3GPP TSG-RAN WG1 Meeting #107-e Tdoc R1-21xxxxx

e-Meeting, 11th – 19th November, 2021

Agenda Item: 7.2.2

Source: Moderator (Ericsson)

Title: Summary of [107-e-NR-NRU-04] Email discussion/approval on UL Transmissions in Wideband Operation

Document for: Discussion, Decision

# 1 Introduction

According to the vice-chair, the following e-mail discussion thread has been allocated for Rel-16 NR-U maintenance.

[107-e-NR-NRU-04] Email discussion/approval on UL Transmissions in Wideband Operation (Issue T6 in R1-2112461), until November 17 – Steve (Ericsson)

# 2 Issue Description from [1]

In [1], a correction to 37.213 is proposed to properly capture the below two agreements related to UL transmissions in wideband operation.

This agreement was made in RAN1#98bis:

Agreement #1:

* For UL transmissions in a serving cell with carrier bandwidth greater than the LBT bandwidth, for the case where UE performs CCA before UL transmission, UE transmits on the UL only if CCA is successful at UE in all LBT bandwidths that overlap with the resource allocation for the UL transmission
* The UE is not expected to receive resource allocations in discontiguous LBT bandwidths within a wideband carrier

This agreement was made in the subsequent meeting RAN1#99:

Agreement #2:

* The RRC parameters *intraCellGuardBandDL-r16* and *intraCellGuardBandUL-r16* include a mechanism to indicate that no intra-carrier guard-bands are configured
  + Note: This configuration may be used for the case where transmission only occurs in a BWP if LBT is successful in all RB sets within the BWP

In Section 4 of [3], a "channel" is defined as a carrier or part of a carrier (RB set) over which a channel access procedure is performed. In Section 4.2.1.0.4 of [3], channel access procedures for UL multi-channel transmission(s) are specified. A multi-channel transmission can consist of an aggregation of multiple 20 MHz carriers or to a single (or multiple) wideband carrier(s) of 40/60/80 MHz. For the latter, a carrier consists of multiple RB sets, where LBT is performed in each RB set (referred to as the LBT bandwidth in the first agreement). Such a wideband carrier can be configured either with or without intra-cell guardband as specified Clause 7 of [4]. According to this same clause, a 20 MHz carrier consists of a single RB set and is not configured with intra-cell guardbands since there is no need to have such guards.

For the case of a wideband carrier, the above agreements state that an UL transmission scheduled/configured in multiple RBs can only occur if LBT is successful in all RB sets. These agreements apply both to the case of a wideband carrier with or without intra-cell guardbands. For a 20 MHz carrier, it is implicitly understood that transmission on the carrier can occur only if LBT is successful on that carrier.

As can be seen in Section 4.2.1.0.4 of [3] (see yellow and green highlighted text below), the above agreements are currently captured only for the case when the UE performs a Type1 channel access procedure (Cat 4 LBT) on one channel and a Type 2 channel access procedure (Cat 2 LBT) on the remaining channels, also known as Type B multi-channel access procedure.

4.2.1.0.4 Channel access procedures for UL multi-channel transmission(s)

If a UE

- is scheduled to transmit on a set of channels , and if Type 1 channel access procedure is indicated by the UL scheduling grants for the UL transmissions on the set of channels , and if the UL transmissions are scheduled to start transmissions at the same time on all channels in the set of channels , or

- intends to perform an uplink transmission on configured resources on the set of channels with Type 1 channel access procedure, and if UL transmissions are configured to start transmissions on the same time all channels in the set of channels , and

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 .

- if a UE is configured without intra-cell guard band(s) on a UL bandwidthpart as described in clause 7 in [8], the UE may not transmit on a channel within the bandwidth of the carrier, if the UE fails to access any of the channels of the UL bandwidthpart.

- otherwise, 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 scheduled or configured by UL resources.

The issue is that the RAN1#98bis and RAN1#99 agreements are generic in the sense that they apply regardless of what channel access procedure is applied. In other words, the agreements apply also to the case when Type 1 channel access (CAT 4 LBT) is applied on all channels, also known as Type A multi-channel access procedure. For Type A multi-channel access procedure, there is no need to restrict the channel frequencies of the set of channels to be a subset of one of the sets of channel frequencies defined in clause 5.7.4 of TS 36.104 (reference [2] in the above clause) as specified currently.

To correct the issue, the draft CR in [2] is proposed and is copied in Appendix A for convenience. The draft CR proposes some restructuring of Section 4.2.1.0.4 such that both green highlighted paragraphs also apply to Type A multi-channel access procedure.

## **Proposal 1 Adopt the draft CR in [2] (copied in Appendix A below for convenience).**

Please provide you company view on Proposal #1

|  |  |
| --- | --- |
| **Company** | **View/Position** |
| LG Electronics | Support Proposal 1, as a co-sourcing company. |
| ZTE, Sanechips | We understand the motivation of this CRs but the current draft CR seems unclear for us since we don’t see which part of CR explicitly reflect the previous agreements that apply also to the case when Type 1 channel access (CAT 4 LBT) is applied on all channels. Could you please further clarify it?  Besides, we think the current CR is only for Rel-16 NR-U UE, not for UE before Rel-16 version. So it seems to need to further clarify or determine whether the current CR directly replaces Clause 4.2.1.0.4 of the existing spec or only adds this CR as a new paragraph in Clause 4.2.1.0.4 of the existing spec to reflect wideband operation. |
| Nokia, NSB | We support the proposal as a co-sourcing company. |
| OPPO | We share the same view with ZTE, the proposed CR does not explicitly reflect how Type 1 channel access is used. We propose some changes to make it clear, please see Appendix B. |
| Intel | We agree with the CR in principle. However, we share same concern as ZTE and OPPO, since it is not clear which part for the revision is for Type A multi-channel access procedure. It will be helpful and appreciated if the supporters can clarify it. |
| Samsung | Agree with the intention of the CR, and agree with OPPO’s further clarification. One typo in OPPO’s draft CR: the channel performing Type 1 channel access should be c\_j. |
| Sharp | We agree with the proposal in principle and also share the views from others that some more clarification on Type 1 channel access is necessary. |
| Huawei, HiSilicon | We support the proposal as a co-sourcing company. Nevertheless, we are also fine with adopting the further clarifying changes proposed by OPPO on the use of Type 1 |
| Moderator | @OPPO: Thank-you for the proposed change to the CR (Version 2 in Appendix B). I agree that this improves clarity since it explicitly captures both Type A and Type B multi-channel access procedures. However, with this modified structure, I believe the last two bullets should be moved up one level since they are generic w.r.t. to any channel access procedure. In this way, these two bullets occur at the same level with the others under the words "the following are applicable:". Please see Version 3 in Appendix C with this change.  @ ZTE: Do OPPO's proposed changes to the CR address you concerns (see Version 3 in Appendix C)? Regarding your question about Rel-15 vs. Rel-16. First of all, a wideband carrier with multiple RB sets is only relevant for Rel-16 as there was no such thing in Rel-15. Hence, any paragraph mentioning RB sets is only applicable to Rel-16 UEs. Secondly, the proposed CR does not change the behavior at all for the case of CA with 20 MHz carriers, hence is backwards compatible to Rel-15.  @Samsung: Not sure I agree that that c\_i should be changed to c\_j in the newly added paragraph applicable to Type A multi-channel access inserted by OPPO. This new paragraph is independent from the previous paragraph applicable to Type B channel access. Morevoer, for Type B, "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 ." Clearly this is not relevant for Type A multi-channel access, so the (generic) index i should be used in this case. Furthermore, if i was changed to j, then the same change would be needed for the 2nd last paragraph of the CR which applies to Rel-15 as well, so probably better not to touch that.  @All: Please check Version 3 in Appendix C in which the last two bullets are moved up one level as described above in the response to OPPO. Please respond if you have any remaining concerns. |
| LG Electronics | Support version 3 in Appendix C. |
| WILUS | Support version 3 in Appendix C. |
| Intel | Support version 3 in Appendix C. |

# References

1. R1-2111461, "UL transmissions in wideband operation," Ericsson, Nokia, NSB, LG Electronics, Qualcomm, Huawei, HiSilicon, RAN1#107-e, November 2021
2. R1-2111461, "draft CR UL transmissions in wideband operation," Ericsson, Nokia, NSB, LG Electronics, Qualcomm, Huawei, HiSilicon, RAN1#107-e, November 2021
3. 3GPP TS 37.213, "Physical layer procedures for shared spectrum channel access," v16.6.0, June 2021.
4. 3GPP TS 38.214, "Physical layer procedures for data," v16.7.0, September 2021.

# Appendix A – Version 1 (Draft CR from [1])

**3GPP TSG-RAN WG1 Meeting #107-e *R1-2111461***

**e-Meeting, 11th – 19th November, 2021**

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| *CR-Form-v12.1* | | | | | | | | |
| **DRAFT CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **37.213** | **CR** | **xxxx** | **rev** |  | **Current version:** |  |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** | UL transmissions in wideband operation | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson, Nokia, NSB, LG Electronics, Qualcomm, Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | TSG RAN WG1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_unlic-Core | | | | |  | ***Date:*** | | | 2021-11-11 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The below two agreements are captured in 37.213 Section 4.2.1.0.4, but only for the case when Type 1 channel access procedure (Cat 4 LBT) is applied on one channel (RB set) and Type 2 channel access procedure (Cat 2 LBT) is applied on the remaining channels (RB sets), also known as Type B multi-channel access procedure.  The issue is that the agreements apply also for the case where Type 1 channel access procedure (Cat 4 LBT) is performed on all channels (RB sets), also known as Type A multi-channel access procedure. For type A multi-channel access procedure there is no need to restrict the channel frequencies to be within a subset of a set of channel frequencies defined by Clause 5.7.4 of 36.104 as specified currently.  Agreement #1 (RAN1#98bis):   * For UL transmissions in a serving cell with carrier bandwidth greater than the LBT bandwidth, for the case where UE performs CCA before UL transmission, UE transmits on the UL only if CCA is successful at UE in all LBT bandwidths that overlap with the resource allocation for the UL transmission * The UE is not expected to receive resource allocations in discontiguous LBT bandwidths within a wideband carrier   Agreement #2 (RAN1 #99):   * The RRC parameters *intraCellGuardBandDL-r16* and *intraCellGuardBandUL-r16* include a mechanism to indicate that no intra-carrier guard-bands are configured   + Note: This configuration may be used for the case where transmission only occurs in a BWP if LBT is successful in all RB sets within the BWP | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Clarification that multi-channel transmission on carrier(s) both with and without guard bands applies also to the case when Type 1 channel access procedure (Cat 4 LBT) is performed on all channels (RB sets), also known as Type A multi-channel access procedure. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Undefined UE behavior for multi-channel transmission on carrier(s) both with and without guard bands applies for the case when Type 1 channel access procedure (Cat 4 LBT) is performed on all channels (RB sets), also known as Type A multi-channel access procedure. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 4.2.1.0.4 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

\*\*\* Unchanged text omitted \*\*\*

4.2.1.0.4 Channel access procedures for UL multi-channel transmission(s)

If a UE

- is scheduled to transmit on a set of channels , and if the UL transmissions are scheduled to start transmissions at the same time on all channels in the set of channels , or

- intends to perform an uplink transmission on configured resources on the set of channels , and if UL transmissions are configured to start transmissions at the same time on all channels in the set of channels ,

the following are applicable:

- if Type 1 channel access procedure is indicated or intended for the scheduled or configured UL transmissions, respectively, to be transmitted on the set of channels , and if the channel frequencies of the set of channels is a subset of one of the sets of channel frequencies defined in Clause 5.7.4 of [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 scheduled or configured with UL resources.

- the UE may not transmit on a channel within the bandwidth of a carrier if the UE is configured without intra-cell guard band(s) on an UL bandwidth part as described in clause 7 of [8] and if the UE fails to access any of the channels of the UL bandwidth part.

\*\*\* Unchanged text omitted \*\*\*

# Appendix B – Version 2 (Proposal from OPPO)

\*\*\* Unchanged text omitted \*\*\*

4.2.1.0.4 Channel access procedures for UL multi-channel transmission(s)

If a UE

- is scheduled to transmit on a set of channels , and if the UL transmissions are scheduled to start transmissions at the same time on all channels in the set of channels , or

- intends to perform an uplink transmission on configured resources on the set of channels , and if UL transmissions are configured to start transmissions at the same time on all channels in the set of channels ,

the following are applicable:

- if Type 1 channel access procedure is indicated or intended for the scheduled or configured UL transmissions, respectively, to be transmitted on the set of channels ,

- the UE may transmit on channel using Type 2 channel access procedure as described in clause 4.2.1.2,

- 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], and

- 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 transmit on channel using Type 1 channel access procedure as described in clause 4.2.1.1

- 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 scheduled or configured with UL resources.

- the UE may not transmit on a channel within the bandwidth of a carrier if the UE is configured without intra-cell guard band(s) on an UL bandwidth part as described in clause 7 of [8] and if the UE fails to access any of the channels of the UL bandwidth part.

\*\*\* Unchanged text omitted \*\*\*

# Appendix C – Version 3 (Ammendment to OPPO's Proposal)

\*\*\* Unchanged text omitted \*\*\*

4.2.1.0.4 Channel access procedures for UL multi-channel transmission(s)

If a UE

- is scheduled to transmit on a set of channels , and if the UL transmissions are scheduled to start transmissions at the same time on all channels in the set of channels , or

- intends to perform an uplink transmission on configured resources on the set of channels , and if UL transmissions are configured to start transmissions at the same time on all channels in the set of channels ,

the following is applicable:

- if Type 1 channel access procedure is indicated or intended for the scheduled or configured UL transmissions, respectively, to be transmitted on the set of channels ,

- the UE may transmit on channel using Type 2 channel access procedure as described in clause 4.2.1.2,

- if the channel frequencies of the set of channels is a subset of the sets of channel frequencies defined in clause 5.7.4 in [2], and

- 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 transmit on channel using Type 1 channel access procedure as described in clause 4.2.1.1

- 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 scheduled or configured with UL resources.

- the UE may not transmit on a channel within the bandwidth of a carrier if the UE is configured without intra-cell guard band(s) on an UL bandwidth part as described in clause 7 of [8], and the UE fails to access any of the channels of the UL bandwidth part.

\*\*\* Unchanged text omitted \*\*\*