**3GPP TSG RAN WG1 #100bis-e** **R1-200XXXX**

**e-meeting, April 20-30, 2020**

**Agenda item: 7.2.2.2.1**

**Source: Moderator (Nokia)**

**Title: TPs related to the email discussion [100b-e-NR-unlic-NRU-ChAcc-01]**

**Document for: Discussion and Decision**

# 1 Introduction

This document captures the text proposals related to the following RAN1#100bis-e email thread:

[100b-e-NR-unlic-NRU-ChAcc-01] Email discussion/approval on clarifications to LBT with consecutive UL transmissions by 4/23; if necessary, followed by endorsing the corresponding TPs by 4/28 – Timo (Nokia)

During the preparation phase it was identified that the following TDocs and proposals relate to corrections and clarifications to consecutive UL transmissions:

**Issue #2** Clarifications to LBT with consecutive UL transmissions

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| Clarifications to LBT with consecutive UL transmissions | R1-2001534 (2.7)  R1-2001652 (2.3)  R1-2001705 (2.2)  R1-2001759 (2.1)  R1-2001935 (p7)  R1-2001987 (p3)  R1-2002117 (p2, p3)  R1- 2002193 (p4)  R1-2002383 (p1)  R1-2002530 (p1)  R1-2002632 (p4, p5) |

This contribution provides text proposals for some of the related aspects.

# 2. TPs

## 2.1 LBT type after failing to transmit first PUSCH(s) of a set scheduled by an UL grant

From the agreement in [100b-e-NR-unlic-NRU-ChAcc-01]:

Agreement:

For LBT type and CP extension, after failing to transmit first PUSCH(s) of a set scheduled by a single UL grant,

* If a UE fails to access the channel with UL Type 2B channel access, Type 2A UL channel access shall be used for the following consecutively scheduled transmissions.
* If a UE fails to access the channel prior to the first of the consecutive UL transmissions, it shall use “0” CP extension for the subsequent UL transmissions irrespective of the CP extension indicated in the scheduling grant.

Would a text proposal be needed for the above or is the plan to leave it to the editor? If a TP is needed, it can be discussed until 4/28.

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| \*\*\* <Beginning of **Text Proposal 1**> \*\*\* 4.2.1.0.1 Channel access procedures for consecutive UL transmission(s) For contiguous UL transmission(s), the following are applicable:  - If a UE is scheduled to transmit a set of UL transmissions including PUSCH using a UL grant, and if the UE cannot access the channel for a transmission in the set prior to the last transmission according to one of Type 1 or Type 2A UL channel access procedures, the UE shall attempt to transmit the next transmission according to the channel access type indicated in the UL grant. Otherwise, if the UE cannot access the channel for a transmission in the set prior to the last transmission according to Type 2B UL channel access procedure, the UE shall attempt to transmit the next transmission according to the Type 2A UL channel access procedure.  - If a UE is scheduled by a gNB to transmit a set of UL transmissions including PUSCH using a UL grant, the UE shall apply a CP extension value “0” for the UL transmissions in the set other than the first one.  - If a UE is scheduled to transmit a set of consecutive UL transmissions without gaps including PUSCH using one or more UL grant(s) and the UE transmits one of the scheduled UL transmissions in the set after accessing the channel according to one of Type 1, Type 2A, Type 2B or Type 2C UL channel access procedures, the UE may continue transmission of the remaining UL transmissions in the set, if any.  - A UE is not expected to be indicated with different channel access types for any consecutive UL transmissions without gaps in between the transmissions.  \*\*\* <End of **Text Proposal 1**> \*\*\* |

Companies are asked to provide their views on the TP using the Table below:

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| **Company / Org.** | **View on FL proposal #4** |
| Huawei, HiSilicon | We are Ok with the TP but we have the following editorial suggestions:  - If a UE is scheduled to transmit a set of UL transmissions including PUSCH using a UL grant, and if the UE cannot access the channel for a transmission in the set prior to the last transmission according to one of Type 1 or Type 2A UL channel access procedures, the UE shall attempt to transmit the next transmission according to the channel access type indicated in the UL grant. Otherwise, if the UE cannot access the channel for a transmission in the set prior to the last transmission according to Type 2B UL channel access procedure, the UE shall attempt to transmit the next transmission according to Type 2A UL channel access procedure.  - If a UE is scheduled by a gNB to transmit a set of UL transmissions including PUSCH using a UL grant, the UE shall apply a CP extension value “0” for the UL transmissions in the set other than the first transmission.  For the following subbullet, isn’t it sufficient to leave it as Type 2 since it covers all the 3 sub types?  - If a UE is scheduled to transmit a set of consecutive UL transmissions without gaps including PUSCH using one or more UL grant(s) and the UE transmits one of the scheduled UL transmissions in the set after accessing the channel according to one of Type 1 or Type 2 UL channel access procedures, the UE may continue transmission of the remaining UL transmissions in the set, if any.  For the last subbullet, it is OK to revise if the understanding of the group is that the UE switching implicitly to Type 2A for a later transmission is considered an indication with a different channel access type. |
| ZTE, Sanechips | Support this TP and some clarifications can be needed as follows:  In my view, CP extension value “0” is applied for the remaining UL transmission after first UL transmission of accessing channel. So the following modification is proposed:  - If a UE is scheduled to transmit a set of UL transmissions including PUSCH using a UL grant, and if the UE cannot access the channel for a transmission in the set prior to the last transmission according to one of Type 1 or Type 2A UL channel access procedures, the UE shall attempt to transmit the next transmission according to the channel access type indicated in the UL grant. Otherwise, if the UE cannot access the channel for a transmission in the set prior to the last transmission according to Type 2B UL channel access procedure, the UE shall attempt to transmit the next transmission according to the Type 2A UL channel access procedure.  - If a UE is scheduled by a gNB to transmit a set of UL transmissions including PUSCH using a UL grant, the UE shall apply a CP extension value “0” for the remaining UL transmissions in the set ~~other than~~ after the first ~~one~~ UL transmission of accessing channel.  For the last sub-bullet, I tend to keep the current paragragh. If this restriction specified in LTE-LAA doesn’t apply to NR-U, in my understanding, at least it still fit for LTE-LAA. So I think we can declare that it is just available for LTE-LAA.  Possible modification:  - A UE is not expected to be indicated by eNB with different channel access types for any consecutive UL transmissions without gaps in between the transmissions. |
| Samsung | OK with the TP |
| Ericsson | I propose two changes in addition to the ones by ZTE and HW.  First change: The reason for this change is not to change the rule for LAA since “A is related to NR-U. Therefore, I thought we can keep the main text and add the condition when the change is possible at the end. Since it is “or” and TA and TB are used, it is clearly valid for NR-U, not LAA.  Second update: Isn’t it CP extension value 20”, is no COP extension? If it is correct, then we can simplify.  ======================================= 4.2.1.0.1 Channel access procedures for consecutive UL transmission(s) For contiguous UL transmission(s), the following are applicable:  - If a UE is scheduled to transmit a set of UL transmissions including PUSCH using a UL grant , and if the UE cannot access the channel for a transmission in the set prior to the last transmission, the UE shall attempt to transmit the next transmission according to the channel access type indicated in the UL grant~~.~~ or Type 2A UL channel access procedures if the UE cannot access the channel for the previous UL transmission in the set using Type 2B UL channel access procedures.  - If a UE is scheduled by a gNB to transmit a set of UL transmissions including PUSCH using a UL grant, the UE shall not apply a CP extension ~~value “0”~~ for the remaining UL transmissions in the set ~~other than~~ after the first ~~one~~ UL transmission ~~of~~ after accessing channel.  - If a UE is scheduled to transmit a set of consecutive UL transmissions without gaps including PUSCH using one or more UL grant(s) and the UE transmits one of the scheduled UL transmissions in the set after accessing the channel according to one of Type 1 or Type 2 UL channel access procedures, the UE may continue transmission of the remaining UL transmissions in the set, if any.  - A UE is not expected to be indicated by eNB with different channel access types for any consecutive UL transmissions without gaps in between the transmissions.  <<unchanged text omitted>>  ====================================== |
| LG | We are Ok with the modified TP suggested by Huawei for the first bullet and second bullet. But, for the Huawei’s comments on the third sub-bullet, we prefer Timo's original text because it seems a bit clearer.  For the last bullet, I agree with ZTE and Ericsson that it needs to be revised rather than removing it considering the followings.   * The last bullet is still valid for LTE LAA. * The last bullet is also valid for NR-U for the case where consecutive UL transmissions are indicated with Type 1 or Type 2A channel access.   The exceptional case for NR-U is that the gNB can indicate Type 2B or Type 2C channel access for 1st UL transmission and Type 2A channel access for the following UL transmissions. |
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## 2.2 LBT type for consecutive CG transmissions

From the agreement in [100b-e-NR-unlic-NRU-ChAcc-01]:

Finally, regarding the proposal to discuss the TP on LBT type for consecutive CG transmissions, in general we should work on TPs in the second phase only if there is consensus that there is something missing that needs to be captured in a TP. It was not clear that is the case here, but let’s continue discussion as Timo recommends.

Discuss if the second change in TP7 of R1-2001534 is agreeable, possibly with some modifications until 4/28

The second change of the text proposal TP#7 from R1-2001534 is copied below, renamed as TP2:

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| \*\*\* <Beginning of **Text Proposal 2**> \*\*\*  4.2.1.0.1 Channel access procedures for consecutive UL transmission(s)  For contiguous UL transmission(s), the following are applicable:  - If a UE is scheduled to transmit a set of UL transmissions including PUSCH using a UL grant , and if the UE cannot access the channel for a transmission in the set prior to the last transmission, the UE shall attempt to transmit the next transmission according to the channel access type indicated in the UL grant.  - If a UE is scheduled to transmit a set of consecutive UL transmissions without gaps including PUSCH using one or more UL grant(s) and the UE transmits one of the scheduled UL transmissions in the set after accessing the channel according to one of Type 1 or Type 2 UL channel access procedures, the UE may continue transmission of the remaining UL transmissions in the set, if any.  - If a UE is configured to transmit a set of consecutive PUSCH transmissions on resources configured by the gNB, the time domain resource configuration defines multiple transmission occasions at which the UE may access the channel according to Type 1 UL channel access procedure, each transmission occasion starts at the starting symbol of a configured grant PUSCH within the duration of the COT.  - A UE is not expected to be indicated with different channel access types for any consecutive UL transmissions without gaps in between the transmissions.  \*\*\* <End of **Text Proposal 2**> \*\*\* |

Companies are asked to provide their views on the TP using the Table below:

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| **Company / Org.** | **View on FL proposal #4** |
| Huawei, HiSilicon | We need to capture the channel access behavior for CG with multiple transmission occasions similar to scheduled consecutive UL transmissions. Given the comments in the previous email discussion, we propose the following modification to the above TP:  - If a UE is configured to transmit a set of consecutive PUSCH transmissions on resources configured by the gNB, the time domain resource configuration defines multiple transmission occasions, and if the UE cannot access the channel according to Type 1 UL channel access procedure for transmitting in a transmission occasion prior to the last transmission occasion, the UE shall attempt to transmit in the next transmission occasion according to Type 1 UL channel access procedure. If the UE transmits in a transmission occasion, the UE may continue transmission in the remaining transmission occasions in the set, if any wherein each of the remaining transmission occasions starts at the starting symbol of a configured grant PUSCH within the duration of the COT. |
| Samsung | OK with the TP |
| Ericsson | OK with HW updates on the TP |
| LG | We are Ok with the modified TP proposed by Huawei. |
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## 2.3 Direct transmission of UL transmission(s) following configured grant UL transmission(s)

From the agreement in [100b-e-NR-unlic-NRU-ChAcc-01]:

Agreement:

Back-to-back transmission of GC-PUSCH and dynamically scheduled PUSCH is supported in NR-U with restrictions similar to those in LTE LAA.

Discuss the exact TP taking TP#9 in R1-2001534 as the starting point (until 4/28)

The text proposal TP#9 from R1-2001534 is copied below, renamed as TP3:

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| \*\*\* <Beginning of **Text Proposal 3**> \*\*\*  4.2.1.0.1 Channel access procedures for consecutive UL transmission(s)  \*\*\* Unchanged text is omitted \*\*\*  For UL transmission(s) following configured grant UL transmission(s), the following are applicable:  - If a UE is scheduled by a DCI received from a gNB to transmit UL transmission(s) starting from symbol in slot using Type 1 channel access procedure without CP extension, and if the UE starts configured grant UL transmissions before slot using Type 1 channel access procedure, and the scheduled UL transmission(s) occupies all the RBs of the same channels occupied by the configured grant UL transmission(s) or all the RBs of a subset thereof, the UE may directly transmit the scheduled UL transmission(s) according to the received DCI from symbol in slot without a gap, if the priority class value of the performed channel access procedure is larger than or equal to the priority class value indicated in the DCI, and the configured grant UL transmission shall end at the symbol preceding symbol . The sum of the lengths of the configured grant UL transmission(s) and the scheduled UL transmission(s) shall not exceed the maximum channel occupancy time corresponding to the priority class value used to transmit the configured grant UL transmission(s). Otherwise, the UE shall terminate the configured grant UL transmission by dropping the transmission of at least the CG-PUSCH before symbol in slot and transmit the scheduled UL transmission(s) according to the received DCI.  \*\*\* Unchanged text is omitted \*\*\*  \*\*\* <End of **Text Proposal 3**> \*\*\* |

Companies are asked to provide their views on the TP using the Table below:

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| **Company / Org.** | **View on FL proposal #4** |
| Huawei, HiSilicon | Based on the changes proposed by OPPO and Samsung, we have the following suggestions and comments:   * For inserting the CG PUSCH cancellation rule, can’t we just follow the approach in 6.1.2.3.1 of 38.214 and insert the follwing sentence instead?   PUSCH transmission with a configured grant in a slot is omitted according to the conditions in Clause 11.1 of [6, TS38.213] relative to a last symbol of a CORESET where the UE detects the DCI format.   * The case when CG PUSCH is dropped, it actually corresponds to one or more of the conditions for back-to-back tranmissions not being met (Full BW allocation, CAPC, and MCOT). So, I don’t see how we can allow the back-to-back transmission to happen in case the CG PUSCH cancellation ruleis not applicable to the preceding PUSCH     Also, given the requirement for Full BW allocation per channel of those occupied by the CG transmission, we should discuss whether this subcaluse should be limited to PUSCHs scheduled by an UL grant only |
| Samsung | Agree with the sentence provided by Huawei.  For the case when the CG-PUSCH cancellation rule is not applicable to the preceding PUSCH, we think the proper UE behaviour should be defined and the possible option is to transmit scheduled PUSCH without a gap. If we agree with this, it seems that we can include this in the conditions for back-to-back transmission (i.e., Full BW allocation, CAPC, MCOT, and not applicable CG-PUSCH cancellation)  Also, it seems that we should discuss other UL channels and signals such as PRACH, PUCCH (including configured PUCCH) in this subclause, but it is also ok to limit to the case of PUSCHs scheduled by UL grant only in this meeting. |
| Ericsson | The proposed TP is fine in general. Some further refinement for consideration below:  \*\*\* <Beginning of **Text Proposal 3**> \*\*\*  4.2.1.0.1 Channel access procedures for consecutive UL transmission(s)  \*\*\* Unchanged text is omitted \*\*\*  For UL transmission(s) following configured grant UL transmission(s), the following are applicable:  - If a UE is scheduled ~~by a DCI received from a gNB~~ to transmit UL transmission(s) starting from symbol in slot using Type 1 channel access procedures without CP extension with a corresponding CAPC, and if the UE starts configured grant UL transmissions before slot using Type 1 channel access procedures with a corresponding CAPC, and the scheduled UL transmission(s) occupies ~~all~~ a subset of the RBs of the same channels occupied by the configured grant UL transmission(s) ~~or all the RBs of a subset thereof~~, the UE may ~~directly~~ continue to transmit the scheduled UL transmission(s) ~~according to the received DCI~~ to the corresponding CAPC from symbol in slot without a gap, if the CAPC ~~priority class~~ value of the performed channel access procedure is larger than or equal to the CAPC ~~priority class~~ value corresponding to the scheduled UL transmission(s) ~~indicated in the DCI~~, ~~and the configured grant UL transmission shall ends at the symbol preceding symbol~~ . The sum of the ~~lengths~~ transmission durations of the configured grant UL transmission(s) and the scheduled UL transmission(s) shall not exceed the maximum channel occupancy time corresponding to the CAPC ~~priority class~~ value used to transmit the configured grant UL transmission(s). Otherwise, the UE shall terminate the configured grant UL transmission(s) by dropping at least the transmission of ~~at least~~ ~~the CG-PUSCH~~ before symbol in slot and attempt to transmit the scheduled UL transmission(s) according to the corresponding CAPC ~~received DCI~~.  \*\*\* Unchanged text is omitted \*\*\*  \*\*\* <End of **Text Proposal 3**> \*\*\*  The reasons for above changes, in addition to improve a the flow a bit, are as the following:   * For first change, Better to be general. The CAPC of a scheuled transmisison is not neccesary indicated in DCI, for example in case of fall-back DCI. It is enough to say that the UL transmission is scehduel. * For second change, a subset is also a set.   For the third change, the sentecne is nto needed. Because it infact, considers a case that CG PUSCH overlaps with DG PUSCH. In that case, due to the intra-UE priroitization rule, one of the transmisions would be canceled and there wont be overlap. That operation is definitely before LBT. When in this case, we can assume that tranmsmisisons are back to back and not overlapped. |
| LG | For the CG PUSCH cancellation rule, I think that the two things should be specified on the TP. Firstly, to guarantee the enough time for a UE to cancel CG PUSCH, the timeline for the ending symbol of UL grant scheduled DG PUSCH relative to the starting symbol of CG-PUSCH should be specified. By extending the approach in 6.1 of TS 38.214, a UE is not expected to be scheduled by a PDCCH ending in symbol in symbol *i* to transmit a PUSCH overlapping in time with CG-PUSCH starting in a symbol *j* if the end of symbol I is not at least *N2* symbols before the beginning of symbol *j*.  Secondly, to guarantee the enough LBT gap for a UE to transmit DG PUSCH when one or more of the conditions for the back-to-back transmissions are not met, how many symbols or slots to cancel should be specified. It can be 1 slot along the feLAA, or at least X symbol(s), the exact X value can be determined by further discussion. |
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# 3. Conclusions

TBA

# References

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| 1 | [**R1-2001534**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2001534.zip) | Maintainance on the channel access procedure | Huawei, HiSilicon |
| 2 | [**R1-2001652**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2001652.zip) | Remaining issues on the channel access procedures | vivo |
| 3 | [**R1-2001705**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2001705.zip) | Remaining issues on the channel access procedure for NR-U | ZTE, Sanechips |
| 4 | [**R1-2001759**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2001759.zip) | Discussion on the remaining issues of channel access procedure | OPPO |
| 5 | [**R1-2001935**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2001935.zip) | Remaining issues of channel access procedure for NR-U | LG Electronics |
| 6 | [**R1-2001987**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2001987.zip) | Channel access mechanism for NR-unlicensed | Intel Corporation |
| 7 | [**R1-2002031**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002031.zip) | Channel access procedures | Ericsson |
| 8 | [**R1-2002117**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002117.zip) | Channel access procedures for NR-U | Samsung |
| 9 | [**R1-2002193**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002193.zip) | Remaining Issues on Channel Access Procedures for NR-U | Nokia, Nokia Shanghai Bell |
| 10 | [**R1-2002247**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002247.zip) | Remaining issues on channel access procedures for NR-U | ETRI |
| 11 | [**R1-2002383**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002383.zip) | Remaining issues and corrections on channel access procedure for NR-U | Sharp |
| 12 | [**R1-2002405**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002405.zip) | Remaining issues on channel access for NR-U operation | MediaTek Inc. |
| 13 | [**R1-2002434**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002434.zip) | Remaining issues on channel access procedures for NR-U | NTT DOCOMO, INC. |
| 14 | [**R1-2002465**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002465.zip) | TP on shared spectrum in NR-U | NEC |
| 15 | [**R1-2002530**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002530.zip) | TP for Channel access procedures for NR unlicensed | Qualcomm Incorporated |
| 16 | [**R1-2002632**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002632.zip) | Remaining issues on channel access procedure for NR-U | WILUS Inc. |
| 17 | [**R1-2002684**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002684.zip) | COT sharing information in CG-UCI | Lenovo, Motorola Mobility |