**3GPP TSG RAN WG1 #101-e** **R1-200XXXX**

**e-meeting, May 25 – June 5, 2020**

**Agenda item: 7.2.2.2.1**

**Source: Moderator (Nokia)**

**Title: Summary of [101-e-NR-unlic-NRU-ChAcc-01] Email discussion/approval on XXXX**

**Document for: Discussion and Decision**

# 1 Introduction

This document captures the discussion in the following RAN1#101s-e email thread:

[101-e-NR-unlic-NRU-ChAcc-01] Email discussion/approval on the following from R1-2004539 by 5/29; if necessary, endorse associated TPs by 6/4 – Timo (Nokia)

* Issue#1: Indication of LBT type, CP extension and CAPC; N1 timeline for UL transmissions with CP extension
* Issue#2: Clarifications to LBT with consecutive UL transmissions

This contribution summarizes the discussion and collects companies views on each question.

# 2. Issue #1

**Issue #1** (Indication of LBT type, CP extension and CAPC; N1 timeline for UL transmissions with CP extension) was discussed in the following contributions

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| N1 timeline for UL transmissions with CP extension | R1-2003656 (p1)R1-2003728 (p2, p3)R1-2004085 (p7) |
| CP extension related | R1-2003728 (p2)R1-2004013 (p5)R1-2004085 (p6) |
| CP extension for semi-static channel access | R1-2004443 (p2) |
| Channel Access for periodic signals / channels | R1-2004275 (p3) |
| Applicability of CP extension for SRS | R1-2003972 (p5)R1-2004275 (p2) |

## 2.1 N1 timeline for UL transmissions with CP extension

Three TDocs addressed the issue of how to determine the processing timeline for UL transmission when CP extension is applied. A related agreement from RAN1#98bis is as follows:

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| Agreement:* For the CP extension prior to at least a dynamically scheduled PUSCH transmission, the CP extension is located in the symbol(s) immediately preceding the PUSCH allocation indicated by SLIV. The supported durations for CP extension at the UE are:
	+ 0 (i.e. no CP extension)
	+ C1\*symbol length – 25 us
	+ C2\*symbol length – 16 us - TA
	+ C3\*symbol length – 25 us – TA
* C1=1 for 15 and 30 kHz SCS, C1=2 for 60 kHz SCS
* FFS: Whether C2/C3 is fixed or implicitly derived based on TA for each subcarrier spacing
* The N2 timeline (UL grant to PUSCH delay) needs to be relaxed to take the CP extension into account
* FFS: Whether the limit as per the previous agreement bounding the resulting CP extension to be less than or equal to one symbol for the given subcarrier spacing should be relaxed
* FFS: Applicability of this to other UL transmissions
* FFS: Whether the number of durations for CP extension that the UE can be signalled dynamically can be configured
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Related proposals in the TDocs are the following:

**R1-2003656:**

Proposal 1: When CP extension is applied to a dynamically scheduled PUCCH transmission, the N1 timeline needs to be relaxed to take the CP extension into account.

**R1-2003728**

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| **------------------------------------------------------- TP2: TS 38.214 section 6.4 ----------------------------------------------------**\*\*\* Unchanged text is omitted \*\*\*6.4 UE PUSCH preparation procedure timeIf the first uplink symbol in the PUSCH allocation for a transport block, including the DM-RS, as defined by the slot offset *K2* and the start and length indicator *SLIV* of the scheduling DCI and including the effect of the timing advance, is no earlier than at symbol *L2*, where *L2* is defined as the next uplink symbol with its CP starting after the end of the reception of the last symbol of the PDCCH carrying the DCI scheduling the PUSCH, then the UE shall transmit the transport block. *- N2* is based on *µ* of Table 6.4-1 and Table 6.4-2 for UE processing capability 1 and 2 respectively, where *µ* corresponds to the one of (*µDL*, *µUL*) resulting with the largest *Tproc,2*, where the *µDL* corresponds to the subcarrier spacing of the downlink with which the PDCCH carrying the DCI scheduling the PUSCH was transmitted and *µUL* corresponds to the subcarrier spacing of the uplink channel with which the PUSCH is to be transmitted, and *κ* is defined in subclause 4.1 of [4, TS 38.211].*-* For operation with shared spectrum channel access, is calculated according to [4, TS 38.211], otherwise =0.- If the first symbol of the PUSCH allocation consists of DM-RS only, then *d2,1* = 0*,* otherwise *d2,1* = 1. - If the UE is configured with multiple active component carriers, the first uplink symbol in the PUSCH allocation further includes the effect of timing difference between component carriers as given in [11, TS 38.133]. - If the scheduling DCI triggered a switch of BWP, *d2,2* equals to the switching time as defined in [11, TS 38.133], otherwise *d2,2*=0. - For a UE that supports capability 2 on a given cell, the processing time according to UE processing capability 2 is applied if the high layer parameter *processingType2Enabled* in *PUSCH-ServingCellConfig* is configured for the cell and set to *enable*,- If the PUSCH indicated by the DCI is overlapping with one or more PUCCH channels, then the transport block is multiplexed following the procedure in subclause 9.2.5 of [9, TS 38.213], otherwise the transport block is transmitted on the PUSCH indicated by the DCI.\*\*\* Unchanged text is omitted \*\*\* |

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| **------------------------------------------------------- TP3: TS 38.214 section 5.3 ----------------------------------------------------**\*\*\* Unchanged text is omitted \*\*\*5.3 UE PDSCH processing procedure timeIf the first uplink symbol of the PUCCH which carries the HARQ-ACK information, as defined by the assigned HARQ-ACK timing *K1* and the PUCCH resource to be used and including the effect of the timing advance, starts no earlier than at symbol *L1*, where *L1* is defined as the next uplink symbol with its CP starting after  after the end of the last symbol of the PDSCH carrying the TB being acknowledged, then the UE shall provide a valid HARQ-ACK message. *- N1* is based on *µ* of table 5.3-1 and table 5.3-2 for UE processing capability 1 and 2 respectively, where *µ* corresponds to the one of (*µPDCCH*, *µPDSCH*, *µUL*) resulting with the largest *Tproc,1*, where the *µPDCCH* corresponds to the subcarrier spacing of the PDCCH scheduling the PDSCH, the *µPDSCH* corresponds to the subcarrier spacing of the scheduled PDSCH, and *µUL* corresponds to the subcarrier spacing of the uplink channel with which the HARQ-ACK is to be transmitted, and κ is defined in subclause 4.1 of [4, TS 38.211]. *-* For operation with shared spectrum channel access, is calculated according to [4, TS 38.211], otherwise =0.*-* If the PDSCH DM-RS position for the additional DM-RS in Table 7.4.1.1.2-3 in subclause 7.4.1.1.2 of [4, TS 38.211] is then *N1,0=14* inTable 5.3-1*,* otherwise *N1,0=13.*- If the UE is configured with multiple active component carriers, the first uplink symbol which carries the HARQ-ACK information further includes the effect of timing difference between the component carriers as given in [11, TS 38.133].\*\*\* Unchanged text is omitted \*\*\* |

**R1-2004085**

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| ***Proposal 7:*** *The starting position of the CP extension of the first uplink symbol of PUSCH or PUCCH in shared spectrum shall start no earlier than the symbol L2 or L1.** *Adopt TP7 into section 6.4 of TS 38.214.*
* *Adopt TP8 into section 5.3 of TS 38.214.*

----------------------------------- TP7: Start of TP 38.214 section 6.4 ----------------------------------------------6.4 UE PUSCH preparation procedure timeIf the first uplink symbol or the first uplink symbol with its CP extension with shared spectrum channel access in the PUSCH allocation for a transport block, including the DM-RS, as defined by the slot offset *K2* and the start and length indicator *SLIV* of the scheduling DCI, or by *ChannelAccess-CPext or ChannelAccess-CPext-CAPC* with shared spectrum channel access, and including the effect of the timing advance, is no earlier than at symbol *L2*, where *L2* is defined as the next uplink symbol with its CP starting after the end of the reception of the last symbol of the PDCCH carrying the DCI scheduling the PUSCH, then the UE shall transmit the transport block. <Unchanged parts are omitted>----------------------------------------End of TP 38.214 section 6.4 ---------------------------------------------------------------------------------- TP8: Start of TP 38.214 section 5.3 ----------------------------------------------5.3 UE PDSCH processing procedure timeIf the first uplink symbol or the first uplink symbol with its CP extension with shared spectrum channel access of the PUCCH which carries the HARQ-ACK information, as defined by the assigned HARQ-ACK timing *K1* and the PUCCH resource to be used, or by *ChannelAccess-CPext* with shared spectrum channel access, and including the effect of the timing advance, starts no earlier than at symbol *L1*, where *L1* is defined as the next uplink symbol with its CP starting after  after the end of the last symbol of the PDSCH carrying the TB being acknowledged, then the UE shall provide a valid HARQ-ACK message. <Unchanged parts are omitted>----------------------------------------End of TP 38.214 section 5.3 ----------------------------------------------- |

Companies are asked to provide their views related to the above proposals with the table below:

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## 2.2 Other CP extension / LBT type indication related issues

One Tdoc addressed the issue of the duration of CP extension being capped to 1 symbol, e.g. in the case of misaligned assumption of the TA value at the UE and gNB. The related proposal is listed below:

**R1- 2004013**

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| **Proposal #5: If , the UL transmission performed with Cat-1 or Cat-2 LBT should be dropped, and the UL transmission performed with Cat-4 LBT can be transmitted with CP extension length of .** |

Companies are asked to provide their views related to the proposal above with the table below:

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Another Tdoc discusses the case where multiple DL assignments schedule a PUCCH transmission for the same PUCCH. The related proposal is as follows:

**R1-2004085**

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| ***Proposal 6:*** *The LBT type indication in the last DL grant should be used for PUCCH transmission if multiple DL grants indicate a same PUCCH transmission.** *Adopt TP6 into section 4.2.1 of TS 37.213.*

------------------------------------TP6: Start of TP 37.213 section 4.2.1 ---------------------------------------------4.2.1 Channel access procedures for uplink transmission(s)<Unchanged parts are omitted>A UE shall use Type 1 channel access procedures for PUCCH transmissions unless stated otherwise in this subclause. If a last DL grant among the DL grants that scheduling a PUCCH transmission on a same slot indicates Type 2 channel access procedures, or a random access response (RAR) message for successRAR scheduling a PUCCH transmission indicates Type 2 channel access procedures, the UE shall use Type 2 channel access procedures. <Unchanged parts are omitted>----------------------------------------End of TP 37.213 section 4.2.1 --------------------------------------------- |

Companies are asked to provide their views related to the proposal above with the table below:

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## 2.3 CP extension and LBT type for semi-static channel access

R1-2003728 points out that the Type 2A channel access definition may not be quite the same as the LBT type used with semi-static channel access, and proposes introducing a new Type 2D DL channel access procedure in to 37.213:

**R1-2003728**

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| **-------------------------------------------------- TP4: TS 37.213 --------------------------------------------------**\*\*\* Unchanged text is omitted \*\*\*4.1.2.4 Type 2D DL channel access procedureAn eNB/gNB may transmit a DL transmission immediately after sensing the channel to be idle for at least a sensing interval . consists of a duration immediately followed by one sensing slot and includes a sensing slot at start of . The channel is considered to be idle for if at least one of the sensing slots of is sensed to be idle.\*\*\* Unchanged text is omitted \*\*\*4.2.1.2.4 Type 2D UL channel access procedureIf a UE is indicated to perform Type 2D UL channel access procedures, the UE uses Type 2D UL channel access procedures for a UL transmission. The UE may transmit the transmission immediately after sensing the channel to be idle for at least a sensing interval . consists of a duration immediately followed by one slot sensing slot and includes a sensing slot at start of . The channel is considered to be idle for if at least one of the sensing slots of is sensed to be idle.\*\*\* Unchanged text is omitted \*\*\* |

Correspondingly, R1-2003728 also suggests changes to 38.212, such that in the case of semi-static channel access, a reference is made to Type 2D channel access. Moreover, R1-2003728 further points out a typo in section 8.1 of 38.213, where “*ChannelAccessType-r16*” should be replaced with “*ChannelAccessMode-r16*”,

Companies are asked to provide their views related to the above proposals with the table below:

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**R1-2004443,** Section 4 discusses also issues related to semi-static channel access, proposing the following: unlike in the current specs, the CPext-ChannelAccess- CAPC is included into the DCI formats. The UE ignores CAPC value; UE does not expected to be configured entries with cat 4 LBT; UE does not expect to be configured with entries with CP extension values other than C2\*symbol length – 16 us – TA or 0.

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| **Proposal 2. ChannelAccess-CPext-CAPC and ChannelAccess-CPext fields are applicable for DCI 0\_1 and 1\_1 respectively for FBE as well, though some combinations may not be valid for FBE and gNB should not configure those.** |

Companies are asked to provide their views related to the above proposals with the table below:

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## 2.4 Channel Access for UL Signals and Channels in a gNB COT

One contribution discusses UL channel access for periodic signals and channels, as well as transmissions scheduled with Type 1 UL channel access falling within a gNB COT, and proposes to generalize the current specifications text in 37.213, Section 4.2.1.0.0 to also cover the cases where the DL-UL gaps is 16 us or less. The related proposal is as follows:

**R1-2004275:**

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| ***Proposal 3*** *: When a UL transmission scheduled with Type 1 UL channel access (either dynamically scheduled or configured) falls within a gNB COT, the UE may switch to either Type 2A, 2B, or 2C channel access, when the related conditions (duration of the gap and duration of the UL transmission) are met*-------- Beginning of Text Proposal, TS 37.213 ------------============================<<unchanged text omitted>>===============================4.2.1.0.0 Channel access procedures upon detection of a common DCIIf a UE detects 'UL duration and offset' field in DCI Format 1C as described in clause 5.3.3.1.4 of [5], the following are applicable:- If the 'UL duration and offset' field indicates an 'UL offset' and an 'UL duration' for subframe , then the scheduled UE may use channel access procedures Type 2 for transmissions in subframes where , irrespective of the channel access Type signalled in the UL grant for those subframes, if the end of UE transmission occurs in or before subframe .- If the 'UL duration and offset' field indicates an 'UL offset' and an 'UL duration' for subframe and the 'COT sharing indication for AUL' field is set to '1', then a UE configured with autonomous UL may use channel access procedures Type 2 for autonomous UL transmissions assuming any priority class in subframes where , if the end of UE autonomous UL transmission occurs in or before subframe and the autonomous UL transmission between and shall be contiguous.- If the 'UL duration and offset' field indicates an 'UL offset' and an 'UL duration' for subframe and the 'COT sharing indication for AUL' field is set to '0', then a UE configured with autonomous UL shall not transmit autonomous UL in subframes where .If a UE determines the duration in time domain and the location in frequency domain of a remaining channel occupancy initiated by the gNB from a DCI format 2\_0 as described in clause 11.1.1 of [7], the following is applicable:- The UE may switch from Type 1 channel access procedures as described in clause 4.2.1.1 to Type 2A, Type 2B, and Type 2C channel access procedures as described in clauses 4.2.1.2.1, 4.2.1.2.2, and 4.2.1.2.3, respectively, for its corresponding UL transmissions within the determined duration in time and location in frequency domain of the remaining channel occupancy, when the conditions in clause 4.2.1.0.3 are met. In this case, if the UL transmissions are PUSCH transmissions on configured resources, the UE may assume any priority class for the channel occupancy shared with the gNB. ============================<<unchanged text omitted>>===============================-------- End of Text Proposal ------------ |

Companies are asked to provide their views related to the above proposals with the table below:

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## 2.5 Applicability of CP extension for SRS

Two Tdocs discuss the applicability of CP extension for SRS:

**R1-2003972**

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| **Proposal 5:** The CP extension is additionally supported for SRS transmission. |

**R1-2004275:**

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| ***Proposal 2*** *When Aperiodic SRS is triggered with a DCI (0\_1, 1\_1) that also includes indication of CP extension, the CP extension applies to SRS as well.*------------- Beginning of Text Proposal, 38.211 ------------In case of cyclic prefix extension of the first OFDM symbol allocated for PUSCH, SRS or PUCCH transmission, the time-continuous signal for the interval preceding the first OFDM symbol for PUSCH, SRS or PUCCH is given bywhere refers to the signal in the previous subframe and - for dynamically scheduled PUSCH, SRS and PUCCH transmissions------------- End of Text Proposal ------------ |

Companies are asked to provide their views related to the above proposals with the table below:

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# 3. Issue #2

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

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| Clarifications to LBT with consecutive UL transmissions | R1-2003370 (p6, p7)R1-2003450 (p2, p3)R1-2003512 (p13, p14, p15, p16)R1-2003843 (p1)R1-2003860 (p5)R1-2004013 (p1)R1-2004085 (p2, p3)R1-2004275 (p4)R1-2004443 (p1)R1-2004521 (p4, p5, p6) |

## 3.1 CG UL transmission cancellation

A few TDocs addressed the issue of cancelling CG UL transmissions, when CG and dynamically scheduled UL transmission occur back-to back. At RAN1#100bis-e following was agreed:

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.

Agreement:

Adopt TP #2.1 and TP#2.2 in R1-2003062 for TS 37.213, Section 4.2.1.0.1

**R1- 2003370**

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| *Proposal 6: The cancellation rule in TS38.214 Section 6.1 can also be applied to NR-U.**Proposal 7: The earliest time where the CG UL transmission can be dropped is the starting boundary of the last slot before the DG UL transmission, or the symbol to which the duration from the ending symbol of the UL grant scheduling the DG PUSCH is equal to or larger than the UE processing time, whichever comes last.* |

**R1-2003450**

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| --------------------------------------------------------- Start of TP #2-----------------------------------------------------------------4.2.1.0.1 Channel access procedures for consecutive UL transmission(s) For UL transmission(s) following autonomous UL transmission(s), the following are applicable: <unchanged part omitted>If a UE is scheduled ~~by a UL grant received from an eNB on a channel~~ to transmit a PUSCH transmission(s) starting from symbol i in ~~subframe~~ slot on the same channel using Type 1 channel access procedure without CP extension and if ~~at least for the first~~ scheduled ~~subframe~~ UL transmission(s) occupies all of resource blocks of the same channels occupied by the configured grant UL transmission(s) and ~~the indicated PUSCH starting position is OFDM symbol zero, and if~~ the UE starts ~~autonomous~~ configured grant UL transmissions before symbol i ~~subframe~~ slot ~~using Type 1 channel access procedure on the same channel~~, the UE may transmit scheduled UL transmission(s) ~~according to the received UL grant~~ from symbol i in ~~subframe~~ slot without a gap, if the priority class value of the performed channel access procedure is larger than or equal to priority class value corresponding to the scheduled UL transmission(s) ~~indicated in the UL grant~~, and the ~~autonomous~~ configured grant UL transmission ~~in the subframe preceding subframe~~ shall end at the last OFDM symbol before symbol i in slot n ~~of the subframe regardless of the higher layer parameter endingSymbolAUL~~. The sum of the lengths of the ~~autonomous~~ 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 perform the ~~autonomous~~ configured grant uplink channel access procedure. Otherwise, the UE shall terminate the ongoing ~~autonomous~~ configured grant UL transmission(s) by dropping at least the last configured grant UL transmission ~~at least one subframe~~ before the start of the scheduled UL transmission from symbol i in slot n ~~according to the received UL grant on the same channel~~.--------------------------------------------------------- End of TP #2-----------------------------------------------------------------**Proposal 2**: **It is proposed to capture a missing 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” in Section 4.2.1.0.1 of the latest version of TS 37.213.**--------------------------------------------------------- Start of TP #3-----------------------------------------------------------------4.2.1.0.1 Channel access procedures for consecutive UL transmission(s) For UL transmission(s) following autonomous UL transmission(s), the following are applicable: <unchanged part omitted>If a UE is scheduled ~~by a UL grant received from an eNB on a channel~~ to transmit a PUSCH transmission(s) starting from symbol i in ~~subframe~~ slot on the same channel using Type 1 channel access procedure without CP extension and if ~~at least for the first~~ scheduled ~~subframe~~ UL transmission(s) occupies all of resource blocks of the same channels occupied by the configured grant UL transmission(s) and ~~the indicated PUSCH starting position is OFDM symbol zero, and if~~ the UE starts ~~autonomous~~ configured grant UL transmissions before symbol i ~~subframe~~ slot ~~using Type 1 channel access procedure on the same channel~~, the UE may transmit scheduled UL transmission(s) ~~according to the received UL grant~~ from symbol i in ~~subframe~~ slot without a gap, if the priority class value of the performed channel access procedure is larger than or equal to priority class value corresponding to the scheduled UL transmission(s) ~~indicated in the UL grant~~, and the ~~autonomous~~ configured grant UL transmission ~~in the subframe preceding subframe~~ shall end at the last OFDM symbol before symbol i in slot n ~~of the subframe regardless of the higher layer parameter endingSymbolAUL~~. The sum of the lengths of the ~~autonomous~~ 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 perform the ~~autonomous~~ configured grant uplink channel access procedure. Otherwise, the UE shall terminate the ongoing ~~autonomous~~ configured grant UL transmission(s) by dropping symbol(s) for the last configured grant UL transmission ~~at least one subframe~~ before the start of the scheduled UL transmission from symbol i in slot n ~~according to the received UL grant on the same channel~~. Configured grant UL transmission in a slot is omitted according to the mechanism in Clause 11.1 of [6, TS38.213] relative to a last symbol of a CORESET where the UE detects the DCI format.--------------------------------------------------------- End of TP #3-----------------------------------------------------------------**Proposal 3**: **For back-to-back transmission of CG-PUSCH and dynamically scheduled PUSCH, cancellation rule and granularity should be considered in Section 4.2.1.0.1 of the latest version of TS 37.213.** |

**R1-2003512**

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| ***Proposal 13：For the back-to-back transmission of GC-PUSCH and dynamically scheduled PUSCH in NR-U, the following is applicable:**** ***The duration for which the transmission on CG-PUSCH is dropped should be determined by UE implementation such that at least the transmission on the symbols of the last CG-PUSCH before the beginning of the DG-PUSCH should be dropped***
* ***If the UE cannot terminate the configured grant UL transmission(s), the UE ignores the scheduling UL grant.***

***Proposal 14：Adopt TP8 into section 4.2.1.0.1 of TS 37.213.***

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| \*\*\* <Beginning of **Text Proposal 8**> \*\*\*4.2.1.0.1 Channel access procedures for consecutive UL transmission(s) \*\*\* Unchanged text is omitted \*\*\*For UL transmission(s) following autonomous UL transmission(s), the following are applicable:- If a UE is scheduled by an eNB to transmit on channel by a UL grant received on channel , , and if the UE is transmitting using autonomous UL on channel , the UE shall terminate the ongoing PUSCH transmissions using the autonomous UL at least one subframe before the UL transmission according to the received UL grant.- If a UE is scheduled by a UL grant received from an eNB on a channel to transmit a PUSCH transmission(s) starting from subframe on the same channel using Type 1 channel access procedure and if at least for the first scheduled subframe occupies resource blocks and the indicated PUSCH starting position is OFDM symbol zero, and if the UE starts autonomous UL transmissions before subframe using Type 1 channel access procedure on the same channel, the UE may transmit UL transmission(s) according to the received UL grant from subframe without a gap, if the priority class value of the performed channel access procedure is larger than or equal to priority class value indicated in the UL grant, and the autonomous UL transmission in the subframe preceding subframe shall end at the last OFDM symbol of the subframe regardless of the higher layer parameter *endingSymbolAUL*. The sum of the lengths of the autonomous 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 perform the autonomous uplink channel access procedure. Otherwise, the UE shall terminate the ongoing autonomous UL transmission at least one subframe before the start of the UL transmission according to the received UL grant on the same channel.For UL transmission(s) following configured grant UL transmission(s), the following are applicable:- If a UE is scheduled 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 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) to the corresponding CAPC from symbol in slot without a gap, if the CAPC value of the performed channel access procedure is larger than or equal to the CAPC value corresponding to the scheduled UL transmission(s). The sum of the transmission durations of the configured grant UL transmission(s) and the scheduled UL transmission(s) shall not exceed the MCOT duration corresponding to the CAPC value used to transmit the configured grant UL transmission(s). Otherwise, the UE shall terminate the configured grant UL transmission(s) by dropping the transmission on the symbols of at least the last configured grant UL transmission before symbol in slot and attempt to transmit the scheduled UL transmission(s) according to the corresponding CAPC. PUSCH transmission with a configured grant in a slot is dropped according to the mechanism in Clause 11.1 of [7, TS 38.213] relative to a last symbol of a CORESET where the UE detected the scheduling DCI. In this case, if the UE cannot terminate the configured grant UL transmission(s), the UE ignores the scheduling DCI.\*\*\* Unchanged text is omitted \*\*\*\*\*\* <End of **Text Proposal 8**> \*\*\* |

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**R1-2003843**

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| **============= TP1 for Clause 4.2.1.0.1 of TS 37.213 ==================**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 to transmit UL transmission(s) starting from symbol *i* in slot *n* using Type 1 channel access procedures without CP extension with a corresponding CAPC, and if the UE starts configured grant UL transmissions before slot *n* using Type 1 channel access procedures with a corresponding CAPC, and the scheduled UL transmission(s) occupies all of  the RBs of the same channels occupied by the configured grant UL transmission(s), the UE may continue to transmit the scheduled UL transmission(s) to the corresponding CAPC from symbol *i* in slot *n* without a gap, if the following conditions are fulfilled:- the CAPC value of the performed channel access procedure is larger than or equal to the CAPC value corresponding to the scheduled UL transmission(s), and- the sum of the transmission durations of the configured grant UL transmission(s) and the scheduled UL transmission(s) do not exceed the maximum channel occupancy time corresponding to the CAPC value used to transmit the configured grant UL transmission(s). Otherwise, the UE shall cancel any transmission attempt at least on the configured grant resource before symbol *i* in slot *n* and shall attempt to transmit the scheuled UL transmission(s)according to the corresponding CAPC. For cancellation of the configured grant UL transmission, the UE expects the time interval between the end of the UL grant and the start of the corresponding configured UL grant resource meets the cancellation time requirement as described in Clause 6.1 of [8]. |

**R1-2003860**

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| ================================= Start of TP for TS 37.213 =================================4.2.1.0.1 Channel access procedures for consecutive UL transmission(s)================================ Unchanged Texts Omitted =================================For UL transmission(s) following configured grant UL transmission(s), the following are applicable:- If a UE is scheduled by a DCI format to transmit a PUSCH transmission(s) without CP extension starting from symbol *i* in slot *n* using Type 1 channel access procedure with a corresponding CAPC according to Clause 4.2.1.1, and if the UE starts configured grant UL transmission(s) before slot n using Type 1 channel access procedures with a corresponding CAPC, and the scheduled PUSCH transmission(s) occupies a subset or all of the RBs of the same channels occupied by the configured grant UL transmission(s), the UE may continue to transmit the scheduled UL transmission(s). The sum of the 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 used to transmit the configured grant UL transmission(s). Otherwise, the UE shall cancel the configured grant UL transmission(s) in symbols of at least the last configured grant UL transmission before the symbol *i* in slot *n* that occur, relative to a last symbol of a CORESET where the UE detects the DCI format, after a number of symbols that is greater than or equal to the PUSCH preparation time Tproc,2, for corresponding PUSCH processing capability [8, TS38.214], and attempt to transmit the scheduled UL transmission(s) according to the corresponding CAPC.================================ Unchanged Texts Omitted ================================= |

**R1-2004013**

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| ================================ Start of TP#1 for TS 37.213 ================================4.2.1.0.1 Channel access procedures for consecutive UL transmission(s)================================ Unchanged Texts Omitted =================================For UL transmission(s) following configured grant PUSCH transmission(s), the following is 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(s) by dropping the transmission of at least the configured grant PUSCH transmission before symbol in slot and transmit the scheduled UL transmission(s) according to the received DCI.================================ Unchanged Texts Omitted ================================================================== End of TP#1 for TS 37.213 =============================================================== Start of TP#2 for TS 38.214 ===============================6.1 UE procedure for transmitting the physical uplink shared channel================================ Unchanged Texts Omitted =================================A UE is not expected to be scheduled by a PDCCH ending in symbol to transmit a PUSCH on a given serving cell overlapping in time with a transmission occasion, where the UE is allowed to transmit a PUSCH with configured grant according to [10, TS38.321], starting in a symbol on the same serving cell if the end of symbol is not at least symbols before the beginning of symbol . The value in symbols is determined according to the UE processing capability defined in Clause 6.4, and and the symbol duration are based on the minimum of the subcarrier spacing corresponding to the PUSCH with configured grant and the subcarrier spacing of the PDCCH scheduling the PUSCH.A UE is not expected to be scheduled by a PDCCH ending in symbol to transmit a PUSCH on a given serving cell immediately after a transmission occasion, where the UE is allowed to transmit a PUSCH with configured grant according to [10, TS38.321], starting in a symbol on the same serving cell if the end of symbol is not at least *Tproc,2* before the beginning of symbol assuming *d2,1*=1.================================ Unchanged Texts Omitted ================================================================== End of TP#2 for TS 38.214 =============================== |

**R1-2004085:**

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| ----------------------------------- TP2: Start of TP 37.213 section 4.2.1.0.1 ---------------------------------------4.2.1.0.1 Channel access procedures for consecutive UL transmission(s) For contiguous UL transmission(s), the following are applicable:<Unchanged parts are omitted>- If a UE is scheduled, by a DCI format, to transmit UL transmission(s) starting from symbol *i* in slot *n* using Type 1 channel access procedures without CP extension with a corresponding CAPC, and if the UE starts configured grant UL transmissions before slot *n* using Type 1 channel access procedures with a corresponding CAPC, and the scheduled UL transmission(s) occupies a subset all of  the RBs of the same channels occupied by the configured grant UL transmission(s), the UE may continue to transmit the scheduled UL transmission(s) to the corresponding CAPC from symbol *i* in slot *n* without a gap, if the CAPC value of the performed channel access procedure is larger than or equal to the CAPC value corresponding to the scheduled UL transmission(s). The sum of the 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 value used to transmit the configured grant UL transmission(s). Otherwise, the UE shall terminate the configured grant UL transmission(s) by dropping the transmission on the symbols of at least the last configured grant UL transmission of before symbol *i* in slot *n* that occur, relative to a last symbol of a CORESET where the UE detects the DCI format after a number of symbols that is greater than or equal to the PUSCH preparation time  for corresponding UE processing capability [6, TS 38.214], and attempt to transmit the scheduled UL transmission(s) according to the corresponding CAPC.<Unchanged parts are omitted>----------------------------------------End of TP 37.213 section 4.2.1.0.1 ----------------------------------------- |

**R1-2004521**

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| ===========================Start of Text Proposal for TS37.213===========================4.2.1.0.1 Channel access procedures for consecutive UL transmission(s) ============================<<unchanged text omitted>>===============================For UL transmission(s) following autonomous UL transmission(s), the following are applicable:- If a UE is scheduled by an eNB to transmit on channel by a UL grant received on channel , , and if the UE is transmitting using autonomous UL on channel , the UE shall terminate the ongoing PUSCH transmissions using the autonomous UL at least one subframe before the UL transmission according to the received UL grant.- If a UE is scheduled by a UL grant received from an eNB on a channel to transmit a PUSCH transmission(s) starting from subframe on the same channel using Type 1 channel access procedure and if at least for the first scheduled subframe occupies resource blocks and the indicated PUSCH starting position is OFDM symbol zero, and if the UE starts autonomous UL transmissions before subframe using Type 1 channel access procedure on the same channel, the UE may transmit UL transmission(s) according to the received UL grant from subframe without a gap, if the priority class value of the performed channel access procedure is larger than or equal to priority class value indicated in the UL grant, and the autonomous UL transmission in the subframe preceding subframe shall end at the last OFDM symbol of the subframe regardless of the higher layer parameter *endingSymbolAUL*. The sum of the lengths of the autonomous 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 perform the autonomous uplink channel access procedure. Otherwise, the UE shall terminate the ongoing autonomous UL transmission at least one subframe before the start of the UL transmission according to the received UL grant on the same channel.For UL transmission(s) following configured grant UL transmission(s), the following are applicable:- If a UE is scheduled by a UL grant to transmit UL transmission(s) starting from symbol in slot using Type 1 channel access procedure without CP extension with a corresponding CAPC, and if the UE starts configured grant UL transmissions before slot using Type 1 channel access procedure with a corresponding CAPC, and the scheduled UL transmission(s) occupies a subset all of RBs of the same channels occupied by the configured grant UL transmission(s), the UE may transmit the scheduled UL transmission(s) according to the received DCI from symbol in slot without a gap, if the CAPC value of the performed channel access procedure is larger than or equal to the CAPC value indicated in the DCI. The sum of the transmission duration 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 value used to transmit the configured grant UL transmission(s). Otherwise, the UE shall terminate the ongoing configured grant UL transmission(s) at least one slot before symbol in slot and attempt to transmit the scheduled UL transmission(s) according to the corresponding CAPC.============================<<unchanged text omitted>>==========================================================End of Text Proposal for TS37.213======================================================Start of Text Proposal for TS38.214===========================6.1 UE procedure for transmitting the physical uplink shared channel=========================<<unchanged text omitted>>===========================A UE is not expected to be scheduled by a PDCCH ending in symbol to transmit a PUSCH on a given serving cell for a given HARQ process, if there is a transmission occasion where the UE is allowed to transmit a PUSCH with configured grant according to [10, TS38.321] with the same HARQ process on the same serving cell starting in a symbol after symbol , and if the gap between the end of PDCCH and the beginning of symbol is less than symbols. The value in symbols is determined according to the UE processing capability defined in Clause 6.4, and and the symbol duration are based on the minimum of the subcarrier spacing corresponding to the PUSCH with configured grant and the subcarrier spacing of the PDCCH scheduling the PUSCH.For operation with shared spectrum channel access, a UE is not expected to be scheduled by a PDCCH ending in symbol to transmit a PUSCH on a given serving cell for a given HARQ process where the PUSCH corresponding to the configured grant starts in a symbol , and if the gap between the end of PDCCH and the beginning of symbol is less than symbols. The value in symbols is determined according to the UE processing capability defined in Clause 6.4, and and the symbol duration are based on the minimum of the subcarrier spacing corresponding to the PUSCH with configured grant and the subcarrier spacing of the PDCCH scheduling the PUSCH.=========================<<unchanged text omitted>>=====================================================End of Text Proposal for TS38.214=========================== |

Companies are asked to provide their views related to the above proposals with the table below, including:

* which of the TPs should serve as the starting point?
* is a CR needed for both 37.213 and 38.214, or 37.213 only?

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## 3.2 UL transmission in a contiguous UL transmission burst

Three TDocs discuss clarifications and corrections to UE operation when selecting the LBT type for UL transmissions in a contiguous UL TX burst.

**R1-2004443:**

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| **Proposal 1. For LBT type and CP extension, of a contiguous burst of UL transmission (including PUCCH, PUSCH and SRS) scheduled by one or more DL or UL grants, where the first scheduled transmission is indicated to use UL Type 2A, Type 2B, or Type 2C channel access, if the UE failed the LBT to transmit the first scheduled transmission, for the later transmissions, the UE will use Type 2A UL channel access with CP extension of 0.**=====TP for 37.213 4.2.1.0.1================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, PUCCH using a DL grant, or SRS with either a DL grant or 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, Type 2, 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 the first of the consecutive UL transmissions 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, PUCCH using a DL grant, or SRS with either a DL grant or UL grant, the UE shall not apply a CP extension for the UL transmissions except for the first of the consecutive UL transmissions.- If a UE is scheduled to transmit a set of consecutive UL transmissions without gaps including PUSCH using one or more UL grant(s), PUCCH using one or more DL grant(s), or SRS with one or more DL grant(s) or 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 2, 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.-    If a UE is configured to transmit a set of consecutive PUSCH, PUCCH, or SRS 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 one of the multiple transmission occasions after accessing the channel according to Type 1 UL channel access procedure, the UE may continue transmission in the remaining transmission occasions in the set, wherein each transmission occasion starts at the starting symbol of a configured grant PUSCH, periodic PUCCH, or periodic SRS 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, except if Type 2B or Type 2C UL channel access procedures are identified for the first of the consecutive UL transmissions. ============================<<unchanged text omitted>>=============================== |

**R1-2003512**

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| ***Proposal 15：If a UE is scheduled by a gNB to transmit a set of contiguous PUSCHs using one or more UL grants, and if the UE has stopped transmitting during or before one of these UL transmissions, the UE may transmit a later UL transmission in the set using Type 2A UL channel access procedure without applying a CP extension.******Proposal 16：Adopt TP9 into section 4.2.1.0.1 of TS 37.213.***

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| \*\*\* <Beginning of **Text Proposal 9**> \*\*\*4.2.1.0.1 Channel access procedures for consecutive UL transmission(s) \*\*\* Unchanged text is omitted \*\*\*For contiguous UL transmissions(s) including a transmission pause, the following are applicable:- If a UE is scheduled to transmit a set of consecutive UL transmissions without gaps using one or more UL grant(s), and if the UE has stopped transmitting during or before one of these UL transmissions in the set and prior to the last UL transmission in the set, and if the channel is sensed by the UE to be continuously idle after the UE has stopped transmitting, the UE may transmit a later UL transmission in the set using Type 2 channel access procedure or Type 2A UL channel access procedure without applying a CP extension. - If a channel sensed by a UE is not continuously idle after the UE has stopped transmitting, the UE may transmit a later UL transmission in the set using Type 1 channel access procedure with the UL channel access priority class indicated in the DCI corresponding to the UL transmission.\*\*\* Unchanged text is omitted \*\*\*\*\*\* <End of **Text Proposal 9**> \*\*\* |

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**R1-2004275**

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| ***Proposal 4****: A UE is allowed to transmit according to Type 2C UL channel access for up to 0.584 ms also when type 2B channel access has been indicated in the DCI.* -------- Beginning of Text Proposal ------------============================<<unchanged text omitted>>===============================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, Type 2, 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 cannot access the channel for transmission according to a Type 2B UL channel access procedure, the UE may access the channel according to Type 2C 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 not apply a CP extension for the remaining UL transmissions in the set after the first UL transmission after accessing the 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, Type 2, 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.-    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 one of the multiple transmission occasions after accessing the channel according to Type 1 UL channel access procedure, the UE may continue transmission in the remaining transmission occasions in the set, wherein 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, except if Type 2B or Type 2C UL channel access procedures are identified for the first of the consecutive UL transmissions. ============================<<unchanged text omitted>>===============================-------- End of Text Proposal ------------ |

Companies are asked to provide their views related to the three proposals above with the table below:

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# 4. Conclusions

TBA

# References