**3GPP TSG RAN WG1#112bis-e R1-23xxxxx**

**Online, April 17th – April 26th, 2023**

**Agenda Item: 7.2**

**Source: Qualcomm (Moderator)**

**Title: Email discussion on issue CA-1 of channel access of Rel.17 FR2-2**

**Document for: Discussion, Decision**

# Introduction

This document summarizes the email discussion for the following thread:

[112bis-e-R17-FR2\_2-01] Email discussion on Rel-17 FR2\_2 maintenance for channel access mechanism issue CA-1 (from RAN1#112) by April 20 – Jing (Qualcomm)

# Issue CA-1

This issue is about Type 1 LBT to Type 2 or Type 3 LBT upgrade when back in gNB COT for FR2-2 unlicensed operation in R17. The following proposals are collected in the submitted papers

Discussion CA-1

On Type 1 LBT to Type 2 or Type 3 LBT upgrade when back in gNB COT for FR2-2 unlicensed operation in R17

* Alt 1: Type 1 LBT to Type 2 LBT upgrade when back in gNB COT for FR2-2 unlicensed operation in R17, if UE supports Type 2 LBT. Otherwise, if UE does not support Type 2 LBT, Type 1 LBT upgrade when back in gNB COT is not supported
  + Support: Oppo [4], CATT [6], Qualcomm [13]
  + Draft CR in [5] (TP CA-1-oppo)
  + Draft CR in [7] (TP CA-1-CATT)
* Alt 2: Assume UE is aware of local regulation, and UE determines if Type 2 LBT is needed to share the gNB COT
  + Support: ZTE [8], Nokia [10], HW [15]
  + Draft CR in [9] (TP CA-1-ZTE)
  + Draft CR in [11] (TP CA-1-Nokia)
  + Draft CR in [15] (TP CA-1-HW)
* Alt 3: Concludes to not support the Type 1 LBT to Type 2 or Type 3 LBT in R17
  + Support: Qualcomm [13]
* Alt 4:
  + channel access procedures can be used only if Type 2 has been configured as a table entry by any of the higher layer parameters *ul-AccessConfigListDCI-0-1* *ul-AccessConfigListDCI-0-2* or *ul-AccessConfigListDCI-1-1 or ul-AccessConfigListDCI-1-2.*
  + Type 3 channel access procedures can be used only if Type 3 has been configured as a table entry by any of the higher layer parameters *ul-AccessConfigListDCI-0-1* *ul-AccessConfigListDCI-0-2* or *ul-AccessConfigListDCI-1-1 or ul-AccessConfigListDCI-1-2*
  + Support: LGE [12], Qualcomm [13]
  + Draft CR in [12] (TP CA-1-LGE)
* Alt 5: reuse ra-ChannelAccess-r17 to control if Type 1 LBT can be upgraded to Type 2 or Type 3 LBT
  + Suport: vivo[1], Wilus [16]
  + Draft CR in [2] (TP CA-1-vivo)
  + Draft CR in [16] (TP cA-1-Wilus)

TP CA-1-oppo

4.4.4 Channel access procedures in an initiated channel occupancy

If a gNB/UE initiates a channel occupancy using the channel access procedures described in clause 4.4.1 on a channel, the gNB/UE may transmit a DL/UL transmission(s) that is followed by a UL/DL transmission(s) within the maximum *Channel Occupancy Time* described in Clause 4.4.1. The followings are applicable to the UL/DL transmission(s):

- The transmission bandwidth(s) corresponding to the UL/DL transmission(s) shall be within the DL/UL bandwidth part(s) where in the channel occupancy is initiated:

- Regardless of the duration of the gap between the UL/DL transmission(s) and previous DL/UL transmission(s) on the channel, the UL/DL transmission(s) occurs following the procedures described in Clause 4.4.3; or

- if the gap between the UL/DL transmission(s) and previous DL/UL transmission(s) on the channel is more than a threshold that is determined by the gNB and is at least , the UL/DL transmission(s) occurs following the procedures described in Clause 4.4.2. Otherwise, the UL/DL transmission(s) occurs following the procedures described in Clause 4.4.3.

If a gNB initiates a channel occupancy using the channel access procedures described in clause 4.4.1 on a channel, the gNB may transmit a DL transmission(s) on the channel within the maximum *Channel Occupancy Time* described in Clause 4.4.1 on the channel after the DL transmission(s) initiating the channel occupancy. The followings are applicable to the DL transmission(s):

- Regardless of the duration of the gap between the DL transmission(s) and any previous transmission(s) corresponding to the channel occupancy initiated by the gNB, the DL transmission(s) occurs following the procedures described in Clause 4.4.3; or

- if the gap between the DL transmission(s) and any previous transmission(s) corresponding to the channel occupancy initiated by the gNB is more than a threshold that is determined by the gNB and is at least , the DL transmission(s) occurs following the procedures described in Clause 4.4.2.

If a gNB shares a channel occupancy initiated by a UE using the channel access procedures described in clause 4.4.1 on a channel, the gNB may transmit a transmission on the channel that follows a scheduled UL transmission or a configured PUSCH transmission by the UE if the following conditions are satisfied:

- The DL transmission shall contain transmission to the UE that initiated the channel occupancy and can include non-unicast and/or unicast transmissions where any unicast transmission that includes user plane data is only transmitted to the UE that initiated the channel occupancy.

When a UE is provided *cg-COT-SharingList-r17* by higher layers, the UE is configured with a table wherein each row is given by higher layer parameter *CG-COT-Sharing-r17*. One row of the table is configured for indicating that the channel occupancy sharing is not available and other rows of the table each provides a channel occupancy sharing information. In this case, each configured grant PUSCH transmission includes 'COT sharing information' in CG-UCI as described in [10] that indicates a row index to the table.

If a gNB shares a channel occupancy initiated by a UE using configured grant PUSCH transmission and the UE is configured by *cg-COT-SharingList-r17*, the gNB may transmit a transmission that follows the configured grant PUSCH transmission by the UE if the following conditions are satisfied:

- If the gNB determines that the 'COT sharing information' in CG-UCI in slot *n* indicates a row index that corresponds to a *CG-COT-Sharing-r17* that provides channel occupancy sharing information, the gNB can share the UE channel occupancy starting from slot , where  *offset-r17* slots, for a duration of *duration -r17* slots where *duration-r17*, and *offset-r17* are higher layer parameters provided by *CG-COT-Sharing-r17*.

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 4.4.1 to Type 2 channel access procedures as described in clause 4.4.2 for its corresponding UL transmissions within the determined duration in time and location in frequency domain of the remaining channel occupancy.

TP CA-1-CATT

4.4 Channel access procedures for frequency range 2-2

4.4.8 Channel access procedures upon detection of a DCI format 2\_0

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 4.4.1 to Type 2 channel access procedures as described in clause 4.4.2 for its corresponding UL transmissions within the determined duration in time and determined location in frequency domain of the remaining channel occupancy if a UE indicates the capability of Type 2 channel access. In this case, if the UL transmissions are PUSCH transmissions on configured resources, the UE may assume the channel occupancy is shared with the gNB.

TP CA-1-ZTE

4.4 Channel access procedures for frequency range 2-2

<Unchanged part is omitted>

4.4.X Channel access procedures upon detection of a common DCI

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 4.4.1 to Type 2 channel access procedures as described in Clause 4.4.2 or Type 3 channel access procedures as described in Clause 4.4.3 for its corresponding UL transmissions within the determined duration in time and location in frequency domain of the remaining channel occupancy. If Type 2 channel access procedure is allowed by regulation, the UE can use Type 2 channel access for UL transmission. Otherwise, UE can use Type 3 channel access for UL transmission.

TP CA-1-Nokia

4.4 Channel access procedures for frequency range 2-2

**<Unchanged parts omitted>**

When a UE is scheduled by a DCI to transmit a UL transmission(s), the scheduling DCI may indicate the corresponding channel access procedures for the UL transmission(s) as described in [10]. The UE determines based on the DCI if Type 1, or Type 2, or Type 3 channel access procedures described in Clause 4.4.1, Clause 4.4.2 and Clause 4.4.3, respectively, is applicable. If the UE determines that the scheduled UL transmission(s) occur within the channel occupancy initiated by the gNB, it may transmit the UL transmission(s) following the procedures described in Clause 4.4.4, irrespective of the channel access type determined based on the DCI.

TP CA-1-LGE

4.4.4 Channel access procedures in an initiated or a shared channel occupancy

If a gNB/UE initiates a channel occupancy using the channel access procedures described in clause 4.4.1 on a channel, the gNB/UE may transmit a DL/UL transmission(s) that is followed by a UL/DL transmission(s) within the maximum *Channel Occupancy Time* described in Clause 4.4.1. The followings are applicable to the UL/DL transmission(s):

- The transmission bandwidth(s) corresponding to the UL/DL transmission(s) shall be within the DL/UL bandwidth part(s) where in the channel occupancy is initiated:

- Regardless of the duration of the gap between the UL/DL transmission(s) and previous DL/UL transmission(s) on the channel, the UL/DL transmission(s) occurs following the procedures described in Clause 4.4.3; or

- if the gap between the UL/DL transmission(s) and previous DL/UL transmission(s) on the channel is more than a threshold that is determined by the gNB and is at least , the UL/DL transmission(s) occurs following the procedures described in Clause 4.4.2. Otherwise, the UL/DL transmission(s) occurs following the procedures described in Clause 4.4.3.

If a gNB initiates a channel occupancy using the channel access procedures described in clause 4.4.1 on a channel, the gNB may transmit a DL transmission(s) on the channel within the maximum *Channel Occupancy Time* described in Clause 4.4.1 on the channel after the DL transmission(s) initiating the channel occupancy. The followings are applicable to the DL transmission(s):

- Regardless of the duration of the gap between the DL transmission(s) and any previous transmission(s) corresponding to the channel occupancy initiated by the gNB, the DL transmission(s) occurs following the procedures described in Clause 4.4.3; or

- if the gap between the DL transmission(s) and any previous transmission(s) corresponding to the channel occupancy initiated by the gNB is more than a threshold that is determined by the gNB and is at least , the DL transmission(s) occurs following the procedures described in Clause 4.4.2.

If a gNB shares a channel occupancy initiated by a UE using the channel access procedures described in clause 4.4.1 on a channel, the gNB may transmit a transmission on the channel that follows a scheduled UL transmission or a configured PUSCH transmission by the UE if the following conditions are satisfied:

- The DL transmission shall contain transmission to the UE that initiated the channel occupancy and can include non-unicast and/or unicast transmissions where any unicast transmission that includes user plane data is only transmitted to the UE that initiated the channel occupancy.

When a UE is provided *cg-COT-SharingList-r17* by higher layers, the UE is configured with a table wherein each row is given by higher layer parameter *CG-COT-Sharing-r17*. One row of the table is configured for indicating that the channel occupancy sharing is not available and other rows of the table each provides a channel occupancy sharing information. In this case, each configured grant PUSCH transmission includes 'COT sharing information' in CG-UCI as described in [10] that indicates a row index to the table.

If a gNB shares a channel occupancy initiated by a UE using configured grant PUSCH transmission and the UE is configured by *cg-COT-SharingList-r17*, the gNB may transmit a transmission that follows the configured grant PUSCH transmission by the UE if the following conditions are satisfied:

- If the gNB determines that the 'COT sharing information' in CG-UCI in slot *n* indicates a row index that corresponds to a *CG-COT-Sharing-r17* that provides channel occupancy sharing information, the gNB can share the UE channel occupancy starting from slot , where  *offset-r17* slots, for a duration of *duration -r17* slots where *duration-r17*, and *offset-r17* are higher layer parameters provided by *CG-COT-Sharing-r17*.

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 4.4.1 to Type 2 channel access procedures as described in clause 4.4.2, if configured among the entries provided by any of the higher layer parameters *ul-AccessConfigListDCI-0-1* or *ul-AccessConfigListDCI-1-1,* for its corresponding UL transmissions within the determined duration in time and location in frequency domain of the remaining channel occupancy.

- Otherwise, the UE may switch from Type 1 channel access procedures as described in clause 4.4.1 to Type 3 channel access procedures as described in clause 4.4.3, if configured among the entries provided by any of the higher layer parameters *ul-AccessConfigListDCI-0-1* or *ul-AccessConfigListDCI-1-1,* for its corresponding UL transmissions within the determined duration in time and location in frequency domain of the remaining channel occupancy.

TP CA-1-HW

4.4.4 Channel access procedures in an initiated channel occupancy

If a gNB/UE initiates a channel occupancy using the channel access procedures described in clause 4.4.1 on a channel, the gNB/UE may transmit a DL/UL transmission(s) that is followed by a UL/DL transmission(s) within the maximum *Channel Occupancy Time* described in Clause 4.4.1. The followings are applicable to the UL/DL transmission(s):

- The transmission bandwidth(s) corresponding to the UL/DL transmission(s) shall be within the DL/UL bandwidth part(s) where in the channel occupancy is initiated:

- Regardless of the duration of the gap between the UL/DL transmission(s) and previous DL/UL transmission(s) on the channel, the UL/DL transmission(s) occurs following the procedures described in Clause 4.4.3; or

- if the gap between the UL/DL transmission(s) and previous DL/UL transmission(s) on the channel is more than a threshold that is determined by the gNB and is at least , the UL/DL transmission(s) occurs following the procedures described in Clause 4.4.2. Otherwise, the UL/DL transmission(s) occurs following the procedures described in Clause 4.4.3.

If a gNB initiates a channel occupancy using the channel access procedures described in clause 4.4.1 on a channel, the gNB may transmit a DL transmission(s) on the channel within the maximum *Channel Occupancy Time* described in Clause 4.4.1 on the channel after the DL transmission(s) initiating the channel occupancy. The followings are applicable to the DL transmission(s):

- Regardless of the duration of the gap between the DL transmission(s) and any previous transmission(s) corresponding to the channel occupancy initiated by the gNB, the DL transmission(s) occurs following the procedures described in Clause 4.4.3; or

- if the gap between the DL transmission(s) and any previous transmission(s) corresponding to the channel occupancy initiated by the gNB is more than a threshold that is determined by the gNB and is at least , the DL transmission(s) occurs following the procedures described in Clause 4.4.2.

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 the channel access procedures described in clause 4.4.1 to the channel access procedures described in clause 4.4.3 for its corresponding UL transmissions within the determined duration in time and location in frequency domain of the remaining channel occupancy if the use of the procedures described in clause 4.4.3 is allowed by regulations. Otherwise, the UE may switch to the procedures described in clause 4.4.2 if the UE has indicated the corresponding capability.

If a gNB shares a channel occupancy initiated by a UE using the channel access procedures described in clause 4.4.1 on a channel, the gNB may transmit a transmission on the channel that follows a scheduled UL transmission or a configured PUSCH transmission by the UE if the following conditions are satisfied:

- The DL transmission shall contain transmission to the UE that initiated the channel occupancy and can include non-unicast and/or unicast transmissions where any unicast transmission that includes user plane data is only transmitted to the UE that initiated the channel occupancy.

\*\*\* unchanged text omitted\*\*\*

TP CA-1-vivo

4.4.4 Channel access procedures in an initiated channel occupancy

<Unchanged parts omitted>

If a gNB shares a channel occupancy initiated by a UE using configured grant PUSCH transmission and the UE is configured by *cg-COT-SharingList-r17*, the gNB may transmit a transmission that follows the configured grant PUSCH transmission by the UE if the following conditions are satisfied:

- If the gNB determines that the 'COT sharing information' in CG-UCI in slot *n* indicates a row index that corresponds to a *CG-COT-Sharing-r17* that provides channel occupancy sharing information, the gNB can share the UE channel occupancy starting from slot , where  *offset-r17* slots, for a duration of *duration -r17* slots where *duration-r17*, and *offset-r17* are higher layer parameters provided by *CG-COT-Sharing-r17*.

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:

- If *ra-ChannelAccess-r17* is configured, the UE may switch from Type 1 channel access procedures as described in clause 4.4.1 to Type 2 channel access procedures as described in clause 4.4.2 for its corresponding UL transmissions within the determined duration in time and location in frequency domain of the remaining channel occupancy. Otherwise, the UE may switch from Type 1 channel access procedures as described in clause 4.4.1 to Type 3 channel access procedures as described in clause 4.4.3 for its corresponding UL transmissions within the determined duration in time and location in frequency domain of the remaining channel occupancy.

<Unchanged parts omitted>

TP CA-1-Wilus

4.4.4 Channel access procedures in an initiated channel occupancy

If a gNB/UE initiates a channel occupancy using the channel access procedures described in clause 4.4.1 on a channel, the gNB/UE may transmit a DL/UL transmission(s) that is followed by a UL/DL transmission(s) within the maximum *Channel Occupancy Time* described in Clause 4.4.1. The followings are applicable to the UL/DL transmission(s):

- The transmission bandwidth(s) corresponding to the UL/DL transmission(s) shall be within the DL/UL bandwidth part(s) where in the channel occupancy is initiated:

- Regardless of the duration of the gap between the UL/DL transmission(s) and previous DL/UL transmission(s) on the channel, the UL/DL transmission(s) occurs following the procedures described in Clause 4.4.3; or

- if the gap between the UL/DL transmission(s) and previous DL/UL transmission(s) on the channel is more than a threshold that is determined by the gNB and is at least , the UL/DL transmission(s) occurs following the procedures described in Clause 4.4.2. Otherwise, the UL/DL transmission(s) occurs following the procedures described in Clause 4.4.3.

If a gNB initiates a channel occupancy using the channel access procedures described in clause 4.4.1 on a channel, the gNB may transmit a DL transmission(s) on the channel within the maximum *Channel Occupancy Time* described in Clause 4.4.1 on the channel after the DL transmission(s) initiating the channel occupancy. The followings are applicable to the DL transmission(s):

- Regardless of the duration of the gap between the DL transmission(s) and any previous transmission(s) corresponding to the channel occupancy initiated by the gNB, the DL transmission(s) occurs following the procedures described in Clause 4.4.3; or

- if the gap between the DL transmission(s) and any previous transmission(s) corresponding to the channel occupancy initiated by the gNB is more than a threshold that is determined by the gNB and is at least , the DL transmission(s) occurs following the procedures described in Clause 4.4.2.

If a gNB shares a channel occupancy initiated by a UE using the channel access procedures described in clause 4.4.1 on a channel, the gNB may transmit a transmission on the channel that follows a scheduled UL transmission or a configured PUSCH transmission by the UE if the following conditions are satisfied:

- The DL transmission shall contain transmission to the UE that initiated the channel occupancy and can include non-unicast and/or unicast transmissions where any unicast transmission that includes user plane data is only transmitted to the UE that initiated the channel occupancy.

When a UE is provided *cg-COT-SharingList-r17* by higher layers, the UE is configured with a table wherein each row is given by higher layer parameter *CG-COT-Sharing-r17*. One row of the table is configured for indicating that the channel occupancy sharing is not available and other rows of the table each provides a channel occupancy sharing information. In this case, each configured grant PUSCH transmission includes 'COT sharing information' in CG-UCI as described in [10] that indicates a row index to the table.

If a gNB shares a channel occupancy initiated by a UE using configured grant PUSCH transmission and the UE is configured by *cg-COT-SharingList-r17*, the gNB may transmit a transmission that follows the configured grant PUSCH transmission by the UE if the following conditions are satisfied:

- If the gNB determines that the 'COT sharing information' in CG-UCI in slot *n* indicates a row index that corresponds to a *CG-COT-Sharing-r17* that provides channel occupancy sharing information, the gNB can share the UE channel occupancy starting from slot , where  *offset-r17* slots, for a duration of *duration -r17* slots where *duration-r17*, and *offset-r17* are higher layer parameters provided by *CG-COT-Sharing-r17*.

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 4.4.1 to Type 2 channel access procedures as described in clause 4.4.2 for its corresponding UL transmissions within the determined duration in time and location in frequency domain of the remaining channel occupancy if the higher layer parameter *ra-ChannelAccess-r17* is configured. Otherwise, the UE may switch from Type 1 channel access procedures as described in clause 4.4.1 to Type 3 channel access procedures as described in clause 4.4.3 for its corresponding UL transmissions within the determined duration in time and location in frequency domain of the remaining channel occupancy.

# Discussion

Please provide your view in the following tables for the support AND objection for each alternative (Multiple choices are allowed).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Company | Alt 1 | Alt 2 | Alt 3 | Alt 4 | Alt 5 |
| Qualcomm | Y | N | Y | Y | N |
| Xiaomi | Y | N |  | Y | N |
| CATT | Y | Y | N | Y | Y |
| ZTE, Sanechips | N | Y | Y | N | N |
| Samsung | Y | Y | Y | N | N |
| Intel | N | N | Y | N | N |
| Huawei, HiSilicon | N | Y | Y | N | N |
| NTT DOCOMO | Y (1st) | Y (3rd) | Y (2nd) | N | N |
| vivo | Y | N | Y | N | Y |
| LG | N | N | N | Y | Y |
| WILUS | Y | N | N | Y | Y |
| OPPO | Y | Y | N | Y | N |
| Nokia, NSB | N | Y(1st) | N | Y(2nd) | Y(2nd) |
|  | 8 | 7 | 7 | 7 | 5 |

Please provide additional comments below:

|  |  |
| --- | --- |
| Company | Comments |
| Qualcomm | We don’t see a reliable way for UE to know the local regulation. Thus cannot support Alt 2.  ra-ChannelAccess-r17 is for the control of a separate feature, and we don’t support sharing RRC control.  We are open for Alt 1 or Alt 3. Alt 1 support the functionality is most cases and is preferred. Alt 3 is simpler (do nothing).  Alt 4 is also acceptable for us though the spec impact might be larger. |
| Xiaomi | We slightly prefer to support a mechanism that UE can switch from Type1 LBT to Type 2/3. And we support the procedures in Alt 1, and Alt 4 defines how to judge “if UE supports Type 2 LBT or Type 3 LBT”  But if no consensus is made, we can also go to Alt 3(not support the Type 1 LBT to Type 2 or Type 3 LBT in R17) |
| CATT | Similar to FR1 unlicensed operation, the LBT update procedure should be supported in FR2-2 unlicensed band. Regarding that how to indicate the UE switching from Type-1 LBT to Type-2 LBT or Type-3 LBT, we prefer to support Alt1, since it can apply to most of regions and have minimum spec impact.  For Alt.2, Alt 4 and Alt5, one clarification is needed that only the UE with Type 2 LBT capability can switch from Type1 LBT to Type2 LBT. |
| ZTE, Sanechips | We think that Alt 2 is a relatively simple way to support this function. On how to identify local regulation, we think that UE can obtain its location through PLMN and further get local regulation.  For Alt1, we don’t expect to restrict the type of LBT update, such as only allow LBT update from Type 1 to Type2 if Type 2 is supported.  For Alt 4, as we mentioned in the last meeting, we are not sure if additional spec impact is needed. From our point of view, we have some concerns about how to solve the mismatch problem between the LBT type indicated by an entry and UE capability to support Type2, for instance, Type 2 is indicated by an entry but UE doesn't have a capability to support Type 2, or Type 3 is configured for UE but actually UE has a capability to support type2 and Type 2 is allowed in local regulation.  For Alt 5, we don’t want to use the same RRC parameter for different independent features and add some spec workload to other work group.  If we cannot use the simplest way to support this feature, we prefer to go back for Alt 3, not support this feature in Rel-17. |
| Samsung | To us, the whole feature is an optimization (the spec is not broken without it), and if supported, it should be simple with minimized spec impact.  We are ok with Alt 1, Alt 2, or Alt 3. |
| Intel | We also think that this is a new feature, and specification is not broken without it. Our preference is for Alt.3. |
| Huawei, HiSilicon | For **Alt-1**, @Qualcomm and CATT, our understanding is that **Alt-2**, at least according to TP CA-1-HW, achieves the goal of Alt-1 but would be even applicable to more regions. That is Switching to Type 3 is default if allowed by regulations, **otherwise (including as well UE not aware of the regulations**), **Type 2 can be used if UE has indicated the corresponding capability.**  **For Alt-4,** current spec only restricts scheduling with Type 2, if corresponding capability has not been indicated as follows. So, strictly speaking there could be mismatch between the configured DCI entries and the UE capability as ZTE also pointed out.  “A UE is not expected to be scheduled to apply Type 2 channel access procedures for a UL transmission(s) before indicating the corresponding capability.”  **For Alt-5**, we do not support reusing the RRC parameter for controlling SCSt. In addition to ZTE and Samsung’s concerns, our understanding is that NW can still configure *ra-ChannelAccess-r17,* even though Type 3 is allowed, due to the 10% limit of SCSt. So, configuring the parameter does not necessarily mean that Type 3 is not allowed by regulations.  We would be also OK with **Alt 3** (no support for this feature in Rel-17) if we cannot agree on a simple mechanism. |
| NTT DOCOMO | Ok with Alt 1, Alt 2 or Alt 3. Agree with Samsung that it should be simpler. Among the three, our priority is Alt 1 (best preference) > Alt 3 > Alt 2, while all of them are acceptable. In our understanding, no consensus leads to alt 3. |
| vivo | For Alt. 2, UE may not obtain its location through PLMN and get local regulation in some cases. In private network, MCC code in PLMN is always set to ‘999’ and there is no location information. So Alt. 2 doesn’t work in this case.  For Alt. 4, if a UE doesn’t support Type 2, gNB will not configure Type 2 to UE but configure Type 3 to UE. However, it doesn’t mean it is allowed to switch to Type 3 in shared COT. In this case, UE switch to Type 3 that may violate regulation in certain region.  Thus we are OK with Alt. 1, Alt. 3 and Alt. 5.  @Huawei: For Alt. 5, in your mentioned case, UE will switch to Type 2 LBT if supported. There is no problem since it will not violate any regulation. |
| LG Electronics | We support Alt 4 or Alt 5.  It is worth noting that supporting the LBT upgrade within a gNB-initiated COT are beneficial for operation in FR2-2. However, we do not support allowing UE to determine the LBT upgrade (i.e., leave it to implementation), because it is not clear how UE knows the local regulation without explicit parameter configuration.  As we commented in Athens, RAN2 has already been an agreement on the introduction of higher layer parameter ra-ChannelAccess-r17. Therefore, we can use this parameter to determine LBT type in gNB-initiated COT. Alternatively, the LBT type determination within a gNB-initiated COT can be based on the configured entry by the higher layer parameters (ul-AccessConfigListDCI-0-1 or ul-AccessConfigListDCI-1-1).  Regarding Alt 2, Even though UE knows its geographical location and local regulations, we think that the LBT type determination within a gNB-initiated COT or UE-initiated COT to resume the transmission should be controlled by gNB rather than UE determining on its own. The reason for this is that local regulation also continues to be revised and changed, so the gNB needs to indicate accordingly, or even in areas where Type 2 is not mandated, gNB may need to indicate Type 2 LBT to the UE intentionally. Above all, leaving LBT type decisions to UE haves a risk of degradation in terms of cell performance. |
| WILUS | Our preference is to support Alt 4 or Alt 5 without any RRC, spec impact and depending on UE’s own decision. However, we can accept to go with Alt-1 that Type 2 can be used if UE has indicated the corresponding capability. |
| OPPO | As we pointed out in our contribution, currently, the DL to UL COT sharing cannot be supported for CG-PUSCH since LBT upgrade functionality has not been introduced in FR2-2. However, we have agreed that “UL to DL COT sharing is supported for FR2-2 unlicensed operation, including from dynamically scheduled UL and CG-PUSCH.” in RAN1#107-e meeting. As a result, the COT sharing mechanism in FR2-2 is incomplete and unfair to the UE side, so we suggest to introduce LBT upgrade functionality. To address LG’s concern, Type 1 LBT to Type 2 LBT upgrade when back in gNB COT(Alt 1) can guarantee the UE complying with regional regulation all the time.  Besides, Alt 2 and Alt4 are also acceptable to us. |
| Nokia, NSB | In our view, it is important to support especially upgrade from Type 1 to Type 3. Type 1 🡪 Type 2 upgrade is less critical, but we are ok with that as well. Alt 2 would be the simplest solution. If a UE is uncertain of the regulation, it will simply not apply the LBT upgrade. Alt 1 does not provide significant benefits as the UE still needs to perform LBT in a COT. Alt 4 and Alt 5 are more complex that necessary, but we can be open to those as well. |
| Huawei, HiSilicon 2 | @ all companies supporting Alt-1 or having concerns on how Alt-2 is described above “Assume UE is aware of local regulation,...” , please note that although TP CA-1-HW is listed under Alt-2, it does not strictly assume knowledge of local regulations.  That is Switching to Type 3 is default if allowed by regulations, **otherwise (including as well UE being unaware of the regulations**), **Type 2 can be used if UE has indicated the corresponding capability.**  Therefore, TP CA-1-HW achieves the goal of Alt-1 and does not restrict the LBT upgrade to Type 2 LBT as Nokia commented. |

# References

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