDL/UL, the UE report a wider bandwidth, it would be not used finally and it will not affect RAN4. Reporting a wider value just a signaling method to reduce the impact on the current spec, it doesn’t mean that the network would configure this wider bandwidth to the UE.This problem was because RAN2 made a mistake with the signalling: We made an error with it (in RAN2#113e, i.e. literally previous meeting), so while one can claim option 2 is NBC for networks, it would be far cleaner and avoid any future problems. [ZTE-Wenting] Option 2 can also work, thus we also want to hear companies’ views in the Q3. Similar to above regardless of option 1 and option 2, once a new bandwidth was added, some spec change are needed, e.g. for the option 2, it also need to add new bandwidth to the Asn.1 coding. So hope that the option 1 can be accepted. |
| vivo | Option 1 |  |

**Summary:**

11 companies provided inputs, 8 companies support option 1, 3 companies give more comments to the option 1 and option 2.

Based on the feedback, the 2 main questions for the option 1 are as follow:

1. Whether it would have impact to the Ran4 and thus suggest to consult with RAN4 first
2. Option 2 seems more future proof.

For the first question, Rapporteur think that from the RAN2 signaling perspective, the network will determine the final bandwidth based on the channelBW\_UL/DL, SupportedBandwidthDL/UL and BCS, so even in the SupportedBandwidthDL/UL, the UE report a wider bandwidth, it would be not used finally and it will not affect RAN4. Reporting a wider value just a signaling method to reduce the impact on the current spec, it doesn’t mean that the network would configure this wider bandwidth to the UE.

For the second question, Rapporteur just want to mention that regardless of option 1 and option 2, once a new bandwidth was added, some spec change are needed, e.g. for the option 2, it also need to add new bandwidth to the Asn.1 coding.

To move forward, Rapporteur suggest to take the option 1.

**Proposal 7: Adopt the option 1 (8/11): add clarifications to the current field description of supportedBandwidthDL/UL.**

For the option 1, the proponent hope to confirm RAN2’s understanding on the proposal 1 in [11] as below first:

**Q2.2: With the current spec, whether the UE is allowed to indicate a bandwidth in the *supportedBandwidthDL/UL* wider than *channelBW\_UL/DL*, this *supportedBandwidthDL/UL* may even not be included in the Table 5.3.5-1 of TS 38.101-1/TS 38.101-2 for the corresponding band?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree** **(Allowed or Not allowed)** | **Comments** |
| ZTE | Not allowed | For that in the current field description, it has been clearly said that the supportedBandwidthDL/UL shall be defined in Table 5.3.5-1 in TS 38.101-1 for FR1 and Table 5.3.5-1 in TS 38.101-2 for FR2. Especially for the single carrier case, it said “ the UE shall indicate the maximum channel bandwidth for the band according to TS 38.101-1 [2] and TS 38.101-2 [3].”  |
| Qualcomm | Not allowed | Same view as ZTE. The UE can only indicate a bandwidth in feature set according to TS 38.101-1 [2] and TS 38.101-2 [3]. This is indeed unfortunate limitation because the intention of the “feature set“ is that a feature set combination can be resued for different band combinations, i.e. different bands. So the value that the UE can indicate shall not be restricted by bandwidths defined for a given band. |
| Huawei, HiSilicon | Not allowed |  |
| OPPO | Not allowed |  |
| MediaTek | Not allowed |  |
| Apple | We don’t think it’s a binding requirements | We think the UE can report the nearest BW that matches 35/45/70 or 90 that the UE supports for this band. We are also open to views from other companies. This whole BW topic has been changed multiple times and can be confusing. |
| Ericsson | Not allowed |  |
| Intel | Not allowed |  |
| Nokia | Not allowed | UE capabilities are defined per band and must conform to 38.101-X (even if signalling is more flexible).  |
| vivo | Not allowed |  |

**Summary:**

11 companies provided inputs, 10 companies share the same view that “the UE is allowed to indicate a bandwidth in the supportedBandwidthDL/UL wider than channelBW\_UL/DL, this supportedBandwidthDL/UL may even not be included in the Table 5.3.5-1 of TS 38.101-1/TS 38.101-2 for the corresponding band” 1 company don’t think it’s a binding requirements and think that the UE can report the nearest BW that matches 35/45/70 or 90 that the UE supports for this band, but also open to see other companies views. For this issue, Rapporteur suggest to follow the majorities views.

**Proposal 8: Ran2 confirm that “Based on the current spec, the UE is not allowed to indicate a bandwidth in the supportedBandwidthDL/UL wider than channelBW\_UL/DL”.**

For the Q2.2, if the answer is allowed, please go to the question Q2.2.a, otherwise, please go to the question Q2.2.b.

**Q2.2.a: If the answer to Q2.2 is “allowed”, to make the spec clear, do you agree that a note shall be added for the field description of *supportedBandwidthDL/supportedBandwidthUL* e.g.**

|  |
| --- |
| NOTE1: The UE may report a supportedBandwidthDL wider than channelBW\_UL/DL, and this supportedBandwidthDL may not be included in the Table 5.3.5-1 of TS 38.101-1/TS 38.101-2 |

Please notice that this modification is not only for the BC that including band with 35M/45M bandwidth, but also for the other BCs (e.g. BC that doesn’t include band with 35M/45M bandwidth). .

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree**  | **Comments** |
| Apple | Yes | Maybe we can just clarify the field description. |
|  |  |  |

**Q2.2.b: If the answer to Q2.2 is “not allowed”, to support 35M/45M feature, do you agree to add a note as below to the field description of *supportedBandwidthDL/supportedBandwidthUL* and thus agree with the CR [12][1**3**].**

|  |
| --- |
| NOTE1: For the BC with a band that supports 35M/45M bandwidth, the UE may report a supportedBandwidthDL/UL wider than channelBW\_UL/DL, and this supportedBandwidthDL/UL may not be included in the Table 5.3.5-1 of TS 38.101-1/TS 38.101-2 |

Please notice that compare with the Q2.2.a, the difference that the modification is only for the BC that including the Band with 35M/45M bandwidth.

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree**  | **Comments** |
| ZTE | Agree (proponent) | To support 35M/45M bandwidth, this clarification was needed, otherwise, the UE can’t report a wider bandwidth in the supportedBandwidthDL/UL and thus the 35M/45M bandwidth feature can be supported indeed. |
| Qualcomm  | Agree | It makes sense to facilitate 35/45MHz channel BW |
| Huawei, HiSilicon |  | We think the maximum BW value in FeatureSetperCC does not need to be restricted by RAN4 table, which is not only for the BC that including band with 35M/45M bandwidth, but also for the other BCs. For the correction, we could just remove the restriction of RAN4 reference. |
| OPPO | Agree  |  |
| MediaTek | Agree | We prefer limit the change to 35M/45M bandwidth case. It is still preferable to have this maximum allowed value defined in RAN4 table. |
| Ericsson | Agree to the principle | But we should probably not restrict this to 35 and 45 MHz, at least in theory we already have 70MHz, and other BWs may be added in future. |
| Nokia | Disagree | We don't understand how current specification would disallow this behaviour, but then only a NOTE is needed to change it? NOTEs are not normative so saying that NOTE is sufficient means the earlier specification already conformed to this.so normative text is the only way to go here, not a NOTE. |
| OPPO | Agree  |  |

**Summary:**

8 companies provided inputs, 6 companies generally agree with the modification in the draft CR, 1 company have different views on the modification, and 1 company think that the Note is not normative, the normative text shall be used.

**Proposal 9: Further discuss the CR in phase 2.**

**Q2.3: For the companies prefer the option 2, considering the related draft CRs were not provided, do you agree to finish the related CR in the next meeting if all of the companies agree to go to the option 2 in this meeting?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree**  | **Comments** |
| ZTE |  | We think the option1 is simple, anyway, if the option 2 was selected by most of companies, the CRs for the option 2 can be provided and concluded in the next meeting. |
| Apple | Option 2 bring additional open items, and so just a clarification in the text is better. |  |
| Nokia | Yes | If we go with Option 2, it makes sense to finish it in the next meeting. |

**Summary:**

For this part, for that most companies prefer option 1, so the summary for this part not provided.

# 3 Conclusion

Summary of Phase I

*Handover with PSCell*

**Proposal 1: [7/10] Inform RAN4 that RAN2 understands the RRC processing delay (50ms) (defined for inter-RAT handover from NR to E-UTRAN) can be applicable to “NR to EN-DC”, but final decision is up to RAN4.**

**Proposal 2: Reply to RAN4, the RRC processing delay for “EN-DC to EN-DC” is 20ms.**

**Proposal 3: [9/10] Reply to RAN4, the RRC processing delay for “NE-DC to NE-DC” and “NR-DC to NR-DC” is 16ms.**

**Proposal 4: No need to mention RRC segmentation in the reply LS.**

**Proposal 5: Update TS 38.331 CRs R2-2103033 and R2-2103034, provide TS 36.331 CRs. Continue discussing the CRs in phase 2.**

**Proposal 6: Reply to RAN4 the answer to Q2 is Option1, and add more details in reply LS to clarify the detailed UE behaviour. The draft LS will be discussed in phase 2.**

*35MHz and 45MHz*

**Proposal 7: Adopt the option 1 (8/11): add clarifications to the current field description of supportedBandwidthDL/UL.**

**Proposal 8: Ran2 confirm that “based on the current spec, the UE is not allowed to indicate a bandwidth in the supportedBandwidthDL/UL wider than channelBW\_UL/DL”.**

**Proposal 9: Further discuss the CR in phase 2.**

**.**

# 4 References

1. R2-2102652 LS on handover with PSCell (R4-2103674; contact: Apple) RAN4 LS in Rel-17 NR\_RRM\_enh2-Core To:RAN2 Cc:-
2. R2-2103032 Discussion on handover with PSCell ZTE Corporation, Sanechips discussion Rel-17 NR\_RRM\_enh2-Core
3. R2-2103340 Response LS to RAN4 on HO with PSCell requirements Nokia, Nokia Shanghai Bell LS out Rel-17 NR\_RRM\_enh2-Core To:RAN4
4. R2-2103862 Clarification on handover with PSCell Apple discussion Rel-17 NR\_RRM\_enh2-Core
5. R2-2103863 Draft LS Reply to RAN4 on handover with PSCell Apple LS out Rel-17 NR\_RRM\_enh2-Core To:RAN4
6. R2-2104133 Discussion on RAN4 LS on handover with PSCell Huawei, HiSilicon discussion Rel-17 NR\_RRM\_enh2
7. R2-2104155 Discussion of LS on Handover with PSCell from RAN4 CATT discussion Rel-17 NR\_RRM\_enh2-Core
8. R2-2103033 CR on RRC processing delay ZTE Corporation, Sanechips CR Rel-15 38.331 15.13.0 2495 - F NR\_newRAT-Core
9. R2-2103034 CR on RRC processing delay ZTE Corporation, Sanechips CR Rel-16 38.331 16.4.1 2496 - F NR\_newRAT-Core
10. R2-2104156 Correction on RRC Processing Delay for Handover from NR to E-UTRA CATT draftCR Rel-17 38.331 16.4.1 F NR\_RRM\_enh2-Core
11. [R2-2104249](file://D://__%E4%BC%9A%E8%AE%AE%5C2021%5C202104_RAN2%5CTSGR2_113bis-e%5CDocs%5CR2-2104249.zip) Further Clarification on the 35M/45M supporting ZTE Corporation, Sanechips discussion Rel-17 NR\_FR1\_35MHz\_45MHz\_BW-Core
12. [R2-2104250](file://D://__%E4%BC%9A%E8%AE%AE%5C2021%5C202104_RAN2%5CTSGR2_113bis-e%5CDocs%5CR2-2104250.zip) CR on the 35M/45M supporting-R15 ZTE Corporation, Sanechips CR Rel-15 38.306 15.13.0 0567 - F NR\_FR1\_35MHz\_45MHz\_BW-Core
13. [R2-2104251](file://D://__%E4%BC%9A%E8%AE%AE%5C2021%5C202104_RAN2%5CTSGR2_113bis-e%5CDocs%5CR2-2104251.zip) CR on the 35M/45M supporting-R16 ZTE Corporation, Sanechips CR Rel-16 38.306 16.4.0 0568 - A NR\_FR1\_35MHz\_45MHz\_BW-Core