**3GPP T****SG-RAN WG2 Meeting #115-electronic R2-210xxxx**

**Online, August 16th – August 27th, 2021**

**Agenda item: 6.1.3.1**

**Source: vivo**

**Title:** **Report of [AT114-e][019][NR16] MAC I (vivo)**

**Document for: Discussion and Decision**

# 1 Introduction

This contribution is aimed at reporting the discussion and results of the following email discussion:

* [AT115-e][019][NR16] MAC I (vivo)

Scope: Take on-line outcome into account, Treat remaining aspects, determine agreeable parts and agree CRs Treat R2-2106926, R2-2106997, R2-2108232, R2-2107927, R2-2108092, R2-2108093, R2-2107198, R2-2107609, R2-2107163, R2-2107160, R2-2107161, R2-2108781.

Intended outcome: Report, Agreed CRs.

Deadline: On-Line first, Schedule 1

The discussion scope is to gather companies’ comments on the revised text proposal for capturing the conclusion in RAN1 LS [1], draft LS to RAN1 regarding cupturing the RAN2 WA that LCH based priority has higher priority than UL skipping, and to check if there is sufficient support to pursue the CRs [11] [12].

Then, the rapporteur would like to point out the specific deadline for this discussion with two phases,

* In phase 1, companies are invited to provide their views by August 19th (Thursday), 2021, 12:00 UTC.
* In phase 2, the corresponding summary proposals, draft CR(s), draft LS to RAN1 will be provided. Further comments are invited to be provided by August 26th (Thursday), 2021, 12:00 UTC.

# 2 Participants

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| --- | --- |
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# 3 Phase-1 Discussion

## 3.1 Revised RRC text proposal

During the online discussion at RAN2#115-e meeting, a discussion on the modeling of capturing the RAN1 conclusion given in the RAN1 LS [1] was launched. The corresponding discussion records are given as below:

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| R2-2106926 LS on UL skipping for PUSCH in Rel-16 (R1-2106370; contact: vivo) RAN1 LS in Rel-16 NR\_newRAT-Core, TEI16 To:RAN2   * Noted   R2-2106997 Correction on UL Skipping for PUSCH in Rel-16    vivo, ZTE corporation, Xiaomi Communications    CR    Rel-16    38.331    16.5.0    2708    -    F    TEI16   * Revised/Merged   R2-2108092 Corrections to R16 UL skipping with repetitions    Ericsson, NTT DOCOMO INC.    discussion   * Noted   R2-2108093 Corrections to R16 UL skipping with repetitions    Ericsson, NTT DOCOMO INC.    CR    Rel-16    38.321    16.5.0    1135    -    F    NR\_IIOT-Core   * Not Pursued   DISCUSSION  - Huawei think both RRC or MAC based impl could work.  - HW Think that the condition on LCH prioritization is not nessecarily valid, there are proposals to remove it. LG agrees. ZTE think this is still under discussion in R1, Oppo also think this need to be confirmed in R1.  - LG prefer to specify in RRC think this is natural. Samsung also think RRC is better and think that was the intention by R1, but think the RRC CR can be simpler, e.g. acc to Oppo or MTK CR, prefer these.  - Apple think that MAC impl is more complex think RRC could be better.  - MTK think that as late in the release it is better to modify RRC.  - QC think we should stick to RRC, and this was the intention in R1.  - ZTE also prefer RRC. Lenovo and Oppo prefer RRC.  - Nokia support MAC but agrees R1 intention was RRC.  - Chair: We go with an RRC solution, and as there was support to go for simpler text as in MTK, and OPPO papers below, suggest a multi-sourced joint CR.   * We go with a RRC solution.   R2-2108232 On enhanced UL skipping and PUSCH repetitions    MediaTek Inc.    discussion    Rel-16    TEI16   * Noted, Proposal is merged   R2-2107927 CR on the enabling restriction on R16 PUSCH skipping and PUSCH repetitions    OPPO    CR    Rel-16    38.331    16.5.0    2745    -    F    TEI16   * Merged |

Taking all the contributions [2]-[6] and [9] into account, the rapporteur has updated the RRC text proposal on capturing the RAN1 conclusion as follows,

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| --- |
| ***skipUplinkTxDynamic, enhancedSkipUplinkTxDynamic, enhancedSkipUplinkTxConfigured***  If set to *true*, the UE skips UL transmissions as described in TS 38.321 [3]. The network does not configure *enhancedSkipUplinkTxDynamic* or *enhancedSkipUplinkTxConfigured* with value *true*, when PUSCH repetition Type A, in case *K*>1, or PUSCH repetition Type B is applied for the corresponding PUSCH transmission of the uplink grant (see TS 38.214 [19], clause 6.1.2.1 and clause 6.1.2.3). |

Please NOTE that the number of actual repetitions within a nominal repetition with *K*=1 can be larger than 1 based on the current 38.214 spec. Thus, once PUSCH repetition Type B is applied for a PUSCH transmission scheduled by a dynamic grant or a configured grant Type 1 or Type 2, the Rel-16 PUSCH skipping feature is not expected to be enabled, as indicated in the RAN1 LS. Besides, it is the rapporteur’s understanding that the condition (i.e. Rel-16 LCH based prioritization is not configured and there is a single PHY priority for UL transmissions) mentioned in the RAN1 LS is not needed since we have agreed to remove the condition (i.e. if the MAC entity is not configured with *lch-basedPrioritization*) in the current MAC spec.

Please share your view on the above-revised RRC text proposal.

**Q1: Do companies agree with the updated RRC text proposal?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Detailed comments** |
| vivo | Yes | We are fine with the proposed text. Meanwhile, we think it should be allowed to enable CG(DG) PUSCH skipping feature if PUSCH repetition is only configured for DG(CG) PUSCH skipping feature. |
| Samsung | Yes | We are fine with the proposed text. It looks simple and enough. |
| Ericsson | No | We are okay to capture it only in this field description, but have two wording comments.   1. The variable *REPETITION\_NUMBER* in the MAC spec has been updated in Rel-16 to capture both PUSCH reptition type A and repetition type B and it is our preference to use this variable. 2. As mentioned in Ericsson’s paper, PUSCH repetition is a scheduling decision and it is more “dynamic” than RRC reconfiguration. In our view, here is a more logic-straightforward description for implementaiont guys:   If *enhancedSkipUplinkTxDynamic* or *enhancedSkipUplinkTxConfigured* is configured with value *true*, *REPETITION\_NUMBER* (see TS 38.321 [3], clause 5.4.2.1) for the corresponding PUSCH transmission of the uplink grant scheduled by the network is always equal to one. |
| Apple | Yes (see comment) | Fine with the updated RRC text proposal. But if PHY prioritization is enabled then enhanced UL skipping may still be used together with TB repetition in the future, RAN1 has not concluded on this. |
| CATT | No | We agree with vivo’s comment on the independence of CG and DG regarding the mutually excusive configurations of UL skipping and repetition. But this is not clearly reflected in the proposed TP. Thus we prefer the Ericsson’s wording. |
| Qualcomm | Yes | We prefer the TP from the rapporteur |
| Huawei, HiSilicon | Yes | We prefer rapporteur’s TP. |
| ZTE | Yes, with change | Generally speaking, we also prefer to go for RRC during online discussion. But we still have a little bit ambiguous about the wording from NW perspective:  The network does not configure *enhancedSkipUplinkTxDynamic* or *enhancedSkipUplinkTxConfigured* with value *true*, when PUSCH repetition Type A, in case *K*>1, or PUSCH repetition Type B is applied for the **corresponding PUSCH transmission** of the uplink grant (see TS 38.214 [19], clause 6.1.2.1 and clause 6.1.2.3).  This wording is like the following condition structure:  ***Even A shall be triggered, when Event B is occurred.***  With this condition structure, we interpret the wording from NW perspective as following:   * It is allowed that UE can be configured with *enhancedSkipUplinkTxDynamic* in *MAC-CellGroupConfig* and *numberofRepetitions* in *PUSCH-Config* simultaneously. * When NW plan to schedule with a DCI which indicates the repetition number >1, NW shall disable the *enhancedSkipUplinkTxDynamic* in advance .   From this interpretation, the main reason is ‘when’ is about an instant of something is occurred, so we suggest to correct when to ‘if’”  The network does not configure *enhancedSkipUplinkTxDynamic* or *enhancedSkipUplinkTxConfigured* with value *true*, if PUSCH repetition Type A, in case *K*>1, or PUSCH repetition Type B is applied for the corresponding PUSCH transmission of the uplink grant (see TS 38.214 [19], clause 6.1.2.1 and clause 6.1.2.3). |

**Summary:**

## 3.2 Draft LS to RAN1

In addition, during the online discussion at RAN2#115-e meeting, it was agreed to send an LS to RAN1 indicating that RAN2 agrees to remove the condition (i.e. if the MAC entity is not configured with *lch-basedPrioritization*). In the rapporteur’s understanding, removing this condition means that the MAC entity does not generate a MAC PDU for a deprioritized uplink grant even when its associated PUSCH is overlapping with PUCCH. In this sense, the core text part of draft LS is given as follows,

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| **Text of draft LS to RAN1:** Overall description RAN2 has further discussed the overlapped data and SR with equal L1 priority (i.e. case 2-2 and case 3 mentioned in R1-2102244). And RAN2 has concluded the following,   |  | | --- | | * Agree to remove the condition as proposed in this CR, send an LS to R1. |   Specifically, with this agreement, RAN2 agrees that the MAC entity does not generate a MAC PDU for a deprioritized uplink grant even when its associated PUSCH is overlapping with PUCCH. Actions **To RAN1**  **ACTION:** RAN2 respectfully asks RAN1 to take the above into account. |

Please share your view on the above-mentioned text of draft LS.

**Q2: Do companies agree with the intention of the text of draft LS?**

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| **Company** | **Yes/No** | **Detailed comments** |
| vivo | Yes | We think RAN2 should send this LS out as soon as possible. Currently, there is an ongoing parallel discussion about the previously achieved RAN2 WA, where there is a majority view that the RAN2 WA can be confirmed in RAN1. In this sense, this LS may help to lubricate the RAN1 discussion. |
| Samsung | Yes but | More important thing is that removing the condition is to make UL skipping independent of LCH-based Prioritization. |
| Ericsson | No | By the argument of the proponent companies, the intention of the CR is to support the case when there is no overlapping grant. On the other hand, we understand that removing the condition would mean that RAN2’s MAC spec has implemented the below working assumption.   * Confirm the WA that LCH based prio has higher priority than UL skipping still applies, and we expect that if there are issues, RAN1 will come-back.   Thus, we suggest indicating as belows.   |  | | --- | | RAN2 has agreed to remove the condition related with LCH-based prioritization in UL skipping checking (see details in the CR R2-21xxx) due to the need to fixing a hole in the MAC spec and has effectively implemented the working assumption in the MAC spec (assuming both LCH-based prioritization and Rel-16 UL skipping are configured). RAN2 expect that if there are issues, RAN1 will come back. |   As commented by one company also supported by Ericsson, the RAN1 could conclude that LCH-based priorotizatoin and Rel-16 UL skipping cannot be configured together. In this case, RAN1 can come back and RAN2 can update in the RRC spec.  With this being said, we’d prefer RAN1 to settling down discussion on their own, as it is very clear RAN2 preference from the WA. The intention of the LS is to ask RAN1 to finalize the discussion, as it is also clear from the online inputs that companies in RAN2 want to finalize. We propose to wait till the end of the meeting, and in case RAN1 could not reach any consensus, the LS can be sent. |
| Apple | Yes | We are okay to include the text proposed by Ericsson as additional indication. |
| CATT | No | We prefer Ericsson’s wording for the LS, with adding some more context, e.g.:  So far, the R16 UL skipping behavior when *enhancedSkipUplinkTxDynamic* and/or *enhancedSkipUplinkTxConfigured* are configured has been captured in MAC specification based on RAN1 LS R1-2009772, assuming *lch-basedPrioritization* is not configured. The case when *lch-basedPrioritization* is configured was further discussed based on RAN1 LS R1-2102244 resulting in RAN2 reply LS in R2-2106746. In RAN2#115-e meeting, RAN2 has agreed to remove the condition related with LCH-based prioritization in UL skipping checking, due to the need to fix a hole in the MAC spec, thus effectively implementing the working assumption mentioned in RAN2 LS R2-2106746 (assuming both LCH-based prioritization and Rel-16 UL skipping are configured). RAN2 expect that if there are issues, RAN1 will come back.  And we are OK to send the LS now. |
| Qualcomm | See comment | We are fine to replace the agreement box in the draft LS by the TP from Ericsson |
| Huawei, HiSilicon | Yes to the intention | We agree with Samsung’s view and can accept Ericsson’s alternative texts. |
| ZTE | See comment | We are fine to Ericsson’s version |

**Summary:**

## 3.3 UL skipping correction

In contribution [10][11], it is found that no MAC PDU can be generated for the case where there is an overlapping between CG PUSCH and UCI, based on the current MAC spec. The reason is that the conditions of Rel-15 CG PUSCH skipping can be fulfilled in this case. To resolve this issue, the following changes are proposed fro the MAC spec,

|  |
| --- |
| **TS 38.321 clause 5.4.3.1.3:**  The MAC entity shall:  1> if the MAC entity is configured with *enhancedSkipUplinkTxDynamic* with value *true* and the grant indicated to the HARQ entity was addressed to a C-RNTI, or if the MAC entity is configured with *enhancedSkipUplinkTxConfigured* with value *true* and the grant indicated to the HARQ entity is a configured uplink grant:  2> if the MAC entity is not configured with *lch-basedPrioritization*; and  2> if there is no UCI to be multiplexed on this PUSCH transmission as specified in TS 38.213 [6]; and  2> if there is no aperiodic CSI requested for this PUSCH transmission as specified in TS 38.212 [9]; and  2> if the MAC PDU includes zero MAC SDUs; and  2> if the MAC PDU includes only the periodic BSR and there is no data available for any LCG, or the MAC PDU includes only the padding BSR:  3> not generate a MAC PDU for the HARQ entity.  2> else:  3> generate a MAC PDU for the HARQ entity.  1> else if the MAC entity is configured with *skipUplinkTxDynamic* with value *true* and the grant indicated to the HARQ entity was addressed to a C-RNTI, or the grant indicated to the HARQ entity is a configured uplink grant; and  1> if there is no aperiodic CSI requested for this PUSCH transmission as specified in TS 38.212 [9]; and  1> if the MAC PDU includes zero MAC SDUs; and  1> if the MAC PDU includes only the periodic BSR and there is no data available for any LCG, or the MAC PDU includes only the padding BSR:  2> not generate a MAC PDU for the HARQ entity. |

Please share your view on the [CR R2-2107161](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_115-e/Docs/R2-2107161.zip).

**Q3: Do companies agree with the intention of CR R2-2107161?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Detailed comments** |
| vivo | Yes | We are fine with the CR. |
| Samsung | Yes but | We are agree with the problem and the change.  But the following part is not necessary:  2> else:  3> generate a MAC PDU for the HARQ entity.  This paragraph only mention when MAC PDU shall not be generated. When MAC PDU is generated is specified in 5.4.2.1. |
| Ericsson | Yes/No | Agree with the intention, but the change in the CR would make the two branches asymmetric and thus not easy to read. One suggestion is to add the below condition which is simpler.    1> else if the MAC entity is configured with *skipUplinkTxDynamic* with value *true* and the grant indicated to the HARQ entity was addressed to a C-RNTI, or if the MAC entity is not configured with *enhancedSkipUplinkTxConfigured* with value *true* and the grant indicated to the HARQ entity is a configured uplink grant; and |
| Apple | Yes but | Agree with Samsung |
| CATT | Yes with comments | Thanks Huawei for spotting this issue!  We agree with Huawei’s change and also agree with Samsung that the “else” text for generating the MAC PDU is not necessary. |
| Qualcomm | Yes but | Agree with Samsung |
| Huawei, HiSilicon | Yes, proponent | Agree with Samsung’s comments. If the section is about “MAC PDU shall not be generated” and the part  “2> else: 3> generate a MAC PDU for the HARQ entity.” is not needed.  The eventual behavior is that UE will not enter “3> not generate a MAC PDU for the HARQ entity.”, nor enter the next “1> else if the MAC entity is configured with skipUplinkTxDynamic with value true….” either. |
| ZTE | Yes,but | We generally agree with the intention. In addition to the HW’s observation, we also found there is another hole in the current text procedure which is the UE who supports enhanced UL skipping for CG but not configured with the ***enhancedSkipUplinkTxConfigured .***  As a result, assuming that one UE support enhanced UL skipping but the *enhancedSkipUPlinkTxConfigured* not set to true*,* UE would still skip the CG transmission as shown below:  ================ 38.321 ==============================  The MAC entity shall:   1. if the MAC entity is configured with *enhancedSkipUplinkTxDynamic* with value *true* and the grant indicated to the HARQ entity was addressed to a C-RNTI, or if the MAC entity is configured with *enhancedSkipUplinkTxConfigured* with value *true* and the grant indicated to the HARQ entity is a configured uplink grant; and   /\*omit for short\*/  1> else if the MAC entity is configured with *skipUplinkTxDynamic* with value *true* and the grant indicated to the HARQ entity was addressed to a C-RNTI, or the grant indicated to the HARQ entity is a configured uplink grant; and  1> if there is no aperiodic CSI requested for this PUSCH transmission as specified in TS 38.212 [9]; and  1> if the MAC PDU includes zero MAC SDUs; and  1> if the MAC PDU includes only the periodic BSR and there is no data available for any LCG, or the MAC PDU includes only the padding BSR:  2> not generate a MAC PDU for the HARQ entity.  ================ 38.321 ==============================  It can be seen the *enhancedSkipUplinkTxConfigured* is voided because of the hole of text procedure. For this issue, we can have two potential ways for the fix:   * Option 1: Dummy the *enhancedSkipUplinkTxConfigured* * Option 2: Only Add a condition in the text procedure for making R16 UE only follow R16 enhanced skipping procedure. * Option 3: Extend the current container of *enhancedSkipUplinkTxConfigured* with *false* value, and modify the current text procedure accordingly.   It is obvious option 1 cannot be adopted since we already agree that the UL skipping cannot be configured alone with the repetition transmission, if this IE is dummy, NW can not configured a UE with repeptition transmission forever.  So the only way is option 2 or Option 3  for option 2, but in the current text procedure in MAC spec, we have no any models for dealing with this issue from which new UE have a configurable feature which is a default value for the old UE. So maybe we need some magic sentences to make specification clear.  For option 3, it is more easier to implement, no more magic sentence is needed.  38.331 CR:  enhancedSkipUplinkTxConfigured-r16 ENUMERATED {true,false} OPTIONAL -- Need S  38.321 CR:  The MAC entity shall:  1> if the MAC entity is configured with *enhancedSkipUplinkTxDynamic* with value *true* and the grant indicated to the HARQ entity was addressed to a C-RNTI, or if the MAC entity is configured with *enhancedSkipUplinkTxConfigured* with value *true* and the grant indicated to the HARQ entity is a configured uplink grant; and  1> if the MAC entity is not configured with *lch-basedPrioritization*; and  1> if there is no UCI to be multiplexed on this PUSCH transmission as specified in TS 38.213 [6]; and  1> if there is no aperiodic CSI requested for this PUSCH transmission as specified in TS 38.212 [9]; and  1> if the MAC PDU includes zero MAC SDUs; and  1> if the MAC PDU includes only the periodic BSR and there is no data available for any LCG, or the MAC PDU includes only the padding BSR:  2> not generate a MAC PDU for the HARQ entity.  1> else if the MAC entity is configured with *skipUplinkTxDynamic* with value *true* and the grant indicated to the HARQ entity was addressed to a C-RNTI, or the grant indicated to the HARQ entity is a configured uplink grant and *enhancedSkipUplinkTxConfigured* is not configured; and  1> if there is no aperiodic CSI requested for this PUSCH transmission as specified in TS 38.212 [9]; and  1> if the MAC PDU includes zero MAC SDUs; and  1> if the MAC PDU includes only the periodic BSR and there is no data available for any LCG, or the MAC PDU includes only the padding BSR:  2> not generate a MAC PDU for the HARQ entity. |

**Summary:**

## 3.4 Stopping configured grant timer

In contribution [12], it is suggested the running *configuredGrantTimer* should be stopped when a UL grant addressed to C-RNTI is received and there is no obtained MAC PDU due to UL skipping or when a UL grant addressed to CS-RNTI is received and the corresponding HARQ buffer is empty. Otherwise, the MAC cannot use a configured grant for this HARQ process (without any buffered data) for a while.

Please share your view on the CR [R2-2108781](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_115-e/Docs/R2-2108781.zip).

**Q4: Do companies agree with the intention of CR R2-21088781?**

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| **Company** | **Yes/No** | **Detailed comments** |
| vivo | Comments | We generally agree that there might be an issue as mentioned in the CR. However, we think this optimization would incur misalignment on the CGT maintenance between the network and UE. For example, when a CG grant is skipped by the UE, the network may misunderstand that the radio condition is bad and keep the CGT running at the network side. Then, the UE will stop the CGT and use the next CG occasion associated with the same HARQ process for the new transmission. However, the network may assume that CG occasion will not be used since the CGT is still running.  In conclusion, we think this optimization is not needed for Rel-16. |
| Samsung | No | Agree with vivo. This optimization is not needed for Rel-16. We think the network can continuously rely on dynamic grant allocation by keeping CGT running at the NW side. |
| Ericsson | No | We are not sure if we have understood the problem. It is our understanding from reading the existing MAC spec that the *configuredGrantTimer* is not started if the grant is skipped/ignored. In other words, the timers are not running and so no need to stop them. |
| Apple | No | We think the CR may not be not needed. If the grant is ignored or skipped then we don't have a first PUSCH symbol to transmit, hence the CGT/CGRT is not started and the problem should not occur.  38.321: “When *configuredGrantTimer* or *cg-RetransmissionTimer* is started or restarted by a PUSCH transmission, it shall be started at the beginning of the first symbol of the PUSCH transmission.” |
| CATT | No | CGT/CGRT are indeed started at grant reception in 5.4.1. But we don’t think the proposed change would be correct because NW would not know that CGT was stopped and so UE and NW would be out of sync regarding CGT. |
| Qualcomm | No | Agree with vivo and Samsung |
| Huawei, HiSilicon | Yes | Agree with the intention. As CATT commented, CGT/CGRT can be started at grant reception. We can disucuss about how to handle any “side effect” of stopping the timer for ignored or skipped grant. |
| ZTE | No | Agree with vivo and Samsung |

**Summary:**

# 5 Conclusion

The contribution is summarized with proposals as follows,

***Phase-1***

# 6 Reference

1. R2-2106926, LS on UL skipping for PUSCH in Rel-16, vivo.
2. R2-2106997, Correction on UL Skipping for PUSCH in Rel-16, vivo, ZTE corporation, Xiaomi Communication.
3. R2-2108092, Corrections to R16 UL skipping with repetitions, Ericsson, NTT DOCOMO INC.
4. R2-2108093, Corrections to R16 UL skipping with repetitions, Ericsson, NTT DOCOMO INC.
5. R2-2108232, On enhanced UL skipping and PUSCH repetitions, MediaTek Inc.
6. R2-2107927, CR on the enabling restriction on R16 PUSCH skipping and PUSCH repetitions, OPPO.
7. R2-2107198, Correction on UL skipping with lch-basedPrioritization, CATT, Samsung.
8. R2-2107609, Enhanced UL skipping with intra-UE prioritization, APPLE.
9. R2-2107163, Discussion on R16 uplink skipping with TB repetitions, Huawei, HiSilicon.
10. R2-2107160, Discussion about a loophole for R16 uplink skipping procedure, Huawei, HiSilicon.
11. R2-2107161, Correction on R16 uplink skipping procedure, Huawei, HiSilicon.
12. R2-2108781, Stopping configuredGrantTimer upon ignored or skipped uplink grant, LG Electronics UK.