**3GPP TSG RAN WG1 Meeting #107bis-e** **R1-2200703**

**January 17th – January 25th, 2021**

**Agenda item: 8.2.6**

**Source: Moderator (Qualcomm Incorporated)**

**Title: FL summary of channel access mechanism for 52.6GHz-71GHz band, ver01**

**Document for: Discussion and Decision**

# Introduction

This paper summarizes the channel access related proposals submitted to agenda item 8.2.6 in RAN1-107bis-e.

# Summary of contributions

The section summarises key proposals and observations from submitted contributions. Discussion points arising from each group of topics are captured separately in subsections.

## LBT Bandwidth FFS Items

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| Agreement:   * For LBT for single carrier transmission, gNB/UE performs LBT over the channel bandwidth (or BWP bandwidth) (Alt SC.1. in earlier agreements) * For LBT for multi-carrier transmission in intra-band CA, gNB/UE performs multiple LBT, one for each channel bandwidth separately (Alt CA.1. in earlier agreements)   + FFS: Additional support of performing single LBT over all CCs (Alt CA.2. in earlier agreements)   more than one alternative for at least multi-carrier transmission in intra-band CA is not precluded.  Conclusion:  There is no consensus to support explicitly introducing in the spec using single LBT covering multiple CCs under CA.   * Note: This does not rule out gNB/UE implementation to perform single LBT to cover multiple CCs. However, the EDT needs to be selected such that if interference on one of the CCs exceeds the CC EDT, the LBT is declared as failed |

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| FUTUREWEI | **Proposal 1: No further clarifications on LBT bandwidth in EDT are to be specified.** |
| Huawei HiSilicon | **Proposal 1: For operation in FR2-2, define the term ‘BW’ in the EDT formula specified in Section 4.4.7 of TS 37.213 v17.0.0 as the channel bandwidth (as defined by RAN4) for a gNB accessing the channel and the UL BWP bandwidth for a UE accessing the channel.**  **Adopt following TP#1 for TS 37.213 v17.0.0**  \*\*\* < **Beginning of TP#1 for TS 37.213 v17.0.0**> \*\*\*  4.4.7 Energy detection threshold adaptation procedures  A gNB/UE accessing a channel on which transmission(s) on beam(s) are performed within a channel occupancy, shall set the energy detection threshold to be less than or equal to the maximum energy detection threshold that is determined as follows:  where:  - is the RF output power limit in .  - is the maximum EIRP of the intended transmission(s) by the gNB/UE during a channel occupancy in where . The maximum EIRP used for the transmission(s) by a gNB/UE that acquires the channel occupancy is limited to .  - is the channel bandwidth for a gNB accessing the channel, or the bandwidth part bandwidth for a UE accessing the channel, in MHz.  \*\*\* < **End of TP#1 for TS 37.213 v17.0.0**> \*\*\* |
| vivo | ***Proposal 1: The LBT bandwidth for UE is the active BWP bandwidth, the LBT bandwidth for gNB is up to implementation and no larger than the channel bandwidth.*** |
| Nokia Nokia Shanghai Bell | ***Proposal 6: Earlier agreement on LBT bandwith in the case of intra-band CA is revised as: “For LBT for multi-carrier transmission in intra-band CA, gNB/UE performs multiple LBT, one for each channel bandwidth separately (or one for each active BWP bandwidth in each channel separately)(Alt CA.1. in earlier agreements)”*** |
| ZTE Sanechips | **Proposal 5:** *The Operating Channel BW used in the EDT equation is equivalent to the LBT BW.*  **Proposal 6:** *The definition of LBT BW in previous agreement can be updated as:*   * *For single carrier transmission,*   + *UE performs LBT over the active BWP bandwidth.*   + *gNB performs LBT over channel/carrier bandwidth or active BWP bandwidth, depending on the implementation* * *For multi-carrier transmission in intra-band CA,*   + *UE performs multiple LBT, one for each active BWP bandwidth in each channel separately.*   + *gNB performs multiple LBT, one for each active BWP bandwidth in each channel separately, or for each channel bandwidth separately, depending on the implementation.* |
| Qualcomm Incorporated | **Proposal 1: Modify the earlier agreements as follows**  **Agreement:**  **For LBT for single carrier transmission, gNB/UE performs LBT over ~~the channel bandwidth (or~~ BWP bandwidth)**  **Agreement:**  **For LBT for multi-carrier transmission in intra-band CA, gNB/UE performs multiple LBT, one for each active BWP bandwidth in each channel ~~bandwidth~~ separately (Alt CA.1. in earlier agreements)**  ***Proposal 2: In the case when active DL BWP and active UL BWP are not the same (one is wider than the other), gNB/UE should perform LBT over the wider one between the active DL BWP and active UL BWP.*** |
| OPPO | ***Observation 1: RAN1 spec does not define channel bandwidth, which leads to potential confusion about how to apply channel bandwidth in channel access mechanism.***  ***Proposal 1:***  ***1) RAN1 should clearly define channel bandwidth, either based on RAN4 definition or others.***  ***2) RAN1 should clarify how to select a channel bandwidth presuming RAN4 definition is the baseline.***  ***3) EDT should be calculated based on actual LBT bandwidth, instead of fixing it to BWP bandwidth.*** |
| Ericsson | ***Observation 1 RAN4 channel bandwidth/Carrier bandwidth is different from RAN1 channel bandwidth***  ***Proposal 1 RAN1 to conclude that BW is the bandwidth of the “channel” defined in 37.213 clause 4.0 and hence modify the spec. text in 37.213 CR clause 4.4.7 as follows***  **[BW is the [channel bandwidth or bandwidth part bandwidth] in MHz.]** |
| Transsion | ***Proposal 1: Modify the earlier agreements as follows***  ***Agreement:***  ***For LBT for single carrier transmission, gNB/UE performs LBT over the ~~channel bandwidth (or~~ BWP bandwidth~~)~~***  ***Agreement:***  ***For LBT for multi-carrier transmission in intra-band CA, gNB/UE performs multiple LBT, one for each active BWP bandwidth in each channel ~~bandwidth~~ separately (Alt CA.1. in earlier agreements)*** |

**Summary of Positions**

For LBT for single carrier transmission the UE performs LBT over

* UL BWP Bandwidth: Huawei
* Active BWP Bandwidth: Vivo, Nokia, Ericsson , Transsion

For LBT for single carrier transmission the gNB performs LBT over

* Channel Bandwidth: Huawei
* Active BWP Bandwidth: Nokia
* gNB Implementation : Vivo (no larger than Channel Bandwidth) ZTE

For LBT for multi-carrier transmission in intra-band CA,

* gNB/UE performs multiple LBT, one for each active BWP bandwidth in each channel separately: Majority Support

Proposal 2.1-1

Modify the earlier agreements as follows

Agreement:

For LBT for single carrier transmission, gNB/UE performs LBT over ~~the channel bandwidth (or~~ active BWP bandwidth~~)~~

Note: Per earlier agreements, gNB/UE can always perform LBT over wider bandwidth as implementation

Agreement:

For LBT for multi-carrier transmission in intra-band CA, gNB/UE performs multiple LBT, one for each active BWP bandwidth in each channel ~~bandwidth~~ separately (Alt CA.1. in earlier agreements)

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## Energy Detection Threshold and Pout Determination

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| Agreement:  The baseline ED threshold can be computed as  Where Pout is RF output power (EIRP) and Pmax is the RF output power limit, Pout≤Pmax.   * FFS: Further adjustment on ED threshold based on the sensing beam and the transmission beam (further adjustment should not violate EDT requirements as per regulations) * FFS: If Pout is max output EIRP of the device or instantaneous output EIRP * FFS definition of Operating Channel BW * FFS: Whether ED threshold for NR-U and NR-U coexistence scenarios (eg, at regulation level) can be appropriately relaxed compared with the threshold of coexistence between NR-U and Wi-Fi. * FFS: EDT when the COT has time varying transmission beams and varying EIRP   **Agreement**  Confirm the WA with some clarifications  Working assumption:   * For Pout in EDT determination, define Pout as the maximum EIRP of the intended transmissions by the node determining EDT during a COT.   + The node is not expected to transmit in the COT with higher Pout than the Pout used to determine the EDT used to acquire the COT   **Agreement**   * For LBT purpose, the energy at gNB/UE is measured after antenna and antenna gain is included in the energy measurement. * The energy measurement is compared with EDT with no further adjustment to EDT standardized in Rel.17   + Note: This does not rule out extra backoff (conservative) EDT being applied as gNB or UE implementation   **Agreement**  For gNB initiated COT, for Pout in EDT determination at the initiating device (gNB), the Pout of the responding device (UE) is not considered  **Agreement**  For UE initiated COT, for EDT determination at the initiating device (UE), the Pout of the responding device (gNB) is not considered |

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| Company | Key Proposals/Observations/Positions |
| FUTUREWEI | **Observation 1: For Pout in EDT determination, define Pout as the maximum EIRP of the intended transmissions by the node determining EDT during a COT.**  ·          **EIRP of an intended transmission in a COT can be determined as the product of transmit power and beamforming gain estimated for that transmission.**  **Observation 2: Using common Pout (common EDT) for multiple sensing beams can limit spatial reuse.**  **Proposal 2: Allow a separate EDT per sensing beam LBT.** |

For FWs proposal 2, the moderator believes this is allowed by the node implementation, thus no spec impact.

## Multi-Beam COT

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| Agreement:  For a COT with MU-MIMO (SDM) transmission, further consider the follow alternatives (down-select or support both)   * Alt 1: Single LBT sensing at the start of the COT with wide beam ‘cover’ all beams to be used in the COT with appropriate ED threshold * Alt 2: Independent per-beam LBT sensing at the start of COT is performed for beams used in the COT   Agreement:  Within a COT with TDM of beams with beam switching, down-select one or more of the following LBT operations   * Alt 1: Single LBT sensing with wide beam ‘cover’ all beams to be used in the COT with appropriate ED threshold   + FFS: Details on the definition of “cover” * Alt 2: Independent per-beam LBT sensing at the start of COT is performed for beams used in the COT * Alt 3: Independent per-beam LBT sensing at the start of COT is performed for beams used in the COT with additional requirement on Cat 2 LBT before beam switch   Agreement:   * SSB transmission with LBT is supported, at least when the conditions for contention exempt short control signalling based SSB transmission is not met   + Note the channel access for SSB with LBT may not be different from a normal COT with multiple beams   + FFS: If any difference from a multi-beam COT LBT needs to be introduced   Agreement:  For a COT with MU-MIMO (SDM) transmission, when independent per-beam LBT sensing at the start of COT is performed for beams used in the COT (Alt 2 in earlier agreement) is considered, the following alternatives are further considered   * Alt A: The per-beam LBT for different beams is performed in TDM fashion   + Alt A-1: The node completes one eCCA on one beam, and directly move on to the eCCA on the other beam, with no transmission in the middle   + Alt A-2: The node completes one eCCA on one beam, start transmission with the beam to occupy the COT, then move on to the eCCA on the other beam   + Alt A-3: The node performs eCCA of the different beams simultaneous, round robin between different beams * Alt B: The per-beam LBT for different beams is performed simultaneously in parallel, assuming the node has the capability to simultaneously sense in different beams   Agreement:  Within a COT with TDM of beams with beam switching, when independent per-beam LBT sensing at the start of COT is performed for beams used in the COT (Alt 2 or Alt 3 in earlier agreement) is considered, the following alternatives are further considered   * Alt A: The per-beam LBT for different beams is performed one after another in time domain   + Alt A-1: The node completes one eCCA on one beam, and directly move on to the eCCA on the other beam, with no transmission in the middle   + Alt A-2: The node completes one eCCA on one beam, start transmission with the beam to occupy the COT, then move on to the eCCA on the other beam   + Alt A-3: The node performs eCCA of the different beams simultaneous, round robin between different beams * Alt B: The per-beam LBT for different beams is performed simultaneously in parallel, assuming the node has the capability to simultaneously sense in different beams   **Agreement**  For a COT with MU-MIMO (SDM) transmission, support both Alt 1 and Alt 2 below:   * Alt 1: Single LBT sensing at the start of the COT with wide beam ‘cover’ all beams to be used in the COT with appropriate ED threshold * Alt 2: Independent per-beam LBT sensing at the start of COT is performed for beams used in the COT, if the node can perform simultaneous sensing in different beams   Note: On UE side, no UE capability will be introduced for this purpose.  **Agreement**  Within a COT with TDM of beams with beam switching, at least support Alt 1   * Alt 1 (from previous agreement): Single LBT sensing with wide beam ‘cover’ all beams to be used in the COT   **Agreement**  Within a COT with TDM of beams with beam switching, Alt 2 is supported if the node has the capability to perform simultaneous sensing in different beams. Alt 3 is allowed as node implementation choice if the node also supports Cat 2 LBT. The use of Alt 2 or Alt 3 is based on node’s implementation.   * Alt 2 from previous agreement: Independent per-beam LBT sensing at the start of COT is performed for beams used in the COT * Alt 3 from previous agreement: Independent per-beam LBT sensing at the start of COT is performed for beams used in the COT with additional requirement on Cat 2 LBT before beam switch |

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| FUTUREWEI | **Observation 2: Using common Pout (common EDT) for multiple sensing beams can limit spatial reuse.**  **Proposal 2: Allow a separate EDT per sensing beam LBT.**  **Proposal 3:**  ·                  **For a COT with MU-MIMO (SDM) transmission, when Independent per-beam LBT sensing at the start of COT is performed, the SDM transmission is done along beams whose corresponding Type-1 LBTs are the first to acquire their respective channels.**  ·                  **For a COT with TDM of beams with beam switching, transmissions corresponding to any of the sensing beams can be initiated within the COT after channel access has succeeded for those sensing beams.** |
| Huawei HiSilicon | ***Proposal 7: When independent per-beam LBTs are performed to initiate a multi-beam COT with TDMed or SDMed transmission beams, support aligning the channel access start time for the multiplexed beams as follows such that a transmission on one beam does not start while sensing is ongoing on another beam:*** |
| InterDigital Inc. | ***Proposal 1: For a COT with MU-MIMO (SDM) transmission, support simultaneous round robin eCCA between different beams (Alt A-3).***  ***Proposal 2: For a COT with TDM of beams with beam switching, support Alt A-2 or A-3.***  Proposal 3: Support of Alt B for SDM or TDM of beams can be considered for some UEs.  Proposal 5: A node that has initiated a first COT and wishing to transmit on a new transmission beam not applicable to the first COT, performs LBT on a sensing beam covering at least the new transmission beam and if possible, initiates a new COT and terminates the first COT. |
| CATT | ***Proposal 4：If the gNB/UE perform independent per-beam LBT sensing at the start of COT and the results of per-beam LBT are not successful on all the beams , the gNB/UE can perform transmission on the beams where the LBT result is successful.*** |
| Samsung | **Proposal 2: For SDM scenario, when Type 1 channel access procedure is applied before the start of the channel occupancy simultaneously per sensing beam where each sensing beam covers a transmission beam within the channel occupancy, if a channel is failed to be accessed for any sensing beam, the corresponding transmission(s) is dropped during the channel occupancy.**  **• Adopt TP#1 for TS 37.213.**  ======= Start of TP #1 for TS 37.213 ==================================  4.4 Channel access procedures for frequency range 2-2  ========= Unchanged Text Omitted ===================================  If a channel occupancy includes transmission(s) in different beams that are multiplexed in spatial domain, one of the followings is applicable for the corresponding sensing to perform the transmission(s) within the channel occupancy:  - Type 1 channel access procedure as described in Clause 4.4.1 is applied before the start of the channel occupancy using a single sensing beam where the single beam covers all the transmission beams within the channel occupancy. When the channel is accessed the transmission(s) within the channel occupancy across different beams can occur.  - Type 1 channel access procedure as described in Clause 4.4.1 is applied before the start of the channel occupancy simultaneously per sensing beam where each sensing beam covers a transmission beam within the channel occupancy. When the channel is accessed the transmission(s) within the channel occupancy across different beams can occur. If the channel is failed to be accessed for any sensing beam, the corresponding transmission(s) is dropped during the channel occupancy.  ========Unchanged Text Omitted ===================================  ======== End of TP #1 for TS 37.213 ==================================  **Proposal 3: For TDM scenario, when Type 1 channel access procedure is applied before the start of the channel occupancy simultaneously per sensing beam where each sensing beam covers a transmission beam within the channel occupancy, and no LBT is performed within the channel occupancy, if a channel is failed to be accessed for any sensing beam, the corresponding transmission(s) is dropped during the channel occupancy.**  **• Adopt TP#2 for TS 37.213.** TP#2 for TS 37.213 ========= Start of TP #2 for TS 37.213 ==================================  4.4 Channel access procedures for frequency range 2-2  ========= Unchanged Text Omitted ===================================  If a channel occupancy includes transmissions in different beams that are multiplexed in time domain, one of the followings is applicable for the corresponding sensing to perform the transmissions within the channel occupancy:  - Type 1 channel access procedure as described in Clause 4.4.1 is applied before the start of the channel occupancy using a single sensing beam where the single beam covers all the transmissions beams within the channel occupancy. When the channel is accessed the transmissions within the channel occupancy across different beams can occur following the procedures described in Clause 4.4.3.  - When the gNB/UE can perform simultaneous sensing in different beams, Type 1 channel access procedure as described in Clause 4.4.1 is applied before the start of the channel occupancy per sensing beam where each sensing beam covers a transmission beam within the channel occupancy. When the channel is accessed the transmission within the channel occupancy across different beams can occur following the procedures described in Clause 4.4.3. If the channel is failed to be accessed for any sensing beam, the corresponding transmission(s) is dropped during the channel occupancy, and the following are applicable to the transmission(s) after the dropped transmission(s):  - regardless of the duration of the gap, the transmission(s) after the dropped transmission(s) occurs following the procedures described in Clause 4.4.3, or  - if the gap is more than a threshold that is determined by the gNB and is at least 8 us, the transmission(s) after the dropped transmission(s) occurs following the procedures described in Clause 4.4.2; otherwise, the transmission(s) after the dropped transmission(s) occurs following the procedures described in Clause 4.4.3.  - When the gNB/UE can perform simultaneous sensing in different beams, Type 1 channel access procedure as described in Clause 4.4.1 is applied before the start of the channel occupancy per sensing beam where each sensing beam covers a transmission beam within the channel occupancy. When the channel is accessed the transmission within the channel occupancy can occur following the procedures in Clause 4.4.2 before switching to a different beam within the channel occupancy.  ======= Unchanged Text Omitted ===================================  ======= End of TP #2 for TS 37.213 ================================== |
| ZTE Sanechips | **Proposal 19:** *Considering LBT overhead and transmission delay, Alt B that“The per-beam LBT for different beams is performed simultaneously in parallel, assuming the node has the capability to simultaneously sense in different beams” should be considered for the transmission with multiple beams .*  **Proposal 20:** *If the node has no the capability to simultaneously sense in different beams, Alt A-3 that “The node performs eCCA of the different beams simultaneous, round robin between different beams” can be considered for the transmission with multiple beams.*  **Proposal 21:** *Adopt the above updated RRC parameters list according to Running RRC CR for 71GHz from RAN2.* |
| OPPO | ***Proposal 10: Alt A (i.e., per beam LBT for different beam is performed in TDM fashion) should be supported to address the overprotection issue of Alt 1.***  ***Proposal 11: For COT containing multiple beams, including MU-MIMO (SDM) and TDM of beams, Alt A-2 is not supported. Alt A-1 and Alt A-3 can be left for implementation.*** |
| Intel Corporation | ***Proposal 10: When independent per-beam LBT sensing is performed, a transmission may be allowed to occur as long as the LBT procedure has been successful before a channel occupancy for at least a single beam. However, a transmission (via either spatial or time multiplexing) may not be allowed on those beams for which the LBT procedure was not successful.***  ***Proposal 11: When time-domain switching across beams within the same COT is supported, the per-beam LBT for different beams is also performed in a sequential manner. In particular, the initiating device may sense on a beam before ether transmitting on that beam or switching to a separate beam to perform sensing.***  ***Proposal 12: When independent per-beam LBT sensing is performed, an LBT failure is counted per transmission, and an LBT failure is reported only if all per beam LBTs fail.*** |
| Ericsson | Proposal 6 RAN1 to agree that only a single Type 1 channel access mechanism (or same N\_init for all the applicable sensing) is initiated for multi-beam COTs when the gNB/UE can perform simultaneous sensing in different beams.  Proposal 7 RAN1 to agree that for simultaneous per-beam LBT in a multi-beam COT, if the channel is failed to be accessed for any sensing beam, all the beam transmission(s) is/are dropped during the channel occupancy.  Proposal 8 Considering above two proposals, following changes highlighted in yellow with some pats of the text struck through are proposed for 37.213  [If a channel occupancy includes transmission(s) in different beams that are multiplexed in spatial domain, one of the followings is applicable for the corresponding sensing to perform the transmission(s) within the channel occupancy:  - Type 1 channel access procedure as described in Clause 4.4.1 is applied before the start of the channel occupancy using a single sensing beam where the single beam covers all the transmission beams within the channel occupancy. When the channel is accessed the transmission(s) within the channel occupancy across different beams can occur.  - A single Type 1 channel access procedure as described in Clause 4.4.1 is applied before the start of the channel occupancy simultaneously per sensing beam using multiple sensing beams where each sensing beam covers a transmission beam within the channel occupancy. When the channel is accessed the transmission(s) within the channel occupancy across different beams can occur. If the channel is failed to be accessed for any sensing beam, the channel access is deemed to have failed for all the sensing beams.  If a channel occupancy includes transmissions in different beams that are multiplexed in time domain, one of the followings is applicable for the corresponding sensing to perform the transmissions within the channel occupancy:  - Type 1 channel access procedure as described in Clause 4.4.1 is applied before the start of the channel occupancy using a single sensing beam where the single beam covers all the transmissions beams within the channel occupancy. When the channel is accessed the transmissions within the channel occupancy across different beams can occur following the procedures described in Clause 4.4.3.  - When the gNB/UE can perform simultaneous sensing in different beams, a single Type 1 channel access procedure as described in Clause 4.4.1 is applied before the start of the channel occupancy per sensing beam using multiple sensing beams where each sensing beam covers a transmission beam within the channel occupancy. When the channel is accessed the transmission within the channel occupancy across different beams can occur following the procedures described in Clause 4.4.3. If the channel is failed to be accessed for any sensing beam, the channel access is deemed to have failed for all the sensing beams.  - When the gNB/UE can perform simultaneous sensing in different beams, a single Type 1 channel access procedure as described in Clause 4.4.1 is applied before the start of the channel occupancy using multiple sensing beams per sensing beam where each sensing beam covers a transmission beam within the channel occupancy. When the channel is accessed the transmission within the channel occupancy can occur following the procedures in Clause 4.4.2 before switching to a different beam within the channel occupancy.] |
| LG Electronics | Proposal #1: When simultaneous sensing in different beams is used to Type 1channel access for gNB-initiated COT to transmit SDM transmission, the partial SDM transmission can be allowed for transmission(s) corresponding to the beam direction that succeeded in LBT, except for transmission(s) corresponding to the beam direction that failed the LBT, instead of dropping the entire transmission(s).  Proposal #2: When simultaneous sensing in different beams is used to Type 1channel access for UE-initiated COT to transmit SDM transmission, the entire transmission(s) can be dropped if at least one sensing beam is failed to LBT considering the UE complexity.  Proposal #3: When simultaneous sensing in different beams is used to Type 1channel access for gNB-initiated COT to transmit TDM transmission, the partial TDM transmission can be allowed for the transmission(s) corresponding to the beam direction that succeeded in LBT, except for transmission(s) corresponding to the beam direction that failed the LBT, instead of dropping the entire transmission(s). |
| Lenovo Motorola Mobility | **Proposal 1: For NR unlicensed bands between 52.6 GHz and 71 GHz with directional LBT based channel access mechanism, If a channel occupancy includes transmission(s) in different beams that are multiplexed in spatial domain, then one or both of the following behaviors can be applied for sensing to perform transmission(s) within the channel occupancy:**  **- Single wider beam sensing before the start of the channel occupancy**  ***- Multiple beam sensing before the start of the channel occupancy (including both simultaneous sensing and TDM sensing, when simultaneous not supported by the node)***  ***Proposal 2: For NR unlicensed bands between 52.6 GHz and 71 GHz with directional LBT based channel access mechanism, If a channel occupancy includes transmission(s) in different beams that are multiplexed in time domain, then one or both of the following behaviors can be applied for sensing to perform transmission(s) within the channel occupancy:***  - Single wider beam sensing before the start of the channel occupancy  - Multiple beam sensing before the start of the channel occupancy (including both simultaneous sensing and TDM sensing, when simultaneous not supported by the node) |

Understanding of Independent Per Beam LBT is clarified in the following proposal

Proposal 2.3-1:

When independent per-beam LBT sensing is performed, a transmission may be allowed to occur as long as the LBT procedure has been successful before a channel occupancy for at least a single beam. However, a transmission (via either spatial or time multiplexing) is not allowed on those beams for which the LBT procedure was not successful.

Support: Intel , LGE, Samsung

Do not support: Ericsson

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## Multi-Channel channel access

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| Agreement:  Define Type A and Type B multi-channel channel access as:   * Type A: Perform independent eCCA for each channel * Type B: Identify a primary channel and perform eCCA on the primary channel, while perform Cat 2 LBT for other channels in the last observation slot   Down-selection between   * Alt1: Support Type A multi-channel channel access only * Alt2: Support both Type A and Type B multi-channel channel access.   Note: How eCCA is performed on each channel, and the BW of the channels over which eCCAs are performed are separately discussed |

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| FUTUREWEI | **Proposal 4: Type A multi-channel channel access is supported. Discuss regulatory compliance of Type-B and selection of primary channel in Type-B multi-channel channel access.** |
| Huawei HiSilicon | ***Proposal 11: For Type A multi-channel access procedure in FR2-2, it should be clarified whether other aspects of legacy Type A are applicable.***  ***This includes whether or not to support resuming decrementing the backoff counter on a channel i after ceasing the transmission on a channel j when idle sensing slots are detected as in legacy Type A1.*** |
| vivo | ***Proposal 5: Both Type A and Type B multi-channel channel access can be supported.*** |
| Nokia Nokia Shanghai Bell | Proposal 5: Only Type A multi-channel access procedure (i.e. Alt.1 defined in RAN1#104-e meeting) shall be supported in NR-U on 60GHz band. |
| ZTE Sanechips | **Proposal 3:** *Support Type A and Type B multi-channel channel access.*  **Proposal 4:** *Adopt TP2 into Section 4.4.6 of TS 37.213 if both Type A and Type B multi-channel channel access are supported:* |
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| Qualcomm Incorporated | ***Proposal 10:***  ***• Type A multi-channel channel access is supported.***  ***• Type B multi-channel channel access is also supported if the node has Cat 2 LBT capability.***  ***o The current mechanism in 37.213 is reused to pick primary channel for type B***  ***The choice between Type A and Type B is up to node’s implementation*** |
| MediaTek Inc. | **Proposal 1: Support only type A multi-channel channel access scheme.** |

On multi-channel LBT

Discussion 2.4-1

Alt 1: Type A multi-channel channel access is supported. Type B multi-channel channel access is allowed as node implementation if the node has Cat 2 LBT capability.

* The currently mechanism in 37.213 is reused to pick primary channel for type B
* The choice between Type A and Type B is up to node’s implementation
* Support: Qualcomm, NEC, DOCOMO, vivo, ZTE, , TCL, LGE, Transsion, Huawei, Lenovo, Convida, Futurewei,

Alt 2: Only Type A multi-channel channel access is supported.

* Support: Intel, Nokia, Ericsson, Apple, Mediatek

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## Directional LBT

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| Agreement:  3GPP specification consider defining at least the relative relationship between all applicable sensing beam(s) and the transmission beam(s) to define sensing beam for LBT, where at least sensing beam(s) “covers” the transmission beam(s), considering following alternatives. Target down-selection by RAN1 #106bis-e   * Alt 1: Specify necessary requirement/test procedure to guarantee sensing beam “covers” the transmission beam   + Some methods to define “cover” have been discussed in RAN1 (may further down select the list) and are considered as acceptable from RAN1 perspective     - Alt-1A: the angle included in the [3] dB beamwidth of the transmission beam is ncluding in the [X, FFS] dB beamwidth of the sensing beam.     - Alt-1B: the sensing beam gain measured along the direction of peak transmission direction is at least X [FFS] dB of the transmission beam gain     - Alt-1C: The sensing beam gain is measured in one or more directions where the transmission beam EIRP is within A [FFS] dB of the peak EIRP. The sensing beam gain measured along the chosen directions is at least X [FFS] dB of the transmission beam gain in those directions.     - Alt-1D: The sensing beam gain is measured in one or more directions where the transmission beam EIRP is within A [FFS] dB of the peak EIRP and the sensing beam gain measured along the chosen directions is at least X [FFS] dB of the peak sensing beam gain     - Alt-1E: Sensing beam has the minimum [3] dB beamwidth which at least contains all beam peak directions of transmission beams.   + Sending LS to RAN4 and inform them the above and request them to make the final choice     - RAN4 choice may not be limited by the list above, but if different method is selected, RAN1 would like to have an opportunity to check as well * Alt 2. Extending the beam correspondence framework and QCL/TCI/SpatialRelationInfo framework to define “cover” and to indicate sensing beam(s) associated with a transmission beam(s)   + On gNB side sensing beam selection for a DL transmission beam,     - Option 1: The selection of eligible sensing beam for a transmission beam is left for gNB implementation       * No testing or enforcement introduced in 3GPP spec for this option     - Option 2: Beam correspondence at gNB side is assumed. Supporting one or more of the following behaviors       * A1. For a gNB transmission beam corresponding to TCI state A for a certain UE, the gNB can use the same beam for sensing       * A2. If TCI B is used as QCL source (Type D) for TCI A for a certain UE, then gNB transmission beam corresponding to TCI B can be used as the sensing beam for transmission with TCI A.       * A3. If TCI C is NOT used as QCL source (Type D) for TCI A for any UE, then gNB cannot use the transmission beam corresponds to TCI C as the sensing beam for transmission with TCI A.       * FFS: How and if to support sensing with a beam without corresponding RS sent? For example, how to use quasi-Omni beam for sensing if there is no SSB transmitted with quasi-omni beam   + On UE side sensing beam selection for a UL transmission beam     - Beam correspondence is assumed at UE       * FFS: What if beam correspondence is not supported at UE.     - Supporting one or more of the following behaviors       * If the UE is indicated to transmit with a beam corresponding to a certain SRI, the UE can use the same beam for sensing       * Assuming Rel.17 unified TCI framework, if the UE is indicated to transmit with a beam corresponding to a certain unified TCI, the UE can use the reception beam corresponding to the TCI for sensing       * FFS: How and if to support a wider sensing beam (such as pseudo-omni beam, which is supported in WiFi) to be used for a narrower transmission beam under QCL/TCI framework         + Option 0: Not supported         + Option 1: UE implementation.   No testing or enforcement introduced in 3GPP spec for this option   * + - * + Option 2: gNB indication.   FFS details.   * + FFS: How and if to support multiple sensing beams to be used for a transmission beam under QCL/TCI framework * Note: Supporting both alternatives or a combination of the two alternatives is not precluded   Agreement:   * When UE indicates a capability for beam correspondence with beamCorrespondenceWithoutUL-BeamSweeping ={1}, support the following behaviors * If the UE is indicated to transmit with a beam corresponding to a certain SRI, the UE can use the same beam for sensing * Assuming Rel.17 unified TCI framework, if the UE is indicated to transmit with a beam corresponding to a certain unified TCI, the UE can use the reception beam corresponding to the TCI for sensing * FFS: The case when UE does not indicate a capability for beam correspondence * Note: The UE should meet local regulatory requirements |

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| Ericsson | **Proposal 4 RAN1 to agree to modify the sentence in CR 37.213, clause 4.4 to the following-**  **[The ~~spatial domain filter for~~ sensing beam(s) during the sensing slot duration at the gNB, or at a UE when the UE does not indicate a capability for beam correspondence without the uplink beam sweeping, or at a UE when the UE uses a different beam for sensing than the beam used for transmission, ~~covers~~ relates to the transmission beam(s) of the intended transmission(s) within the channel occupancy according to [RAN4 reference].]**  **Editor’s note: ~~Definition of “cover”~~ Where [RAN4 reference] is pending RAN4 LS response.**  **Proposal 5 RAN1 to agree to modify the sentence in CR 38.214 to the following-**  [A UE that has indicated a capability beamCorrespondenceWithoutUL-BeamSweeping set to ‘1’, as described in [X, TS 38.306], can determine a spatial domain filter to be used while performing the applicable channel access procedures described in [16, TS 37.213] prior to ~~transmit~~ a UL transmission on the channel as follows:] |
| LG Electronics | **Proposal #5: Introduce a mechanism to indicate the sensing beam that is not corresponding to the transmission beam, or a single (wide) sensing beam (such as pseudo-omni beam), i.e., a resource index (e.g., SSB index for wide sensing beam or CSI-RS index for sensing beam same as transmission beam) corresponding to the sensing beam can be jointly encoded or separately indicated together with SRI or TCI indication for the transmission beam in the DCI.** |
| Lenovo Motorola Mobility | ***Proposal 3: For NR unlicensed bands between 52.6 GHz and 71 GHz with directional LBT based channel access mechanism, if a UE is going to transmit a set of consecutive PUSCH transmissions including both dynamically scheduled PUSCH transmissions and CG-PUSCH transmissions, the UE can select the latest indicated UL Tx beam to transmit the consecutive UL transmissions***  Proposal 4: For NR unlicensed bands between 52.6 GHz and 71 GHz with directional LBT based channel access mechanism, within a COT, PDCCH monitoring is not supported in the CORESETs corresponding to other COTs (PDCCH monitoring restricted to monitoring corresponding to only one COT at a time) |

This discussion may need to wait for RAN4 response to our LS. The moderator recommend to deprioritize the discussion in this meeting

## No LBT

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| Agreement:  For regions where LBT is not mandated, gNB should indicate to the UE this gNB-UE connection is operating in LBT mode or no-LBT mode   * Support both cell specific (common for all Ues in a cell as part of system information or dedicated RRC signalling or both) and UE specific (can be different for different Ues in a cell as part of UE-specific RRC configuration) gNB indication   Conclusion:  There is no consensus to support per beam LBT mode or no-LBT mode UE specific gNB indication.  Conclusion:  For regions where LBT is not mandated, there is no consensus to introduce L1 signalling for gNB to indicate to the UE if the operation is in LBT mode or no-LBT mode. Note this is different from the DCI field indicate the LBT type for UL transmission. |

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| FUTUREWEI | **Proposal 6: Priority or precedence rules should be defined to address the scenarios when UE receives multiple types of LBT/No-LBT mode indications.**  **Proposal 7: For regions where LBT is not mandated, gNB should indicate to the UE this gNB-UE connection is operating in LBT mode or no-LBT mode**  ·        **Support both cell specific (common for all Ues in a cell as part of system information or dedicated RRC signalling or both) and UE specific (can be different for different Ues in a cell as part of UE-specific RRC configuration) gNB indication**  **When LBT mode or no-LBT mode is indicated to a UE, the mode applies to the UE for the operation between the gNB and UE.** |
| Huawei HiSilicon | ***Proposal 3: For operation in FR2-2, clarify that gNB indication of the LBT/No-LBT mode is also applicable in regions where LBT is mandated by regulations.***  ***Adopt following TP#3 for TS 37.213 v17.0.0***  \*\*\* < **Beginning of TP#3 for TS 37.213 v17.0.0**> \*\*\*  4.4 Channel access procedures for frequency range 2-2  When a gNB provides UE(s) with higher layer parameters *LBT-Mode* by SIB1 or dedicated configuration indicating that the channel access procedures would be performed for performing transmission(s) on channel(s), the channel access procedures described in this clause for accessing the channel(s) on which the transmission(s) are performed by the gNB/UE(s), are applied.  \*\*\* < Unchanged parts are ommitted> \*\*\*  \*\*\* < **End of TP#3 for TS 37.213 v17.0.0**> \*\*\*  ***Update the RRC parameters list sent to RAN2 accordingly***  ***Proposal 8: The UE receives indication of the channel access mode (omni-directional, directional, receiver assistance, no LBT) from the gNB.*** |
| vivo | Proposal 6: The indication of the channel access mode for gNB depends on if P-CSI-RS validation is supported.  Proposal 7: If the channel access mode for gNB is indicated, gNB and UE can use different channel access modes. |
| CATT | ***Proposal 1: The size of ChannelAccess-CPext field of DCI format DCI 1\_0 and DCI format 1\_1 is 0 bit when the UE is indicated as No-LBT mode.***  ***Proposal 2: The configuration of channel access mode should be based on per BWP for a UE to match different interference scenarios.*** |
| Samsung | ***Proposal 1: For indication of the LBT/no-LBT mode:***  **• gNB determines its mode by implementation;**  **• UE assumes both the gNB and UE operates according to the indicated mode in the cell-specific indication;**  **• UE assumes the UE operates according to the indicated mode in the UE-specific indication;**  **• the UE-specific indication overrides the cell-specific indication when both of them are provided.** |
| ZTE Sanechips | **Proposal 8:** *No LBT can be considered to be used in the following use cases:*  ·        *Specific areas such as ITU region 2 and 3.*  ·        *Interference controlled environment.*  ·        *The transmission beams of nodes of different operators in the same system (e.g., NR-U) have little interference with each other.*  **Observation 3:** *No LBT should be workable only if some interference elimination mechanisms are applied on top of it. If no LBT is supported, the spec impact of introducing such enhancement should be further studied and evaluated.*  **Proposal 9:** *Similar restriction as defined in Type 2C channel access procedure in TS 37.213 can also introduced in above 52.6GHz NR-U frequency band but the length of a transmission can be relaxed.*  l   *The duration of the corresponding DL transmission is at most [Y] symbols or ms.*  **Proposal 10:** *Adopt TP4 into Section 4.4.3 of TS 37.213:*    \*\*\* <Beginning of **Text Proposal 4 TS 37.213**> \*\*\*  4.4.3 Type 3 channel access procedures  A gNB/UE may transmit a transmission on a channel without sensing the channel. The duration of the corresponding DL transmission is at most [Y] symbols or ms.    \*\*\* <Ending of **Text Proposal 4 TS 37.213**> \*\*\* |
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| Qualcomm Incorporated | ***Proposal 11: Modify the earlier agreement as follows.***  ***Agreement:***  ***For regions where LBT is not mandated, gNB should indicate to the UE this gNB-UE connection is operating in LBT mode or no-LBT mode***  ***• Support both cell specific (common for all Ues in a cell as part of system information or dedicated RRC signalling or both) and UE specific (can be different for different Ues in a cell as part of UE-specific RRC configuration) gNB indication***  ***When LBT mode or no-LBT mode is indicated to a UE, the UE assumes the mode applies to both gNB and UE for the operation between the gNB and UE.***  ***• Note: The gNB still may or may not perform LBT, but UE does not need to know*** |
| Intel Corporation | ***Proposal 7: The gNB indicates through a cell-specific RRC parameter whether the short signal exemption should be applied or not.*** |
| Ericsson | - for regions where there are no local regulatory requirements to perform sensing before each transmission in a shared channel occupancy  • 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  • the UL transmission(s) occurs following the channel access procedure indicated by the scheduling DCI  - for regions where there are local regulatory requirements to perform sensing before each transmission in a shared channel occupancy  • 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 8μs, 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.]  Proposal 14 For regions where sensing is not required before every transmission, if a UE is scheduled to transmit a set of consecutive UL transmissions with or 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 the first of the scheduled UL transmissions in the set after accessing the channel using the LBT indicated in the DCI, the UE may continue transmission of the remaining UL transmissions in the set without any LBT.  Proposal 15 For regions where sensing is not required before every transmission, and gNB shares a channel occupancy initiated by a UE with a UL transmission on scheduled resources or a PUSCH transmission on configured resources, the gNB may transmit a DL transmission that follows the UL transmissions without any LBT.  Proposal 16 In regions where sensing is required before all transmissions, for DL transmissions in a UE-initiated COT, the gNB may choose Type 1 channel access or Type 2 channel access based on implementation. |
| Apple | Proposal 1: Support SIB1 signaling of 2 bit LBT regional information where:  • 00: LBT is not mandated in unlicensed band access (e.g. FCC) or operating in licensed band.  • 01: CAT3 LBT is required to initiate a COT with COT sharing, and short control signaling is allowed (e.g., governed by EN 302 567)  • 10: LBT is required before every transmission (e.g., Japan), and no COT sharing and short control signaling is allowed.  • 11: reserved.  Proposal 2: UE performs LBT or no LBT, before RACH transmission based LBT region signaling in SIB 1.  • LBT region 00: no LBT before RACH transmission.  • LBT region 01: RACH msg 1/msg A is transmitted as short control signaling.  • LBT region 10: either CAT2 or CAT3 LBT before RACH transmission.  Proposal 6: In regions where no LBT is mandated, the cell specific or UE specific RRC LBT mode indication applies to UE only. The UE can assume SSB. CSI-RS are always transmitted for RRM/RLM and beam management. |
| Xiaomi | Proposal 2: For channel access type determination, DCI indication has higher priority than dedicated RRC signalling indication, and dedicated RRC signalling indication has higher priority than system information indication. |
| NEC | Proposal 3: For regions where LBT is not mandated, when LBT mode or no-LBT mode is indicated to a UE, the mode applies to the UE for the operation between the gNB and the UE. The operating mode of the gNB could be additionally indicated explicitly or implicitly if necessary. |

Discussion 2.6-1:

For regions where LBT is not mandated, and gNB indicates to the UE this gNB-UE connection is operating in LBT mode, should periodic CSI-RS be validated by COT duration or dynamically granted PDCH or aperiodic CSI-RS over the same set of symbols?

* Yes.
* No.

Please provide your view if not captured above:

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If we agree to “Yes” in the previous discussion, we may need to following revision to the previous agreement.

Agreement:

For regions where LBT is not mandated, gNB should indicate to the UE this gNB-UE connection is operating in LBT mode or no-LBT mode

* Support both cell specific (common for all Ues in a cell as part of system information or dedicated RRC signalling or both) and UE specific (can be different for different Ues in a cell as part of UE-specific RRC configuration) gNB indication

When LBT mode or no-LBT mode is indicated, the mode applies to both gNB and UE for the operation between the gNB and UE.

Proposal 2.6-2:

From the email discussion in the last meeting, we have two ways to update the earlier agreement

**Approach 1 to revise earlier agreement:**

For regions where LBT is not mandated, gNB should indicate to the UE this gNB-UE connection is operating in LBT mode or no-LBT mode

* Support both cell specific (common for all Ues in a cell as part of system information or dedicated RRC signalling or both) and UE specific (can be different for different Ues in a cell as part of UE-specific RRC configuration) gNB indication

When LBT mode or no-LBT mode is indicated to a UE, the UE assumes the mode applies to both gNB and UE for the operation between the gNB and UE.

* Note: The gNB still may or may not perform LBT, but UE does not need to know

**Approach 2 to revise earlier agreement:**

For regions where LBT is not mandated, gNB should indicate to the UE this gNB-UE connection is operating in LBT mode or no-LBT mode

* Support both cell specific (common for all Ues in a cell as part of system information or dedicated RRC signalling or both) and UE specific (can be different for different Ues in a cell as part of UE-specific RRC configuration) gNB indication

When LBT mode or no-LBT mode is indicated to a UE, the mode applies to the UE for the operation between the gNB and UE.

Please indicate the preferred language the two approaches, or provide your alternative suggestion

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## Short Control Signaling and Contention Exempt Transmission

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| Agreement:   * Contention Exempt Short Control Signaling rules can be applicable to the transmission of SS/PBCH.   + FFS: What are the other DL signals and channels that can be multiplexed with SS/PBCH transmission under Contention Exempt Short Control Signaling rule   + FFS: Whether this can be applied to all supported SCS or specific SCS.   + FFS: Extension to discovery burst if it is defined including signals other than SS/PBCH   + Note: Restriction for short control signalling transmissions apply (10% over any 100ms interval) * FFS: Other DL signals/channels can be transmitted with Contention Exempt Short Control Signaling rule, such as PDCCH, broadcast PDSCH, PDSCH without user plain data, CSI-RS, PRS, etc   Agreement:  For contention exemption short control signalling based DL transmission of SS/PBCH, further consider if the following signals/channels can be multiplexed with SS/PBCH block transmission.   * RMSI PDCCH and RMSI PDSCH * Other broadcast PDSCH * PDSCH without user-plane data * PDCCH * CSI-RS * PRS * Other signals/channels contained in Discovery Burst (i.e., exemption applies to Discovery Burst)   Note: Total exempted signals/channels should meet the restriction of 10% over any 100ms interval.  FFS: If contention exemption short control signalling based DL transmission is allowed when not multiplexed with SS/PBCH block transmission. |

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| Agreement:   * Contention Exempt Short Control Signaling rules apply to the transmission of msg1 for the 4 step RACH and MsgA for the 2-step RACH for all supported SCS.   + Note restriction for short control signalling transmissions apply (10% over any 100ms intervals)   + Alt 1: The 10% over any 100ms interval restriction is applicable to all available msg1/msgA resources configured (not limited to the resources actually used) in a cell   + Alt 2: The 10% over any 100ms interval restriction is applicable to the msg1/msgA transmission from one UE perspective * FFS: Other UL signals/channels can be transmitted with Contention Exempt Short Control Signaling rule, such as msg3, SRS, PUCCH, PUSCH without user plain data, etc |

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| Huawei HiSilicon | ***Proposal 12: In regions where channel sensing is mandated and short control signaling exemption is allowed by regulations, contention-exempt short control signaling rules apply to the transmission of msg1 for 4 step RACH and msgA for 2-step RACH such that the 10% over any 100ms interval restriction is applicable to all available msg1/msgA resources configured in a cell (Alt 1).***  ***Adopt following TP#7 for TS 37.213 v17.0.0***  \*\*\* < **Beginning of TP#7 for TS 37.213 v17.0.0**> \*\*\*  4.4.5 Exempted transmissions from sensing  In regions where channel sensing is required to access a channel for transmission and short control signalling exemption is allowed by regulation, a gNB/UE may transmit the following transmission(s) on a channel without sensing the channel:  - Transmission(s) of the discovery burst by the gNB  - Transmission(s) of the first message in a random access procedure by the UE  When the gNB/UE transmits the above transmission(s) without sensing on a channel by utilizing the exemption above, the total duration of such transmission(s) by the gNB/UE shall not occupy the corresponding channel more than over any interval. The limit of over any interval is applied to all available resources configured in the cell for transmitting the first message in a random access procedure by the cell UEs.  \*\*\* < **End of TP#7 for TS 37.213 v17.0.0**> \*\*\* |
| vivo | ***Proposal 10: The 10% over any 100ms interval restriction is applicable to the msg1/msgA transmission from one UE perspective.***  ***Proposal 11: No need to introduce RRC configuration to allow gNB to control which channels can be transmitted with contention exemption*** |
| CATT | Proposal 7: The 10% over any 100ms interval restriction should be applicable to all Contention Exempt Short Control Signals from cell perspective.  Proposal 8 In order to meet 10ms limit over 100ms, the Contention Exempt Short Signaling rules should be supported and be applied to sub-set of PRACH slots for msg1/msgA. |
| Nokia Nokia Shanghai Bell | ***Observation 1: EN 302 567, v2.2.0 allows for Short Control Signalling transmissions for up to 10% of time within an observation period of 100 ms.***  ***Proposal 7: There is a separate 10% allowance for the gNB, and another one common for all the UEs in the cell.***  ***Proposal 8: Whether the short control signalling exemption is applicable in a cell or not is indicated to the UEs via system information.***  ***Observation 2: Depending on SSB sub-carrier spacings and SSB periodicity, only a sub-set of all SSBs can be covered by short control signalling exemption.***  ***Proposal 9: It is possible to apply SCSe to one part of actually transmitted SSBs and LBT procedure for other/rest of the SSBs.***  ***Proposal 10: UEs may assume that if short control signalling is in use in a cell, the network shall not configure more than 10% of all time resources for msg1/msgA.***  ***Proposal 11: Use of short control signal contention exemption and use of LBT for different SSBs is predefined or semi-statically indicated for the UEs.*** |
| Samsung | **Proposal 4: For short control signalling, the duty cycle calculation for UL is per UE.**  **• No spec impact.** |
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| ZTE Sanechips | **Proposal 1:** *Adopt Alt 1: The 10% over any 100ms interval restriction is applicable to all available msg1/msgA resources configured (not limited to the resources actually used) in a cell*  **Proposal 2:** *Adopt TP1 into Section 4.4.5 of TS 37.213:*    \*\*\* <Beginning of **Text Proposal 1 TS 37.213**> \*\*\*  4.4.5 Exempted transmissions from sensing  In regions where channel sensing is required to access a channel for transmission and short control signalling exemption is allowed by regulation, a gNB/UE may transmit the following transmission(s) on a channel without sensing the channel:  - Transmission(s) of the discovery burst by the gNB  - Transmission(s) of the first message in a random access procedure by the UE  When the gNB/all UEs in a cell transmit(s) the above transmission(s) without sensing on a channel by utilizing the exemption above, the total duration of such transmission(s) by the gNB/all UEs in a cell shall not occupy the corresponding channel more than     |  | | --- | | over any |      |  | | --- | | interval. |     \*\*\* <Ending of **Text Proposal 1 TS 37.213**> \*\*\*    **Observation 1:** *Once the transmission of DL/UL channels/signals considered as Short Control Signalling exceeds 10ms limitation, it is a natural way to switch from No LBT mode to LBT mode.*  Besides, if the transmission of DL/UL channels/signals considered as Short Control Signalling is in a COT initiated by gNB or UE and LBT is performed before Short Control Signalling transmission, in our understanding, it should not be counted into 10ms limitation within the 100ms observation period.  **Observation 2:** *For the case of the transmission of DL/UL channels/signals considered as Short Control Signalling is in a COT initiated by gNB or UE and LBT is performed before Short Control Signalling transmission, it is suggested that such transmission should not be counted into 10ms limitation within the 100ms observation period.* |
| Qualcomm Incorporated | ***Proposal 13: The contention exemption for short control signaling applies to following DL transmission bursts multiplexed with SS/PBCH block transmission, but does not contain unicast information. The transmission burst may contain***  • PDSCH without user plane data  • PDCCH  ***• CSI-RS***  • PRS  Note: Restriction for short control signalling transmissions apply (10% over any 100ms interval)  Proposal 14: Contention Exempt Short Control Signaling rules apply to the transmission of msg1 for the 4 step RACH and MsgA for the 2-step RACH for all supported SCS. Restriction for short control signalling transmissions apply (10% over any 100ms intervals).  • The 10% over any 100ms interval restriction is applicable to the msg1/msgA transmission from one UE perspective |
| Intel Corporation | ***Proposal 8: The 10% over any observation period of 100ms is applicable to the msg1/msgA transmission from one UE perspective.***  ***Proposal 9: TP#3 should be supported.*** |
| Ericsson | **Proposal 2 RAN1 to conclude that for short control signalling transmissions from UEs, the requirement of 10ms over 100ms duration is applicable to transmissions from a single UE perspective (Alt2 in the agreement)**  **Proposal 3 RAN1 to agree that the use of LBT for contention exempt transmissions is indicated in SIB1. The type of LBT (CAT3 or CAT2 LBT) to be used can be left for implementation and depending on the UE feature.** |
| LG Electronics | **Proposal #14: The 10% over any 100ms interval restitution should be applied to all available msg1/msgA resources configured in a cell to avoid coexistence problems with the incumbent system operating in the same band.**  **Proposal #15: Whether a short control signing rule is applicable or not to the configured msg1/msgA resources can be explicitly indicated by the gNB or can be implicitly determined by the UE.** |
| AsusTek | **Observation 1: 10% limitation is too restricted for all possible PRACH resources and could induce undesired delay.**  **Observation 2: Handling the case actual transmitted Msg1/MsgA opportunities from a UE exceeding 10% limit is not required.**  **Proposal 1: 10% limitation over 100 ms applies to actual transmitted Msg1/MsgA opportunities from a UE**  **Proposal 2: the case of actual transmitted Msg1/MsgA opportunities from a UE exceeding such limit is not handled from specification perspective.** |
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Proposal 2.7-1:

Contention Exempt Short Control Signaling rules apply to the transmission of msg1 for the 4 step RACH and MsgA for the 2-step RACH for all supported SCS. Restriction for short control signalling transmissions apply (10% over any 100ms intervals).

* The 10% over any 100ms interval restriction is applicable to the msg1/msgA transmission from one UE perspective

The above is the majority view, but a few companies have different opinions (HW, ZTE, CATT). Moderator would recommend to go with majority view.

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Proposal 2.7-2:

gNB provides RRC configuration to indicate if msg1 or msgA transmission with Contention Exempt Short Control Signaling based transmission is allowed.

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Proposal 2.7-3:

Contention Exempt Short Control Signaling rules can be applicable to the transmission of discovery burst multiplexed with non-unicast information.

* Note: Restriction for short control signalling transmissions apply (10% over any 100ms interval)

**Support**: Nokia, Ericsson, Lenovo, Intel, Xiaomi, NEC, Transsion, Sony, DOCOMO, CATT, Samsung,

**Do not support**: Apple, ASUSTek, Vivo, ZTE, Huawei,

Please provide your view if not captured above:

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Proposal 2.7-4:

The contention exemption for short control signaling applies to following DL transmission bursts not multiplexed with SS/PBCH block transmission,It but does not contain unicast information. The transmission burst may contain

* PDSCH without user plane data
* PDCCH
* CSI-RS
* PRS

Note: Restriction for short control signalling transmissions apply (10% over any 100ms interval)

**Support**: Nokia, Ericsson, Lenovo, Intel, Apple, Xiaomi, LGE,Vivo, NEC, Transsion, Sony,

**Do not support**: ASUSTek, Huawei

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## CP Extension

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| vivo | ***Proposal 4: CP extension should be introduced for CG-PUSCH in FR 2-2, and the CP extension length should be determined based on the sensing slot duration in FR 2-2.*** |
| Nokia Nokia Shanghai Bell | Proposal 1: NR-U like CP extensions are not introduced for CG-PUSCH in FR 2-2. |
| Qualcomm Incorporated | ***Proposal 12: For CG-PUSCH in FR2-2 unlicensed operation, about CP extension, do not introduce CP extension.*** |
| OPPO | ***Observation 2: Introducing CPE may lead the UE to perform UL transmission in large number of symbols as CPE in advance to the allocated resource for 480kHz and 960kHz.***  ***Proposal 5: For CG-PUSCH in FR2-2, CP extension has a granularity of 1 symbol according to 120kHz SCS or larger than 8 us.*** |
| Intel Corporation | ***Proposal 3: Support cyclic prefix extension for CG-PUSCH transmissions in the FR2-2 frequency range using the same design principle as NR-U.***  • The first starting offset value should be equal to 8us and the granularity among the set of starting offsets should be equal to 5us.  Proposal 4: TP#2 should be supported. |
| NEC | Proposal 2: For CG-PUSCH in FR2-2 unlicensed operation, CP extension should be introduced, and the set of CP extension lengths should be designed based on the sensing slot duration and the defer duration for FR2-2. |
| Transsion | ***Proposal 2: CP extension is supported for CG-PUSCH transmission in FR2-2.***  ***Proposal 3: The set of candidate CP extension lengths should be 8us with a step size of 5us.*** |

**Summary of Positions:**

For CG-PUSCH in FR2-2 unlicensed operation, about CP extension

* Alt 1: Do not introduce CP extension for CG-PUSCH for FR2-2
  + Support: Apple, DCM, ZTE, HW, MTK, Nokia, Qualcomm
* Alt 2: Introduce CP extension for CG-PUSCH for FR2-2 with maximum duration of 1 symbol at 15KHz
  + Since we don’t have interlaced waveform, the CP extension candidate numbers can leverage the Rel.16 NR-U version with full bandwidth allocation
  + FFS: The set of CP extension lengths, including the maximum CP extension length
  + Support: LGE, NEC, Lenovo, Ericsson, vivo, Intel, TCL, Transsion, Convida, Oppo

Discussion 2.8-1

For CG-PUSCH in FR2-2 unlicensed operation, about CP extension

* Alt 1: Do not introduce CP extension for CG-PUSCH for FR2-2
  + Support: Apple, DCM, ZTE, HW, MTK, Nokia, Qualcomm
* Alt 2: Introduce CP extension for CG-PUSCH for FR2-2 with maximum duration of 1 symbol at 15KHz
  + For the set of CP extension candidate numbers adopt the design principle of the Rel.16 NR-U CG-PUSCH CP extension with full bandwidth allocation, but consider 5us observation slot
  + Support: LGE, NEC, Lenovo, Ericsson, vivo, Intel, TCL, Transsion, Convida, Oppo

Please provide your view if not captured above:

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## LBT Type Indication in Fallback DCI

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| Company | Position |
| Huawei HiSilicon | ***Proposal 4: For operation in a cell with shared spectrum access in FR2-2 and LBT-mode is provided and indicates that channel access procedures would be performed, the ChannelAccess-CPext field size in fallback DCI formats 0\_0/1\_0 and RAR UL grant is 2 bits; 0 bit otherwise***  ***- Adopt following TP#4 for TS 38.212 v17.0.0 and TP#5 for TS 38.213 v17.0.0***  \*\*\* < **Beginning of TP#4 for TS 38.212 v17.0.0**> \*\*\*  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 parts are ommitted> \*\*\*  - ChannelAccess-CPext – 2 bits indicating combinations of channel access type and CP extension as defined in Table 7.3.1.1.1-4, or Table 7.3.1.1.1-4A if *ChannelAccessMode-r16* = "*semistatic*" is provided, for operation in a cell with shared spectrum channel access; 0 bit otherwise. 2 bits indicating channel access type as defined in Table 7.3.1.1.1-4B if *LBT-mode* is provided and indicates that channel access procedures would be performed for operation in a cell in frequency range 2-2; 0 bit otherwise.  \*\*\* < Unchanged parts are ommitted> \*\*\*  The following information is transmitted by means of the DCI format 0\_0 with CRC scrambled by TC-RNTI:  \*\*\* < Unchanged parts are ommitted> \*\*\*  - ChannelAccess-CPext – 2 bits indicating combinations of channel access type and CP extension as defined in Table 7.3.1.1.1-4, or Table 7.3.1.1.1-4A if *ChannelAccessMode-r16* = "*semistatic*" is provided, for operation in a cell with shared spectrum channel access; 0 bit otherwise. 2 bits indicating channel access type as defined in Table 7.3.1.1.1-4B if *LBT-mode* is provided and indicates that channel access procedures would be performed for operation in a cell in frequency range 2-2; 0 bit otherwise.  \*\*\* < Unchanged parts are ommitted> \*\*\*  **Table 7.3.1.1.1-4B: Channel access type for DCI format 0\_0 and DCI format 1\_0in frequency range 2-2**   |  |  | | --- | --- | | **Bit field mapped to index** | **Channel Access Type** | | 0 | Type 1 channel access defined in clause 4.4.1 of 37.213 | | 1 | Type 2 channel access defined in clause 4.4.2 of 37.213 | | 2 | Type 3 channel access defined in clause 4.4.3 of 37.213 | | 3 | Reserved |   \*\*\* < Unchanged parts are ommitted> \*\*\*  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:  - Identifier for DCI formats – 1 bits  - The value of this bit field is always set to 1, indicating a DL DCI format  - Frequency domain resource assignment –  bits where  is given by clause 7.3.1.0  If the CRC of the DCI format 1\_0 is scrambled by C-RNTI and the "Frequency domain resource assignment" field are of all ones, the DCI format 1\_0 is for random access procedure initiated by a PDCCH order, with all remaining fields set as follows:  \*\*\* < Unchanged parts are ommitted> \*\*\*  - ChannelAccess-CPext – 2 bits indicating combinations of channel access type and CP extension as defined in Table 7.3.1.1.1-4, or Table 7.3.1.1.1-4A if *ChannelAccessMode-r16* = "*semistatic*" is provided, for operation in a cell with shared spectrum channel access; 0 bits otherwise. 2 bits indicating channel access type as defined in Table 7.3.1.1.1-4B if *LBT-mode* is provided and indicates that channel access procedures would be performed for operation in a cell in frequency range 2-2; 0 bit otherwise.  - Reserved bits – 2 bits when the DCI format is monitored in common search space for operation in a cell in frequency range 2-2 and the number of bits for the field of 'ChannelAccess-CPext' is 0; 0 bits otherwise  \*\*\* < Unchanged parts are ommitted> \*\*\*  The following information is transmitted by means of the DCI format 1\_0 with CRC scrambled by TC-RNTI:  \*\*\* < Unchanged parts are ommitted> \*\*\*  - ChannelAccess-CPext – 2 bits indicating combinations of channel access type and CP extension as defined in Table 7.3.1.1.1-4, or 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. 2 bits indicating channel access type as defined in Table 7.3.1.1.1-4B if *LBT-mode* is provided and indicates that channel access procedures would be performed for operation in a cell in frequency range 2-2; 0 bit otherwise.  - Reserved bits – 2 bits when the DCI format is monitored in common search space for operation in a cell in frequency range 2-2 and the number of bits for the field of 'ChannelAccess-CPext' is 0; 0 bits otherwise  \*\*\* < Unchanged parts are ommitted> \*\*\*  \*\*\* < **End of TP#4 for TS 38.212 v17.0.0**> \*\*\*  ***Proposal 6: For operation in a cell with shared spectrum access in FR2-2, it should be discussed whether to extend the indication of the corresponding LBT types to the ChannelAccess-CPext(-CAPC) field in the non-fallback DCI formats 0\_2/1\_2 as done in Rel-17 WI on enhanced IIoT/URLLC for FR1.*** |
| vivo | ***Proposal 3: Type 2 channel access should be indicated in the fallback DCI formats.*** |
| Nokia Nokia Shanghai Bell | ***Proposal 2: Fallback DCIs 0\_0 and 1\_0 support indication of Type 1 and Type 3 channel access, using 1 bit.*** |
| NTT DOCOMO INC. | **Proposal 1:** *For channel access type indication by fallback DCI formats, adapt either of the following TP:*  l  *TP Alt-1: Support 2-bit indication to cover all the three channel access types*  l  *TP Alt-2: Support 1-bit indication, and the association between entries and the indicated types to be configurable* |
| ZTE Sanechips | **Proposal 11:** *Conditions for No LBT fallback to LBT should be further studied, e.g., based on the interference level or correctly decoding rate.*  **Proposal 13:** *Adopt TP5 into Section 4.4.x of TS 37.213:* |
| OPPO | ***Proposal 3: Type 2 channel access should be included in fallback DCI formats 0\_0 and 1\_0.***  ***Proposal 4: UE expects the gNB only indicates Type 1 or Type 3 LBT in the initial access.*** |
| Intel Corporation | ***Proposal 1: For fallback DCI formats 0\_0 and 1\_0, for FR2-2 operation, the ChannelAccess-Cpext field indicates one of the entries of a table which entries are “Type 1 channel access in 4.4.1 of 37.213”, “Type 2 channel access in 4.4.2 of 37.213” and “Type 3 channel access in 4.4.3 of 37.213”.***  ***Proposal 2: TP#1 should be supported.*** |
| Ericsson | Proposal 13 For LBT indication in Fallback DCI formats support Option 2 in Proposal 2.4.2-1. |
| Apple | Proposal 3: 1 bit CCA indication in fall back DCI  • In LBT region 00: the UE can transmit without LBT regardless how the bit is set.  • In LBT region 01: When UL transmission is outside of gNB initiated COT, the bit is set, and the UE perform CAT 3 LBT. Otherwise, no LBT.  • In LBT region 10: the UE can perform CAT2 or CAT3 LBT before UL transmission regardless how the bit is set. |
| LG Electronics | **Proposal #7: All three channel access types should be able to be indicated through fallback DCI formats (i.e., Option 1 should be supported) and an indication for Type 2 LBT for a UE not capable of supporting Type 2 LBT can be treated as an indication of Type 1 LBT.** |

Discussion 2.9-1

For fallback DCI formats 0\_0 and 1\_0, for FR2-2 operation, the ChannelAccess-Cpext field in DCI indicates the channel access type only.

* Option 1: A new table similar to Table 7.3.1.1.1-4 is introduced with entries “Type 1 channel access in 4.4.1 of 37.213”, “Type 2 channel access in 4.4.2 of 37.213” and “Type 3 channel access in 4.4.3 of 37.213”, and “reserved”.
  + Note: This option requires 2 bis in fallback DCI
  + For a UE not capable of supporting Type 2 LBT, an indication for Type 2 LBT for UL transmission will be treated as an indicate for Type 1 LBT
  + Support: Lenovo, Qualcomm, Futurewei, Intel, LGE, Oppo, DCM, vivo, ZTE, HW, Transsion, CATT, Convida
* Option 2: A new table similar to Table 7.3.1.1.1-4 is introduced with entries “Type 1 channel access in 4.4.1 of 37.213” and “Type 3 channel access in 4.4.3 of 37.213”.
  + Note: This option requires 1 bit in fallback DCI. This option also implies in Japan, fallback DCI cannot be used to schedule UL transmission with Type 2 LBT
  + Support: Samsung, Apple, Ericsson, TCL, Nokia

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| Company | View |
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## DCI 2\_0

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| Company | Position |
| vivo | ***Proposal 8: The remaining COT should be indicated together with the sensing beam related information.*** |
| CATT | ***Proposal 3：The range of higher layer parameter should be extended to 4480 symbols for FR2-2 unsilenced band.*** |
| Sony | Proposal 1: Per-beam indication of DCI format 2\_0 (COT duration, available RB set, and/or SS set group switching) should be supported when independent per-beam LBT sensing is applied. |
| Nokia Nokia Shanghai Bell | Proposal 4: Beam-specific indication of remaining COT duration and search space group switching in DCI format 2\_0 can be supported.  ***• Indicatation can be e.g. a bitmap indicator of beam groups served in the CO, where reference signals in UE’s PUCCH-SpatialRelationInfo or TCI-State\_r17 are associated to a beam group via RRC signalling.*** |
| ZTE Sanechips | **Proposal 12:** *Introduce LBT switching mechanism when the UE detects DCI format 2-0 and know its corresponding UL transmission is within the remaining channel occupancy.*  **Proposal 18:** *If directional LBT is configured, it is a natural way to support CO duration, search space group switching in a beam-specific manner in FR2-2.* |
| Qualcomm Incorporated | ***Proposal 4: Introduce beam specific COT-SI (remaining COT duration and optionally, available RB sets) delivery in DCI 2\_0. The beam specific nature is applied to the SFI and SSGS as well.***  **Proposal 5: Consider the introduction of one or more optional TCI-like field in the DCI 2\_0 to make the DCI 2\_0 beam specific.** |
| Transsion | ***Proposal 4: Introduce beam specific COT duration and SSSGS indication delivery in DCI 2\_0.***  ***Proposal 5: The beam specific COT duration and SSSGS indication can only be used for the COT of the corresponding beam that the information is received.*** |
| LG Electronics | **Proposal #9: The information on the DL beam (such as SSB index, CSI-RS index, etc.) can be provided by DCI format 2\_0 to indicate which DL beam is actually used by gNB to acquire the COT among the multiple candidates of DL beams.**  **Proposal #10: If the beam-specific COT information on the DL beam transmitted by the gNB is identified through DCI format 2\_0, the UE can change Type 1 channel access to Type 2 or Type 3 channel access and transmit the UL transmission associated with DL beam in terms of QCL relationship by sharing the COT of the gNB. If the beam-specific COT information is not associated with the UL transmission, or not received by the UE, Type 1 channel access should be performed to transmit the UL transmission.** |
| Panasonic | **Proposal 1: RAN1 to agree on the issue of unintended COT sharing caused by the existing DCI 2\_0.**  **Proposal 2: To address the issue of unintended COT sharing, consider specifying one or more of the following:**  **• COT sharing from gNB to UE is only allowed along the beam of transmitting DCI 2\_0**  **• Introduce a new field, beam availability indicator, in DCI 2\_0 to indicate whether a beam is available or unavailable for the gNB’s COT.**  **o UL transmission in spatial domain within the available beam and in time domain within the COT duration is considered with the COT.**  **o UE is not allowed to transmit UL transmission within the unavailable beam for the duration of COT.** |

Proposal 2.10-1

Introduce beam specific COT-SI (COT duration and (if introduced) available RB sets) delivery in DCI 2\_0

* Against:
* FFS: If this applies to SFI as well
  + Support: Sony, Qualcomm
  + Not support:
* FFS: If this applies to SSGS as well
  + Support: Nokia, ZTE, Qualcomm, Transsion,
  + Not support:

Please provide your view if not captured above:

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| Company | View |
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Discussion 2.10-2

On mechanism to specific beam specific COT-SI

* Alt 1: Bitmap indicator of beam groups served in CO for PUCCH-SpatialRelationInfo
  + Nokia
* Alt 2: Introduced one or more TCI field in DCI 2\_0
  + Nokia, Qualcomm TCI\_R17
* Alt 3:Beam Availability indicator
  + Panasonic
* Others?

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## L3-RSSI

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| Company | Position |
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| FUTUREWEI | **Proposal 5: For the QCL Type-D of L3-RSSI measurement for unlicensed operation in FR2-2, an explicit TCI state is configured in RMTC-Config. Introduce new parameter in RMTC-Config for L3-RSSI to indicate measurement bandwidth.** |
| Huawei HiSilicon | **Proposal 8: For L3-RSSI enhancements in FR2-2, consider the following:**  **Extend the reference SCS/CP field to include 120, 480 and 960 kHz.**  **Extend the measurement duration field to include 140 symbols, i.e. {1,14,28,42,70, 140}**  **Proposal 9: For the QCL Type-D of L3-RSSI measurement, gNB configures the beam when configures the L3-RSSI measurement (Alt 1 in RAN1 107-e agreement).**  ***Proposal 10: For L3-RSSI enhancements in FR2-2, include the channel bandwidths defined by RAN4 in the value range of the respective parameter in RMTC-Config to indicate measurement bandwidth.*** |
| InterDigital Inc. | Proposal 6: Support Alt. 1: the gNB configured the beam when it configured the L3-RSSI measurement.  ***Proposal 7: Support Proposal 2.6.1-4b from RAN1 #107-e (R1-2112820) Proposal: 2.6.1-4b For the QCL Type-D of L3-RSSI measurement for unlicensed operation in FR2-2, if explicit TCI state is configured in RMTC-Config, use the TCI state. Otherwise use the QCL type-D of the latest PDSCH reception or latest CORESET monitoring for RSSI measurement • A dynamic update mechanism for TCI-State in RMTC-Config is not further considered in Rel.17*** |
| CATT | ***Proposal 5: The value of new SCS, i.e. 120 kHz, 480 kHz and 960 kHz should be added to the candidate values of the reference SCS/CP field (ref-SCS-CP-r16) in RMTC-Config.***  ***Proposal 6: Considering the transmitter transient period for the BS, for the duration of L3-RSSI measurement that are configured by measurement duration field (measDurationSymbols-r16) in RMTC-Config, the following two options can be further studied:***  ***- Option 1: Depending on gNB implementation to avoid configuring the L3-RSSI measurement on the symbols of transmitter transient time for BS.***  - Option 2: Depending on UE implementation to exclude the symbols of transmitter transient time for BS from the duration of L3-RSSI measurement. |
| Sony | Proposal 2: For the QCL Type-D of L3-RSSI measurement, at least Alt 1 (gNB configures the beam when configures the L3-RSSI measurement) should be supported.  Alt 2 (Use the QCL type-D of the latest received PDSCH and the latest monitored CORESET) could be applied in the case that gNB does not configure the beam for the L3-RSSI measurement |
| Nokia Nokia Shanghai Bell | ***Proposal 12: Add 120, 480 and 960 kHz as SCS options to ref-SCS-CP-r16***  ***Proposal 13: Use the Rel-16 values for measurement duration (measDurationSymbols-r16) as a baseline, and consider adding further larger values such as multiples of 70 symbols.***  ***Proposal 14: Channel bandwidths defined by RAN4 are used as measurement bandwidths.***  ***Proposal 15: For the QCL Type-D of L3-RSSI measurement, gNB configures the beam when it configures the L3-RSSI measurement (Alt 2)*** |
| NTT DOCOMO INC. | **Proposal 2:** *For L3-RSSI measurement and reporting:*  l  *On ref-SCS-CP, all the SCSs supported in FR2-2 should be configurable*  l  *On measDurationSymbols, all the existing number of symbols should be kept, and no limitation on the combination with ref-SCS-CP is needed*  l  *On QCL Type-D of L3-RSSI measurement, support Alt 1* |
| ZTE Sanechips | **Proposal 14:** *To extend RSSI and Channel occupancy measurement in above 52.6GHz spectrum, the reference SCS/CP field (ref-SCS-CP-r1x) in RMTC-Config needs to be extend to support 120kHz, 480kHz and 960kHz.*  **Proposal 15:** *Reuse current measurement duration values for extending reference SCS in FR2-2.*  **Proposal 16:** *For 480kHz and 960kHz SCS, more measurement symbols may need to be considered to more accurately reflect the current channel occupancy situation.*  **Proposal 17:** *For QCL assumption of L3-RSSI measurement, the UE can assume the configured RSSI measurement resources are QCL-ed with Type-D to one of the latest received PDSCH and the latest monitored CORESET.* |
| Qualcomm Incorporated | **Proposal 6: For the QCL Type-D of L3-RSSI measurement for unlicensed operation in FR2-2., Support both Alt 1 and Alt 2. If explicit beam/TCI state is configured, use Alt 1. Otherwise use Alt 2.**  ***• Alt 1: gNB configures the beam when configures the L3-RSSI measurement by introducing TCI-State IE in RMTC-Config***  ***o A dynamic update mechanism for TCI-State in RMTC-Config is not further considered in Rel.17***  ***• Alt 2: Use the QCL type-D of the latest received PDSCH and the latest monitored CORESET***  ***• Alt 1: Extend the reference SCS/CP field (ref-SCS-CP-r16) to include 120KHz, 480 KHz and 960KHz subcarrier spacing.***  ***• Alt 2: Extend the reference SCS/CP field (ref-SCS-CP-r16) to include 120KHz only***  ***Proposal 8:***  ***• On measDurationSymbols-r16 with ref-SCS-CP-r16=120KHz, extend measDurationSymbols-r16 to {1,14,28,42,70,140}***  ***• On measDurationSymbols-r16 with ref-SCS-CP-r16=480KHz (if supported), extend measDurationSymbols-r16 to {1,14,28,42,70,140, 560}***  ***• On measDurationSymbols-r16 with ref-SCS-CP-r16=960KHz (if supported), extend measDurationSymbols-r16 to {1,14,28,42,70,140, 560,1120}***  ***Proposal 9: Introduce new parameter in RMTC-Config for L3-RSSI to indicate measurement bandwidth. Select Alt 1 from the following two alternatives.***  o Alt1: channel bandwidths should include the maximum and the minimum channel bandwidth and the intermediate channel bandwidths defined by RAN4.  o Alt 2: Always use sensing bandwidth: |
| Intel Corporation | ***Proposal 5: ref-SCS-CP-r16 is extended to include all the supported SCS for FR2-2 (i.e., 120, 480 and 960 KHz).***  ***Proposal 6: For the QCL Type-D of L3-RSSI measurement use the QCL type-D of the latest received PDSCH and the latest monitored CORESET.*** |
| Ericsson | Proposal 9 RAN1 to support RSSI and CO measurement in FR2-2, the current ref-SCS-CP in RMTC-Config in Rel-16 is extended to include 120, 480 and 960 kHz SCS (i.e., Alt-1).  Proposal 10 RAN1 to support RSSI and CO measurement in FR2-2, the current RMTC-Config in Rel-16 is extended to include an indication of channel bandwidth for RSSI measurement. The enumeration of channel bandwidths should include the maximum and the minimum channel bandwidth and the intermediate channel bandwidths defined by RAN4.  Proposal 11 RAN1 to conclude that for L3-RSSI in FR2-2, UE can assume the configured RSSI measurement resources are QCL-ed with Type-D to either the latest received PDSCH or the latest monitored CORESET (i.e., Alt-2). |
| LG Electronics | **Proposal #12: For L3-RSSI measurement configuration in frequency range 2-2, define reference SCS only for 120 kHz and keep the value range of measurement duration same as in Rel-16 NR-U, i.e., 1/14/28/42/70 symbols.**  **Proposal #13: For the QCL Type-D of L3-RSSI measurement, gNB can configure the beam when configuring the L3-RSSI measurement by indicating SSB index or CSI-RS index for target frequency to perform L3-RSSI measurement.** |

Discuss 2.11-1

On QCL Type-D for L3-RSSI

Alt 1. For the QCL Type-D of L3-RSSI measurement for unlicensed operation in FR2-2, gNB configures the beam when configures the L3-RSSI measurement by introducing TCI-State IE in RMTC-Config

* A dynamic update mechanism for TCI-State in RMTC-Config is not further considered in Rel.17
* Support: Nokia, FW, Lenovo, Xiaomi, LGE, Transsion, DCM, Samsung, IDCC, HW, TCL, Convida

Alt 2: For the QCL Type-D of L3-RSSI measurement for unlicensed operation in FR2-2, use the QCL type-D of the latest received PDSCH or the latest monitored CORESET

* Support: Ericsson, Intel, CATT

Alt 3 (both Alt 1 and Alt 2): For the QCL Type-D of L3-RSSI measurement for unlicensed operation in FR2-2, if explicit TCI state is configured in RMTC-Config, use the TCI state. Otherwise use the QCL type-D of the latest PDSCH reception or latest CORESET monitoring for RSSI measurement

* A dynamic update mechanism for TCI-State in RMTC-Config is not further considered in Rel.17
* Support: Apple, Qualcomm, vivo, Sony, ZTE

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Discuss 2.11-2

On measDurationSymbols and reference SCS/CP for L3-RSSI

Alt 1

* On measDurationSymbols-r16 with ref-SCS-CP-r16=120KHz, extend measDurationSymbols-r16 to {1,14,28,42,70,140}
* On measDurationSymbols-r16 with ref-SCS-CP-r16=480KHz (if supported), extend measDurationSymbols-r16 to {1,14,28,42,70,140, 560}
* On measDurationSymbols-r16 with ref-SCS-CP-r16=960KHz (if supported), extend measDurationSymbols-r16 to {1,14,28,42,70,140, 560,1120}
* Support: All other companies except LGE and HW (?)

Alt 2: Support ref-SCS-CP-r16=120KHz, ref-SCS-CP-r16=480KHz, ref-SCS-CP-r16=960KHz

* On measDurationSymbols-r16, extend measDurationSymbols-r16 to {1,14,28,42,70,140}
* Support: LGE

Alt 3: Support ref-SCS-CP-r16=120KHz, ref-SCS-CP-r16=480KHz, ref-SCS-CP-r16=960KHz

* On measDurationSymbols-r16, extend measDurationSymbols-r16 to {1,14,28,42,70,140, 560, 1120}
* Support: HW

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| Company | View |
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Discuss 2.11-3

On how to indicate measurement bandwidth

Alt 1: Introduce new parameter in RMTC-Config for L3-RSSI to indicate measurement bandwidth.

* FFS: channel bandwidths should include the maximum and the minimum channel bandwidth and the intermediate channel bandwidths defined by RAN4.
* Support: Nokia, Ericsson, Lenovo, Intel, Apple, Transsion, DCM, CATT, Sony, ZTE (starting PRB and # of PRBs), Convida

Alt 2: Always use sensing bandwidth (depends on the agreement on the UL sensing bandwidth)

* Support: Xiaomi

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## LBT Upgrade

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| Company | Position |
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| vivo | Proposal 2: UE can switch from Type 1 channel access to Type 2 or Type 3 channel access when sharing gNB-initiated COT. The regional regulation information should be carried in the cell-specific signaling. |
| Nokia Nokia Shanghai Bell | ***Proposal 3: For an UL transmission indicated or configured to use Type 1 channel access, if the UE later finds out the transmission is in a gNB COT, the UE can change the channel access type to Type 2 channel access or Type 3 channel access***  ***• RRC configuration is introduced to enable/disable and to control whether Type 2 channel access or Type 3 channel access is used for this case.*** |
| Qualcomm Incorporated | ***Proposal 3: For an UL transmission indicated or configured to use Type 1 channel access, if the UE later finds out the transmission is in a gNB COT, the UE can change the channel access type to Type 2 channel access or Type 3 channel access***  ***• RRC configuration is introduced to control either Type 2 channel access or Type 3 channel access that will be used for this case*** |
| OPPO | ***Proposal 7: For LBT type switching within gNB COT, the gNB may configure a target LBT type between type 2 or type 3, then UE may switch to the target LBT type within gNB COT.*** |
| Apple | Proposal 4: In LBT region 01 where COT sharing is allowed, UE can upgrade CAT-3 LBT indication to no LBT if the transmission is within gNB initiated COT.  Proposal 5: In LBT regions where LBT is not mandated or COT sharing is not defined, no upgrade behavior is allowed. |
| LG Electronics | **Proposal #8: Introduce a new RRC parameter to configure which LBT type can be switched between Type 2 and Type 3 channel access if the UE later finds out the transmission is in a gNB COT.** |

Proposal 2.12-1

For an UL transmission indicated or configured to use Type 1 channel access, if the UE later finds out the transmission is in a gNB COT, the UE can change the channel access type to Type 2 channel access or Type 3 channel access

* RRC configuration is introduced to control either Type 2 channel access or Type 3 channel access will be used for this case
  + Support: Vivo (cell specific signaling), Nokia, Qualcomm, Oppo, Apple (to No-LBT), LGE

Please provide your view if not captured above:

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| Company | View |
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## Cat 3 LBT procedure

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| **Agreement**  For Type 1 channel access, is a random number uniformly distributed between 0 and CW=3   * By implementation, a node may choose a larger number for counter N than |

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| Company | Position |
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| Huawei HiSilicon | ***If the backoff counter N\_(B\_i ) for a sensing beam B\_i reaches zero before the aligned channel access start time, the device continues to decrement the counter〖 N〗\_(B\_i ) and transmits in the corresponding beam at the aligned start time if either the channel continues to be sensed idle in all of the additional sensing slot durations or the channel is sensed idle within at least T\_d duration ending immediately before the aligned start time.***  ***If the backoff counter N\_(B\_i ) for a sensing beam B\_i does not reach zero before the aligned start time, or reaches zero but the channel has been sensed busy in any of the additional sensing slot durations and has not been sensed idle within at least T\_d duration ending immediately before the aligned start time, the transmission(s) in the corresponding beam is dropped.***  ***Denote the sensing beam with the maximum backoff counter at the start of the channel access procedure as B\_j. Aligned channel start time is at least T\_min after the start of the channel access procedure where T\_min is the minimum required duration for N\_(B\_j ) to decrement to zero.*** |
| Intel Corporation | ***Proposal 13: RAN1 should send an LS to RAN2 to inform them about the decision made in terms of how an LBT failure should be counted.***  ***Proposal 14: TP#4 should be supported.*** |
| NEC | Proposal 1: The maximum gap allowed without LBT between two initiating device transmissions should be defined as follows  • Alt 1: No maximum gap defined between two initiating device transmissions. An initiating device transmission can occur without LBT with any gap within the maximum COT duration.  • Alt 2: Define a maximum gap Y, such that an initiating device transmission can occur without LBT only if the transmission starts within Y from the end of the last initiating device transmission.  **Proposal 4: If a gNB/UE has not transmitted a transmission after Type 1 channel assess procedure, the gNB/UE behavior should be specified for the gNB/UE’s subsequent transmission.** |
| LG Electronics | **Proposal #6: UL LBT failure indication in Rel-16 NR-U can also be supported for frequency range 2-2 and the enhancements such as managing the UL LBT failure counter for each sensing beam can be considered.** |

Seems that we need a discussion on if UE LBT failure event report (from PHY to MAC) should be counted per beam or over all beams

Discuss 2.13-1

Please provide your view for the following:

* Alt 1. For LBT failure indication from PHY to MAC, no beam indication is included
  + No spec impact.
  + Support:
* Alt 2. For LBT failure indication from PHY to MAC, further introduce beam indication on which beam fails LBT
  + FFS spec impact
  + Support:

Please provide your view:

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| Company | View |
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## Rx Assistance

Agreement:

For receiver to provide assistance in channel access, channel sensing and reporting need to be performed. The following schemes can be further considered. Target down-selection by RAN1 #106bis-e

* Scheme 1: L1-RSSI based receiver assistance
  + Resource used for RSSI measurement
    - Alt 1: RSSI measurement is based on the time/frequency resources configured for ZP-CSI-RS
      * FFS: any enhancement needed for ZP-CSI-RS for this purpose (e.g., ZP-CSI-RS over all REs in BWP over one or more symbols).
    - Alt 2: Energy measurement on operating BW over indicated or specified number of symbols or time interval
  + L1-RSSI is reported in an AP-CSI report
  + L1-RSSI trigger in UL grant
    - FFS if L1-RSSI trigger can also be carried in DL grant
  + Timeline for L1-RSSI reporting is at least equal to AP-CSI reporting and RAN1 strives to tighten the timeline
    - Note: If L1-RSSI reporting timeline cannot be tighter than AP-CSI reporting timeline, this scheme is not needed
  + FFS: How to indicate the measurement beam for L1-RSSI
  + FFS: What is included in the L1-RSSI report, such as the value of RSSI measurement, comparison outcome with Energy Detection threshold, etc
* Scheme 2: CCA or eCCA based receiver assistance with existing phy channel/signals
  + Scheme 2-1: gNB schedules/triggers UL PUCCH/SRS transmission with the DL assignment DCI and indicates CCA or eCCA in the DCI. UE performs CCA or eCCA for the scheduled/triggered UL transmission and if LBT passes, transmits the Receiver-assistance information (implicitly or explicitly) in the PUCCH (or SRS in the case of 1-bit Rx-assistance) to indicate the LBT outcome. gNB detects the scheduled UL transmission to tell if UE passes the CCA or eCCA. After detecting the Receiver-assistance information, the downlink data transmission happens.
    - FFS if the downlink data transmission can be granted with the same DL DCI that schedules/triggers the first UL PUCCH/SRS transmission, in which case, the CCA or eCCA is performed for at least the first UL PUCCH/SRS transmission
  + Scheme 2-2: gNB schedules/triggers UL transmission PUSCH with the UL assignment DCI and indicates CCA or eCCA in the DCI. UE performs CCA or eCCA for the scheduled/triggered UL transmission and if LBT passes, transmits the Receiver-assistance information (implicitly or explicitly) in the PUSCH to indicate the LBT outcome. gNB detects the scheduled UL transmission to tell if UE passes the CCA or eCCA. After detecting the Receiver-assistance information, the downlink data transmission happens.
* Scheme 3: CCA or eCCA based receiver assistance with new RTS/CTS type transmission
  + New RTS/CTS-like signaling introduced.
  + gNB sends RTS-like signaling to UE. UE performs CCA or eCCA and if LBT passes, transmits CTS-like signaling to explicitly indicate the LBT outcome. gNB detects the CTS-like signaling to identify if the UE passed CCA or eCCA. After detecting the CTS-like signal, the data transmission happens
* Scheme 4: Legacy L3-RSSI with potential enhancements
  + FFS potential enhancements, e.g., supporting gNB indicating the beam used for UE RSSI measurement, supporting gNB indicating new reference SCS and measurement bandwidths
* Note: The schemes listed above are not mutually exclusive and should be discussed separately.

Conclusion:

There is no consensus to support CCA or eCCA based receiver assistance with new RTS/CTS type transmission

Agreement:

Support extending Rel.16 L3-RSSI to unlicensed operation in FR2-2

* Introduce RRC configuration for reference SCS, measurement duration, and measurement bandwidth
  + Extend the reference SCS/CP field (*ref-SCS-CP-r16*) and measurement duration field (*measDurationSymbols-r16*) in *RMTC-Config*
    - FFS value range and valid combinations for *ref-SCS-CP-r16* and *measDurationSymbols-r16*
  + Introduce parameter in *RMTC-Config* to indicate the measurement bandwidth
    - FFS: Value range for measurement bandwidth
* For the QCL Type-D of L3-RSSI measurement, down-select one or both of the following alternatives
  + Alt 1: gNB configures the beam when configures the L3-RSSI measurement
  + Alt 2: Use the QCL type-D of the latest received PDSCH and the latest monitored CORESET

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| vivo | ***Proposal 9: Adopt the modified scheme 2.*** |
| OPPO | ***Proposal 13: RTS-like signal can be carried in a PDCCH and CTS-like signal can be carried in a PUCCH.***  ***Proposal 14: Introduce in the spec the DL transmission restriction that the gNB should not perform DL transmission if PUCCH/SRS/PUSCH is not detected.*** |

Moderator would recommend to treat this discussion as low priority in this meeting.

## Cat 2 LBT

Agreement:

For Cat 2 LBT, down-select from the following alternatives

* Alt 1: Do not introduce Cat 2 LBT for 60GHz unlicensed band operation
* Alt 2: Introduce Cat 2 LBT for 60GHz unlicensed band operation

Agreement:

If Cat 2 LBT is introduced, the following use cases can be further studied:

* Resume transmission after a gap Y:  Cat 2 LBT may be used to resume transmission by the initiating device within the COT after a gap Y (FFS the value of Y)
* COT sharing: Cat 2 LBT may be used before transmission by a responding node sharing a COT
* Multi-Beam LBT:  Cat 2 LBT may be used before switching to a new transmission beam (not used in earlier part of the COT) in a COT with TDM beams, or resume a previously used transmission beam after a gap Z (FFS the value of Z)
* Rx-Assistance:  Cat 2 LBT may be used for sensing at the receiver as a responding device for Rx-Assistance measurements and associated signalling

Other use cases not precluded.

FFS if Cat 2 LBT is mandated for each use case or not.

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| Company | Key Proposals/Observations/Positions |
| Huawei HiSilicon | ***Proposal 5: For operation in a cell with shared spectrum access in FR2-2, capture that the UE does not expect to be indicated with Type 2 Channel access procedure if it has not indicated the capability to support it.***  ***- Adopt following TP#6 for TS 37.213 v17.0.0***  \*\*\* < **Begining of TP#6 for TS 37.213 v17.0.0**> \*\*\*  4.4.2 Type 2 channel access procedures  This clause describes channel access procedures to be performed by a gNB/UE where the time duration spanned by sensing slots that are sensed to be idle before a DL/UL transmission(s) is deterministic.  A gNB/UE may transmit a transmission(s) on a channel immediately after which includes a sensing slot with a duration where the channel is sensed to be idle.  The UE does not expect to be indicated with Type 2 channel access procedures before the UE indicates the corresponding capability.  \*\*\* < **End of TP#6 for TS 37.213 v17.0.0**> \*\*\* |
| InterDigital Inc. | Proposal 4: A UE determines whether to use Cat 2 LBT based on the gap duration between an upcoming transmission and a preceding transmission on at least the same beam. |
| OPPO | ***Proposal 8: Cat-2 LBT should be introduced for resuming transmission within the COT after a gap and Rx-assisted LBT.***  ***Proposal 9: For resuming transmission after a gap, RAN1 should firstly discuss the gap is defined per device or per beam.***  ***Proposal 12: Introduce Cat 2 LBT for the independent per-beam LBT sensing procedure.*** |
| Xiaomi | Proposal 1: If Type 1 or Type 3 channel access mechanism is indicated, Type 1 or Type 3 channel access can be applied to each transmission burst among the multiple scheduled PUSCHs. If Type 2 channel access mechanism is indicated, Type 2 channel access can be applied to the first transmission burst, and Type 1 channel access can be for the subsequent bursts, if any. |
| LG Electronics | **Proposal #4: The pause within a COT may occur due to the transmission(s) corresponding to the beam direction that failed the LBT and further transmission(s) can be resumed after the pause without additional channel sensing or with additional channel sensing for a UE capable of cat 2 LBT.** |
| WILUS Inc. | **Proposal 1: It should be discussed whether or not to specify the channel access mechanism after failure of Type 2 channel access procedure for UL/DL transmission.**  **Proposal 2: Similar with NR-U and LTE-LAA, we propose to perform Type 1 channel access procedure after failure of Type 2 channel access (Cat-2 LBT) for DL/UL transmission followed by a UL/DL transmission(s) within the maximum Channel Occupancy Time in a shared channel occupancy on FR2-2.** |

Discussion 2.15-1

Should we allow the initiating device to resume transmission with a Cat 2 LBT if there is gap longer than Y us from the previous transmission from initiating device or responding device, at least in some regions (say Japan)?

* Yes:
* No:

Please provide your view:

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| Company | View |
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Discussion 2.15-2

Before the UE indicates it capability on if Cat 2 LBT is supported, should we introduce in the spec that UE does not expect UL transmission with Cat 2 LBT to be granted?

Please provide your view:

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| Company | View |
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## Sensing Structures FFS Items

Agreement:

For energy measurement in 8us deferral period, at least a single measurement within 8us is performed, and the measurement duration is selected from one of the following alternatives:

* Alt 1: At least 3+X us (FFS X, such as X=1).
* Alt 2: At least X us, where X is the same as the minimum measurement duration in a 5 us observation slot and is within the 5 us observation slot.
* Alt 3: At least a contiguous duration of X+Y us where the Y us part of the measurement is done at the end of the first 3 us and X is the same as the minimum measurement duration in a 5 us observation slot and is at the beginning of the 5 us duration.

Agreement:

For energy measurement in 8us deferral period, Alt 2 is supported while Alt 1 and Alt 3 can be considered as gNB/UE implementation (Alt. 1/2/3 are defined as per previous agreement)

Agreement:

Confirm the WA with the following updates:

For energy measurement in 5us observation slot~~, when performing single measurement, the~~ location of the measurement within the 5us is left for implementation, i.e., anywhere within the 5us.

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| Huawei HiSilicon | **Proposal 2: For operation in FR2-2, when LBT is used, clarify that the 5us observation slot is at the end of the 8us deferral period.**  **Adopt following TP#2 for TS 37.213 v17.0.0**  \*\*\* <**Beginning of TP#2 for TS 37.213 v17.0.0**> \*\*\*  4.4.1 Type 1 channel access procedures  This clause describes channel access procedures to be performed by a gNB/UE where the time duration spanned by the sensing slots that are sensed to be idle before a transmission(s) is random based on a fixed contention window size. The clause is applicable to any transmission initiating a channel occupancy by the gNB/UE.  The gNB/UE may transmit a transmission after first sensing the channel to be idle during the sensing slot duration of a defer duration and after the counter is zero in step 4. The counter is adjusted by sensing the channel for additional sensing slot duration(s) according to the steps below:  1) set , where is a random number uniformly distributed between 0 and , and go to step 4;  2) if and the gNB/UE chooses to decrement the counter, set ;  3) sense the channel for an additional sensing slot duration, and if the channel is idle for the additional sensing slot duration, go to step 4; else, go to step 5;  4) if , stop; else, go to step 2.  5) sense the channel until either it is detected busy within an additional defer duration or it is detected to be idle for the sensing slot of the additional defer duration ;  6) if the channel is sensed to be idle during the sensing slot duration of the additional defer duration , go to step 4; else, go to step 5;  In the above procedures, is the contention window and .  The defer duration is and includes a sensing slot duration at the end of the for performing as least a single measurement to determine whether the channel is idle.  A gNB/UE shall not transmit on a channel for a *Channel Occupancy Time* that exceeds .  4.4.2 Type 2 channel access procedures  This clause describes channel access procedures to be performed by a gNB/UE where the time duration spanned by sensing slots that are sensed to be idle before a DL/UL transmission(s) is deterministic.  A gNB/UE may transmit a transmission(s) on a channel immediately after which ends with a sensing slot of a duration where the channel is sensed to be idle.  \*\*\* <**End of TP#2 for TS 37.213 v17.0.0**> \*\*\* |
| OPPO | ***Proposal 2: The location of the 5us observation slot within the 8us deferral period can be left for implementation.*** |

For the location of 5us observation slot within 8us, the moderator remembers the intention was to leave it at the end of the 8us

Proposal 2.16-1

Clarify that the 5us observation slot is at the end of the 8us deferral period, and adopt the TP from HW above

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## COT Sharing

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| Agreement:  On COT sharing from an initiating device transmission to responding device transmission, support both of the following two alternatives   * Alt 1: No maximum gap defined between the initiating device transmission and responding device transmission. A responding device transmission can occur without LBT with any gap within the maximum COT duration * Alt 3: Define a maximum gap Y, such that a responding device transmission can occur without LBT only if the transmission starts within Y from the end of the initiating device transmission. If the responding device transmission starts after Y from the end of the initiating device transmission, a Cat 2 LBT is needed before the responding device transmission.   + The Cat 2 LBT uses the same sensing structure as the 8 us initial deferral period as in eCCA   + Further downselect between the following options:     - Option 1: Y=8 us (motivated by need to operate in all regions)     - Option 2: Y=a multiple number of OFDM symbols     - Option 3: gNB determines Y (for example, according to local regulation)   + Cat. 2 LBT is a UE capability * The usage of the two alternatives is a gNB choice and depends at least on local regulations. * Note: Alt. 3 is motivated by the regulations in Japan but use of Cat. 3 LBT is also an option for operation in Japan and Cat. 2 LBT is not restricted for use only in Japan.   Note: Maximum gap allowed without Cat 2 LBT between two initiating device transmissions is to be separately discussed  Note: Other use cases of Cat 2 LBT will be separately discussed  **Agreement**  On COT sharing from an initiating device transmission to responding device transmission, when a maximum gap Y is defined, such that a responding device transmission can occur without LBT only if the transmission starts within Y from the end of the initiating device transmission, and a responding device transmission can occur with Cat 2 LBT if the transmission starts later than Y from the end of the initiating device transmission.   * gNB determines Y as gNB implementation (for example, according to local regulation) and the value of Y will not be captured in 3GPP spec other than requiring Y to be no less than 8 us.   **Conclusion**  UL to DL COT sharing is supported for FR2-2 unlicensed operation, including from dynamically scheduled UL and CG-PUSCH.  **Agreement**  For CG-PUSCH to DL COT sharing, extend the duration and offset range to {1, …, 319}. |

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| Company | Key Proposals/Observations/Positions |
| OPPO | ***Proposal 6: In FR2-2, if the higher layer parameter ul-toDL-COT-SharingED-Threshold-r16 is not provided, the UE COT sharing mechanism still follow the R16 NRU case when ul-toDL-COT-SharingED-Threshold-r16 is configured.*** |
| Ericsson | ***Observation 3 UE behavior for consecutive scheduled UL transmissions in a gNB-initiated COT needs further clarifications***  Proposal 12 RAN1 to agree to modify the text in clause 4.4.4 in the CR 37.213 to the following including the text highlighted in yellow-  [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. In this case, the following are applicable to the UL/DL transmission(s):  ***- for regions where there are no local regulatory requirements to perform sensing before each transmission in a shared channel occupancy***  ***• 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***  ***• the UL transmission(s) occurs following the channel access procedure indicated by the scheduling DCI***  ***- for regions where there are local regulatory requirements to perform sensing before each transmission in a shared channel occupancy***  ***• 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 8μs, 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.]*** |
| LG Electronics | **Proposal #11: If the information on UL beam (such as SSB index, CSI-RS index, preconfigured index, etc.) is identified explicitly through CG-UCI, gNB is allowed to perform Type 2 or Type 3 channel access and transmit the DL transmission associated with UL beam in terms of QCL relationship by sharing the COT acquired by CG-PUSCH. If the information on UL beam is not associated with the DL transmission, Type 1 channel access should be performed to transmit DL transmission.** |

Discussion 2.17-1

Shall we introduce separate UL to DL COT sharing ED threshold as in Rel.16 NR-U?

* Yes:
* No:

Please provide your view:

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| Company | View |
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Discussion 2.17-2

Shall we introduce UL beam indicate in CG-UCI for UL to DL COT sharing?

* Yes:
* No:

Please provide your view:

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| Company | View |
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