**3GPP TSG RAN WG1 #103-e R1- 200XXXX**

**e-Meeting, October 26th – November 13th, 2020**

**Agenda item: 7.2.2**

**Source: Moderator (Nokia)**

**Title: Feature Lead Summary on Channel Access Procedures for NR-U**

**Document for: Discussion and Decision**

# 1 Introduction

This document summarizes the main issues brought forward in the contributions submitted to AI 7.2.2 that are related to Channel Access Procedures. Earlier agreements reached during the Study Item are captured in TR 38.889.

[1 Introduction](#_Toc54010342)

[2. Issues identified in the contributions](#_Toc54010343)

[2.1 LBT type for non-contiguous SRS and PUSCH/PUCCH](#_Toc54010344)

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# 2. Issues identified in the contributions

To organize the email discussion, the issues have been grouped according to the chairman’s guidance.

## 2.1 LBT type for non-contiguous SRS and PUSCH/PUCCH

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| LBT type for non-contiguous SRS and PUSCH/PUCCH | R1-2007903  R1-2008043  R1-2008127  R1-2008248  R1-2008383 |

Five contributions discuss the determination of LBT type and other related parameters for non-contiguous SRS and PUSCH/PUCCH transmissions, that are triggered with a single DCI.

**R1-2007903:**

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| ***Proposal 1*** *No special behavior is defined for the case where a single DCI schedules multiple UL transmissions. The related TP for 38.212 is in TP#1 in this document.*  ================================= Start of TP#1 for TS 38.212 ============================== 7.3.1.1.2 Format 0\_1 ================================ Unchanged Texts Omitted =================================  - ChannelAccess-CPext-CAPC – 0, 1, 2, 3, 4, 5 or 6 bits. The bitwidth for this field is determined as bits, where *I* is the number of entries in the higher layer parameter *ul-dci-triggered-UL-ChannelAccess-CPext-CAPC-r16* for operation in a cell with shared spectrum channel access; otherwise 0 bit. One or more entries from Table 7.3.1.1.2-35 are configured by the higher layer parameter *ul-dci-triggered-UL-ChannelAccess-CPext-CAPC-r16.* The indicated CP extension and the channel access type only apply to the first UL transmission scheduled by the scheduling DCI.  ================================ Unchanged Texts Omitted ================================= 7.3.1.2.2 Format 1\_1 ================================ Unchanged Texts Omitted =================================  - ChannelAccess-CPext – 0, 1, 2, 3 or 4 bits. The bitwidth for this field is determined as bits, where *I* is the number of entries in the higher layer parameter *dl-DCI-triggered-UL-ChannelAccess-CPext-r16* for operation in a cell with shared spectrum channel access; otherwise 0 bit. One or more entries from Table 7.3.1.2.2-6 are configured by the higher layer parameter *dl-DCI-triggered-UL-ChannelAccess-CPext-r16.* The indicated CP extension and the channel access type only apply to the first UL transmission scheduled by the scheduling DCI.  ================================ Unchanged Texts Omitted =================================  ================================= End of TP#1 for TS 38.212 =========================== |

**R1-2008043:**

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| **Proposal #1: It should be clarified that the indicated LBT type and CPE can be applied even if it is an SRS-only transmission when the SRS is triggered without PUSCH or PUCCH.**  **Proposal #2: The LBT type and CPE for the second UL transmission, the following options can be considered:**   * **Option 1: Use Type 2A LBT with a zero-CP extension regardless of what was indicated for the first transmission, unless it falls outside of the gNB COT, in which case Type 1 LBT is used** * **Option 2: The LBT type and CPE can be determined by the ChannelAccess-CPext table configured in advance for the second transmission** |

**R1-2008127:**

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| **Proposal 1: For 2nd UL transmission of two non-consecutive UL transmissions (e.g., PUSCH&SRS, or PUCCH&SRS) scheduled by a single DCI, CP extension is zero, LBT type is Type 2A inside gNB’s COT and type 1 LBT outside gNB’s COT.**   * **Adopt the following TP for TS 38.211 & TS 37.213.**   ================================= Start of TP for TS 38.211 ================================  5.3.1 OFDM baseband signal generation for all channels except PRACH and RIM-RS  ================================ Unchanged Texts Omitted =================================  - for dynamically scheduled PUSCH, SRS, and PUCCH transmissions  where is given by Table 5.3.1-1 with for , for , and and given by the higher-layer parameters *cp-ExtensionC2-r16* and *cp-ExtensionC3-r16*, respectively, and given by clause 4.3.1. For contention-based random access, or in absence of higher-layer configuration of and , the value of shall be set to the largest integer fulfilling for each of the values of . *Text* is applied to the first UL transmission scheduled by the scheduling DCI.  ================================ Unchanged Texts Omitted =================================  ================================= End of TP for TS 38.211 =================================  ================================= Start of TP for TS 37.213 ================================  4.2.1 Channel access procedures for uplink transmission(s)  A UE can access a channel on which UL transmission(s) are performed according to one of Type 1 or Type 2 UL channel access procedures. Type 1 channel access procedure is described in clause 4.2.1.1. Type 2 channel access procedure is described in clause 4.2.1.2.  If a UL grant scheduling a PUSCH transmission indicates Type 1 channel access procedures, the UE shall use Type 1 channel access procedures for transmitting transmissions including the PUSCH transmission unless stated otherwise in this clause.  A UE shall use Type 1 channel access procedures for transmitting transmissions including the autonomous or configured grant PUSCH transmission on configured UL resources unless stated otherwise in this clause.  If a UL grant scheduling a PUSCH transmission indicates Type 2 channel access procedures, the UE shall use Type 2 channel access procedures for transmitting transmissions including the PUSCH transmission unless stated otherwise in this clause.  A UE shall use Type 1 channel access procedures for transmitting SRS transmissions not including a PUSCH transmission. UL channel access priority class in Table 4.2.1-1 is used for SRS transmissions not including a PUSCH.  If a UE is scheduled by an eNB/gNB to transmit PUSCH and SRS in contiguous transmissions without any gaps in between, and if the UE cannot access the channel for PUSCH transmission, the UE shall attempt to make SRS transmission according to uplink channel access procedures specified for SRS transmission.  If a UE is scheduled by a gNB to transmit PUSCH and SRS by a single UL grant in non-contiguous transmissions with gap in between, or a UE is scheduled by a gNB to transmit PUCCH and SRS by a single DL assignment in non-contiguous transmissions with gap in between, the UE shall use the channel access procedure for first UL transmission scheduled by the UL grant or the DL assignment according to the channel access indicated by the UL grant or the DL assignment, and the UE shall use Type 2A channel access procedure for second UL transmission scheduled by the UL grant or the DL assignment if the second UL transmission is within gNB *Channel Occupancy Time,* otherwise the UE shall use Type 1 channel access procedure for the second UL transmission.  A UE shall use Type 1 channel access procedures for PUCCH transmissions unless stated otherwise in this clause. If a DL grant determined according to Clause 9.2.3 in [7, TS38.213] 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.  ================================= End of TP for TS 37.213 ================================= |

**R1-2008248:**

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| ***Proposal 2: for cases where one DCI schedules/triggers two UL transmissions, select the following one option***   * ***Option 1: a default LBT type and CP extension are used for the second UL transmission.*** * ***Option 2: the second UL transmission also follows the indicated CP extension and the LBT type.*** |

**R1-2008383:**

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| **Proposal 1:**   * **The second one of the two non-consecutive UL transmissions scheduled with a single DCI:**   + **Type 1 LBT is used (switching to Type 2A LBT is still applicable as in a normal UL transmission),**   + **CP extension length is zero,**   + **The indicated CAPC in DCI format 1\_0 applies to the PUSCH regardless of the order of the PUSCH and SRS transmissions.** * **Adopt the following Text proposal #1.**   **Text proposal #1**  --------- beginning of text proposal for TS 37.213  **<omitted>** 4.2.1 Channel access procedures for uplink transmission(s) A UE can access a channel on which UL transmission(s) are performed according to one of Type 1 or Type 2 UL channel access procedures. Type 1 channel access procedure is described in clause 4.2.1.1. Type 2 channel access procedure is described in clause 4.2.1.2.  If a UL grant scheduling a PUSCH transmission indicates Type 1 channel access procedures, the UE shall use Type 1 channel access procedures for transmitting transmissions including the PUSCH transmission unless stated otherwise in this clause.  A UE shall use Type 1 channel access procedures for transmitting transmissions including the autonomous or configured grant PUSCH transmission on configured UL resources unless stated otherwise in this clause.  If a UL grant scheduling a PUSCH transmission indicates Type 2 channel access procedures, the UE shall use Type 2 channel access procedures for transmitting transmissions including the PUSCH transmission unless stated otherwise in this clause.  A UE shall use Type 1 channel access procedures for transmitting SRS transmissions not including a PUSCH transmission. UL channel access priority class in Table 4.2.1-1 is used for SRS transmissions not including a PUSCH.  If a UE is scheduled by an eNB/gNB to transmit PUSCH and SRS in contiguous transmissions without any gaps in between, and if the UE cannot access the channel for PUSCH transmission, the UE shall attempt to make SRS transmission according to uplink channel access procedures specified for SRS transmission.  If a UE is scheduled with a DCI by a gNB to transmit PUSCH/PUCCH and SRS in non-contiguous transmissions with a gap in between, the UE shall use the indicated channel access type and the indicated CP extension index for the first UL transmission and shall use Type 1 channel access procedures and CP extension index 0 for the second UL transmission. If a UE is scheduled with a DCI by a gNB to transmit PUSCH and SRS in non-contiguous transmissions with a gap in between, the UE shall use the indicated channel access priority class for the PUSCH transmission. |

## 2.2 Clarifications to LBT with consecutive UL transmissions

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| Clarifications to LBT with consecutive UL transmissions | R1-2008724 |

One contribution discusses the 2.1 UL channel access procedure after LBT failure in the case of multi-slot scheduling without gap by multiple UL grants with the following TP:

**R1-2008724:**

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| ===========================Start of Text Proposal for TS37.213===========================  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 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 more UL grants, and if the UE cannot access the channel for a transmission in the set prior to the last transmission regardless of any Type of UL channel access procedures, 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 by a gNB to transmit a set of UL transmissions without gaps including PUSCH using more 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), 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 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.  - If a UE is configured by the gNB to transmit a set of consecutive UL transmissions without gaps including PUSCH, periodic PUCCH, or periodic SRS and the UE transmits one of the configured UL transmissions in the set after accessing the channel according to Type 1 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, 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 for TS37.213=========================== |

## 2.3 Clarifications to channel access for semi-static channel occupancy

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| Clarifications to channel access for semi-static channel occupancy | R1-2007608  R1-2007903  R1-2007980  R1-2008601 |

One contribution proposes a clarification to the conditions when a UE is permitted to transmit within a gNB COT:

**R1-2007608:**

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| \*\*\* <Beginning of **Text Proposal 1**> \*\*\*  4.3 Channel access procedures for semi-static channel occupancy  \*\*\* Unchanged text is omitted \*\*\*  A channel occupancy initiated by a gNB and shared with UE(s) shall satisfy thefollowing:  - The gNB shall transmit a DL transmission burst starting at the beginning of the channel occupancy time immediately after sensing the channel to be idle for at least a sensing slot duration . If the channel is sensed to be busy, the gNB shall not perform any transmission during the current period.  - The gNB may transmit a DL transmission burst(s) within the channel occupancy time immediately after sensing the channel to be idle for at least a sensing slot duration if the gap between the DL transmission burst(s) and any previous transmission burst is more than .  - The gNB may transmit DL transmission burst(s) after UL transmission burst(s) within the channel occupancy time without sensing the channel if the gap between the DL and UL transmission bursts is at most  - A UE may transmit UL transmission burst(s) after detection of a DL transmission burst(s) within the channel occupancy time if the UL transmission burst(s) is scheduled by one or more DCI(s) detected within the same channel occupancy time as follows:  - If the gap between the UL and DL transmission bursts is at most , the UE may transmit UL transmission burst(s) after a DL transmission burst(s) within the channel occupancy time without sensing the channel.  - If the gap between the UL and DL transmission bursts is more than , the UE may transmit UL transmission burst(s) after a DL transmission burst(s) within the channel occupancy time after sensing the channel to be idle for at least a sensing slot duration within a interval ending immediately before transmission.  \*\*\* Unchanged text is omitted \*\*\*  \*\*\* <End of **Text Proposal 1**> \*\*\* |

Three contributions discuss the aspects related to indication of the LBT type, CP extension and CAPC in the case of semi-static channel access:

**R1-2007903:**

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| ================================= Start of TP#2 for TS 37.213 ==============================  ================================ Unchanged Texts Omitted ================================= 4.3 Channel access procedures for semi-static channel occupancy Channel assess procedures based on semi-static channel occupancy as described in this Clause, are intended for environments where the absence of other technologies is guaranteed e.g., by level of regulations, private premises policies, etc. If a gNB provides UE(s) with higher layer parameters *ChannelAccessMode-r16 ='semistatic'* by SIB1 or dedicated configuration, a periodic channel occupancy can be initiated by the gNB every within every two consecutive radio frames, starting from the even indexed radio frame at with a maximum channel occupancy time , where *period* in , is a higher layer parameter provided in *SemiStaticChannelAccessConfig* and *.*  In the following procedures in this clause, when a gNB or UE performs sensing for evaluating a channel availability, the sensing is performed at least during a sensing slot duration . The corresponding adjustment for performing sensing by a gNB or a UE is described in clauses 4.1.5 and 4.2.3, respectively.  A channel occupancy initiated by a gNB and shared with UE(s) shall satisfy thefollowing:  - The gNB shall transmit a DL transmission burst starting at the beginning of the channel occupancy time immediately after sensing the channel to be idle for at least a sensing slot duration . If the channel is sensed to be busy, the gNB shall not perform any transmission during the current period.  - The gNB may transmit a DL transmission burst(s) within the channel occupancy time immediately after sensing the channel to be idle for at least a sensing slot duration if the gap between the DL transmission burst(s) and any previous transmission burst is more than .  - The gNB may transmit DL transmission burst(s) after UL transmission burst(s) within the channel occupancy time without sensing the channel if the gap between the DL and UL transmission bursts is at most  - A UE may transmit UL transmission burst(s) after detection of a DL transmission burst(s) within the channel occupancy time as follows:  - If the UE is indicated to perform Type 2C UL channel access procedures, the UE may transmit UL transmission burst(s) after a DL transmission burst(s) within the channel occupancy time without sensing the channel.  - If the UE is indicated to perform Type 2A UL channel access procedures , the UE may transmit UL transmission burst(s) after a DL transmission burst(s) within the channel occupancy time after sensing the channel to be idle for at least a sensing slot duration within a interval ending immediately before transmission.  - The gNB and UEs shall not transmit any transmissions in a set of consecutive symbols for a duration of at least before the start of the next period.  If a UE fails to access the channel(s) prior to an intended UL transmission to a gNB, Layer 1 notifies higher layers about the channel access failure.  ================================ Unchanged Texts Omitted =================================  ================================= End of TP#1 for TS 38.212 =============================== |

**R1-2007980:**

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| **Proposal 2 Introduce a new table in 38.212 to capture the following combinations for channel access and CP extension for operation based on semi-static channel access.**  **1. No sensing (no LBT) without CP extension**  **2. No sensing (no LBT) with CP extension of C2\*symbol length – 16 us – TA**  **3. Sensing (LBT) of 9us without CP extension**  **• Adopt TPs in Proposals 3,4,5 for clauses 7.3.1.1.1, 7.3.1.1.2, 7.3.1.2.1, 7.3.1.2.2 in TS38.212, clauses 8.2 and 8.2A in TS38.213 and clause 4.3 in TS37.213, respectively, to properly specify indication of channel access and CP extension and corresponding UE behavior.**  **Proposal 3 Adopt the following changes in clause 7.3.1.1.1, 7.3.1.1.2, 7.3.1.2.1, 7.3.1.2.2 in TS38.212:** ===============<Start of Text Proposal for TS 38.212>======================7.3.1.1.1 Format 0\_0 DCI format 0\_0 is used for the scheduling of PUSCH in one cell.  The following information is transmitted by means of the DCI format 0\_0 with CRC scrambled by C-RNTI or CS-RNTI or MCS-C-RNTI:  <Unchanged text omitted>  - ChannelAccess-CPext – 2 bits indicating combinations of channel access type and CP extension as defined in Table 7.3.1.1.1-4A if *ChannelAccessMode-r16* = "*semistatic*" is provided or Table 7.3.1.1.1.4, for operation in a cell with shared spectrum channel access; 0 bit otherwise.  <Unchanged text omitted>  The following information is transmitted by means of the DCI format 0\_0 with CRC scrambled by TC-RNTI:  <Unchanged text omitted>  - ChannelAccess-CPext – 2 bits indicating combinations of channel access type and CP extension as defined in Table 7.3.1.1.1-4A if *ChannelAccessMode-r16* = "*semistatic*" is provided or Table 7.3.1.1.1.4, for operation in a cell with shared spectrum channel access; 0 bit otherwise.  <Unchanged text omitted>  Table 7.3.1.1.1-4: Channel access type & CP extension for DCI format 0\_0 and DCI format 1\_0 unless *ChannelAccessMode-r16* = "*semistatic*" is provided   |  |  |  | | --- | --- | --- | | **Bit field mapped to index** | **Channel Access Type** | **The CP extension T\_"ext" index defined in Clause 5.3.1 of [4, TS 38.211]** | | 0 | Type2C-ULChannelAccess defined in [clause 4.2.1.2.3 in 37.213] | 2 | | 1 | Type2A-ULChannelAccess defined in [clause 4.2.1.2.1 in 37.213] | 3 | | 2 | Type2A-ULChannelAccess defined in [clause 4.2.1.2.1 in 37.213] | 1 | | 3 | Type1-ULChannelAccess defined in [clause 4.2.1.1 in 37.213] | 0 |   Table 7.3.1.1.1-4A: Channel access type & CP extension if *ChannelAccessMode-r16* = "*semistatic*" is provided   |  |  |  | | --- | --- | --- | | **Bit field mapped to index** | **Channel Access Type** | **The CP extension T\_"ext" index defined in Clause 5.3.1 of [4, TS 38.211]** | | 0 | No sensing as defined in Clause 4.3 in TS 37.213 | 0 | | 1 | No sensing as defined in Clause 4.3 in TS 37.213 | 2 | | 2 | Sensing as defined in Clause 4.3 in TS 37.213 | 0 | | 3 | Reserved | - |  7.3.1.1.2 Format 0\_1 DCI format 0\_1 is used for the scheduling of one or multiple PUSCH in one cell, or indicating CG downlink feedback information (CG-DFI) to a UE.  The following information is transmitted by means of the DCI format 0\_1 with CRC scrambled by C-RNTI or CS-RNTI or SP-CSI-RNTI or MCS-C-RNTI:  <Unchanged text omitted>  - ChannelAccess-CPext-CAPC – 0, 1, 2, 3, 4, 5 or 6 bits. The bitwidth for this field is determined as bits , where *I* is the number of entries in the higher layer parameter *ul-dci-triggered-UL-ChannelAccess-CPext-CAPC-r16* or in Table 7.3.1.1.1-4A if *ChannelAccessMode-r16* = "*semistatic*" is provided for operation in a cell with shared spectrum channel access; otherwise 0 bit. One or more entries from Table 7.3.1.1.2-35 are configured by the higher layer parameter *ul-dci-triggered-UL-ChannelAccess-CPext-CAPC-r16.*  <Unchanged text omitted> 7.3.1.2.1 Format 1\_0 DCI format 1\_0 is used for the scheduling of PDSCH in one DL cell.  The following information is transmitted by means of the DCI format 1\_0 with CRC scrambled by C-RNTI or CS-RNTI or MCS-C-RNTI:  <Unchanged text omitted>  - ChannelAccess-CPext – 2 bits indicating combinations of channel access type and CP extension as defined in Table 7.3.1.1.1-4A if *ChannelAccessMode-r16* = "*semistatic*" is provided or Table 7.3.1.1.1.4, for operation in a cell with shared spectrum channel access; 0 bit otherwise.  <Unchanged text omitted>  The following information is transmitted by means of the DCI format 1\_0 with CRC scrambled by TC-RNTI:  <Unchanged text omitted>  - ChannelAccess-CPext – 2 bits indicating combinations of channel access type and CP extension as defined in Table 7.3.1.1.1-4A if *ChannelAccessMode-r16* = "*semistatic*" is provided or Table 7.3.1.1.1.4, for operation in a cell with shared spectrum channel access; 0 bit otherwise.  ===============<Unchanged text omitted>============= 7.3.1.2.2 Format 1\_1 DCI format 1\_1 is used for the scheduling of PDSCH in one cell.  The following information is transmitted by means of the DCI format 1\_1 with CRC scrambled by C-RNTI or CS-RNTI or MCS-C-RNTI:  ===============<Unchanged text omitted>=============  - ChannelAccess-CPext – 0, 1, 2, 3 or 4 bits. The bitwidth for this field is determined as bits, where *I* is the number of entries in the higher layer parameter *dl-DCI-triggered-UL-ChannelAccess-CPext-r16* or in Table 7.3.1.1.1-4A if *ChannelAccessMode-r16* = "*semistatic*" is provided for operation in a cell with shared spectrum channel access; otherwise 0 bit. One or more entries from Table 7.3.1.2.2-6 are configured by the higher layer parameter *dl-DCI-triggered-UL-ChannelAccess-CPext-r16.*  ===============<End of Text Proposal for TS 38.212>====================== |

**R1-2008601:**

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| ============TP for 38.212==================================  7.3.1.1.2 Format 0\_1  ----------Unchanged text omitted-----------------------  - ChannelAccess-CPext-CAPC – 0, 1, 2, 3, 4, 5 or 6 bits. The bitwidth for this field is determined as bits, where *I* is the number of entries in the higher layer parameter *ULDCI-trigerred-UL-ChannelAccess-CPext-CAPC-List-r16* for operation in a cell with shared spectrum channel; otherwise 0 bit. One or more entries from Table 7.3.1.1.2-35 are configured by the higher layer parameter *ULDCI-trigerred-UL-ChannelAccess-CPext-CAPC-List-r16.* When *ChannelAccessMode-r16*=”*semi-static*”, UE will ignore the CAPC value indicated by ChannelAccess-CPext-CAPC.  ----------Unchanged text omitted-----------------------  =======================================================  ============TP for 37.213 4.3==================================  4.3 Channel access procedures for semi-static channel occupancy  Channel assess procedures based on semi-static channel occupancy as described in this Clause, are intended for environments where the absence of other technologies is guaranteed e.g., by level of regulations, private premises policies, etc. If a gNB provides UE(s) with higher layer parameters *ChannelAccessMode-r16 ='semistatic'* by SIB1 or dedicated configuration, a periodic channel occupancy can be initiated by the gNB every within every two consecutive radio frames, starting from the even indexed radio frame at with a maximum channel occupancy time, where *period* in , is a higher layer parameter provided in *SemiStaticChannelAccessConfig* and *.*  In the following procedures in this subclause, when a gNB or UE performs sensing for evaluating a channel availability, the sensing is performed at least during a sensing slot duration . The corresponding adjustment for performing sensing by a gNB or a UE is described in subclauses 4.1.5 and 4.2.3, respectively.  A channel occupancy initiated by a gNB and shared with UE(s) shall satisfy thefollowing:  - The gNB shall transmit a DL transmission burst starting at the beginning of the channel occupancy time immediately after sensing the channel to be idle for at least a sensing slot duration . If the channel is sensed to be busy, the gNB shall not perform any transmission during the current period.  - The gNB may transmit a DL transmission burst(s) within the channel occupancy time immediately after sensing the channel to be idle for at least a sensing slot duration if the gap between the DL transmission burst(s) and any previous transmission burst is more than .  - The gNB may transmit DL transmission burst(s) after UL transmission burst(s) within the channel occupancy time without sensing the channel if the gap between the DL and UL transmission bursts is at most  - A UE may transmit UL transmission burst(s) after detection of a DL transmission burst(s) within the channel occupancy time as follows:  - If the UL transmission is indicated by DCI format 0\_1 or DCI format 1\_1 to use Type 2C channel access, the UE may transmit UL transmission burst(s) after a DL transmission burst(s) within the channel occupancy time without sensing the channel.  - If the UL transmission is indicated by DCI format 0\_0 or DCI format 1\_0 or RAR UL grant to use Type 1 channel access or Type 2A channel access, or if the UL transmission is indicated by DCI format 1\_1 or DCI format 0\_1 to use Type 2A channel access, the UE may transmit UL transmission burst(s) after a DL transmission burst(s) within the channel occupancy time after sensing the channel to be idle for at least a sensing slot duration before transmission.  - The gNB and UEs shall not transmit any transmissions in a set of consecutive symbols for a duration of at least before the start of the next period.  ======================================================= |

## 2.4 Clarifications to restrictions for Type 1 DL channel access / DRS

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| Clarifications to restrictions for Type 1 DL channel access / DRS | R1-2008127 |

One TDoc proposes clarifications to restrictions for Type 1 DL channel access / DRS:

**R1-2008127:**

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| ================================= Start of TP for TS 37.213 ================================  4.1.1 Type 1 DL channel access procedures  This clause describes channel access procedures to be performed by an eNB/gNB where the time duration spanned by the sensing slots that are sensed to be idle before a downlink transmission(s) is random. The clause is applicable to the following transmissions:  - Transmission(s) initiated by an eNB including PDSCH/PDCCH/EPDCCH, or  - Transmission(s) initiated by a gNB including unicast PDSCH with user plane data, or unicast PDSCH with user plane data and unicast PDCCH scheduling user plane data, or  - Transmission(s) initiated by a gNB with only discovery burst or with discovery burst multiplexed with non-unicast information, where the transmission(s) duration is larger than or the transmission causes the discovery burst duty cycle to exceed , or  - Transmission(s) initiated by a gNB including only non-unicast PDCCH/PDSCH.  ================================ Unchanged Texts Omitted =================================  ================================= End of TP for TS 37.213 ================================= |

## 2.5 Clarifications to UL CWS adjustment

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| Clarifications to UL CWS adjustment | R1-2007608  R1-2008043  R1-2008127 |

Two documents discuss clarifications to UL CWS update with implicit HARQ-feedback during RACH procedure.

**R1-2007608:**

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| ***Proposal 2：In fairness to NR-U in coexistence with other RATs, implicit HARQ-ACK feedback should be used for both CWS reset and CWS increase. Since Msg 3 PUSCH satisfies the subclause in section 4.2.2.2 of TS 37.213 as a UL channel with implicit HARQ feedback NACK, receiving Msg 4 in response should be considered as an implicit HARQ feedback ACK for the purpose of CWS adjustment.***  ***Proposal 3：Adopt TP2 into section 4.2.2.2 of TS 37.213.***   |  | | --- | | \*\*\* <Beginning of **Text Proposal 2**> \*\*\*  4.2.2.2 Contention window adjustment procedures for UL transmissions scheduled/configured by gNB  \*\*\* Unchanged text is omitted \*\*\*  The HARQ-ACK feedback, *reference duration* and duration in the procedure above are defined as the following:   * HARQ-ACK feedback for PUSCH(s) transmissions are expected to be provided to UE(s) explicitly or implicitly where implicit HARQ-ACK feedback for the purpose of contention window adjustment in this subclause, is determined based on either the indication for a new transmission or retransmission in the DCI scheduling PUSCH(s) or the success or failure of receiving of an associated channel/signal in response as follows:   - If a new transmission is indicated, ‘ACK’ is assumed for the transport blocks or code block groups in the corresponding PUSCH(s) for the TB-based and CBG-based transmission, respectively.  - If a retransmission is indicated for TB-based transmissions, ‘NACK’ is assumed for the transport blocks in the corresponding PUSCH(s).  - If a retransmission is indicated for CBG-based transmissions, if a bit value in the code block group transmission information (CBGTI) field is ‘0’ or ‘1’ as described in subclause 5.1.7.2 in [8], ‘ACK’ or ‘NACK’ is assumed for the corresponding CBG in the corresponding PUSCH(s), respectively.  - If the UE successfully receives Msg 4 in response to its transmission of Msg 3 PUSCH, ‘ACK’ is assumed for the corresponding TB in the corresponding PUSCH.  - The *reference duration* corresponding to a channel occupancy initiated by the UE including transmission of PUSCH(s) is defined in this subclause as a duration starting from the beginning of the channel occupancy until the end of the first slot where at least one PUSCH is transmitted over all the resources allocated for the PUSCH, or until the end of the first transmission burst by the UE that contains PUSCH(s) transmitted over all the resources allocated for the PUSCH, whichever occurs earlier. If the channel occupancy includes a PUSCH, but it does not include any PUSCH transmitted over all the resources allocated for that PUSCH, then, the duration of the first transmission burst by the UE within the channel occupancy that contains PUSCH(s) is the *reference duration* for CWS adjustment.  \*\*\* Unchanged text is omitted \*\*\*  \*\*\* <End of **Text Proposal 2**> \*\*\* | |

**R1-2008043:**

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| **Proposal #6: The CWS for Msg3 can be adjusted based on the reception of Msg4.**  **Proposal #7: Adopt Text Proposal #3 into section 4.2.2.2 of TS 37.213.**  ================================ Start of TP#3 for TS 37.213 ================================  4.2.2.2 Contention window adjustment procedures for UL transmissions scheduled/configured by gNB  ================================ Unchanged Texts Omitted =================================  If a UE transmits transmissions using Type 1 channel access procedures associated with the channel access priority class on a channel and the transmissions are not associated with explicit or implicit HARQ-ACK feedbacks as described above in this subclause, the UE adjusts before step 1 in the procedures described in subclause 4.2.1.1, using the latest used for any UL transmissions associated with explicit or implicit HARQ-ACK feedbacks on the channel using Type 1 channel access procedures associated with the channel access priority class . If the corresponding channel access priority class has not been for any UL transmission on the channel, is used.  ================================ Unchanged Texts Omitted =================================  ================================= End of TP#3 for TS 37.213 =============================== |

Two documents address UL CWS update in the case of CG PUSCH.

**R1-2008043:**

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| **Proposal #8: The reference duration for UL CWS adjustment can be defined in the recent UL burst starting before n-X, where n and X correspond to the starting time of UL grant and the minimum time between UL grant and the end of reference duration, respectively, and X is configured by RRC signalling or is set to the same value with cg-minDFIDelay-r16.** |

**R1-2008127:**

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| **Proposal 2: Reuse the RRC configured minimum duration *cg-minDFIDelay-r16* for the minimum latency between reference duration and the following UL grant or CG-PUSCH for CWS adjustment.**   * **Adopt the following TP for TS 37.213.**   ================================= Start of TP for TS 37.213 ================================  4.2.2.2 Contention window adjustment procedures for UL transmissions scheduled/configured by gNB  ================================ Unchanged Texts Omitted =================================  The HARQ-ACK feedback, *reference duration* and duration in the procedure above are defined as the following:  - For the purpose of contention window adjustment in this clause, HARQ-ACK feedback for PUSCH(s) transmissions are expected to be provided to UE(s) explicitly or implicitly where explicit HARQ-ACK is determined based on the valid HARQ-ACK feedback in a corresponding CG-DFI as described in clause 10.5 in [7], and implicit HARQ-ACK feedback is determined based on the indication for a new transmission or retransmission in the DCI scheduling PUSCH(s) as follows:  - If a new transmission is indicated, 'ACK' is assumed for the transport blocks or code block groups in the corresponding PUSCH(s) for the TB-based and CBG-based transmission, respectively.  - If a retransmission is indicated for TB-based transmissions, 'NACK' is assumed for the transport blocks in the corresponding PUSCH(s).  - If a retransmission is indicated for CBG-based transmissions, if a bit value in the code block group transmission information (CBGTI) field is '0' or '1' as described in clause 5.1.7.2 in [8], 'ACK' or 'NACK' is assumed for the corresponding CBG in the corresponding PUSCH(s), respectively.  - The *reference duration* corresponding to a channel occupancy initiated by the UE including transmission of PUSCH(s) is defined in this clause as a duration starting from the beginning of the channel occupancy until the end of the first slot where at least one PUSCH is transmitted over all the resources allocated for the PUSCH, or until the end of the first transmission burst by the UE that contains PUSCH(s) transmitted over all the resources allocated for the PUSCH, whichever occurs earlier, and the duration starting no later than a number of symbols provided by *cg-minDFIDelay-r1* before an UL grant or a CG-DFI. If the channel occupancy includes a PUSCH, but it does not include any PUSCH transmitted over all the resources allocated for that PUSCH, and the duration starting no later than a number of symbols provided by *cg-minDFIDelay-r1* before an UL grant or a CG-DFI, then, the duration of the first transmission burst by the UE within the channel occupancy that contains PUSCH(s) is the *reference duration* for CWS adjustment.  - where is the duration of the transmission burst from start of the *reference duration* in and if the absence of any other technology sharing the channel cannot be guaranteed on a long-term basis (e.g. by level of regulation), and otherwise.  ================================ Unchanged Texts Omitted =================================  ================================= End of TP for TS 37.213 ================================= |

## 2.6 Multi-channel Channel Access:

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| Clarifications to UL Multi-channel access procedures | R1-2007608  R1-2008043 |

Two documents consider clarifications to UL Multi-channel access procedures.

**R1-2007608**

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| ***Proposal 4: UE should be allowed to switch CAT4 LBT to CAT2 LBT on the same RB set(s) where DCI format 2\_0 carrying available RB set indicator is detected when the available RB set indicators indicate all RB sets are not available for reception.***  ***Proposal 5：Adopt TP3 into section 4.2.1.0.0 of TS 37.213.***   |  | | --- | | \*\*\* <Beginning of **Text Proposal 3**> \*\*\*  4.2.1.0.0 Channel access procedures upon detection of a common DCI  \*\*\* Unchanged text is omitted \*\*\*  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 subclause 11.1.1 of [7], the following is applicable:  - The UE may switch from Type 1 channel access procedures as described in subclause 4.2.1.1 to Type 2A channel access procedures as described in subclause 4.2.1.2.1 for its corresponding UL transmissions within the determined duration in time and location in frequency domain of the remaining channel occupancy. 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.  - If the UE determines from a DCI format 2\_0 that all RB sets are not available, the UE may switch from Type 1 channel access procedures to Type 2A channel access procedures on the same RB set(s) where the DCI format 2\_0 was detected.  \*\*\* Unchanged text is omitted \*\*\*  \*\*\* <End of **Text Proposal 3**> \*\*\* | |

**R1- 2008043:**

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| **Proposal #3: Reflect the followings in TS 37.213:**   * **For UL active BWP configured with no intra-cell guard band, a UE is allowed to transmit UL transmission only if the UE succeeds LBT for all RB set(s) corresponding to the UL BWP.** * **For DL, if gNB transmits DL transmission to a UE configured with DL active BWP where *intraCellGuardBandDL-r16* for the corresponding serving cell indicates to the UE that no intra-cell guard-bands are configured, gNB is allowed to transmit DL transmission to the UE only if gNB succeeds LBT for the whole DL BWP.**   **Proposal #4: Adopt the following TP#1 and TP#2 for TS 37.213**  ========================= Start of TP#1 for TS 37.213 ==========================  4.2.1.0.4 Channel access procedures for UL multi-channel transmission(s)  ========================= Unchanged Texts Omitted ==========================  if the channel frequencies of set of channels is a subset of one of the sets of channel frequencies defined in clause 5.7.4 in [2]  - the UE may transmit on channel using Type 2 channel access procedure as described in clause 4.2.1.2,  - if Type 2 channel access procedure is performed on channel immediately before the UE transmission on channel , , and  - if the UE has accessed channel using Type 1 channel access procedure as described in clause 4.2.1.1,  - where channel is selected by the UE uniformly randomly from the set of channels before performing Type 1 channel access procedure on any channel in the set of channels .  - the UE may not transmit on channel within the bandwidth of a carrier, if the UE fails to access any of the channels, of the carrier bandwidth, on which the UE is configured for the UL BWP if *nrofCRBs-r16=*0 is provided for all intra-cell guard band(s) on the carrier as described in [8, 38.214], otherwise, on which the UE is scheduled or configured by UL resources.  ======================== Unchanged Texts Omitted ===========================  ========================= End of TP#1 for TS 37.213 ==========================  ========================= Start of TP#2 for TS 37.213 ==========================  4.1.6.1 Type A multi-channel access procedures  ========================= Unchanged Texts Omitted ==========================  An eNB/gNB shall perform channel access on each channel , according to the procedures described in clause 4.1.1, where is a set of channels on which the eNB/gNB intends to transmit, and , and is the number of channels on which the eNB/gNB intends to transmit.  The counter described in clause 4.1.1 is determined for each channel and is denoted as . is maintained according to clause 4.1.6.1.1 or 4.1.6.1.2.  If gNB provides *nrofCRBs-r16*=0 for all intra-cell guard band(s) on a carrier, the gNB may not transmit on channel within the bandwidth of the carrier, if the gNB fails to access any of the channels, of the carrier bandwidth.  ======================== Unchanged Texts Omitted ===========================  4.1.6.2 Type B multi-channel access procedure  ========================= Unchanged Texts Omitted ==========================  The eNB/gNB shall not transmit a transmission on a channel , , for a period exceeding as given in Table 4.1.1-1, where the value of is determined using the channel access parameters used for channel .  For the procedures in this clause, the channel frequencies of the set of channels selected by gNB, is a subset of one of the sets of channel frequencies defined in [6].  If gNB provides *nrofCRBs-r16*=0 for all intra-cell guard band(s) on a carrier, the gNB may not transmit on channel within the bandwidth of the carrier, if the gNB fails to access any of the channels, of the carrier bandwidth.  ======================== Unchanged Texts Omitted ===========================  ========================= End of TP#2 for TS 37.213 ========================== |

## 2.7 RACH related

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| Channel access for 2-step RACH | R1-2008248 |
| Indication of LBT type for RACH | [R1-2007980](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2007980.zip) |

One TDoc considers channel access for 2-step RACH:

**R1-2008248:**

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| ***Proposal 1: In 2-step RACH, if a PO is within a COT initiated by a UE for PRACH transmission on an associated RO, for PUSCH transmission on the PO,***   * ***If the gap between the RO and the PO is smaller than 16, type 2C channel access procedure should be used.***  * ***If the gap between the RO and the PO is more than or equal to 16 but less than 25, type 2B channel access procedure should be used.***  * ***If the gap between the RO and the PO is more than or equal to 25, type 2A channel access procedure should be used.***  * ***Adopt TP1 into section 4.2.1 of TS 37.213.***   ----------------------------------- TP1: 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 procedure for PRACH transmissions and PUSCH transmissions without user plane data related to random access procedure that initiate a channel occupancy with UL channel access priority class in Table 4.2.1-1.  In Type-2 random access procedure, a UE may transmit a PUSCH on a PUSCH occasion within a channel occupancy that the UE initiated for a PRACH transmission on an associated RACH occasion after a gap as follows:  - If the gap is up to, the UE can transmit the PUSCH on the channel after performing Type 2C UL channel access as described in subclause 4.2.1.2.3.  - If the gap is more than or equal to 16 but less than 25,the UE can transmit the PUSCH on the channel after performing Type 2B UL channel access as described in subclause 4.2.1.2.2.  - If the gap is more than or equal to 25, the UE can transmit the PUSCH on the channel after performing Type 2A UL channel access as described in subclause 4.2.1.2.1.  <Unchanged parts are omitted>  ----------------------------------------End of TP 37.213 section 4.2.1 --------------------------------------------- |

Another TDoc considers indication of LBT type for RACH.

[**R1-2007980**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2007980.zip)**:**

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| 1. Adopt the following changes in Clause 8.2 and Clause 8.2A of TS38.213 to determine the indicated channel access procedures and CP extension for random access procedures.  |  | | --- | | ===============<Start of Text Proposal for TS 38.213>======================8.2 Random access response - Type-1 random access procedure ===============<Unchanged text omitted>=============  The ChannelAccess-CPext field indicates a channel access type and CP extension for operation with shared spectrum channel access [15, TS 37.213] as defined in Table 7.3.1.1.1-4 in TS 38.212.  ===============<Unchanged text omitted>============= 8.2A Random access response - Type-2 random access procedure ===============<Unchanged text omitted>=============  - for operation with shared spectrum channel access, a channel access type and CP extension [15, TS 37.213] for a PUCCH transmission is indicated by a ChannelAccess-CPext field in the successRAR as defined in Table 7.3.1.1.1-4 in TS 38.212.  ===============<End of Text Proposal for TS 38.213>====================== | |

## 2.8 RAN2 LS on CAPC

Four TDocs consider the RAN2 LS in [R1-2007526](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2007526.zip). This topic was also discussed under AI 5.

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| RAN2 LS on CAPC in [**R1-2007526**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2007526.zip) | [R1-2007968](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2007968.zip) (AI 5)  [R1-2008305](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008305.zip) (AI 5)  [R1-2007903](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2007903.zip)  [R1-2008127](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008127.zip) |

# References

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| 1 | [**R1-2007608**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2007608.zip) | Maintenance on channel access procedures | Huawei, HiSilicon |
| 2 | [**R1-2007903**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2007903.zip) | Remaining Issues and Corrections on Channel Access Procedures and Configured Grants for NR-U | Nokia, Nokia Shanghai Bell |
| 3 | [**R1-2007980**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2007980.zip) | Channel Access Procedures | Ericsson |
| 4 | [**R1-2008043**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008043.zip) | Remaining issues of channel access procedure and configured grant for NR-U | LG Electronics |
| 5 | [**R1-2008127**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008127.zip) | Remaining issues on channel access | Samsung |
| 6 | [**R1-2008248**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008248.zip) | Discussion on the remaining issues of channel access procedure | OPPO |
| 7 | [**R1-2008383**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008383.zip) | Remaining issues on channel access procedure for NR-U | Sharp |
| 8 | [**R1-2008601**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008601.zip) | TP for Channel access procedures for NR unlicensed | Qualcomm Incorporated |
| 9 | [**R1-2008724**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_103-e/Docs/R1-2008724.zip) | Correction on UL channel access procedure for NR-U | WILUS Inc. |