**3GPP TSG RAN WG1 #122bis R1-25xxxx**

**Prague, Czech, Oct 13th – 17th, 2025**

Agenda Item: 8.7.1

Source: Moderator (Thales)

Title: FL Summary #1 - Maintenance on NR-NTN downlink coverage enhancements

Document for: Discussion, Decision

## Introduction

This Feature Lead Summary (FLS) document aims to collect and align company views regarding the maintenance of Release-19 NR-NTN downlink coverage enhancements. It provides a summary of contributions under item 8.7.1 at TSG-RAN WG1 #122bis, along with the remaining identified issues.

# Topic#1 Enhanced RO configuration

## Companies’ contributions summary

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| **Companies** | **Proposals** |
| Ericsson | **Observation 1** In the legacy specifications, there exist offsets configured via higher layer parameters for both frame and subframe numbers with respect to random access occasion configurations in the context of IAB.  **Proposal 1** For alleviating PRACH collisions, RAN1 to consider using in the context of system-level enhancements, the PRACH frame and subframe offset solutions already available in TS 38.211 for IAB. |

## Summary of companies’ contributions

**Ericsson** proposes enhancements to PRACH/RO configuration NTN to address challenges due to increased SSB periodicity (now up to 160 ms) as part of system level enhancements in Rel-19. With limited simultaneous active beams relative to the number of NTN cells, it is not feasible to support PRACH transmission every 10 ms in all cells. Longer PRACH RO periodicities (e.g., 80 or 160 ms) are thus desirable.

However, with existing configurations, only a small number of random access occasions are available per beam/cell grouping, likely causing collisions and resource contention for uplink transmissions.

To address this, **Ericsson** suggests **reusing existing solutions from Integrated Access and Backhaul (IAB)** specifications, specifically the ability to configure frame and subframe offsets for PRACH occasions via higher layer parameters. This approach enables more flexible allocation and hopping of PRACH ROs, reducing collision risk and supporting better resource allocation in NR-NTN scenarios.

**Ericsson** recommends that RAN1 consider adopting these offset configuration mechanisms, already standardized for IAB in TS 38.211, to enhance PRACH resource allocation efficiency for NTN coverage.

## Initial proposal

### Proposal 1-1

Based on the above discussion the following initial proposal is made

**Proposal 1-1-v0**

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| **For alleviating PRACH collisions, RAN1 to consider using in the context of system-level enhancements, the PRACH frame and subframe offset solutions already available in TS 38.211 for IAB.** |

Companies are encouraged to comment on Proposal 1-1-v0

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| **Companies** | **Comments** |
| DCM | Does this proposal mean that additional UE implementation is necessary and probably a new FG is necessary, right? If correct, then whether to enhance PRACH in R19 NTN and our conclusion was no consensus in our understanding. The necessity of further discussion is unclear. |
| vivo | In our view this is kind of an UL enhancements, which is out of the scope of R19 maintenance. |

# Topic#2 SIB1 PDSCH repetition

## Companies’ contributions summary

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| **Companies** | **Proposals** |
| Spreadtrum | **Proposal 1**. TP#1 can be adopted for 38.214.   |  | | --- | | **WI Code:** TEI19 [Common\_PDCCH\_Rep\_TN]  **Reason for change**: It is not clear the slot of PDSCH if common PDCCH repetition for TN for FR1 is enabled.  **Summary of change:** UE assume PDSCH scheduled by DCI format 1\_0 in the Type0 PDCCH CSS of searchSpaceZero is in the latter slot.  **Consequence if not approved:** UE behavior for PDSCH reception is not clear. | | 5.1 UE procedure for receiving the physical downlink shared channel \*\*\* Unchanged parts are omitted \*\*\*  A UE capable of PDSCH repetitions for broadcast channels, which assumed the DCI format 1\_0 in the Type0 PDCCH CSS of searchSpaceZero transmitted with two inter-slot repetitions may assume that PDSCHs scheduled by the DCI format 1\_0 have also been transmitted with inter-slot repetitions in the same slots as the Type0 PDCCH CSS, with the same RV as indicated by the DCI format 1\_0. A UE incapable of PDSCH repetitions for broadcast channels, which assumed the DCI format 1\_0 in the Type0 PDCCH CSS of searchSpaceZero transmitted with two inter-slot repetitions may assume that PDSCH scheduled by the DCI format 1\_0 is transmitted in the latter slot as the Type0 PDCCH CSS.  \*\*\* Unchanged parts are omitted \*\*\* | |
| vivo | Proposal 5. Adopt TP#4 for 38.214 for clarifying the application condition of SIB1 repetition. TP#4 for 38.214 **Reason for change:** The SIB1 PDSCH repetition is only applicable to NTN, not for TN.  **Summary of change:** Add the corresponding UE capability for the SIB1 PDSCH repetition.  **Consequences if not approved:** SIB1 PDSCH repetition is also applicable to TN, which is not agreed by RAN1 and RAN plenary.   |  | | --- | | **TP#4 for 38.214** 5 Physical downlink shared channel related procedures5.1 UE procedure for receiving the physical downlink shared channel ==omitted==  If more than one PDSCH on a serving cell each without a corresponding PDCCH transmission are in a slot, after resolving overlapping with symbols in the slot indicated as uplink by *tdd-UL-DL-ConfigurationCommon*, or by *tdd-UL-DL-ConfigurationDedicated*, or determined as non-active periods of cell DTX, if the serving cell is activated with cell DTX, based on [10, TS 38.321], or not available for PDSCH without a corresponding PDCCH transmission receptions as described in clause 24 of [6, TS 38.213], a UE receives one or more PDSCHs without corresponding PDCCH transmissions in the slot as specified below.  ‒ Step 0: set *j=0*, where *j* is thenumber of selected PDSCH(s) for decoding. *Q* is the set of activated PDSCHs without corresponding PDCCH transmissions within the slot  ‒ Step 1: A UE receives one PDSCH with the lowest configured *sps-ConfigIndex* within *Q*, set *j=j+1*. Designate the received PDSCH as survivor PDSCH.  ‒ Step 2: The survivor PDSCH in step 1 and any other PDSCH(s) overlapping (even partially) with the survivor PDSCH in step 1 are excluded from *Q*.  ‒ Step 3: Repeat step 1 and 2 until *Q* is empty or *j* is equal to the number of unicast/multicast PDSCHs in a slot supported by the UE.  A UE capable of *[PDCCH repetition for Type0 PDCCH CSS and SIB1 PDSCH repetition within 20ms duration]*, which assumed the DCI format 1\_0 in the Type0 PDCCH CSS of searchSpaceZero transmitted with two inter-slot repetitions may assume that PDSCHs scheduled by the DCI format 1\_0 have also been transmitted with inter-slot repetitions in the same slots as the Type0 PDCCH CSS, with the same RV as indicated by the DCI format 1\_0.  ==omitted== | |
| ZTE | **Proposal 1:** In case of Type0 PDCCH repetition without SIB1 repetition for TN, the PDSCH carrying SIB1 should be placed in the first slot together with its corresponding PDCCH, and the PDSCH’s timing reference should be based on the PDCCH in the first slot to resolve the potential ambiguity on PDSCH timing. |
| CATT | Proposal 1: SIB1 PDSCH repetition enhancement should also be applied to TN network. |

## Summary of companies’ contributions

On Topic#2, **Spreadtrum** : For TN UEs supporting common PDCCH repetition, there is ambiguity regarding whether the SIB1 PDSCH appears in slot n or slot n+1 when scheduled by DCI 1\_0. **Spreadtrum** analyzes two options and recommends that UEs should assume SIB1 PDSCH exists only in slot n+1 (the latter slot). This avoids reverse processing, simplifies UE implementation, and aligns with current specifications where PDSCH is always in the same or a later slot relative to its PDCCH.

**Vivo** clarifies that while common PDCCH repetition can be used for TN in FR1, SIB1 PDSCH repetition is intended only for NTN. They propose updating TS 38.214 to specify that only UEs supporting both Type0 PDCCH CSS repetition and SIB1 PDSCH repetition within 20 ms (as indicated by UE feature group 65-1-2) should support SIB1 PDSCH repetition. This ensures clear UE capability requirements and avoids ambiguity in TN deployments.

**ZTE** highlights that, while common PDCCH repetition for FR1 TN was agreed upon, SIB1 PDSCH repetition has not been extended to TN. This creates ambiguity in the timing relationship between repeated PDCCH and non-repeated SIB1 PDSCH: with PDCCH repeated in two slots but SIB1 PDSCH only in one slot, legacy TN UEs can only detect the first PDCCH and PDSCH pairing. **ZTE** proposes that, in TN scenarios without SIB1 PDSCH repetition, the SIB1 PDSCH should be transmitted in the first slot together with its corresponding PDCCH. The timing of SIB1 PDSCH should reference the first PDCCH, ensuring backward compatibility and clear UE behavior. If SIB1 PDSCH repetition is eventually applied to TN, then each PDSCH instance should align its timing with the corresponding PDCCH in each slot.

**CATT** observes that common PDCCH repetition is already supported in both TN and NTN, but SIB1 PDSCH repetition is not clearly indicated for TN. Because UEs cannot reliably determine if a cell is TN or NTN before receiving SIB1, this creates ambiguity and potential mismatch in SIB1 reception. To avoid such issues, **CATT** proposes that SIB1 PDSCH repetition enhancement should also be applied to TN networks, ensuring consistent UE behavior and reception.

## Initial proposal

### Proposal 2-1

Based on the above discussion the following initial proposal is made

**Proposal 2-1-v0**

**WF1:**

**Adopt the following TP for 38.214 clarifying the application condition of SIB1 repetition**

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| **Reason for change:** The SIB1 PDSCH repetition is only applicable to NTN, not for TN.  **Summary of change:** Add the corresponding UE capability for the SIB1 PDSCH repetition.  **Consequences if not approved:** SIB1 PDSCH repetition is also applicable to TN, which is not agreed by RAN1 and RAN plenary.   |  | | --- | | 5 Physical downlink shared channel related procedures5.1 UE procedure for receiving the physical downlink shared channel ==omitted==  If more than one PDSCH on a serving cell each without a corresponding PDCCH transmission are in a slot, after resolving overlapping with symbols in the slot indicated as uplink by *tdd-UL-DL-ConfigurationCommon*, or by *tdd-UL-DL-ConfigurationDedicated*, or determined as non-active periods of cell DTX, if the serving cell is activated with cell DTX, based on [10, TS 38.321], or not available for PDSCH without a corresponding PDCCH transmission receptions as described in clause 24 of [6, TS 38.213], a UE receives one or more PDSCHs without corresponding PDCCH transmissions in the slot as specified below.  ‒ Step 0: set *j=0*, where *j* is thenumber of selected PDSCH(s) for decoding. *Q* is the set of activated PDSCHs without corresponding PDCCH transmissions within the slot  ‒ Step 1: A UE receives one PDSCH with the lowest configured *sps-ConfigIndex* within *Q*, set *j=j+1*. Designate the received PDSCH as survivor PDSCH.  ‒ Step 2: The survivor PDSCH in step 1 and any other PDSCH(s) overlapping (even partially) with the survivor PDSCH in step 1 are excluded from *Q*.  ‒ Step 3: Repeat step 1 and 2 until *Q* is empty or *j* is equal to the number of unicast/multicast PDSCHs in a slot supported by the UE.  A UE capable of *[PDCCH repetition for Type0 PDCCH CSS and SIB1 PDSCH repetition within 20ms duration]*, which assumed the DCI format 1\_0 in the Type0 PDCCH CSS of searchSpaceZero transmitted with two inter-slot repetitions may assume that PDSCHs scheduled by the DCI format 1\_0 have also been transmitted with inter-slot repetitions in the same slots as the Type0 PDCCH CSS, with the same RV as indicated by the DCI format 1\_0.  ==omitted== | |

**WF2**:

**Adopt the following TP for TS 38.214** (**SIB1 PDSCH repetition enhancement is also applied to TN)**

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| **Reason for change:** For SIB1 PDSCH repetition of Rel-19 DL enhancement of NTN, it is not yet clear on whether this enhancement is applicable to TN scenarios.  **Summary of change:** In the section of 5.1 of TS 38.214, adding relevant descriptions of SIB1 PDSCH repetition is applicable to both TN and NTN networks.  **Consequences if not approved:** If the repetition of SIB1 PDSCH is not supported by the TN cell, the UE cannot determine whether SIB1 has been repetition by g-NB.  5.1 UE procedure for receiving the physical downlink shared channel  \*\*\* Unchanged parts are omitted \*\*\*  A UE capable of PDSCH repetitions for broadcast channels of a TN or NTN cell in FR1, which assumed the DCI format 1\_0 in the Type0 PDCCH CSS of searchSpaceZero transmitted with two inter-slot repetitions may assume that PDSCHs scheduled by the DCI format 1\_0 have also been transmitted with inter-slot repetitions in the same slots as the Type0 PDCCH CSS, with the same RV as indicated by the DCI format 1\_0.  \*\*\* Unchanged parts are omitted \*\*\* |

Companies are encouraged to comment on WF1 and WF2:

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| **Companies** | **Comments** |
| DCM | Based on the RAN plenary agreement, WF1 is what we go with. Meanwhile, if TN UE supporting the PDCCH repetition, then how the UE works is unclear. This should also be clarified or at least discussed. |
| vivo | WF1 should be the choice. WF2 is not aligned with the RANP’s guidance. |

# Topic#3 R19 SIB1 PDSCH repetition vs R15 SIB PDSCH retransmission

## Companies’ contributions summary

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| **Companies** | **Proposals** |
| NTT DoCoMo | **Proposal 1:**   * **Adopt either TP Alt1 or TP Alt2 for TS 38.214.**   + **TP Alt1**  |  |  | | --- | --- | | ***Reason for change:*** | SIB1 PDSCH repetition introduced in R19 could be interpreted as a part of PDSCH retransmission corresponding to SI-RNTI. In this case, as described from R15, UE is not expected to decode the 2nd PDSCH as there is no sufficient time gap between the two PDSCHs. | | ***Summary of change:*** | It is clarified that the PDSCH retransmission corresponding to SI-RNTI does not include R19 SIB1 PDSCH repetition. | | ***Consequences if not approved:*** | R19 SIB1 PDSCH repetition does not work as intended. |  |  | | --- | | 5.1 UE procedure for receiving the physical downlink shared channel  **<Unchanged parts omitted>**  A UE shall upon detection of a PDCCH with a configured DCI format 1\_0, 1\_1, 1\_2, 1\_3, 4\_0, 4\_1, or 4\_2 decode the corresponding PDSCHs as indicated by that DCI. When the UE is scheduled with multiple PDSCHs on a serving cell by a DCI, HARQ process ID indicated by this DCI applies to the first PDSCH not overlapping with a UL symbol indicated by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* if provided, HARQ process ID is then incremented by 1 for each subsequent PDSCH(s) in the scheduled order, with modulo operation of *nrofHARQ-ProcessesForPDSCH* applied if *nrofHARQ-ProcessesForPDSCH* is provided, or with modulo operation of *nrofHARQ-ProcessesForPDSCH-v1700* applied if or *nrofHARQ-ProcessesForPDSCH-v1700* is provided, or with modulo operation of 8 applied, otherwise. HARQ process ID is not incremented for PDSCH(s) not received if at least one of the symbols indicated by the indexed row of the used resource allocation table in the slot overlaps with a UL symbol indicated by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* if provided. When a UE is configured by the higher layer parameter *repetitionScheme* set to 'tdmSchemeA', the PDSCH includes two PDSCH transmission occasions. For each PDSCH, if either PDSCH occasion overlaps with a UL symbol indicated by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* if provided, the PDSCH is not received and HARQ process ID is not increment for the PDSCH. For any HARQ process ID(s) in a given scheduled cell, the UE is not expected to receive a PDSCH that overlaps in time with another PDSCH if the UE is not capable of receiving FDMed unicast and multicast PDSCH per slot per carrier. When HARQ feedback for the HARQ process ID is not disabled, or for the HARQ process associated with the first SPS PDSCH when *HARQ-feedbackEnablingforSPSactive* is provided and enabled, the UE is not expected to receive another PDSCH for a given HARQ process until after the end of the expected transmission of HARQ-ACK for that HARQ process, where the timing is given by Clause 9.2.3 of [6, TS 38.213]. For HARQ-ACK subject to HARQ-ACK deferral described in Clause 9.2.5.4 of [6 TS 38.213], the expected transmission of HARQ-ACK corresponds to the expected transmission HARQ-ACK in a first slot. When HARQ feedback for the HARQ process ID is disabled, the UE is not expected to receive another PDCCH carrying a DCI scheduling a PDSCH or set of slot-aggregated PDSCH scheduled for the given HARQ process or to receive another PDSCH without corresponding PDCCH for the given HARQ process that starts until Tproc,1 after the end of the reception of the last PDSCH or slot-aggregated PDSCH for that HARQ process. Except for the case when a UE is configured by higher layer parameter *PDCCH-Config* that contains two different values of *coresetPoolIndex* in *ControlResourceSet* and PDCCHs that schedule two PDSCHs are associated to different *ControlResourceSets* having different values of *coresetPoolIndex* and the UE reports its capability of *outOfOrderOperationDL-r16,* in a given scheduled cell, the UE is not expected to receive a first PDSCH and a second PDSCH, starting later than the first PDSCH, with its corresponding HARQ-ACK assigned to be transmitted on a resource ending before the start of a different resource for the HARQ-ACK assigned to be transmitted for the first PDSCH, where the two resources are in different slots for the associated HARQ-ACK transmissions, each slot is composed of symbols [4] or a number of symbols indicated by *subslotLengthForPUCCH* if provided, and the HARQ-ACK for the two PDSCHs are associated with the HARQ-ACK codebook of the same priority. Except for the case when a UE is configured by higher layer parameter *PDCCH-Config* that contains two different values of *coresetPoolIndex* in *ControlResourceSet* and PDCCHs that schedule two PDSCHs are associated to different *ControlResourceSets* having different values of *coresetPoolIndex* and the UE reports its capability of *outOfOrderOperationDL-r16,* in a given scheduled cell, the UE is not expected to receive a first PDSCH and a second PDSCH, starting later than the first PDSCH, with its corresponding HARQ-ACK assigned to be transmitted on a resource ending before the start of a different resource for the HARQ-ACK assigned to be transmitted for the first PDSCH if the HARQ-ACK for the two PDSCHs are associated with HARQ-ACK codebooks of different priorities. For any two HARQ process IDs in a given scheduled cell, if the UE is scheduled to start receiving a first PDSCH starting in symbol *j* by a PDCCH ending in symbol *i* on a scheduling cell, the UE is not expected to be scheduled to receive a PDSCH starting earlier than the end of the first PDSCH with a PDCCH that ends later than symbol *i* of a scheduling cell,. When the PDCCH reception includes two PDCCH candidates from two respective search space sets, as described in clause 10.1 of [6, TS 38.213], the PDCCH ending in symbol *i* is determined based on the PDCCH candidate that ends later in time. In a given scheduled cell, for any PDSCH corresponding to SI-RNTI except for two inter-slot repetitions of PDSCHs scheduled by the DCI format 1\_0 in the Type0 PDCCH CSS of *searchSpaceZero*, the UE is not expected to decode a re-transmission of an earlier PDSCH with a starting symbol less than *N* symbols after the last symbol of that PDSCH, where the value of *N* depends on the PDSCH subcarrier spacing configuration *μ,* with *N*=13 for *μ*=0, *N*=13 for *μ*=1, *N*=20 for *μ*=2, *N*=24 for *μ*=3, *N*=96 for *m*=5, and *N*=192 for *m*=6.  **<Unchanged parts omitted>** |  * + **TP Alt2**  |  |  | | --- | --- | | ***Reason for change:*** | SIB1 PDSCH repetition introduced in R19 could be interpreted as a part of PDSCH retransmission corresponding to SI-RNTI. In this case, as described from R15, UE is not expected to decode the 2nd PDSCH as there is no sufficient time gap between the two PDSCHs. | | ***Summary of change:*** | It is clarified that the scheduling restriction is applied only to SIBs other than SIB1, i.e., only to cases with Type0A-PDCCH CSS. | | ***Consequences if not approved:*** | R19 SIB1 PDSCH repetition does not work as intended. |  |  | | --- | | 5.1 UE procedure for receiving the physical downlink shared channel  **<Unchanged parts omitted>**  A UE shall upon detection of a PDCCH with a configured DCI format 1\_0, 1\_1, 1\_2, 1\_3, 4\_0, 4\_1, or 4\_2 decode the corresponding PDSCHs as indicated by that DCI. When the UE is scheduled with multiple PDSCHs on a serving cell by a DCI, HARQ process ID indicated by this DCI applies to the first PDSCH not overlapping with a UL symbol indicated by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* if provided, HARQ process ID is then incremented by 1 for each subsequent PDSCH(s) in the scheduled order, with modulo operation of *nrofHARQ-ProcessesForPDSCH* applied if *nrofHARQ-ProcessesForPDSCH* is provided, or with modulo operation of *nrofHARQ-ProcessesForPDSCH-v1700* applied if or *nrofHARQ-ProcessesForPDSCH-v1700* is provided, or with modulo operation of 8 applied, otherwise. HARQ process ID is not incremented for PDSCH(s) not received if at least one of the symbols indicated by the indexed row of the used resource allocation table in the slot overlaps with a UL symbol indicated by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* if provided. When a UE is configured by the higher layer parameter *repetitionScheme* set to 'tdmSchemeA', the PDSCH includes two PDSCH transmission occasions. For each PDSCH, if either PDSCH occasion overlaps with a UL symbol indicated by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* if provided, the PDSCH is not received and HARQ process ID is not increment for the PDSCH. For any HARQ process ID(s) in a given scheduled cell, the UE is not expected to receive a PDSCH that overlaps in time with another PDSCH if the UE is not capable of receiving FDMed unicast and multicast PDSCH per slot per carrier. When HARQ feedback for the HARQ process ID is not disabled, or for the HARQ process associated with the first SPS PDSCH when *HARQ-feedbackEnablingforSPSactive* is provided and enabled, the UE is not expected to receive another PDSCH for a given HARQ process until after the end of the expected transmission of HARQ-ACK for that HARQ process, where the timing is given by Clause 9.2.3 of [6, TS 38.213]. For HARQ-ACK subject to HARQ-ACK deferral described in Clause 9.2.5.4 of [6 TS 38.213], the expected transmission of HARQ-ACK corresponds to the expected transmission HARQ-ACK in a first slot. When HARQ feedback for the HARQ process ID is disabled, the UE is not expected to receive another PDCCH carrying a DCI scheduling a PDSCH or set of slot-aggregated PDSCH scheduled for the given HARQ process or to receive another PDSCH without corresponding PDCCH for the given HARQ process that starts until Tproc,1 after the end of the reception of the last PDSCH or slot-aggregated PDSCH for that HARQ process. Except for the case when a UE is configured by higher layer parameter *PDCCH-Config* that contains two different values of *coresetPoolIndex* in *ControlResourceSet* and PDCCHs that schedule two PDSCHs are associated to different *ControlResourceSets* having different values of *coresetPoolIndex* and the UE reports its capability of *outOfOrderOperationDL-r16,* in a given scheduled cell, the UE is not expected to receive a first PDSCH and a second PDSCH, starting later than the first PDSCH, with its corresponding HARQ-ACK assigned to be transmitted on a resource ending before the start of a different resource for the HARQ-ACK assigned to be transmitted for the first PDSCH, where the two resources are in different slots for the associated HARQ-ACK transmissions, each slot is composed of symbols [4] or a number of symbols indicated by *subslotLengthForPUCCH* if provided, and the HARQ-ACK for the two PDSCHs are associated with the HARQ-ACK codebook of the same priority. Except for the case when a UE is configured by higher layer parameter *PDCCH-Config* that contains two different values of *coresetPoolIndex* in *ControlResourceSet* and PDCCHs that schedule two PDSCHs are associated to different *ControlResourceSets* having different values of *coresetPoolIndex* and the UE reports its capability of *outOfOrderOperationDL-r16,* in a given scheduled cell, the UE is not expected to receive a first PDSCH and a second PDSCH, starting later than the first PDSCH, with its corresponding HARQ-ACK assigned to be transmitted on a resource ending before the start of a different resource for the HARQ-ACK assigned to be transmitted for the first PDSCH if the HARQ-ACK for the two PDSCHs are associated with HARQ-ACK codebooks of different priorities. For any two HARQ process IDs in a given scheduled cell, if the UE is scheduled to start receiving a first PDSCH starting in symbol *j* by a PDCCH ending in symbol *i* on a scheduling cell, the UE is not expected to be scheduled to receive a PDSCH starting earlier than the end of the first PDSCH with a PDCCH that ends later than symbol *i* of a scheduling cell,. When the PDCCH reception includes two PDCCH candidates from two respective search space sets, as described in clause 10.1 of [6, TS 38.213], the PDCCH ending in symbol *i* is determined based on the PDCCH candidate that ends later in time. In a given scheduled cell, for any PDSCH corresponding to a DCI format with CRC scrambled by a SI-RNTI in a Type0A-PDCCH CSS set, the UE is not expected to decode a re-transmission of an earlier PDSCH with a starting symbol less than *N* symbols after the last symbol of that PDSCH, where the value of *N* depends on the PDSCH subcarrier spacing configuration *μ,* with *N*=13 for *μ*=0, *N*=13 for *μ*=1, *N*=20 for *μ*=2, *N*=24 for *μ*=3, *N*=96 for *m*=5, and *N*=192 for *m*=6.  **<Unchanged parts omitted>** | |

## Summary of companies’ contributions

**NTT DOCOMO** highlights a potential confusion in 3GPP specs between R19 SIB1 PDSCH repetition and the R15 SIB PDSCH retransmission with SI-RNTI. In R19, SIB1 PDSCH is repeated in consecutive slots with no HARQ feedback, while in R15, retransmissions require a minimum time gap between transmissions. The current specification does not clearly distinguish between “inter-slot repetition” (R19) and “retransmission” (R15), which could lead to misinterpretation and inadvertently prohibit the R19 feature due to R15 restrictions. **DOCOMO** proposes adding clarification in TS 38.214 to explicitly separate the two mechanisms and ensure R15 retransmission restrictions do not apply to R19 SIB1 PDSCH repetitions.

## Initial proposal

### Proposal 3-1

Based on the above discussion the following initial proposal is made

**Proposal 3-1-v0**

**Refer to NTT DOCOMO’s proposal**

Companies are encouraged comment on TP alt1 and TP alt2 proposed by DCM

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| **Companies** | **Comments** |
| DCM | Difference of “repetition”/“retransmission” in spec are unclear in our understanding. If there is a clear definition in spec, then we can skip this proposal; otherwise, at least some clarification should be agreed. |
| vivo | In our view, the context here is for the out-of-order scheduling, thus, the “re-transmission” here should be understood as a HARQ retx scheduled by another DCI differ from the initial scheduling DCI. While in the case of R19 SIB PDSCH repetitions, the repetitions are scheduled by a same DCI repeated in two slots, which is not the case discussed in this context. In the sense, the changes may not be needed. |

# Topic#4 On searchSpaceLinkingId-r19

## Companies’ contributions summary

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| **Companies** | **Proposals** |
| Oppo | **Proposal 1:** Put a statement that “Descriptions in clause 10.1 in TS 38.213, and in other clauses referring to this clause, are also applicable when the UE is provided *searchSpaceLinkingId-r19*, by replacing *searchSpaceLinkingId* by *searchSpaceLinkingId-r19*”, instead of adding the R19 parameter *searchSpaceLinkingId-r19* everywhere. |

## Summary of companies’ contributions

**OPPO** observes that there are some places in the current specification referring to the R17 parameter searchSpaceLinkingId, but missing the R19 parameter **searchSpaceLinkingId-r19**. Rather than adding **searchSpaceLinkingId-r19** throughout the specification (which would be repetitive and inefficient), OPPO proposes adding a clarifying statement in TS 38.213 clause 10.1: wherever **searchSpaceLinkingId** is referenced, it should also apply to **searchSpaceLinkingId-r19** for R19. This approach streamlines the spec update and ensures consistent interpretation for intra-slot PDCCH repetition in NR-NTN.

## Initial proposal

### Proposal 4-1

Based on the above discussion the following initial proposal is made

**Proposal 4-1-v0**

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| **Proposal 1: Add a statement that “Descriptions in clause 10.1 of TS 38.213, and elsewhere as referenced, also apply when the UE is provided searchSpaceLinkingId-r19, by substituting searchSpaceLinkingId with searchSpaceLinkingId-r19”.** |

Companies are encouraged to provide comments on Proposal 4-1-v0

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| **Companies** | **Comments** |
| DCM | Is there any missing part in the current 10.1 of 213? We are not sure whether this is essential. |
| vivo | This sentence may not be needed. Instead, we can simply refer the RRC parameter without the “rxx” postfix. |

# Topic#5 TBS determination of MCS mapping for PDCCH scheduling Msg4 repetitions

## Companies’ contributions summary

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| --- | --- |
| **Companies** | **Proposals** |
| Nokia | **Proposal 1: Adopt the following text proposal for TS38.214:**  **Reason for change:** Current implementation of activation indication for PDSCH repetitions for Msg4 is colliding with TBS indication for HARQ operation for Msg4.  **Consequence if not approved:** Scheduling of retransmissions for PDSCH carrying Msg4 may not be possible if the physical resources for retransmissions are changed compared to earlier transmissions.  **Text proposal for TS38.214:** 5.1.3.1 Modulation order and target code rate determination < Unchanged text omitted >  elseif the UE is configured with the higher layer parameter *mcs-Table* given by *SPS-Config* or *mcs-Table* of *pdsch-ConfigMulticast* in the same *CFR-ConfigMulticast* set to 'qam64LowSE'  - if the GC-PDSCH is scheduled by a GC-PDCCH with CRC scrambled by G-CS-RNTI or  - if the GC-PDSCH is scheduled without corresponding GC-PDCCH transmission using *SPS-Config*,  - the UE shall use *IMCS* and Table 5.1.3.1-3 to determine the modulation order (*Qm*) and Target code rate (*R*) used in the physical downlink shared channel.  elseif the UE has indicated support for [*pdsch-msg4AggregationFactor*] via Msg3, and the MSB of MCS field of the DCI format is ‘1’, and the value of the MCS Index *IMCS is less than 29,*  - the UE shall assume the MSB of MCS field to be ´0´, and the UE shall use *IMCS* and Table 5.1.3.1-1 to determine the modulation order (*Qm*) and Target code rate (*R*) used in the physical downlink shared channel.  else  - the UE shall use *IMCS* and Table 5.1.3.1-1 to determine the modulation order (*Qm*) and Target code rate (*R*) used in the physical downlink shared channel.  end  < Unchanged text omitted >  **Proposal 2: Adopt the following text proposal for TS38.214:**  **Reason for change:** Current implementation of activation indication for PDSCH repetitions for Msg4 is colliding with TBS indication for HARQ operation for Msg4.  **Consequence if not approved:** Scheduling of retransmissions for PDSCH carrying Msg4 may not be possible if the physical resources for retransmissions are changed compared to earlier transmissions.  **Text proposal for TS38.214:** 5.1.2.1 Resource allocation in time domain < Unchanged text omitted >  When receiving PDSCH scheduled by DCI format 1\_0 in PDCCH with CRC scrambled by TC-RNTI, if the UE is configured with [*pdsch-mgs4AggregationFactor]*, the UE has indicated support for [*pdsch-msg4AggregationFactor*] via Msg3, and the MSB of MCS field of the DCI format is ‘1’ and the value of the MCS Index *IMCS is less than 29,*, the same symbol allocation is applied across the [*pdsch-msg4AggregationFactor]* consecutive slots. The UE may expect that the TB is repeated within each symbol allocation among each of the [*pdsch-msg4AggregationFactor]* consecutive slots and the PDSCH is limited to a single transmission layer. The redundancy version to be applied on the *n*th transmission occasion of the TB, where n = 0, 1, …[*pdsch-msg4AggregationFactor]* -1, is determined according to table 5.1.2.1-2 and "*rvid* indicated by the DCI scheduling the PDSCH" in table 5.1.2.1-2 is provided by the DCI format.  < Unchanged text omitted > |

## Summary of companies’ contributions

**Nokia** identifies a conflict in the current specification regarding the use of the MCS index for scheduling Msg4 PDSCH repetitions. The agreed method leverages the MSB of the MCS index to indicate repetition activation, but this clashes with the reserved MCS indices (e.g., 29-31 in TS38.214 Table 5.1.3.1-1) used to signal that the UE should reuse a previous TBS for HARQ retransmissions.

**Nokia** observes that an alternative proposal (higher layer parameter [mcs-Msg4-Repetitions]) does not adequately resolve the issue, as it cannot indicate the reserved state and introduces overhead. To address this, **Nokia** proposes adjusting the implementation of the current agreement to ensure it remains possible to signal the reuse of an earlier TBS for HARQ retransmissions when using dynamic allocations for Msg4 PDSCH, thus maintaining HARQ functionality and alignment with resource constraints.

## Initial proposal

### Proposal 5-1

Based on the above discussion the following initial proposal is made

**Proposal 5-1-v0**

**Adopt the following text proposal for TS38.214**

|  |
| --- |
| **Reason for change:** Current implementation of activation indication for PDSCH repetitions for Msg4 is colliding with TBS indication for HARQ operation for Msg4.  **Consequence if not approved:** Scheduling of retransmissions for PDSCH carrying Msg4 may not be possible if the physical resources for retransmissions are changed compared to earlier transmissions.  **Text proposal for TS38.214:** 5.1.3.1 Modulation order and target code rate determination < Unchanged text omitted >  elseif the UE is configured with the higher layer parameter *mcs-Table* given by *SPS-Config* or *mcs-Table* of *pdsch-ConfigMulticast* in the same *CFR-ConfigMulticast* set to 'qam64LowSE'  - if the GC-PDSCH is scheduled by a GC-PDCCH with CRC scrambled by G-CS-RNTI or  - if the GC-PDSCH is scheduled without corresponding GC-PDCCH transmission using *SPS-Config*,  - the UE shall use *IMCS* and Table 5.1.3.1-3 to determine the modulation order (*Qm*) and Target code rate (*R*) used in the physical downlink shared channel.  elseif the UE has indicated support for [*pdsch-msg4AggregationFactor*] via Msg3, and the MSB of MCS field of the DCI format is ‘1’, and the value of the MCS Index *IMCS is less than 29,*  - the UE shall assume the MSB of MCS field to be ´0´, and the UE shall use *IMCS* and Table 5.1.3.1-1 to determine the modulation order (*Qm*) and Target code rate (*R*) used in the physical downlink shared channel.  else  - the UE shall use *IMCS* and Table 5.1.3.1-1 to determine the modulation order (*Qm*) and Target code rate (*R*) used in the physical downlink shared channel.  end  < Unchanged text omitted > |

Companies are encouraged to provide comments on Proposal 5-1-v0

|  |  |
| --- | --- |
| **Companies** | **Comments** |
| DCM | When the MSB is ‘1’, then the value is interpreted as ‘0’ by the sub-bullet. This means the original indication value can be such as 11111 that can be interpreted as 01111. The added condition seems to be incorrect. |
| vivo | We don’t think this enhancement is necessary. Without this enhancement, the network can still schedule the MSG4 repetition, e.g., using different MCS as along as the TBS is unchanged. |

### Proposal 5-2

**Proposal 5-2-v0**

**Adopt the following text proposal for TS38.214**

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| --- |
| **Reason for change:** Current implementation of activation indication for PDSCH repetitions for Msg4 is colliding with TBS indication for HARQ operation for Msg4.  **Consequence if not approved:** Scheduling of retransmissions for PDSCH carrying Msg4 may not be possible if the physical resources for retransmissions are changed compared to earlier transmissions.  **Text proposal for TS38.214:** 5.1.2.1 Resource allocation in time domain < Unchanged text omitted >  When receiving PDSCH scheduled by DCI format 1\_0 in PDCCH with CRC scrambled by TC-RNTI, if the UE is configured with [*pdsch-mgs4AggregationFactor]*, the UE has indicated support for [*pdsch-msg4AggregationFactor*] via Msg3, and the MSB of MCS field of the DCI format is ‘1’ and the value of the MCS Index *IMCS is less than 29,*, the same symbol allocation is applied across the [*pdsch-msg4AggregationFactor]* consecutive slots. The UE may expect that the TB is repeated within each symbol allocation among each of the [*pdsch-msg4AggregationFactor]* consecutive slots and the PDSCH is limited to a single transmission layer. The redundancy version to be applied on the *n*th transmission occasion of the TB, where n = 0, 1, …[*pdsch-msg4AggregationFactor]* -1, is determined according to table 5.1.2.1-2 and "*rvid* indicated by the DCI scheduling the PDSCH" in table 5.1.2.1-2 is provided by the DCI format.  < Unchanged text omitted > |

Companies are encouraged to comment on Proposal 5-2-v0

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| --- | --- |
| **Companies** | **Comments** |
| DCM | Similar comment above. |
| vivo | Same comment as P5-1. |
|  |  |

# Topic#6 Indication of support for msg4-NumberofRepetitions

## Companies’ contributions summary

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| --- | --- |
| **Companies** | **Proposals** |
| Nokia | **Proposal 3:** Update specification text to also have Msg 3 PUSCH retransmission carry indication of support for *msg4-NumberofRepetitions*.  **Proposal 4:** Adopt the following text proposal for TS38.213:  **Reason for change:** In current specification text there is no capturing of UE indicating support for Msg4 PDSCH repetitions as part of the Msg3 PUSCH if this is provided as a Msg3 retransmission.  **Consequence if not approved:** UE may not be able to indicate support for Msg4 retransmissions if the UE is having to provide retransmissions of Msg3.  **Text proposal for TS38.213:** 8.4 PDSCH with UE contention resolution identity In response to a PUSCH transmission scheduled by a RAR UL grant or corresponding PUSCH retransmission scheduled by a DCI format 0\_0 with CRC scrambled by a TC-RNTI provided in the corresponding RAR message when a UE has not been provided a C-RNTI, the UE attempts to detect a DCI format 1\_0 with CRC scrambled by a corresponding TC-RNTI scheduling a PDSCH that includes a UE contention resolution identity [11, TS 38.321]. If *SIB1* provides *msg4-NumberofRepetitions*, the UE may indicate FG-XYZ in the PUSCH transmission or in a corresponding PUSCH retransmission scheduled by a DCI format 0\_0 with CRC scrambled by a TC-RNTI provided in the corresponding RAR message when a UE has not been provided a C-RNTI.  < Unchanged text omitted > |

## Summary of companies’ contributions

**Nokia** points out an inconsistency in TS38.213 clause 8.4 regarding how the UE can indicate its support for msg4-NumberofRepetitions. While the specification clearly distinguishes between Msg3 PUSCH transmission and retransmission, it currently allows the indication of this capability only in initial PUSCH transmissions, not retransmissions. To resolve this, Nokia proposes updating the specification to allow Msg3 PUSCH retransmissions to also carry the indication of support for msg4-NumberofRepetitions, ensuring clearer capability signaling regardless of transmission attempt.

## Initial proposal

### Proposal 6-1

Based on the above discussion the following initial proposal is made

**Proposal 6-1-v0**

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| --- |
| **Update specification text to also have Msg 3 PUSCH retransmission carry indication of support for *msg4-NumberofRepetitions*.** |

Companies are encouraged to provide comments on Proposal 6-1-v0

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| --- | --- |
| **Companies** | **Comments** |
| DCM |  |
| vivo | This proposal is not necessary. The TB content is always same between the initial transmission and retransmission, including the capability report. |

### Proposal 6-2

Based on the above discussion the following initial proposal is made

**Proposal 6-2-v0**

**Adopt the following text proposal for TS38.213:**

**Reason for change:** In current specification text there is no capturing of UE indicating support for Msg4 PDSCH repetitions as part of the Msg3 PUSCH if this is provided as a Msg3 retransmission.

**Consequence if not approved:** UE may not be able to indicate support for Msg4 retransmissions if the UE is having to provide retransmissions of Msg3.

**Text proposal for TS38.213:**

## 8.4 PDSCH with UE contention resolution identity

In response to a PUSCH transmission scheduled by a RAR UL grant or corresponding PUSCH retransmission scheduled by a DCI format 0\_0 with CRC scrambled by a TC-RNTI provided in the corresponding RAR message when a UE has not been provided a C-RNTI, the UE attempts to detect a DCI format 1\_0 with CRC scrambled by a corresponding TC-RNTI scheduling a PDSCH that includes a UE contention resolution identity [11, TS 38.321]. If *SIB1* provides *msg4-NumberofRepetitions*, the UE may indicate FG-XYZ in the PUSCH transmission or in a corresponding PUSCH retransmission scheduled by a DCI format 0\_0 with CRC scrambled by a TC-RNTI provided in the corresponding RAR message when a UE has not been provided a C-RNTI.

< Unchanged text omitted >

Companies are encouraged to provide comments on Proposal 6-2-v0

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| --- | --- |
| **Companies** | **Comments** |
| DCM | “the PUSCH transmission” of the right before the update includes the update part of “corresponding PUSCH retransmission scheduled by a DCI format 0\_0 with CRC scrambled by a TC-RNTI provided in the corresponding RAR message when a UE has not been provided a C-RNTI”, in our understanding. In this case, no update is necessary. |
| vivo | This TP is not needed. |

# Topic#7 PDCCH repetition for CSS type 3 and USS

## Companies’ contributions summary

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| --- | --- |
| **Companies** | **Proposals** |
| NTT DOCOMO | **Proposal 3:**   * **For PDCCH repetition for CSS type 3 and USS,**   + **BD is counted as one or two, subject to UE capability.** * **Adopt the following TP for TS 38.213.**  |  |  | | --- | --- | | ***Reason for change:*** | For BD counting rule of PDCCH repetition for CSS type 3 and USS, the same rule as agreed for intra-slot PDCCH repetition for CSS type 0A/0B/1/1A/2/2A is reasonable as the existing specifications of the PDCCH repetition have been designed for M-TRP case. | | ***Summary of change:*** | For PDCCH repetition for CSS type 3 and USS, BD is counted as 1 or 2, subject to UE capability. | | ***Consequences if not approved:*** | For PDCCH repetition for CSS type 3 and USS, excessive number of BDs is counted, which leads to unrequired scheduling burden. |  |  | | --- | | 10.1 UE procedure for determining physical downlink control channel assignment  **<Unchanged parts omitted>**  For search space sets and that include *searchSpaceLinkingId* or *searchSpaceLinkingId-r19* with same value, a UE monitors, in monitoring occasions with same index according to each of search space sets and in a slot, PDCCH candidates and , with , for detection of a DCI format with same information. The UE expects , , , and a same number of non-overlapping PDCCH monitoring occasions per slot based on corresponding *monitoringSymbolsWithinSlot*, for search space sets and .  For CORESET associated with the search space set and for CORESET associated with the search space set , the UE is provided *tci-PresentInDCI* or *tci-PresentDCI-1-2 for* either none or both of CORESETs and *.* For CORESET associated with the search space set and for CORESET associated with the search space set , the UE is either not provided *coresetPoolIndex* value of 1 for any of the two CORESETs, or is provided *coresetPoolIndex* value of 1 for both CORESETs*.*  *A UE can indicate by numBD-twoPDCCH a capability for counting* PDCCH candidates and  *associated with searchSpaceLinkingId either as 2 PDCCH candidates or as 3 PDCCH candidates*, or by [UE capability] a capability for countingPDCCH candidates and either as 1 PDCCH candidate or as 2 PDCCH candidates*.*  A UE can indicate by *numBD-twoPDCCH-r19* a capability for counting PDCCH candidates and *associated with searchSpaceLinkingId-r19* either as 1 PDCCH candidate or as 2 PDCCH candidates.  **<Unchanged parts omitted>** | |

## Summary of companies’ contributions

**NTT DOCOMO** asserts that PDCCH repetition for CSS type 3 and USS is within the scope of R19 and should not be excluded. Currently, UE can report BD counting capability as 2 or 3 for these cases, but this is unsuitable for R19 NTN, where soft-combining is used and only a single decoding is needed for repeated PDCCHs in single-TRP scenarios. **DOCOMO** proposes aligning CSS type 3 and USS UE BD counting capability with other CSS types (0A/0B/1/1A/1B/2/2A), allowing values of 1 or 2, instead of higher limits, to better suit R19 NTN requirements.

## Initial proposal

### Proposal 7-1

**Proposal 7-1-v0**

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| --- |
| **For PDCCH repetition for CSS type 3 and USS,**   * + **BD is counted as one or two, subject to UE capability.** |

Companies are encouraged to comment on Proposal 7-1-v0

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| **Companies** | **Comments** |
| DCM | We believe that this is a necessary change. |
| vivo | We are open to discuss the necessity of this proposal. On the other hand, it seems the system can still work if 2 or 3 BC is still counted for type-3 CSS & USS, right? |

### Proposal 7-2

**Proposal 7-2-v0**

**Adopt the following TP for TS 38.213.**

|  |  |
| --- | --- |
| **Reason for change:** | For BD counting rule of PDCCH repetition for CSS type 3 and USS, the same rule as agreed for intra-slot PDCCH repetition for CSS type 0A/0B/1/1A/2/2A is reasonable as the existing specifications of the PDCCH repetition have been designed for M-TRP case. |
| **Summary of change:** | For PDCCH repetition for CSS type 3 and USS, BD is counted as 1 or 2, subject to UE capability. |
| **Consequences if not approved:** | For PDCCH repetition for CSS type 3 and USS, excessive number of BDs is counted, which leads to unrequired scheduling burden. |

|  |
| --- |
| 10.1 UE procedure for determining physical downlink control channel assignment  **<Unchanged parts omitted>**  For search space sets and that include *searchSpaceLinkingId* or *searchSpaceLinkingId-r19* with same value, a UE monitors, in monitoring occasions with same index according to each of search space sets and in a slot, PDCCH candidates and , with , for detection of a DCI format with same information. The UE expects , , , and a same number of non-overlapping PDCCH monitoring occasions per slot based on corresponding *monitoringSymbolsWithinSlot*, for search space sets and .  For CORESET associated with the search space set and for CORESET associated with the search space set , the UE is provided *tci-PresentInDCI* or *tci-PresentDCI-1-2 for* either none or both of CORESETs and *.* For CORESET associated with the search space set and for CORESET associated with the search space set , the UE is either not provided *coresetPoolIndex* value of 1 for any of the two CORESETs, or is provided *coresetPoolIndex* value of 1 for both CORESETs*.*  *A UE can indicate by numBD-twoPDCCH a capability for counting* PDCCH candidates and  *associated with searchSpaceLinkingId either as 2 PDCCH candidates or as 3 PDCCH candidates*, or by [UE capability] a capability for countingPDCCH candidates and either as 1 PDCCH candidate or as 2 PDCCH candidates*.*  A UE can indicate by *numBD-twoPDCCH-r19* a capability for counting PDCCH candidates and *associated with searchSpaceLinkingId-r19* either as 1 PDCCH candidate or as 2 PDCCH candidates.  **<Unchanged parts omitted>** |

Companies are encouraged to share views on Proposal 7-2-v0

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| **Companies** | **Comments** |
|  |  |
|  |  |

# Conclusion

# References

R1-2506786 Maintenance for Rel-19 NR-NTN Ericsson

R1-2506799 Remaining issues on NR-NTN Spreadtrum, UNISOC

R1-2506877 Maintenance on Rel-19 NR NTN vivo

R1-2506910 Remaining issues on Rel-19 NR NTN ZTE Corporation, Sanechips

R1-2506936 Maintenance for Rel-19 NR NTN Huawei, HiSilicon

R1-2506967 Maintenance for Rel-19 NR NTN Xiaomi

R1-2507123 Maintenance for Rel-19 NR NTN CATT

R1-2507139 Maintenance for Rel-19 NR NTN OPPO

R1-2507233 Maintenance for Rel-19 NR NTN Samsung

R1-2507533 Maintenance of uplink capacity/throughput enhancement for Rel.19 NR-NTN Ph3 Panasonic

R1-2507559 Discussion on Maintenance for Rel-19 NR NTN Nokia

R1-2507700 Maintenance for Rel-19 NR NTN Qualcomm Incorporated

R1-2507794 Maintenance of R19 NR-NTN NTT DOCOMO, INC.