**3GPP TSG RAN WG1#111 R1-22xxxxx**

**Toulouse, FR November 14 – 18, 2022**

**Agenda Item: 8.2**

**Source: Qualcomm Incorporated (Moderator)**

**Title: Preparation Phase discussion on Maintenance of Channel Access Mechanisms for NR in 52.6 to 71GHz band**

**Document for: Discussion, Decision**

# Issues for Channel Access Aspects

The following issues have been identified from the submitted papers on channel access mechanism for NR in 52.6 to 71GHz band.

**Table 1 – Identified issues for Channel Access Aspects**

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| --- | --- | --- |
| **Issue#** | **Issue** | **References** |
| CA-1 | Control of SCSt based msg1/msgA transmission | HW[1], vivo[2], CATT [5], ZTE [6], intel [9], OPPO [10],[11], Ericsson [12], [13], Docomo [15], Samsung [17], Qualcomm [18][19], LGE [21][23], Nokia [26][27] |
| CA-2 | Channel Access Type upgrade within gNB COT | HW[1], vivo[2], CATT [5], Wilus [31] |
| CA-3 | Channel Access Type for resuming UE COT after a gap | HW[1], CATT [3],[4], CATT [5], Nokia [26], [28] |
| CA-4 | Independent Per Beam LBT procedure in a multi-Beam COT | HW[1], intel [9] |
| CA-5 | DCI Format 0\_2, 1\_2 | LGE [21] |
| CA-6 | Exclude CSI-RS validation when in discovery burst | AsusTek [20] |
| CA-7 | PDCCH ordered PRACH | Docomo [15][16] |
| CA-8 | TCI State for L3-RSSI measurement | Ericsson [14] |
| CA-8 | Channel measurement and Interference Measurement subject to validation | ZTE [8] |
| CA-10 | Cg-minDFI-Delay in FR2-2 | ZTE [7] |
| CA-11 | *Channel Occupancy Duration* maximum value | HW[1] |
| CA-12 | Channel Access Procedure after failure of Type 2 channel access | Wilus [29][30] |

# Details of issues

Some details for submitted issues are captured in this section, with some FL recommendations.

The proposal on the table at the end of the meeting RAN1-110b-e was as follows:

|  |
| --- |
| Proposed conclusion 3-3 from RAN1-110bis-e  • No additional control for SCSt based msg1/msgA transmission will be provided in Rel-17  o FFS: Spec impact  • Type 1 CA to Type2 or Type 3 CA upgrade when back in gNB COT is not supported in Rel.17  • UE uses Type 2 or Type 3 CA to resume COT within its own COT is not supported in Rel.17 |

The three bullets of the proposal are captured separately in issues CA-1, CA-2, CA-3.

## CA-1. Short Control Signaling indications

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| --- |
| Proposed conclusion 3-3 from RAN1-110bis-e: Bullet 1  • No additional control for SCSt based msg1/msgA transmission will be provided in Rel-17  o FFS: Spec impact |

Summary of Company positions:

* Support the proposed conclusion: vivo [2], Intel [9], Oppo [10],[11], Docomo [15] (for SCSt), Samsung [17], Qualcomm [18][19],
* Do not support the proposed conclusion:
  + SCSt for Msg1/A:
    - SIB1 based control: CATT, Ericsson, LGE, Nokia, Huawei [33]
    - 10% duty cycle is implemented as a cell-wide constraint: ZTE, Nokia

FL recommendation CA-1-1:

Consider this topic has been discussed multiple rounds, FL recommends to accept the fact we cannot agree on the issue and the remaining discussion is focused on if we should explicitly remove this from the spec.

## CA-2. Channel Access Type upgrade within gNB COT

The following are the positions captured based on company contributions and draft CRs.

|  |
| --- |
| Proposed conclusion 3-3 from RAN1-110bis-e: Bullet 2  • Type 1 CA to Type2 or Type 3 CA upgrade when back in gNB COT is not supported in Rel.17 |

Summary of Company Positions

* Support the proposed conclusion: vivo [2], Intel [9], Oppo [10],[11],Samsung [17], Qualcomm [18][19],
* Do not support the proposed conclusion:
  + Channel Access Type upgrade and Type 2 Channel Access on resuming a COT
    - CATT, Huawei (No-RRC Change) [34]

FL recommendation CA-2-1:

Consider this topic has been discussed multiple rounds, FL recommends to accept we cannot agree on the feature and agree on the conclusion

## CA-3. Channel Access Type for resuming UE COT after a gap

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| --- |
| Proposed conclusion 3-3 from RAN1-110bis-e: Bullet 3  • UE uses Type 2 or Type 3 CA to resume COT within its own COT is not supported in Rel.17 |

Summary of Company Positions

* Support the proposed conclusion: vivo [2], Intel [9], Oppo [10],[11],Samsung [17], Qualcomm [18][19],
* Do not support the proposed conclusion:
  + Channel Access Type upgrade and Type 2 Channel Access on resuming a COT
    - CATT, Huawei (No-RRC Change) [34]

FL recommendation CA-3-1:

Consider this topic has been discussed multiple rounds, FL recommends to accept we cannot agree on the feature and agree on the conclusion

## CA-4. Independent Per Beam LBT procedure in a multi-Beam COT

During RAN1-110bis-e, the following conclusion was reached:

|  |
| --- |
| **Conclusion**  When independent per-beam LBT sensing is performed at UE, whether a transmission is allowed to occur on a subset of beams, where all of the corresponding LBT procedures for the subset of beams have been successful, is left for UE implementation.   * FFS spec impact, if any |

The two companies commenting on this aspect.

**Proposal from Intel [9]:** For the independent per-beam LBT, no specification change is needed to explicitly indicate that a transmission may be allowed on a beam either if LBT succeeds individually on that beam or if LBTs has succeeded across all beams over which the transmission is intended.

On the other hand, Huawei’s draft CR [32] argues the following:

**Reason for change from Huawei [32]:**

For initiating a new multi-beam COT, the Type 1 channel access procedure for a respective beam shall start after the end of the previous COT towards the aligned start time of the new COT. Based on current specifications, if a counter N does not reach 0 before the aligned DL start time, the channel cannot be accessed by the gNB on the respective beam and the corresponding transmission(s) would be dropped. For UL, the channel may not be accessed by the UE on all beams and all corresponding transmissions would be dropped. Since it may not be feasible for the gNB/UE to start one or more per-beam Type 1 channel access procedures early enough before the aligned start time, a minimum gap constraint on the aligned starting time is needed to ensure efficiency of the multi-beam channel access procedures.

FL recommendation CA-4-1:

* For the earlier conclusion, unless some companies believe there is spec impact, we don’t need to further discuss
* For HW proposal on introducing minimum gap, companies are recommended to provide view.

## CA-5. DCI Format 0\_2, 1\_2

**Description/Reason for Change from LGE [21]:** In RAN1#110b-e, it was agreed to reflect that ChannelAccess-CPext field is not configured in DCI format x\_1 in FR2-2 when ChannelAccessMode2-r17 is not configured. However, DCI format x\_2 has not yet been reflected.

FL recommendation CA-5-1:

Porting the agreement for DCI x\_1 to DCI x\_2 seems reasonable. FL recommends to discuss.

## CA-6. Exclude CSI-RS validation when in discovery burst

**Description/Reason for Change from AsusTek [20]:** Currently, CSI-RS validation under FR2-2 only concerns the case that the UE is under LBT mode and CSI-RS verification is not performed for UE under No-LBT mode. However, CSI-RS could be part of discivery bust which could be exempted from LBT as short control signalling according to TS 37.213. When CSI-RS is exempted from LBT, gNB could transmit the CSI-RS without channel occupancy and perform CSI-RS validation for this situation would lead to errorneuos dropping of CSI-RS.

FL recommendation CA-6-1:

Companies please provide view.

## CA-7. PDCCH ordered PRACH

**Description/Reason for Change from Docomo [16]:** In FR2-2, channel access type for PRACH transmission can be different in different regions. In Japan, sensing (i.e., type 1 or type 2) is necessary. In EU, if the condition of SCSe is met, no sensing is needed; otherwise sensing is required. In the other regions, as per the current regulation, sensing is not necessary.

Meanwhile, additional control from NW to UE to configure/indicate the applicability of SCSe transmission is likely to be not supported in Rel-17. To understand its applicability, as per the current specification, a UE needs to identify its location based on the exsiting configuration (e.g., PLMN ID), which is not possible in some cases. In such cases, unnecessary sensing may need to be performed for any PRACH transmission.

Since PDCCH ordered PRACH is generally under NW’s control per the indication, channel access type should be indicated per the triggering DCI.

FL recommendation CA-7-1:

The proposal seems to be, allow PDCCH order DCI to indication no LBT even if the triggered PRACH is not in gNB COT. Of course, gNB should only use this when regulation allows.

Companies please provide view.

## CA-8. TCI State for L3-RSSI measurement

**Description from Ericsson Contribution [14]:**

In RAN1 #110, RAN4 sent an LS response with clarification of the following:

“*When a UE has no serving cell in FR2-2, it is not clear if the explicit TCI state should be configured to the UE for FR2-2 RSSI measurement. If explicit TCI state should be configured, how does the UE use such explicit TCI?”*

In RAN1 #110b-e, RAN1 responded to the above question as follows[1] –

* When a UE has no serving cell in FR2-2, the UE does not expect that a TCI-state is provided in RMTC-Config for inter-frequency RSSI measurement on FR2-2.
* For a UE that has no serving cell in FR2-2 and configured with inter-frequency RSSI measurement in FR2-2, it is up to UE implementation how to determine the spatial domain filter for the inter-frequency RSSI measurement in FR2-2.

… The LS response above disallows configuring FR1/FR2-1 serving cell as reference serving cell index for TCI state provided in RMTC-Config when UE has no serving cell in FR2-2. In our view, the same principle should be applied even for the case where UE does have a serving cell in FR2-2.

1. For intra-frequency and inter-frequency RSSI measurements for FR2-2, when a UE has a serving cell in FR2-2, the UE does not expect to be configured with an explicit TCI-state in RMTC-Config with a reference serving cell in FR1 or FR2-1.
2. Send an LS to RAN4 regarding the understanding above in RAN1.

FL recommendation CA-8-1:

FL recommends to discuss.

## CA-9. Channel measurement and Interference Measurement subject to validation

**Description/Reason for Change from ZTE [8]:**

In RAN1#108-e meeting, one agreement related to periodic CSI-RS validation is reached. The agreement and the corresponding CR for TS 38.213 are as follows.

**Agreement**

For unlicensed operation (or shared spectrum channel access), if gNB indicates to the UE this gNB-UE connection is operating in LBT mode, the periodic CSI-RS should be validated by COT duration or dynamically granted PDSCH or aperiodic CSI-RS over the same set of symbols.

Graphical user interface, text, application, email

Description automatically generated

Similar to periodic CSI-RS validation, channel measurement and interference measurement in FR2-2 also needs to introduce the same restrictions. For a UE operation with shared spectrum channel access, only when the UE is provided ChannelAccessMode2-r17 = 'enabled', the UE shall not average measurements across different transmission bursts.

FL recommendation CA-9-1:

Companies please provide view.

## CA-10. Cg-minDFI-Delay in FR2-2

**Description/Reason for Change from ZTE [7]:**

*cg-minDFI-Delay* is used to indicate the minimum duration (in unit of symbols) from the ending symbol of the PUSCH to the starting symbol of the PDCCH containing the DFI carrying HARQ-ACK for this PUSCH.

In Rel-16 NR-U, above minimum duration is indicated by the parameter *cg-minDFI-Delay-r16*. In Rel-17 FR2-2 NR-U, as new SCSs 120/480/960kHz are introduced for operation with shared spectrum access, thus the values of *cg-minDFI-Delay-r16* were extended, and a new parameter *cg-minDFI-Delay-v1710* is defined for indicating the extended values. Considering the operation with shared spectrum access in different bands, the parameter *cg-minDFI-Delay-r16* in TS 38.213 should be replaced by *cg-minDFI-Delay.*

TS 38.331-h20

– *ConfiguredGrantConfig*

cg-minDFI-Delay-r16 ENUMERATED

{sym7, sym1x14, sym2x14, sym3x14, sym4x14, sym5x14, sym6x14, sym7x14, sym8x14, sym9x14, sym10x14, sym11x14, sym12x14, sym13x14, sym14x14,sym15x14, sym16x14 }

cg-minDFI-Delay-v1710 INTEGER (238..3584) PTIONAL -- Need R

FL recommendation CA-10-1:

Seems to be editorial. Companies please provide view.

## CA-11. Channel Occupancy Duration maximum value

Proposal From Huawei [1]:

***Proposal 4: RAN1 to clarify that only the values 120/480/960 kHz can be configured as reference subcarrier spacing in CO-DurationsPerCell-r17 and that the values 15/30/60 kHz cannot be configured.***

* ***Send an LS to RAN2 informative of the clarification and advising to include in the field description of co-DurationList the max duration values that can be configured for the FR1 SCS values 15/30/60 kHz as 1120/560/280 symbols.***

FL recommendation CA-11-1:

Companies please provide view.

## CA-12. Channel Access Procedure after failure of Type 2 channel access

**Description/Reason for Change from WILUS [30]:**

According to current specification 37.213, it was not specified how to perform channel access for the UL/DL transmission after failure of Type 2 channel access procedure when 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. For this issue, it is proposed to perform Type 1 channel access procedure after failure of Type 2 channel access (Cat-2 LBT) both 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.

FL recommendation CA-12-1:

Companies please provide view.

# Discussions

Please provide your view on if you think we should which issue. Please mark a “Y” for the one you believe discussion is necessary.

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| Company | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
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Additional comments

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| --- | --- |
| Company | Comments |
|  |  |

# References

Contributions related to Channel Access

1. R1-2210918, Remaining issues of channel access mechanism for 60 GHz unlicensed operation, Huawei, HiSilicon
2. R1-2210970, Discussions on support of short control signaling in FR2-2, vivo
3. R1-2211160, Discussion on channel access procedures upon detection of a common DCI for frequency range 2-2, CATT
4. R1-2211161, Correction on channel access procedures upon detection of a common DCI for frequency range 2-2, CATT
5. R1-2211166, Discussion on the remaining issues on channel access, CATT
6. R1-2211273, Clarification on Contention Exempt Short Control Signalling rules for UL in TS 37.213, ZTE, Sanechips
7. R1-2211274, Correction on cg-minDFI-Delay in FR2-2 in TS 38.213, ZTE, Sanechips
8. R1-2211275, Correction on channel measurement and interference measurement in FR2-2 in TS 38.214, ZTE, Sanechips
9. R1-2211379, Discussions on remaining issues on Channel Access for NR extension up to 71 GHz, Intel Corporation
10. R1-2211454, Discussion on remaining issue for short control signaling, OPPO
11. R1-2211455, Draft CR on resolving issue for short control signaling, OPPO
12. R1-2211944, Draft CR on configuration to enable LBT for msg1 and msgA, Ericsson
13. R1-2211945, Discussion on configuration to enable LBT for msg1 and msgA, Ericsson
14. R1-2211946, Discussion on L3-RSSI measurements and LS to RAN4, Ericsson
15. R1-2211952, Discussion on remaining issues for NR in FR2-2, NTT DOCOMO, INC.
16. R1-2211953, Draft CR on channel access type for PDCCH ordered PRACH in FR2-2, NTT DOCOMO, INC.
17. R1-2212019, Discussion on SCSt based msg1/msgA transmission in FR2-2, Samsung
18. R1-2212082, Discussion Paper on Maintenance for NR from 52.6GHz to 71 GHz, Qualcomm Incorporated
19. R1-2212083, Draft CR on Short Control Signaling Exemption for UL Transmissions, Qualcomm Incorporated
20. R1-2212198, Correction on CSI-RS validation, ASUSTeK
21. R1-2212295, Remaining issues of channel access mechanism to support NR above 52.6 GHz, LG Electronics
22. R1-2212296, Draft CR on channel access type indication for DCI format x\_2 in FR2-2, LG Electronics
23. R1-2212297, Draft CR on short control signaling exemption and LBT type determination within a COT, LG Electronics
24. R1-2212395, Correction on short control singnling based on msg1 and msg A, CATT
25. R1-2212396, Correction on UE resuming a UE initiated COT, CATT
26. R1-2212403, Remaining issues on channel access mechanism, Nokia, Nokia Shanghai Bell
27. R1-2212404, Correction on Short Control Signaling, Nokia, Nokia Shanghai Bell
28. R1-2212405, Correction on UE resuming a UE initiated COT, Nokia, Nokia Shanghai Bell
29. R1-2212435, Remaining issue on channel access for NR from 52.6GHz to 71GHz, WILUS Inc.
30. R1-2212436, Draft CR on channel access after failure of Type 2 channel access for FR2-2, WILUS Inc.
31. R1-2212437, Draft CR on channel access procedure upon detection of a common DCI for FR2-2, WILUS Inc.
32. R1-2212469, Corrections to multi beam channel access in TS37.213, Huawei, HiSilicon
33. R1-2212470, Corrections to enable/disable short control signaling transmission in TS37.213, Huawei, HiSilicon
34. R1-2212471, Corrections to support LBT upgrade to Type 2/3 within gNB COT in TS37.213, Huawei, HiSilicon