**3GPP TSG RAN WG1 #110bis-e R1-2210423**

**e-Meeting, October 10th – 19th, 2022**

**Agenda item:** 8.16.1

**Source:** Moderator (NTT DOCOMO, INC.)

**Title:** Summary#2 on UE features for NR MBS

**Document for:** Discussion and Decision

# **Introduction**

This document summarizes contributions submitted to AI 8.16.1 regarding UE features for NR MBS and captures company views based on the announcement in the following email thread.

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| [110bis-e-R17-UE-features-01] Email discussion on Rel-17 UE features topics 1 by October 19 – Hiroki (NTT DOCOMO)   * eIIoT & URLLC, RedCap, UE power saving, coverage enhancement, NB-IoT & eMTC, sidelink, MBS, 5G terrestrial broadcast, UL TX switching, SDT |

Based on the latest RAN1 UE features list in [1] and contributions in AI 8.16.1, the issues to be discussed are tagged and colour coded with High priority or Low priority based on potential RAN2 spec impact (including description update in TS38.306).

# **Discussion**

## **2.1 33-1: Broadcast**

In [1], FG 33-1 is captured as below.

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| 33. NR\_MBS | 33-1 | Broadcast | 1. Support of group-common PDCCH/PDSCH with CRC scrambled by MCCH-RNTI.  2. Support of group-common PDCCH/PDSCH with CRC scrambled by G-RNTI.  3. Support of CFR configuration for broadcast.  4. Support of CORESET and common search space for broadcast.  5. Support of DCI format 4\_0 with CRC scrambled with G-RNTI/MCCH-RNTI for broadcast.  6. Support of inter-slot TDM between unicast PDSCH and group-common PDSCH in different slots.  7. Support MCCH change notification indication via DCI.  8. support of higher layer configured slot-level repetition up to 8 for MTCH |  | Up to RAN2 |  |  | Up to RAN2 | Up to RAN2 | Up to RAN2 |  | It is up to RAN2 whether/how to introduce the capability for support of N > 1 G-RNTIs for broadcast for a UE | Up to RAN2 |

Following views are provided in contributions for the RAN1#110bis-e meeting.

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| [2] | Huawei, HiSilicon | MBS broadcast includes MCCH and MTCH, both of which will be scheduled by G-RNTI. The 6th component needs to clarify that group-common PDSCH including MCCH and MTCH will be TDM-ed or either one will be TDM-ed with unicast in different slots.  It was proposed to have two additional components to be included in FG33-1 regarding rate matching   * Support of semi-static rate-matching resource set configuration. * Support of rate-matching around LTE CRS.   It was concerned to directly include such two bullets but instead was suggested to add “A UE supporting FG 33-1 must indicate support of FGs 5-26 and 5-28 for broadcast” in the column of note to clarify the rate matching capabilities are the ones mandatory support in Rel-15. This suggestion can be taken for approval in this meeting.  ***Proposal 2: Updating FG33-1 and FG33-1-2 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-1 | Broadcast | 1. Support of group-common PDCCH/PDSCH with CRC scrambled by MCCH-RNTI.  2. Support of group-common PDCCH/PDSCH with CRC scrambled by G-RNTI.  3. Support of CFR configuration for broadcast.  4. Support of CORESET and common search space for broadcast.  5. Support of DCI format 1\_0 with CRC scrambled with G-RNTI/MCCH-RNTI for broadcast.  6. Support of inter-slot TDM between unicast PDSCH and MCCH group-common PDSCH or MTCH group-common PDSCH, or between MCCH group-common PDSCH and MTCH group-common PDSCH, or among unicast PDSCH and MCCH group-common PDSCH and MTCH group-common PDSCH in different slots.  7. Support MCCH change notification indication via DCI.  8. support of higher layer configured slot-level repetition up to 8 for MTCH. |  | Up to RAN2 |  |  | Up to RAN2 | Up to RAN2 | Up to RAN2 |  | It is up to RAN2 whether/how to introduce the capability for support of N > 1 G-RNTIs for broadcast for a UE.  Note: A UE supporting FG 33-1 must indicate support of FGs 5-26 and 5-28 for broadcast. | Up to RAN2 | |
| [6] | MediaTek | Considering the concept of group-common PDCCH/PDSCH is used for broadcast and multicast and it only state “group-common PDCCH/PDSCH” in some FG, it may cause some confusing, e.g., which means for broadcast or multicast? Therefore, we want to clarify the concept more clearly with some constrains, e.g., group-common PDCCH/PDSCH for multicast or broadcast, respectively.  *Proposal 1: For FG component description, clarify the wording of group-common PDCCH/PDSCH more clearly for broadcast and multicast respectively, e.g., group-common PDCCH/PDSCH for multicast or broadcast.*  Regarding the CFR number for broadcast reception, it is no clear motivation to support multiple CFR. We had agreed that the number of CFRs for multicast is no more than one, and the corresponding agreement is copied as following. We suggest the similar mechanism can be reused for broadcast reception since we also have agreed that the CFR frequency for MCCH and MTCH can be configured by SIBx.   |  | | --- | | Agreement:  The number of CFRs for multicast is no more than one per dedicated unicast BWP in Rel-17.  Agreement  For broadcast reception with RRC\_IDLE/RRC\_INACTIVE UEs:   * The CFR frequency resources used for MCCH and MTCH are configured by SIBx; |   ***Proposal 2: For FG 33-1, adding a note that “For component 3, only one CFR frequency resource is supported for broadcast and the CFR frequency resource is configured by SIBx”.***  Regarding whether it is optional with or without capability signalling for FG 33-1 and whether/how to introduce the capability for support of N > 1 G-RNTIs for broadcast for a UE, the decision is up to RAN2 based on previous discussion conclusion. These issues were discussed in previous meeting and the following agreements were achieved in RAN2#118-e, RAN2#119-e, re:   * **Introduce the UE capability for MBS broadcast reception as an optional feature without capability signalling and add to chapter 5 in 38.306 (can be revisited if needed based on P4)** * **No need to define additional UE capability for MBS broadcast reception in terms of higher number of G-RNTIs.**   So, the following proposals were raised to reflect the RAN2’s decision:  ***Proposal 3: For FG 33-1, the column of “Mandatory/Optional” should be updated as “Optional without UE capability reporting”.***  ***Proposal 4: For FG 33-1, deleting “It is up to RAN2 whether/how to introduce the capability for support of N > 1 G-RNTIs for broadcast for a UE” in the Note column and add ”only one G-NRTI is supported for broadcast reception” in the main component.***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-1 | Broadcast | 1. Support of group-common PDCCH/PDSCH for broadcast with CRC scrambled by MCCH-RNTI.  2. Support of group-common PDCCH/PDSCH for broadcast with CRC scrambled by G-RNTI.  3. Support of CFR configuration for broadcast.  4. Support of CORESET and common search space for broadcast.  5. Support of DCI format 4\_0 with CRC scrambled with G-RNTI/MCCH-RNTI for broadcast.  6. Support of inter-slot TDM between unicast PDSCH and group-common PDSCH in different slots.  7. Support MCCH change notification indication via DCI.  8. support of higher layer configured slot-level repetition up to 8 for MTCH  9.Only one G-RNTI is supported for broadcast reception. |  | Up to RAN2 |  |  | Up to RAN2 | Up to RAN2 | Up to RAN2 |  | For component 3, only one CFR frequency resource is supported for broadcast and the CFR frequency resource is configured by SIBx | Optional without capability signalling | |
| [8] | Qualcomm | We suggest minor changes on FG 33-1 as:   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-1 | Broadcast | 1. Support of group-common PDCCH/PDSCH with CRC scrambled by MCCH-RNTI.  2. Support of group-common PDCCH/PDSCH with CRC scrambled by G-RNTI(s) for MTCH.  3. Support of CFR configuration for broadcast.  4. Support of CORESET and common search space for broadcast.  5. Support of DCI format 4\_0 with CRC scrambled with G-RNTI/MCCH-RNTI for broadcast.  6. Support of inter-slot TDM between unicast PDSCH and group-common PDSCH in different slots.  7. Support MCCH change notification indication via DCI.  8. support of higher layer configured slot-level repetition up to 8 for MTCH  9. support of FDMed MCCH and PBCH  10. support of up to 64QAM for FR1/FR2 |  | Up to RAN2 |  |  | Up to RAN2 | Up to RAN2 | Up to RAN2 |  | It is up to RAN2 whether/how to introduce the capability for support of N > 1 G-RNTIs for broadcast for a UE | Up to RAN2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-1-3 | Support of 256QAM for broadcast PDSCH in FR1 | 1. For FR1, up to 256QAM is supported | 33-1 | Yes |  |  | Per band | N/A | N/A |  |  | Optional with capability signalling | |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

**High priority proposal 2-1-1:**

* **Components of FG 33-1 are revised as**
  + **Component 1: Support of group-common PDCCH/PDSCH for broadcast with CRC scrambled by MCCH-RNTI. [6]**
  + **Component 2: Support of group-common PDCCH/PDSCH for broadcast with CRC scrambled by G-RNTI(s) for MTCH. [6, 8]**
  + **Component 6: Support of inter-slot TDM between unicast PDSCH and MCCH group-common PDSCH or MTCH group-common PDSCH, or between MCCH group-common PDSCH and MTCH group-common PDSCH, or among unicast PDSCH and MCCH group-common PDSCH and MTCH group-common PDSCH in different slots [2]**
  + **Add a component “Only one G-RNTI is supported for broadcast reception” [6]**
  + **Add a component “Support of FDMed MCCH and PBCH” [8]**
  + **Add a component “Support of up to 64QAM for FR1/FR2” [8]**

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| Company | Comment |
| Huawei, HiSilicon | ok |
| Samsung | OK |
| ZTE | Generally fine with the proposal except for the 4th bullet. One question for clarification, have we agreed that only one G-RNTI for broadcast is supported per UE? If yes, then we are fine to have this new component. |
| NTT DOCOMO | OK |
| Spreadtrum | Ok |
| LG Electronics | OK |
| MTK | Ok for the proposal. Regarding the ZTE’s question, RAN2 has agreed that “**No need to define additional UE capability for MBS broadcast reception in terms of higher number of G-RNTIs**” when they discussed RAN1’s note that “It is up to RAN2 whether/how to introduce the capability for support of N > 1 G-RNTIs for broadcast for a UE”. Thus only one G-NRIT is used for the broadcast is common understanding. |
| vivo | ok |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems the proposal is agreeable. |
| Moderator (NTT DOCOMO) | Following agreement was made at Tuesday GTW session.  **Agreement:**   * Components of FG 33-1 are revised as   + Component 1: Support of group-common PDCCH/PDSCH for broadcast with CRC scrambled by MCCH-RNTI.   + Component 2: Support of group-common PDCCH/PDSCH for broadcast with CRC scrambled by G-RNTI(s) for MTCH.   + Component 6: Support of inter-slot TDM between unicast PDSCH and MCCH group-common PDSCH or MTCH group-common PDSCH, or between MCCH group-common PDSCH and MTCH group-common PDSCH, or among unicast PDSCH and MCCH group-common PDSCH and MTCH group-common PDSCH in different slots   + Add a component “One G-RNTI per UE is supported for broadcast reception”   + Add a component “Support of FDMed MCCH and PBCH”   + Add a component “Support of up to 64QAM for FR1/FR2” |

### **(N)High priority proposal 2-1-2:**

* **Introduce an FG for** **support of 256QAM for broadcast PDSCH in FR1. [8]**

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| 33. NR\_MBS | 33-1-3 | Support of 256QAM for broadcast PDSCH in FR1 | 1. For FR1, up to 256QAM is supported | 33-1 | Yes |  |  | Per band | N/A | N/A |  |  | Optional with capability signalling |

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| Company | Comment |
| Huawei, HiSilicon | Since we are assuming idle and connected UEs will receive the same broadcast given the configurations for receiving broadcast come from SIB/MCCH, it does not seem meaningful to report this FG just to be used for connected UEs to receive broadcast. |
| Samsung | Agree with Huawei |
| Qualcomm | It is optional FG, similar as FG33-1-1  Also, there may be different types of UEs, who can optionally support 256QAM for broadcast. If not, the UE just ignores the broadcast transmission with 256QAM. |
| ZTE | Similar view as Huawei. |
| Spreadtrum | Agree with Huawei |
| Nokia, NSB | These optional FGs for broadcast are not useful, as the network cannot take advantage of them in vast majority of practical scenarios. If added, this FG should be restricted to UEs in RRC\_CONNECTED then, as otherwise the gNB cannot know if any UE in its coverage area supports the feature. We are ok not to define it at all either. |
| LG Electronics | Agree with Huawei |
| MTK | Seems ok based on QC’s clarification. |
| Apple | Agree with Huawei |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems there is no consensus to introduce the proposed new FG. |
| Ericsson | Similar view as Nokia, it seems that this would not be useful unless all UEs in coverage are assumed to have reported whether the feature is supported, which is not practical. |

### **Low priority proposal 2-1-3:**

* **Add a note that “A UE supporting FG 33-1 must indicate support of FGs 5-26 and 5-28 for broadcast.” [2]**
* **Add a note that “For component 3, only one CFR frequency resource is supported for broadcast and the CFR frequency resource is configured by SIBx” [6]**

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| Company | Comment |
| Samsung | The notes are not necessary. |
| Nokia, NSB | Do not support. |
| Apple | Notes are not necessary. |
| Ericsson | For the first note, it seems strange to say that a FG without capability signalling requires the UE should indicate another capability. We’re fine rewording the note saying the network assumes the FGs 5-26 and 5-28 are supported, or removing it  For the second note, we agree with other it is not necessary. |

## **2.2 33-1-2: FDM-ed unicast PDSCH and group-common PDSCH for broadcast**

In [1], FG 33-1-2 is captured as below.

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| 33. NR\_MBS | 33-1-2 | FDM-ed unicast PDSCH and group-common PDSCH for broadcast | 1. Support FDM between one unicast PDSCH and one group-common PDSCH for broadcast in RRC CONNECTED mode in a slot. | 33-1 | Yes |  |  | FFS | FFS | FFS |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| [2] | Huawei, HiSilicon | It was agreed in RAN#97e that FG33-1-2 is reported per FSPC with NA for “Need of FDD/TDD differentiation” and for “Need of FR1/FR2 differentiation” [2].  ***Proposal 2: Updating FG33-1 and FG33-1-2 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-1-2 | FDM-ed unicast PDSCH and group-common PDSCH for broadcast | 1. Support FDM between one unicast PDSCH and one group-common PDSCH for broadcast in RRC CONNECTED mode in a slot. | 33-1 | Yes |  |  | FSPC | NA | NA |  |  | Optional with capability signalling | |
| [6] | MediaTek | ***Proposal 5: Updated the FG 33-1-2 and FG 33-3-2 as following:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-1-2 | FDM-ed unicast PDSCH and group-common PDSCH for broadcast | 1. Support FDM between one unicast PDSCH and one group-common PDSCH for broadcast in RRC CONNECTED mode in a slot. | 33-1 | Yes |  |  | Per FSPC | N/A | N/A |  |  | Optional with capability signalling | |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

**High priority** **proposal 2-2-1:**

* **The reporting type of FG 33-1-2 is per FSPC.**

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| Company | Comment |
| Moderator (NTT DOCOMO) | This was agreed in RAN#97-e. No need discussion. |
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## **2.3 33-2: Dynamic scheduling for multicast for Pcell**

In [1], FG 33-2 is captured as below.

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| 33. NR\_MBS | 33-2 | Dynamic scheduling for multicast for PCell | 1. Support of group-common PDCCH/PDSCH with CRC scrambled by G-RNTI for PCell.  2. Support of CFR configuration for multicast.  3. Support of CORESET and common search space configuration for multicast.  4. Support of DCI format 4\_1 with CRC scrambled with G-RNTI for multicast.  5. Support of inter-slot TDM between unicast PDSCH and group-common PDSCH in different slots.  6. Support {2, 4, 8} times semi-static slot-level repetition for group-common PDSCH for multicast |  | Yes |  |  | Per FS | N/A | N/A |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| [2] | Huawei, HiSilicon | When considering UE capability for supporting both multicast and broadcast, it would be preferred to describe it in FG for multicast instead of defining additional FG for supporting both. For example, for the 5th component of inter-slot TDM between unicast PDSCH and group-common PDSCH in different slots where the group-common PDSCH is intended for multicast, it could be updated to consider broadcast group-common PDSCH as well if UE supports FG33-1.  ***Proposal 3: Updating FG33-2/2h/2i as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-2 | Dynamic scheduling for multicast for PCell | 1. Support of group-common PDCCH/PDSCH with CRC scrambled by G-RNTI for PCell.  2. Support of CFR configuration for multicast.  3. Support of CORESET and common search space configuration for multicast.  4. Support of DCI format 4\_1 with CRC scrambled with G-RNTI for multicast.  5. Support of inter-slot TDM between unicast PDSCH and group-common PDSCH for multicast, or between group-common PDSCH for multicast and group-common PDSCH for broadcast (if UE supports FG33-1), or among unicast PDSCH and group-common PDSCH for multicast and group-common PDSCH for broadcast (if UE supports FG33-1) in different slots.  6. Support {2, 4, 8} times semi-static slot-level repetition for group-common PDSCH for multicast |  | Yes |  |  | Per FS | N/A | N/A |  |  | Optional with capability signalling | |
| [6] | MediaTek | Considering the concept of group-common PDCCH/PDSCH is used for broadcast and multicast and it only state “group-common PDCCH/PDSCH” in some FG, it may cause some confusing, e.g., which means for broadcast or multicast? Therefore, we want to clarify the concept more clearly with some constrains, e.g., group-common PDCCH/PDSCH for multicast or broadcast, respectively.  *Proposal 1: For FG component description, clarify the wording of group-common PDCCH/PDSCH more clearly for broadcast and multicast respectively, e.g., group-common PDCCH/PDSCH for multicast or broadcast.*  Regarding the CFR number for multicast reception, the following agreement was achieved in previous RAN1 meeting:   |  | | --- | | Agreement:  The number of CFRs for multicast is no more than one per dedicated unicast BWP in Rel-17. |   Thus, we prefer to update the 2nd component based on the latest agreement.  *Proposal 6: For FG 33-2, adding a note that “for component 2, up to one CFR is supported for multicast reception”.*  Regarding the multicast service reception on SCell, the following agreement was achieved in previous meeting:   |  | | --- | | **Agreement**: If UE supports carrier aggregation for unicast, multicast reception on an activated SCell with self-scheduling is supported subject to UE capability in Rel-17.   * UE is not expected to be configured simultaneously with more than one component carrier for multicast reception. * Cross-carrier scheduling for multicast reception is not supported in Rel-17. * The capability of supporting MBS multicast on SCell is a separate capability from the CA capability for unicast.   + The granularity of UE reporting the capability of supporting MBS multicast reception is per FSPC |   The part of the agreements has been reflected in the updated UE features after RAN1#108-e, however, some descriptions are not clear in [1]. For example, there is not any sentence to reflect this restriction that “UE is not expected to be configured simultaneously with more than one component carrier for multicast reception.” Thus, we suggest adding a note to reflect the agreement for both FG 33-2 and FG 33-2h.  *Proposal 7: For FG 33-2, adding a note that “UE is not expected to be configured simultaneously with more than one component carrier for multicast reception”.*   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-2 | Dynamic scheduling for multicast for PCell | 1. Support of group-common PDCCH/PDSCH for multicastwith CRC scrambled by G-RNTI for PCell.  2. Support of CFR configuration for multicast.  3. Support of CORESET and common search space configuration for multicast.  4. Support of DCI format 4\_1 with CRC scrambled with G-RNTI for multicast.  5. Support of inter-slot TDM between unicast PDSCH and group-common PDSCH for multicast in different slots.  6. Support {2, 4, 8} times semi-static slot-level repetition for group-common PDSCH for multicast |  | Yes |  |  | Per FS | N/A | N/A |  | Note 1: UE is not expected to be configured simultaneously with more than one component carrier for multicast reception  Note2: for component 2, up to one CFR is supported for multicast reception | Optional with capability signalling | |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

**High priority proposal 2-3-1:**

* **Components of FG 33-2 are revised as**
  + **Component 1: Support of group-common PDCCH/PDSCH for multicast with CRC scrambled by G-RNTI for PCell. [6]**
  + **Component 5: Support of inter-slot TDM between unicast PDSCH and group-common PDSCH for multicast, or between group-common PDSCH for multicast and group-common PDSCH for broadcast (if UE supports FG33-1), or among unicast PDSCH and group-common PDSCH for multicast and group-common PDSCH for broadcast (if UE supports FG33-1) in different slots. [2]**

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| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | Ok |
| Samsung | The update to component 5 is not necessary but OK if majority prefers to have it. |
| Qualcomm | Understand the intention.  But the proposed revision may be misleading that it excludes supporting the inter-slot TDM of multicast + multicast, multicast + SIB/paging, etc..  We slightly prefer a more general description as ‘inter-slot TDM between ~~unicast PDSCH and~~ group-common PDSCH for multicast and other PDSCHs in different slots’ |
| ZTE | OK |
| NTT DOCOMO | Component 1: OK  Component 5: We prefer Qualcomm’s revision. |
| Spreadtrum | Ok |
| Nokia, NSB | OK with component 1, for component 5 we are OK with Qualcomm’s revision. |
| LG Electronics | Ok |
| MTK | Component 1: OK  Component 5: slightly prefer QC’s revision |
| Apple | OK. |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems the proposal with suggested revision from Qualcomm would be agreeable. **Updated proposal 2-3-1:**  * **Components of FG 33-2 are revised as**   + **Component 1: Support of group-common PDCCH/PDSCH for multicast with CRC scrambled by G-RNTI for PCell.**   + **Component 5: Support of inter-slot TDM between ~~unicast PDSCH and~~ group-common PDSCH for multicast and other PDSCHs in different slots.** |
| Moderator (NTT DOCOMO) | Following agreement was made at Tuesday GTW session.  **Agreement:**   * Components of FG 33-2 are revised as   + Component 1: Support of group-common PDCCH/PDSCH for multicast with CRC scrambled by G-RNTI for PCell.   + Component 5: Support of inter-slot TDM between ~~unicast PDSCH and~~ group-common PDSCH for multicast and other PDSCHs in different slots. |

### **Low priority proposal 2-3-2:**

* **Add a note that “UE is not expected to be configured simultaneously with more than one component carrier for multicast reception” [6]**
* **Add a note that “for component 2, up to one CFR is supported for multicast reception” [6]**

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| --- | --- |
| Company | Comment |
| Samsung | The notes are not necessary. |
| Ericsson | The notes are not needed, the information can be found elsewhere in the specs. |
| MTK | We know that it is common understanding that only one CC can be used for multicast reception as agreed in previous meeting. However, the UE feature’s description maybe cause a little confusing for the PCell and Scell. For example, the perquisite FG for SCell FG 33-2h is PCell FG 33-2, it seems to mean that UE can support the two FGs e.g., PCell and SCell, simultaneously if UE report to support multicast reception on SCell. So, the best way to resolve the issue is to add a common understanding note to clarify the issue clearer. |

## **2.4 33-2a: Support of ACK/NACK based HARQ-ACK feedback andRRC-based enabling/disabling ACK/NACK-based feedback for dynamic scheduling for multicast**

In [1], FG 33-2a is captured as below.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-2a | Support of ACK/NACK based HARQ-ACK feedback andRRC-based enabling/disabling ACK/NACK-based feedback for dynamic scheduling for multicast | 1) Support of ACK/NACK based HARQ-ACK feedback, and support of enabling/disabling ACK/NACK based HARQ-ACK feedback configured by RRC signalling  2) Support of PTM retransmission for multicast  3) support of Type-1 and Type-2 HARQ-ACK CB for multicast feedback only  4) Support of shared PUCCH resource configurations with unicast | 33-2 | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-2a | Support of ACK/NACK based HARQ-ACK feedback andRRC-based enabling/disabling ACK/NACK-based feedback for dynamic scheduling for multicast | 1) Support of ACK/NACK based HARQ-ACK feedback, and support of enabling/disabling ACK/NACK based HARQ-ACK feedback configured by RRC signalling  2) Support of PTM retransmission for multicast  3) support of Type-1 and Type-2 HARQ-ACK CB for multicast feedback only  4) Support of shared PUCCH resource configurations with unicast | 33-2 | Yes |  |  | Per BC | N/A | N/A |  | Note: A UE is not expected to be scheduled with unicast and multicast HARQ-ACK feedback with same priority in the same PUCCH if UE does not support FG33-3-3a or 33-3-3b. | Optional with capability signalling | |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

### **Low priority proposal 2-4-1:**

* **Add a note that “A UE is not expected to be scheduled with unicast and multicast HARQ-ACK feedback with same priority in the same PUCCH if UE does not support FG33-3-3a or 33-3-3b” [8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | The note is not needed. |
| Qualcomm | Support this note for clarification.  Otherwise, it is not clear for UE how to treat the overlapping case if not support 33-2a. |
| Ericsson | The note seem to overlap with component 3. |

## **2.5 33-2h: Dynamic scheduling for multicast for SCell**

In [1], FG 33-2h is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-2h | Dynamic scheduling for multicast for SCell | Support of group-common PDCCH/PDSCH with CRC scrambled by G-RNTI for SCell. | 33-2 | Yes |  |  | Per FSPC | N/A | N/A |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | For FG33-2h, as discussed in [3] that it is expected that FG33-5-1 is supposed to be SPS group-common PDSCH for multicast for PCell that is reported per FS as agreed. With FG33-2 as the prerequisite FG, FG33-2h currently defined as MBS dynamic scheduling for SCell can be modified to include the cases of both dynamic and SPS scheduling for MBS, since, from UE perspective, if a CC is reported to support MBS for SCell then it is supposed to support both dynamic and SPS scheduling. A note can be added to clarify the cases supported with a given prerequisite FG.  ***Proposal 3: Updating FG33-2/2h/2i as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-2h | Dynamic or SPS scheduling for multicast for SCell | Support of group-common PDCCH/PDSCH with CRC scrambled by G-RNTI or G-CS-RNTI for SCell. | 33-2 or 33-5-1 | Yes |  |  | Per FSPC | N/A | N/A |  | Note: with 33-2 or 33-5-1 as prerequisite FG, this FG33-2h includes the cases of supporting multicast dynamic scheduling for SCell, and/or supporting multicast SPS scheduling for SCell. | Optional with capability signalling | |
| [6] | MediaTek | Regarding the multicast service reception on SCell, the following agreement was achieved in previous meeting:   |  | | --- | | **Agreement**: If UE supports carrier aggregation for unicast, multicast reception on an activated SCell with self-scheduling is supported subject to UE capability in Rel-17.   * UE is not expected to be configured simultaneously with more than one component carrier for multicast reception. * Cross-carrier scheduling for multicast reception is not supported in Rel-17. * The capability of supporting MBS multicast on SCell is a separate capability from the CA capability for unicast.   + The granularity of UE reporting the capability of supporting MBS multicast reception is per FSPC |   The part of the agreements has been reflected in the updated UE features after RAN1#108-e, however, some descriptions are not clear in [1]. For example, there is not any sentence to reflect this restriction that “UE is not expected to be configured simultaneously with more than one component carrier for multicast reception.” Thus, we suggest adding a note to reflect the agreement for both FG 33-2 and FG 33-2h.  *Proposal 8: For FG 33-2h, adding a note that “UE is not expected to be configured simultaneously with more than one component carrier for multicast reception”.*  Regarding the multicast SPS reception on SCell, RAN1 has received a LS from RAN2 [3] with the following agreement:   |  | | --- | | **1. Overall Description:**  RAN1 agreed that the group common PDCCH/PDSCH with CRC scrambled with G-RNTI on SCell is supported [R1-2202928], i.e. FG 33-2h. So, the multicast data reception via dynamic scheduling can be configured on one SCell or PCell.  RAN2 agreed that MBS SPS for Multicast can be configured on one SCell or PCell.  **2. Actions:**  **To RAN1:**  RAN2 respectfully asks RAN1 to take the RAN2 agreement into account, and provide feedback in case RAN1 sees any issues and whether a new FG for it needs to be defined. |   Since we have defined a FG for SPS reception, the simply way is to reuse the current FG with some modification to clarify the issue clear.  *Proposal 9: For SPS reception on SCell, reusing the current FG 33-2h with some modification is sufficient and it is not needed to define a new FG.*   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-2h | multicast reception for SCell | Support of group-common PDCCH/PDSCH with CRC scrambled by G-RNTI or G-CS-RNTI for SCell. | 33-2， 33-5-1 | Yes |  |  | Per FSPC | N/A | N/A |  | Note 1: UE is not expected to be configured simultaneously with more than one component carrier for multicast reception | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-2h | Dynamic scheduling for multicast for SCell | Support of group-common PDCCH/PDSCH with CRC scrambled by G-RNTI for SCell. | 33-2 | Yes |  |  | Per FSPC | N/A | N/A |  | Note: A UE is not expected to be configured simultaneously with more than one component carrier for multicast reception | Optional with capability signalling | |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

**(D)High priority proposal 2-5-1:**

* **Components of FG 33-2h are revised as “Support of group-common PDCCH/PDSCH with CRC scrambled by G-RNTI or G-CS-RNTI for SCell” [2, 6]**
  + **Prerequisite FG for FG 33-2h is revised as “33-2 or 33-5-1” [2]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | Since FG33-2h is reported per FSPC, if UE supports it for dynamic, UE should be able to support it for SPS but it does not mean UE supports FG33-2h has to support SPS, these are two different things. |
| Samsung | Agree with Huawei. |
| Qualcomm | We prefer to have separate FG for SPS multicast on SCell and DG multicast on SCell. |
| ZTE | Our preference is to include SPS on SCell in “33-5-1SPS group-common PDSCH for multicast”. There is already a separate FG for SPS transmission, it seems more straightforward to merge SPS on PCell and SPS on SCell in one FG.  If we are the only company, we can also compromise to accept this proposal. |
| NTT DOCOMO | OK |
| Spreadtrum | Agree with Huawei |
| Nokia, NSB | It is better not to mix the two. |
| LG Electronics | Agree with Huawei |
| MTK | OK |
| Apple | Agree with Huawei |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems larger number of companies prefer to have separate FG for SPS multicast on SCell from FG 33-2h based on the situation for the proposal 2-16-2 as well. |
| Moderator (NTT DOCOMO) | Based on the discussion in GTW session, following alternatives should be discussed together for the proposals 2-5-1, 2-16-1 and 2-16-2.  Alt.1: Introduce a separate new FG for SPS multicast on SCell from FGs for SPS multicast on PCell and DG multicast on SCell  Alt.2: SPS multicast on SCell is merged into the FG for DG multicast on SCell (33-2h)  Alt.3: SPS multicast on SCell is merged into the FG for SPS multicast on PCell (33-5-1)  Further discussion for above alternatives can be done here. |
| Ericsson | We prefer alt3. Considering SPS configurations are shared with unicast and SPS unicast is reported across serving cells for a cell group, it seems not necessary to create a special FG for Scell multicast SPS. |
| ZTE | Our first preference is Alt.3 and we can also accept Alt.2. Alt.1 is not necessary. |
| MTK | We prefer Alt 2.  Regarding the Alt 3, we don’t support it, the reason is that, in previous meeting, we agreed that the reporting type for SPS on SCell is per FSPC, however, the reporting type for FG 33-5-1 is per FG. So, from this perspective, the Alt 3 is not preferred. |
| Spreadtrum | Either Alt1 or Alt 3 is fine to us. |
| Moderator (NTT DOCOMO) | Thank you very much for further feedbacks!  It seems companies are fine to merge SPS multicast on SCell with either 33-2h or 33-5-1.  Based on the MTK’s argument, maybe we can check if Alt.2 is acceptable to all.  **High priority proposal 2-5-1:**  **Components of FG 33-2h are revised as “Support of group-common PDCCH/PDSCH with CRC scrambled by G-RNTI or G-CS-RNTI for SCell”** |
| Qualcomm2 | We prefer Alt1  SPS on PCell and DG on PCell are separate FGs. Similarly, SPS on SCell and DG on SCell should be separate as well.  ‘RAN2 agreed that MBS SPS for Multicast can be configured on one SCell or PCell’ 🡪it does not mean that if UE can support DG on a SCell, the same SCell may not support SPS. |
| NTT DOCOMO | We are fine with the updated proposal. |
| Ericsson | For Alt2, the consequence of the alternative is that SPS may be supported for Scell but not PCell. We prefer alt3 because it would signal support of SPS in general for multicast (for Pcell or Scell, if supported), and the condition for SPS in Scell multicast is support of FG 33-2h |
| Moderator (NTT DOCOMO) | Thank you very much for further feedbacks!  Let’s discuss following in the GTW session.  **High priority proposal 2-5-1:**  **Alt.1: Introduce a separate new FG for SPS multicast on SCell from FGs for SPS multicast on PCell and DG multicast on SCell**  **Alt.2: SPS multicast on SCell is merged into the FG for DG multicast on SCell (33-2h)**  **Alt.3: SPS multicast on SCell is merged into the FG for SPS multicast on PCell (33-5-1)** |
| Moderator (NTT DOCOMO) | Following agreement was made in GTW session.  **High priority proposal 2-5-1:**  **Introduce a separate new FG for SPS multicast on SCell from FGs for SPS multicast on PCell and DG multicast on Scell**  **Add FG 33-2h and 33-5-1 as prerequisite FGs**   |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-3 | One SPS group-common PDSCH configuration for multicast for Scell | 1. Support one SPS group-common PDSCH configuration for multicast for Scell.  2. Support {2, 4, 8} times semi-static slot-level repetition for SPS group-common PDSCH for Scell. | 33-5-1, 33-2h | Yes | Per FSPC | N/A | N/A |  |  | Optional with capability signalling | | 33. NR\_MBS | 33-5-4 | Up to 8 SPS group-common PDSCH configurations per CFR for multicast for SCell | 1. Support up to 8 SPS group-common PDSCH configuration per CFR for multicast for Scell.  2. Support M>=1 activated SPS group-common PDSCH configurations per CFR for multicast for Scell.  3. The total number of SPS configurations for both multicast and unicast is no larger than 8 [per cell], and activated SPS group-common PDSCH configurations is no larger than M.  4. The total number of SPS configurations for both multicast and unicast in a cell group is no larger than 32. | 33-5-3 | Yes | Per FSPC | N/A | N/A |  | Candidate value set for M is {1, 2, …, 8} | Optional with capability signalling | |

### **Low priority proposal 2-5-2:**

* **Add a note that “A UE is not expected to be configured simultaneously with more than one component carrier for multicast reception” [6, 8]**
* **Add a note that “With 33-2 or 33-5-1 as prerequisite FG, this FG33-2h includes the cases of supporting multicast dynamic scheduling for SCell, and/or supporting multicast SPS scheduling for Scell” [2]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | The notes are not necessary. |
| Ericsson | Not necessary, the outcome of proposal 2.5.1 should suffice. |
| MTK | We know that it is common understanding that only one CC can be used for multicast reception as agreed in previous meeting. However, the UE feature’s description maybe cause a little confusing for the Pcell and Scell. For example, the perquisite FG for Scell FG 33-2h is Pcell FG 33-2, it seems to mean that UE can support the two FGs e.g., Pcell and Scell, simultaneously if UE report to support multicast reception on Scell. So, the best way to resolve the issue is to add a common understanding note to clarify the issue clearer. |

## **2.6 33-2i: Supported maximal modulation order for multicast PDSCH**

In [1], FG 33-2i is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-2i | Supported maximal modulation order for multicast PDSCH | 1. For FR1, up to 1024QAM is supported, candidate values {256QAM, 1024QAM}  2. For FR2, up to 256QAM is supported, candidate values {64QAM, 256QAM}  FFS maximum modulation order for broadcast PDSCH | 33-2 | Yes |  | The UE supports the same modulation order as unicast | Per band | N/A | N/A |  | Note: A UE shall support the corresponding mandatory maximum modulation for unicast. | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | Regarding the UE capabilities for the modulation order, the relevant rows from TS 38.306 [5] are as follows:   | ***pdsch-256QAM-FR1***  *Indicates whether the UE supports 256QAM modulation scheme for PDSCH for FR1 as defined in 7.3.1.2 of TS 38.211 [6].*  ***It is mandatory with capability signalling for non-RedCap Ues and optional for RedCap Ues.*** | UE | CY | No | FR1 only | | --- | --- | --- | --- | --- | | ***pdsch-1024QAM-FR1-r17***  Indicates whether the UE supports 1024QAM modulation scheme for PDSCH for FR1 as defined in TS 38.211 [6], MCS and CQI feedback tables based on 1024QAM modulation order as defined in TS 38.214 [12].  UE indicating support of this feature shall also indicate support of *pdsch-256QAM-FR1*. | Band | No | N/A | FR1 only | | ***pdsch-256QAM-FR2***  Indicates whether the UE supports 256QAM modulation scheme for PDSCH for FR2 as defined in 7.3.1.2 of TS 38.211 [6]. | Band | No | N/A | FR2 only | | ***supportedModulationOrderDL***  Indicates the maximum supported modulation order to be applied for downlink in the carrier **in the max data rate calculation** as defined in 4.1.2. **If included, the network may use a modulation order on this serving cell which is higher than the value indicated in this field as long as UE supports the modulation of higher value for downlink**. If not included:  - for FR1, the network uses the modulation order signalled per band i.e. [pdsch-1024QAM-FR1] when [pdsch-1024QAM-FR1] is signalled for the band, otherwise the network uses the modulation order signalled in *pdsch-256QAM-FR1*.  - for FR2, the network uses the modulation order signalled per band i.e. *pdsch-256QAM-FR2* if signalled. If not signalled in a given band, the network shall use the modulation order 64QAM.  In all the cases, it shall be ensured that the data rate does not exceed the max data rate (*DataRate*) and max data rate per CC (*DataRateCC*) according to TS 38.214 [12]. | FSPC | No | N/A | N/A |   It is noted that the ***supportedModulationOrderDL*** report is just applied for the max data rate calculation as defined in 4.1.2 in [5], which can take any one from {bpsk-halfpi, bpsk, qpsk, qam16, qam64, qam256, qam1024}. If the intention is to separate the max data rate calculation from that for unicast, it should be reported per FSPC as legacy for unicast. However, one additional FG reported per band was added in the last meeting with FFS maximum modulation order for broadcast PDSCH. It should be noted that the broadcast is supposed to be received by UE in IDLE UE as well, so for broadcast scheduling itself network will not take the optional capability UE reported. Therefore, FG33-2i is not to be considered by network whatsoever.  ***Proposal 3: Updating FG33-2/2h/2i as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-2i | Supported maximal modulation order for multicast PDSCH | 1. For FR1, up to 1024QAM is supported, candidate values {256QAM, 1024QAM}  2. For FR2, up to 256QAM is supported, candidate values {64QAM, 256QAM}  FFS maximum modulation order for broadcast PDSCH | 33-2 | Yes |  | The UE supports the same modulation order as unicast | Per band | N/A | N/A |  | Note: A UE shall support the corresponding mandatory maximum modulation for unicast. | Optional with capability signalling | |
| [7] | NTT DOCOMO | It is unlikely that higher-order modulation will be used for broadcast PDSCH transmission. We don’t see the need to add a component about the modulation order for broadcast.  **Proposal 5-1: Update FG 33-2i as follows:**   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-2i | Supported maximal modulation order for multicast PDSCH | 1. For FR1, up to 1024QAM is supported, candidate values {256QAM, 1024QAM}  2. For FR2, up to 256QAM is supported, candidate values {64QAM, 256QAM}  ~~FFS maximum modulation order for broadcast PDSCH~~ | 33-2 | Yes |  | The UE supports the same modulation order as unicast | Per band | N/A | N/A |  | Note: A UE shall support the corresponding mandatory maximum modulation for unicast. | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-2i | Supported maximal modulation order for multicast PDSCH | 1. For FR1, up to 1024QAM is supported, candidate values {256QAM, 1024QAM}  2. For FR2, up to 256QAM is supported, candidate values {64QAM, 256QAM} | 33-2 | Yes |  | The UE supports the same modulation order as unicast | Per band | N/A | N/A |  | Note: A UE shall support the corresponding mandatory maximum modulation for unicast. | Optional with capability signalling | |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

**High priority proposal 2-6-1:**

* **No additional component is added for FG 33-2i [7, 8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | Agree |
| ZTE | OK |
| NTT DOCOMO | Support |
| Spreadtrum | Ok |
| Nokia, NSB | OK |
| LG Electronics | Ok |
| MTK | OK |
| Apple | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems the proposal is agreeable and hence FFS can be removed. |
| Moderator (NTT DOCOMO) | Following agreement was made at Tuesday GTW session.  **Agreement:**  No additional component is added for FG 33-2i, i.e., FFS can be removed |

## **2.7 33-2j: Supported maximum modulation order used for maximum data rate calculation for multicast PDSCH**

In [1], FG 33-2j is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-2j | Supported maximum modulation order used for maximum data rate calculation for multicast PDSCH | 1. For FR1, up to 1024QAM is supported as maximum modulation order used for maximum data rate calculation for multicast PDSCH, candidate values {256QAM, 1024QAM}  2. For FR2, up to 256QAM is supported as maximum modulation order used for maximum data rate calculation for multicast PDSCH, candidate values {64QAM, 256QAM} |  | Yes |  |  | Per FSPC | N/A | N/A |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | ***Proposal 3: Updating FG33-2/2h/2i as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-2j | Supported maximum modulation order used for maximum data rate calculation for multicast PDSCH | 1. For FR1, up to 1024QAM is supported as maximum modulation order used for maximum data rate calculation for multicast PDSCH, candidate values {256QAM, 1024QAM}  2. For FR2, up to 256QAM is supported as maximum modulation order used for maximum data rate calculation for multicast PDSCH, candidate values {64QAM, 256QAM} | 33-2 | Yes |  |  | Per FSPC | N/A | N/A |  |  | Optional with capability signalling | |
| [9] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-2j | Supported maximum modulation order used for maximum data rate calculation for multicast PDSCH | 1. For FR1, up to 1024QAM is supported as maximum modulation order used for maximum data rate calculation for multicast PDSCH, candidate values {256QAM, 1024QAM}  2. For FR2, up to 256QAM is supported as maximum modulation order used for maximum data rate calculation for multicast PDSCH, candidate values {64QAM, 256QAM} | 33-2 | Yes |  |  | Per FSPC | N/A | N/A |  |  | Optional with capability signalling | |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

**High priority proposal 2-7-1:**

* **Prerequisite FG for FG 33-2j is FG 33-2 [2, 8]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | ok |
| Samsung | Agree |
| NTT DOCOMO | OK |
| Nokia, NSB | OK |
| LG Electronics | OK |
| MTK | OK |
| Apple | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems the proposal is agreeable. |
| Moderator (NTT DOCOMO) | Following agreement was made at Tuesday GTW session.  **Agreement:**  Prerequisite FG for FG 33-2j is FG 33-2 |

## **2.8 33-3-2: FDM-ed unicast PDSCH and group-common PDSCH for multicast**

In [1], FG 33-3-2 is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-3-2 | FDM-ed unicast PDSCH and group-common PDSCH for multicast | 1. Support FDM between one unicast PDSCH and one group-common PDSCH for multicast in RRC CONNECTED mode in a slot. | 33-2 | Yes |  |  | [Per UE] | [No] | [No] |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | FG33-3-2 should be reported per FSPC per RAN#97e conclusion [2].  For FG33-3-3, the reporting granularity and the CRs to include FG33-3-3 for TS38.306 and TS38.331 were also discussed in RAN#97e. According to the discussion, it is reaching consensus that it is reported per FSPC [2]. However, the CRs for including FG33-3-3 were not approved because more discussions are needed to finalize the details for the components. For example, two cases (i.e., TDM-ed unicast and multicast and TDM-ed unicast and broadcast) are included depending on whether FG33-1 and/or FG33-2 is/are prerequisite FG(s) for FG33-3-3. Since broadcast is also received by IDLE Ues, more than one PDSCHs for broadcast will not be transmitted by gNB anyway. Therefore, when UE supports both FG33-1 and FG33-2 as prerequisite FGs, N of component 3 or L of component 4 includes at most one group-common PDSCH for MBS broadcast. In addition, it should also be noted that UE supports all the components but does not report candidate values for M, N, K, or L of the corresponding components assuming the sum of M, N, K, and L does not exceed the value UE supports in FG5-11/5-11a/5-11b.  ***Proposal 4: Updating FG33-3-2/3 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-3-2 | FDM-ed unicast PDSCH and one group-common PDSCH for multicast | 1. Support FDM between one unicast PDSCH and one group-common PDSCH for multicast in RRC CONNECTED mode in a slot. | 33-2 | Yes |  |  | Per FSPC | NA | NA |  |  | Optional with capability signalling | |
| [6] | MediaTek | ***Proposal 5: Updated the FG 33-1-2 and FG 33-3-2 as following:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-3-2 | FDM-ed unicast PDSCH and group-common PDSCH for multicast | 1. Support FDM between one unicast PDSCH and one group-common PDSCH for multicast in RRC CONNECTED mode in a slot. | 33-2 | Yes |  |  | Per FSPC | N/A | N/A |  |  | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-3-2 | FDM-ed unicast PDSCH and group-common PDSCH for multicast | 1. Support FDM between one unicast PDSCH and one group-common PDSCH for multicast in RRC CONNECTED mode in a slot. | 33-2 | Yes |  |  | Per FSPC | N/A | N/A |  |  | Optional with capability signalling | | 33. NR\_MBS | 33-3-2a | Scalng factor for maximum data rate and TBS LBRM of FDMed unicast PDSCH and group-common PDSCH | Scaling factor for max data rate and TBS LBRM to support FDMed unicast PDSCH and group-common PDSCH per CC. | 33-3-2, 33-1-2 | Yes |  | If not reported, same as the scaling factor for max data rate of unciast PDSCH | Per FSPC | N/A | N/A |  | value of scaling factor: {1.75, 1.5, 1, and 0.75} | Optional with capability signalling | |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

**High priority proposal 2-8-1:**

* **The reporting type of FG 33-3-2 is per FSPC.**

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| --- | --- |
| Company | Comment |
| Moderator (NTT DOCOMO) | This was agreed in RAN#97-e. No need discussion. |
| Samsung | Agree with moderator. |
|  |  |

### **(N)High priority proposal 2-8-2:**

* **Introduce an FG for scalng factor for maximum data rate and TBS LBRM of FDMed unicast PDSCH and group-common PDSCH. [8]**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| 33. NR\_MBS | 33-3-2a | Scalng factor for maximum data rate and TBS LBRM of FDMed unicast PDSCH and group-common PDSCH | Scaling factor for max data rate and TBS LBRM to support FDMed unicast PDSCH and group-common PDSCH per CC. | 33-3-2, 33-1-2 | Yes |  | If not reported, same as the scaling factor for max data rate of unciast PDSCH | Per FSPC | N/A | N/A |  | value of scaling factor: {1.75, 1.5, 1, and 0.75} | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | OK |
| Qualcomm | Support.  Otherwise, RAN1 needs to clarify that the FDMed unicast and MBS PDSCHs for all the initial and retransmissions cannot be larger than the max data rate/TBS LBRM using unicast scaling factor. |
| Spreaddtrum | Not support. We not understand the motivation why we need this UE feature. Does it intend to introduce much higher max data rate than unicast PDSCH? If so, we have discussed many times in RAN1 meetings that it would bring many negative impact on current UE. It is against the spirit of R17 MBS WID where quick commercial use is expected.  For Qualcomm’s suggestion, we are fine to have the clarification. |
| Nokia, NSB | Agree with Spreadtrum that the motivation is not clear. |
| MTK | Sine the issue will be discussed in AI8.12, we suggest wait the conclusion from AI8.12 and decided whether to define a new FG. Besides, considering it is in the R17 late stage, a new FG is not pursued unless really needed. |
| Vivo | Need to discuss it first in 8.12 and we only achieved the agreements for the non-FDM case.  Agreement  At least in case of no FDMed unicast and MBS PDSCHs, the max data rate and upper bound of TBS LBRM for allocated TB(s) in a 14 consecutive-symbol duration is based on the unicast parameters. |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems there is no consensus to introduce the proposed new FG. |
| Ericsson | Support to introduce the new FG and clarify the behaviour if not supported. |

**High priority proposal 2-8-3:**

* **The feature group name of FG 33-3-2 is revised as “FDM-ed unicast PDSCH and one group-common PDSCH for multicast” [2]**

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| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | Ok. It should be the common understanding based on TS38.214/TS38.202 regarding the channel combination restrictions. Adding ‘one’ should be agreeable I suppose. |
| Samsung | OK although not necessary. |
| ZTE | Ok to clarify this. |
| NTT DOCOMO | OK |
| Nokia, NSB | OK |
| LG Electronics | OK |
| MTK | Ok |
| Apple | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems the proposal is agreeable. |
| Moderator (NTT DOCOMO) | Following agreement was made at Tuesday GTW session.  **Agreement:**  The feature group name of FG 33-3-2 is revised as “FDM-ed unicast PDSCH and one group-common PDSCH for multicast” |

## **2.9 33-3-3: Intra-slot TDM-ed unicast PDSCH and group-common PDSCH**

In [1], FG 33-3-3 is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| 33. NR\_MBS | 33-3-3 | Intra-slot TDM-ed unicast PDSCH and group-common PDSCH | 1. Support TDM between one unicast PDSCH and one group-common PDSCH in a slot.  2. Support TDM between M (M>1) TDMed unicast PDSCHs and one group-common PDSCH in a slot per CC  3. Support TDM among N (N>1) group-common PDSCHs in a slot per CC  4. Support TDM between K (K>1) TDMed unicast PDSCHs and L (L>1) TDMed group-common PDSCHs in a slot per CC  5. The UE maximum number of TDMed PDSCH receptions capability in a slot per CC is kept as for Rel-15/Rel-16, i.e., {2/4/7} based on UE FG5-11/5-11a/5-11b.   * + Note:  Group-common PDSCH(s) are counted as unicast PDSCH(s). | 33-1 or 33-2 | Yes |  |  | [Per UE] | [No] | [No] |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | For FG33-3-3, the reporting granularity and the CRs to include FG33-3-3 for TS38.306 and TS38.331 were also discussed in RAN#97e. According to the discussion, it is reaching consensus that it is reported per FSPC [2]. However, the CRs for including FG33-3-3 were not approved because more discussions are needed to finalize the details for the components. For example, two cases (i.e., TDM-ed unicast and multicast and TDM-ed unicast and broadcast) are included depending on whether FG33-1 and/or FG33-2 is/are prerequisite FG(s) for FG33-3-3. Since broadcast is also received by IDLE Ues, more than one PDSCHs for broadcast will not be transmitted by gNB anyway. Therefore, when UE supports both FG33-1 and FG33-2 as prerequisite FGs, N of component 3 or L of component 4 includes at most one group-common PDSCH for MBS broadcast. In addition, it should also be noted that UE supports all the components but does not report candidate values for M, N, K, or L of the corresponding components assuming the sum of M, N, K, and L does not exceed the value UE supports in FG5-11/5-11a/5-11b.  ***Proposal 4: Updating FG33-3-2/3 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-3-3 | Intra-slot TDM-ed unicast PDSCH and group-common PDSCH | 1. Support TDM between one unicast PDSCH and one group-common PDSCH in a slot.  2. Support TDM between M (M>1) TDMed unicast PDSCHs and one group-common PDSCH in a slot per CC  3. Support TDM among N (N>1) group-common PDSCHs in a slot per CC  4. Support TDM between K (K>1) TDMed unicast PDSCHs and L (L>1) TDMed group-common PDSCHs in a slot per CC  5. The UE maximum number of TDMed PDSCH receptions capability in a slot per CC is kept as for Rel-15/Rel-16, i.e., {2/4/7} based on UE FG5-11/5-11a/5-11b.   * + Note:  Group-common PDSCH(s) are counted as unicast PDSCH(s). | 33-1 and/or 33-2 | Yes |  |  | Per FSPC | NA | NA |  | Note:   1. component 3 and component 4 apply only when FG33-2 as prerequisite FG or when UE supports both FG33-2 and FG33-1 as prerequisite FGs. For the latter case, N of component 3 or L of component 4 includes at most one group-common PDSCH for MBS broadcast.   2. UE supports all the components but does not report candidate values for M, N, K, or L of the corresponding components assuming the sum of M, N, K, and L does not exceed the value UE supports in FG5-11/5-11a/5-11b. | Optional with capability signalling | |
| [3] | ZTE | For all the MBS UE features with FFS for the report type, the following report type can be considered as a middle ground between companies.   * Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2   ***Proposal 9****: Regarding the report type for MBS FG 33-3-3, 33-3-3a, 33-3-3b, 33-3-4, 33-3-5, 33-5-1e, 33-5-1f, 33-5-1g, 33-5-1i, 33-5-2, 33-6-1, 33-6-1a, 33-6-2, 33-6-3, 33-8-1 and 33-9, consider the following as baseline.*   * + *Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2* |
| [4] | Spreadtrum Communications | In RAN#97e, we have discussed about the granularity of FG33-1-2 and FG33-3-2, and finally we agreed that the granularity is per FSPC for both of FG33-1-2 and FG33-3-2. There are also some discussions on FG33-3-3. Due to some divergence and limited time, there is no agreement/conclusion on FG33-3-3. But it seems to be consensus that the granularity of FG33-3-3 can follow FG33-1-2/33-3-2, and can be per FSPC.  For the component 3 and component 4 of FG33-3-3, multiple group-common PDSCHs can be TDMed in a slot. In our mind, it is fine to have multiple TDMed group-common PDSCH for multicast. But for broadcast, we think it should be limited to be one in a slot, no matter how many TDMed PDSCH can be multiplexed in a slot supported by UE. This is because that FG33-3-3 is not visible in idle state, and broadcast PDSCHs are delivered for all Ues. For NW, the safest way is to configure up to one broadcast PDSCH in one slot, to ensure all Ues can receive and decode it. Thus, we propose to add note for component 3 and component 4 to clarify that only up to 1 group-common PDSCH for broadcast is included in the group-common PDSCHs.  For FG33-3-3, we think the basic component is component 1. In our opinion, for component 2, 3 and 4, UE could not support, and if supported component 5 should be obeyed. Thus, for the candidate value of component of 2, 3, and 4, we prefer to add the candidate values as {Supported, Not support}.  Based on the above, we have the following proposal:   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-3-3 | Intra-slot TDM-ed unicast PDSCH and group-common PDSCH | 1. Support TDM between one unicast PDSCH and one group-common PDSCH in a slot.  2. Support TDM between M (M>1) TDMed unicast PDSCHs and one group-common PDSCH in a slot per CC  3. Support TDM among N (N>1) group-common PDSCHs in a slot per CC  4. Support TDM between K (K>1) TDMed unicast PDSCHs and L (L>1) TDMed group-common PDSCHs in a slot per CC  5. The UE maximum number of TDMed PDSCH receptions capability in a slot per CC is kept as for Rel-15/Rel-16, i.e., {2/4/7} based on UE FG5-11/5-11a/5-11b.   * + Note:  Group-common PDSCH(s) are counted as unicast PDSCH(s).   + Note1: For component 3 and component 4, up to 1 group-common PDSCH for broadcast can be included in the group-common PDSCHs. | 33-1 or 33-2 | Yes |  |  | ~~[Per UE]~~  Per FSPC | [No] | [No] |  | For component 2, the candidate values: Support, Not support  For component 3, the candidate values: Support, Not support  For component 4, the candidate values: Support, Not support | Optional with capability signalling | |
| [5] | vivo | In Rel-15, there is a UE capability defined for separation of two unicast PDSCHs with a gap, i.e., FG 5-32. Considering FG 33-3-3 of intra-slot TDM-ed unicast PDSCH and group-common PDSCH, there will be more than 1 PDSCHs in either slot of two consecutive slots, and thus, a new UE capability similar to FG5-32 shall be defined for multicast.  *Proposal 1: Add an FG to include the UE capability for separation of two multicast/unicast PDSCHs with a gap.*   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-3-3c | Separation of two multicast/unicast PDSCHs with a gap | For any two consecutive slots n and n+1, if there are more than 1 multicast/unicast PDSCH in either slot, the minimum time separation between starting time of any two multicast/unicast PDSCHs within the duration of these slots is  4 OFDM symbol for 30kHz and 7 OFDM symbol for 60kHz | 33-3-3 | Yes | FFS | FFS | Optional with capability signalling | |
| [6] | MediaTek | Regarding the intra-slot TDMed FG 33-3-3, the reporting type has not been defined. Considering the FG also can be reused for Scell and FDMed FG has been agreed as per FSPC, the same reporting type can be reused for the FG 33-3-3.  *Proposal 10: For FG 33-3-3, the reporting type is per FSPC*  If the prerequisite FG is FG 33-1, it means that the intra-slot TDMed case can include the broadcast PDSCH. Besides, the FG 33-1 can be used for RRC IDLE/INACTIVE Ues, and these Ues only receive one GC-PDSCH in one slot by default. So, it is suggested that for FG 33-3-3, only one GC-PDSCH for broadcast is scheduled if prerequisite FG is FG 33-1.  *Proposal 11: Only one GC-PDSCH for broadcast is scheduled if FG 33-1 as Prerequisite feature groups for FG 33-3-3.*  Regarding some values, e.g., M/K/L, listed in the component have not been explained clearly, which will cause the RAN2 confusing whether to use one or more capability bits to reporting the FG. In the legacy UE FG 5-11/5-11a/5-11b, the UE can report support only one of them since the three FGs are separate FGs. Following the similar logical, the UE can report any values if only the maximum number of TDMed PDSCH receptions capability in a slot per CC is kept as for Rel-15/Rel-16.  *Proposal 12: For the value of M/N/K, UE can report any value if only the maximum number of TDMed PDSCH receptions capability in a slot per CC is kept as for Rel-15/Rel-16.*   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-3-3 | Intra-slot TDM-ed unicast PDSCH and group-common PDSCH | 1. Support TDM between one unicast PDSCH and one group-common PDSCH in a slot.  2. Support TDM between M (M>1) TDMed unicast PDSCHs and one group-common PDSCH in a slot per CC  3. Support TDM among N (N>1) group-common PDSCHs in a slot per CC  4. Support TDM between K (K>1) TDMed unicast PDSCHs and L (L>1) TDMed group-common PDSCHs in a slot per CC  5. The UE maximum number of TDMed PDSCH receptions capability in a slot per CC is kept as for Rel-15/Rel-16, i.e., {2/4/7} based on UE FG5-11/5-11a/5-11b.   * + Note:  Group-common PDSCH(s) are counted as unicast PDSCH(s). | 33-1 or 33-2 | Yes |  |  | Per FSPC | N/A | N/A |  | Note 1: only one GC-PDSCH for broadcast is scheduled if FG 33-1 as Prerequisite feature groups.  Note 2: For the value of M/N/K, UE can report any value if only the maximum number of TDMed PDSCH receptions capability in a slot per CC is kept as for Rel-15/Rel-16, | |
| [7] | NTT DOCOMO | Since the reporting type of FG for support of intra-slot TDM between unicast PDSCHs is per FS, the type of FG 33-3-3 should also be per FS.  **Proposal 5-2: Update FG 33-3-3 as follows:**   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-3-3 | Intra-slot TDM-ed unicast PDSCH and group-common PDSCH | 1. Support TDM between one unicast PDSCH and one group-common PDSCH in a slot.  2. Support TDM between M (M>1) TDMed unicast PDSCHs and one group-common PDSCH in a slot per CC  3. Support TDM among N (N>1) group-common PDSCHs in a slot per CC  4. Support TDM between K (K>1) TDMed unicast PDSCHs and L (L>1) TDMed group-common PDSCHs in a slot per CC  5. The UE maximum number of TDMed PDSCH receptions capability in a slot per CC is kept as for Rel-15/Rel-16, i.e., {2/4/7} based on UE FG5-11/5-11a/5-11b.   * + Note:  Group-common PDSCH(s) are counted as unicast PDSCH(s). | 33-1 or 33-2 | Yes |  |  | Per FS | N/A | N/A |  |  | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-3-3 | Intra-slot TDM-ed unicast PDSCH and group-common PDSCH | 1. Support TDM between one unicast PDSCH and one group-common PDSCH in a slot.  2. Support TDM between M (M>1) TDMed unicast PDSCHs and one group-common PDSCH in a slot per CC  3. Support TDM among N (N>1) group-common PDSCHs in a slot per CC  4. Support TDM between K (K>1) TDMed unicast PDSCHs and L (L>1) TDMed group-common PDSCHs in a slot per CC  5. The UE maximum number of TDMed PDSCH receptions capability in a slot per CC is kept as for Rel-15/Rel-16, i.e., {2/4/7} based on UE FG5-11/5-11a/5-11b.   * + Note:  Group-common PDSCH(s) are counted as unicast PDSCH(s). | 33-1, 33-2 | Yes |  |  | Per FSPC | N/A | N/A |  | value of M+1: {2, 4, 7}  value of N: {2, 4, 7}  value of K+L: {2, 4, 7}  Note: up to one broadcast PDSCH in a slot. | Optional with capability signalling | |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

### **(D)High priority proposal 2-9-1:**

* **Apply one of the following alternatives as candidate values for component 2, 3 or 4.**
  + **Alt 1: [4]** 
    - **Component 2: {Support, Not support}**
    - **Component 3: {Support, Not support}**
    - **Component 4: [Support, Not support]**
  + **Alt 2: [8]**
    - **M+1: {2, 4, 7}**
    - **N: {2, 4, 7}**
    - **K+L: {2, 4, 7}**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | After further checking after RAN#97e, we are assuming whatever value that meeting the last bullet of component should be supported by Ues. Both two alts are not needed. Otherwise, it cause confusion whether these candidate values are up to UE report or not, and we believe it should be the latter case. |
| Samsung | Agree with Huawei |
| Qualcomm | We prefer Alt2. The UE can report the value of M/N/K, rather than supporting all the combinations of 2, 4, 7, which is similar principle as separate FG 5-11/11a/11b for unicast PDSCHs. |
| ZTE | Question for clarification, do we need any of these Alts considering that the maximum number of multicast/unicast PDSCHs per slot is the same as the maximum number of unicast PDSCHs. |
| Spreadtrum | For component 2, M is larger than 1. If component 2 is supported, it means that UE at least should support 3 PDSCHs in a slot. However, if UE only support 2 TDMed PDSCHs in a slot for FG5-11/5-11a/5-11b, does it mean that UE would not support FG33-3-3? We don’t think that is what we want. The issue also exists in for component 4.  Either Alt 1 or Alt 2 is OK for us. |
| Nokia, NSB | Alt 1 is not acceptable to us as it violates the basic principles of FG definition. And in general we tend to agree with ZTE that neither alt is needed. |
| MTK | Considering the legacy UE can report whether to support FG 5-11/11a/11b separately, Alt 2 is preferred. Regarding the Spreadtrum’s question, we think it can be resolved if the restriction for the value of M/N/K/L is deleted, e..g., (M>1) ,(N>1), etc.   |  |  |  |  | | --- | --- | --- | --- | | 33. NR\_MBS | 33-3-3 | Intra-slot TDM-ed unicast PDSCH and group-common PDSCH | 1. Support TDM between one unicast PDSCH and one group-common PDSCH in a slot.  2. Support TDM between M TDMed unicast PDSCHs and one group-common PDSCH in a slot per CC  3. Support TDM among N group-common PDSCHs in a slot per CC  4. Support TDM between K (TDMed unicast PDSCHs and L TDMed group-common PDSCHs in a slot per CC  5. The UE maximum number of TDMed PDSCH receptions capability in a slot per CC is kept as for Rel-15/Rel-16, i.e., {2/4/7} based on UE FG5-11/5-11a/5-11b.   * + Note:  Group-common PDSCH(s) are counted as unicast PDSCH(s). | |
| Apple | We support Alt2. As commented by Spreadtrum, the M should be equal to or larger than 1. |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  We can further discuss whether Alt.2 is necessary or neither Alt is necessary. |
| Ericsson | Agree with Nokia that alt1 goes against the spirit of what a component is. Thus we support alt2. |
| ZTE | If Alt.2 is adopted, isn’t it the same value as for unicast PDSCH? |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  We can check whether Alt.2 is acceptable to all. **High priority proposal 2-9-1:**  * **Apply following as candidate values for component 2, 3 or 4.**   + - **M+1: {2, 4, 7}**     - **N: {2, 4, 7}**     - **K+L: {2, 4, 7}** |
| NTT DOCOMO | We are fine with the updated proposal. |
| Ericsson | Support the moderator’s update. |
| Moderator (NTT DOCOMO) | Thank you very much for further feedbacks!  Let’s check in the GTW session if above proposal is agreeable. |
| Moderator (NTT DOCOMO) | Based on the discussion in GTW session, proponent companies are invited to provide detailed examples to clarify the necessity of candidate values for component 2/3/4 on top of component 5 (i.e., {2/4/7} based on UE FG5-11/5-11a/5-11b). |

**High priority proposal 2-9-2:**

* **Prerequisite FG for FG 33-3-3 is revised as “33-1 and/or 33-2” [2]**

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| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | Yes, |
| Samsung | OK |
| ZTE | OK |
| NTT DOCOMO | OK |
| Spreadtrum | Ok |
| Nokia, NSB | OK |
| LG Electronics | Ok |
| MTK | OK |
| Apple | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems the proposal is agreeable. |
| Moderator (NTT DOCOMO) | Following agreement was made at Tuesday GTW session.  **Agreement:**  Prerequisite FG for FG 33-3-3 is revised as “33-1 and/or 33-2” |

**High priority proposal 2-9-3:**

* **Apply one of the following alternatives for the reporting type of FG 33-3-3**
  + **Alt.1: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation [3]**
  + **Alt.2: Per FS [7]**
  + **Alt.3: Per FSPC [2, 4, 6, 8]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | Alt3. It was also actually discussed in RAN#97e and reporting per FSPC was concluded but missed in the last round of summary from moderator. |
| Samsung | Alt.3 |
| Qualcomm | Agree with Huawei. |
| ZTE | We prefer Alt.1 |
| Spreadtrum | Alt3 |
| Nokia, NSB | Alt3 has been agreed in RAN#97e already, no need for further discussion. |
| LG Electronics | Alt3 as Huawei commented. |
| MTK | Alt 3 and agree with Huawei’s view. |
| Apple | Alt.3 |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems it was already concluded at RAN#97e and hence following updated proposal should be agreeable. **Updated proposal 2-9-3:**  * **The reporting type of FG 33-3-3 is per FSPC** |
| Moderator (NTT DOCOMO) | Following agreement was made at Tuesday GTW session.  **Agreement:**   * The reporting type of FG 33-3-3 is per FSPC |

### **(N)High priority proposal 2-9-4:**

* **Introduce an FG for separation of two multicast/unicast PDSCHs with a gap. [5]**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-3-3c | Separation of two multicast/unicast PDSCHs with a gap | For any two consecutive slots n and n+1, if there are more than 1 multicast/unicast PDSCH in either slot, the minimum time separation between starting time of any two multicast/unicast PDSCHs within the duration of these slots is  4 OFDM symbol for 30kHz and 7 OFDM symbol for 60kHz | 33-3-3 | Yes | FFS | FFS | FFS |  |  | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | OK |
| Qualcomm | May need further discussion. Since FG33-3-3 includes intra-slot TDM broadcast/unicast/multicast, do we need to consider a gap required between multicast/multicast, broadcast/unicast, broadcast/multicast, broadcast/broadcast as well? |
| ZTE | Similar view as Samsung. In addition, if we are going to have such gap, we don’t think any new FG is needed considering that we have already had one for unicast, the same UE capability can be applied for multicast as well. |
| Spreadtrum | We are also not clear about why we need this optimization. |
| Nokia, NSB | This needs further discussion, it is unclear if needed. |
| MTK | More clarification is needed |
| vivo | This FG targets for reflecting the UE capability on PDSCH processing when there are more than 1 PDSCHs (broadcast/unicast/multicast) in either slot of two consecutive slots and the existing FG 5-32 targets unicast only, to include the intra-slot TDM for broadcast/unicast/multicast, we suggest to update the FG as below:   |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-3-3c | Separation of two broadcast/multicast/unicast PDSCHs (s) with a gap | For any two consecutive slots n and n+1, if there are more than 1 broadcast/ multicast/unicast PDSCH in either slot, the minimum time separation between starting time of any two broadcast/multicast/unicast PDSCHs within the duration of these slots is  4 OFDM symbol for 30kHz and 7 OFDM symbol for 60kHz | 33-3-3 | Yes | FFS | FFS | FFS |  |  | Optional with capability signalling | |
| Apple | The motivation is not clear. |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems there is no consensus to introduce the proposed new FG. |
| Ericsson | Not clear whether it is needed, if the intention is to have the same capability as for unicast. |

### **Low priority proposal 2-9-5:**

* **Add a note that “component 3 and component 4 apply only when FG33-2 as prerequisite FG or when UE supports both FG33-2 and FG33-1 as prerequisite FGs. For the latter case, N of component 3 or L of component 4 includes at most one group-common PDSCH for MBS broadcast” [2]**
* **Add a note that “UE supports all the components but does not report candidate values for M, N, K, or L of the corresponding components assuming the sum of M, N, K, and L does not exceed the value UE supports in FG5-11/5-11a/5-11b” [2]**
* **Add a note that “For component 3 and component 4, up to 1 group-common PDSCH for broadcast can be included in the group-common PDSCHs” [4]**
* **Add a note that “Only one GC-PDSCH for broadcast is scheduled if FG 33-1 as Prerequisite feature groups” [6]**
* **Add a note that “For the value of M/N/K, UE can report any value if only the maximum number of TDMed PDSCH receptions capability in a slot per CC is kept as for Rel-15/Rel-16” [6]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | No need for any of the above notes. |
| Ericsson | Same view as Samsung. |
|  |  |

## **2.10 33-3-3a/33-3-3b: FDM-ed/TDM-ed Type-1 and Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast**

In [1], FG 33-3-3a and FG 33-3-3b are captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-3-3a | FDM-ed Type-1 and Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast | Support of FDM-ed Type-1 and Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast  FFS value of X G-RNTIs | [TBD] | Yes |  |  | [Per UE] | [No] | [No] |  | Note1: FDM-ed Type-1 HARQ-ACK codebook is generated by concatenating the Type-1 sub-codebook for unicast and the Type-1 sub-codebook for multicast.  Note2: The Type-2 HARQ-ACK codebook is generated by concatenating the Type-2 sub-codebook for unicast and the Type-2 sub-codebook for multicast. | Optional with capability signalling |
| 33. NR\_MBS | 33-3-3b | Mode 2 TDM-ed Type-1 and Type-2 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast | Support of Mode 2 TDM-ed Type-1 and Type-2 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast  FFS value of X G-RNTIs | [TBD] | Yes |  |  | [Per UE] | [No] | [No] |  | Note1: Mode 2 TDM-ed Type-1 HARQ-ACK codebook is generated based on the union TDRA tables from unicast and multicast and the union of k1 sets from unicast and multicast.  Note2: The Type-2 HARQ-ACK codebook is generated by concatenating the Type-2 sub-codebook for unicast and the Type-2 sub-codebook for multicast. | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | As discussed in section 3.5, FG33-4 with FG33-2a as prerequisite FG for ACK/NACK based feedback is designed as the basic FG for support of NACK-only feedback for multicast, which includes both the cases for one TB or for more than one TB. For the case of more than one TB, the feedback is converted into ACK/NACK bits, for which either a Type-1 CB or Type-2 CB is generated but for multicast feedback only as already supported in FG33-2a for ACK/NACK based feedback.  When NACK-only collides with other UCI or PUSCH transmission, as agreed, the NACK-only is also converted into ACK/NACK bits. However, such UE behaviour is not expected to be a component of the basic FG33-4 for NACK-only based feedback. The reason is that, for ACK/NACK based feedback for multicast, support of multiplexing with HARQ-ACK for unicast is additional UE capability reporting on top of the basic FG33-2a for ACK/NACK based feedback for multicast.  Furthermore, the currently defined FG33-3-3a/3b/4/5 for multiplexing HARQ-ACK for unicast initially intended for ACK/NACK based feedback for multicast can be expanded to include the case of NACK-only mode1 converted into ACK/NACK bits and also to include the case of multiplexing on PUSCH. The changes can be made to include 33-2a or 33-4 or 33-5-1a or 33-5-1f as prerequisite FG and adding a note that this FG33-3-3a/3b/5 includes the case of multiplexing with ACK/NACK for multicast dynamic scheduling with HARQ-ACK for unicast, or multiplexing with NACK-only for multicast dynamic scheduling with HARQ-ACK for unicast, or multiplexing with ACK/NACK for multicast SPS scheduling with HARQ-ACK for unicast, or multiplexing with NACK-only for multicast SPS scheduling with HARQ-ACK for unicast.  The reporting granularity can be per UE or per BC (as the report for the support of multicast on PCell).  In addition, FFS value of X G-RNTIs for FG33-3-3a and FG33-3-3b can be deleted because the number of G-RNTI for multicast in FG33-2e is not expected to be large based on the discussion in the last RAN1 meeting though the decision was left to RAN2.  Since FG33-2a or FG33-4 or FG33-5-1a or FG33-5-1f are defined for multicast HARQ-ACK feedback and FG33-3-3a and FG33-3-3b are separate FG regarding multiplexing HARQ-ACK feedback for unicast and multicast, if UE supports one of HARQ-ACK feedback for multicast but does not support multiplexing HARQ-ACK feedback for unicast, it imposes too much restriction for network scheduling to avoid multiplexing. Given it is mandatory for unicast to support Type1 or Type2 codebook on PUCCH/PUSCH, it is good balance between UE and network to require that when UE supports 33-2a or 33-4 or 33-5-1a or 33-5-1f, at least one of FG33-3-3a or FG33-3-3b should be supported. Such note is added into FG33-3-3a and FG33-3-3b.  ***Proposal 5: Updating FG33-3-3a/3b/4/5 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-3-3a | FDM-ed Type-1 and Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast on PUCCH or PUSCH | Support of FDM-ed Type-1 and Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast on PUCCH or PUSCH.  ~~FFS value of X G-RNTIs~~ | 33-2a or 33-4 or 33-5-1a or 33-5-1f | Yes |  |  | Per BC | N/A | N/A |  | Note1: FDM-ed Type-1 HARQ-ACK codebook is generated by concatenating the Type-1 sub-codebook for unicast and the Type-1 sub-codebook for multicast.  Note2: The Type-2 HARQ-ACK codebook is generated by concatenating the Type-2 sub-codebook for unicast and the Type-2 sub-codebook for multicast.  Note2: with 33-2a or 33-4 or 33-5-1a or 33-5-1f as prerequisite FG, this FG33-3-3a includes the case of multiplexing with ACK/NACK for multicast dynamic scheduling with HARQ-ACK for unicast, or multiplexing with NACK-only for multicast dynamic scheduling with HARQ-ACK for unicast, or multiplexing with ACK/NACK for multicast SPS scheduling with HARQ-ACK for unicast, or multiplexing with NACK-only for multicast SPS scheduling with HARQ-ACK for unicast.  Note3: when UE supports 33-2a or 33-4 or 33-5-1a or 33-5-1f, at least one of FG33-3-3a or FG33-3-3b should be supported. | Optional with capability signalling | | 33. NR\_MBS | 33-3-3b | Mode 2 TDM-ed Type-1 and Type-2 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast on PUCCH or PUSCH | Support of Mode 2 TDM-ed Type-1 and Type-2 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast on PUCCH or PUSCH  ~~FFS value of X G-RNTIs~~ | 33-2a or 33-4 or 33-5-1a or 33-5-1f | Yes |  |  | Per BC | N/A | N/A |  | Note1: Mode 2 TDM-ed Type-1 HARQ-ACK codebook is generated based on the union TDRA tables from unicast and multicast and the union of k1 sets from unicast and multicast.  Note2: The Type-2 HARQ-ACK codebook is generated by concatenating the Type-2 sub-codebook for unicast and the Type-2 sub-codebook for multicast.  Note3: with 33-2a or 33-4 or 33-5-1a or 33-5-1f as prerequisite FG, this FG33-3-3b includes the case of multiplexing with ACK/NACK for multicast dynamic scheduling with HARQ-ACK for unicast, or multiplexing with NACK-only for multicast dynamic scheduling with HARQ-ACK for unicast, or multiplexing with ACK/NACK for multicast SPS scheduling with HARQ-ACK for unicast, or multiplexing with NACK-only for multicast SPS scheduling with HARQ-ACK for unicast.  Note4: when UE supports 33-2a or 33-4 or 33-5-1a or 33-5-1f, at least one of FG33-3-3a or FG33-3-3b should be supported. | Optional with capability signalling | |
| [3] | ZTE | For all the MBS UE features with FFS for the report type, the following report type can be considered as a middle ground between companies.   * Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2   ***Proposal 9****: Regarding the report type for MBS FG 33-3-3, 33-3-3a, 33-3-3b, 33-3-4, 33-3-5, 33-5-1e, 33-5-1f, 33-5-1g, 33-5-1i, 33-5-2, 33-6-1, 33-6-1a, 33-6-2, 33-6-3, 33-8-1 and 33-9, consider the following as baseline.*   * + *Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2*   The second issue is about whether to delete “FFS value of X G-RNTIs” for FG 33-3-3a and 33-3-3b. This issue has been discussed for several meetings without outcome. From our perspective, our view is we have already introduced an FG to indicate the number of G-RNTIs for each UE. It can already provide sufficient UE implementation flexibility. Thus, we propose to remove this part.  ***Proposal 10:*** *Remove “FFS value of X G-RNTIs” from FG 33-3-3a and 33-3-3b.* |
| [4] | Spreadtrum Communications | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-3-3a | FDM-ed Type-1 and Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast | Support of FDM-ed Type-1 and Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast  FFS value of X G-RNTIs | 33-3-2 | Yes |  |  | Per band | No | No |  | Note1: FDM-ed Type-1 HARQ-ACK codebook is generated by concatenating the Type-1 sub-codebook for unicast and the Type-1 sub-codebook for multicast.  Note2: The Type-2 HARQ-ACK codebook is generated by concatenating the Type-2 sub-codebook for unicast and the Type-2 sub-codebook for multicast. | Optional with capability signalling | | 33. NR\_MBS | 33-3-3b | Mode 2 TDM-ed Type-1 and Type-2 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast | Support of Mode 2 TDM-ed Type-1 and Type-2 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast  FFS value of X G-RNTIs | 33-3-3 | Yes |  |  | Per band | No | No |  | Note1: Mode 2 TDM-ed Type-1 HARQ-ACK codebook is generated based on the union TDRA tables from unicast and multicast and the union of k1 sets from unicast and multicast.  Note2: The Type-2 HARQ-ACK codebook is generated by concatenating the Type-2 sub-codebook for unicast and the Type-2 sub-codebook for multicast. | Optional with capability signalling | |
| [7] | NTT DOCOMO | FG 33-3-2 should be added as a prerequisite FG for FG 33-3-3a. FG 33-3-3 should be added as a prerequisite FG for FG 33-3-3b. Prerequisite FG for FG 33-3-5 should be “FG 33-3-3a or 33-3-3b or 33-3-4”.  The capability of the number of G-RNTIs is already defined as FG 33-2e. We don’t feel the need to be able to report a different value than FG 33-2e.  A time duration allowed for codebook generation depends on the SCS and can vary from band to band. The reporting type of FGs related to codebook generation should be per band.  **Proposal 5-3: Update FG 33-3-3a, 33-3-3b, 33-3-4 and 33-3-5 as follows:**   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-3-3a | FDM-ed Type-1 and Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast | Support of FDM-ed Type-1 and Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast  ~~FFS value of X G-RNTIs~~ | 33-3-2 | Yes |  |  | Per band | N/A | N/A |  | Note1: FDM-ed Type-1 HARQ-ACK codebook is generated by concatenating the Type-1 sub-codebook for unicast and the Type-1 sub-codebook for multicast.  Note2: The Type-2 HARQ-ACK codebook is generated by concatenating the Type-2 sub-codebook for unicast and the Type-2 sub-codebook for multicast. | Optional with capability signalling | | 33-3-3b | Mode 2 TDM-ed Type-1 and Type-2 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast | Support of Mode 2 TDM-ed Type-1 and Type-2 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast  ~~FFS value of X G-RNTIs~~ | 33-3-3 | Yes |  |  | Per band | N/A | N/A |  | Note1: Mode 2 TDM-ed Type-1 HARQ-ACK codebook is generated based on the union TDRA tables from unicast and multicast and the union of k1 sets from unicast and multicast.  Note2: The Type-2 HARQ-ACK codebook is generated by concatenating the Type-2 sub-codebook for unicast and the Type-2 sub-codebook for multicast. | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-3-3a | FDM-ed Type-1 and Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast | 1. Support of FDM-ed Type-1 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast  2. Support of Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast with max number X of G-RNTIs | 33-2a, 33-3-2 | Yes |  |  | Per BC | N/A | N/A |  | Note1: FDM-ed Type-1 HARQ-ACK codebook is generated by concatenating the Type-1 sub-codebook for unicast and the Type-1 sub-codebook for multicast.  Note2: The Type-2 HARQ-ACK codebook is generated by concatenating the Type-2 sub-codebook for unicast and the Type-2 sub-codebook for multicast.  Candidate values of X is {2, 3, 4} with X no lareger than max number of G-RNTIs of FG33-2e | Optional with capability signalling | | 33. NR\_MBS | 33-3-3b | Mode 2 TDM-ed Type-1 and Type-2 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast | * 1. Support of Mode 2 TDM-ed Type-1 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast   2. Support of Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast with max number X of G-RNTIs | 33-2a | Yes |  |  | Per BC | N/A | N/A |  | Note1: Mode 2 TDM-ed Type-1 HARQ-ACK codebook is generated based on the union TDRA tables from unicast and multicast and the union of k1 sets from unicast and multicast.  Note2: The Type-2 HARQ-ACK codebook is generated by concatenating the Type-2 sub-codebook for unicast and the Type-2 sub-codebook for multicast.  Candidate values of X is {2, 3, 4} with X no lareger than max number of G-RNTIs of FG33-2e | Optional with capability signalling | |
| [9] | Nokia, NSB | * **33-3-3a:** * Per UE * **33-3-3b:** * Per UE |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

**High priority proposal 2-10-1:**

* **Components of FG 33-3-3a are revised as “Support of FDM-ed Type-1 and Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast on PUCCH or PUSCH” [2]**
* **Components of FG 33-3-3b are revised as “Support of Mode 2 TDM-ed Type-1 and Type-2 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast on PUCCH or PUSCH” [2]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | Being added is helpful for clarity. |
| Samsung | OK although not necessary since no exception is currently made |
| NTT DOCOMO | OK |
| Nokia, NSB | Not necessary, it includes all possibilities. What is the actual clarification being made here? |
| LG Electronics | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems it is just helpful for clarity and hence it should not be controversial. |
| Moderator (NTT DOCOMO) | Following agreement was made at Tuesday GTW session.  **Agreement:**   * Components of FG 33-3-3a are revised as “Support of FDM-ed Type-1 and Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast on PUCCH or PUSCH” * Components of FG 33-3-3b are revised as “Support of Mode 2 TDM-ed Type-1 and Type-2 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast on PUCCH or PUSCH” |

### **(D)High priority proposal 2-10-2:**

* **Apply one of the following alternatives for the components of FG 33-3-3a and 33-3-3b**
  + **Alt.1: Add a component “Support of Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast with max number X of G-RNTIs” [8]**
    - **Candidate values of X is {2, 3, 4} with X no lareger than max number of G-RNTIs of FG33-2e**
  + **Alt.2: Remove “FFS value of X G-RNTIs”, i.e., No additional component is added to either FG 33-3-3a or 33-3-3b [2, 3, 7]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | OK |
| ZTE | This issue has been discussed for several meetings without outcome. From our perspective, our view is that RAN1 has already introduced an FG to indicate the number of G-RNTIs for each UE. It can already provide sufficient UE implementation flexibility. Thus, we propose to go with Alt.2. |
| NTT DOCOMO | We prefer Alt.2 |
| LG Electronics | OK |
| Apple | Even only one unicast PDSCH and multicast PDSCH can be FDMed in a slot, the ulticast PDSCH could be scrambled by different G-RNTI in different slot. Without X limitation, the codebook size could be larger. |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems further discussion is necessary. |
| Ericsson | We prefer alt2. |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  We can check whether the Alt.2 is acceptable to all. **High priority proposal 2-10-2:** **Apply following for the components of FG 33-3-3a and 33-3-3b**   * **Remove “FFS value of X G-RNTIs”, i.e., No additional component is added to either FG 33-3-3a or 33-3-3b** |
| Qualcomm | In legacy with unicast feedback only, only C-RNTI is multiplexed in one codebook. But now multiple G-RNTIs are introduced for multicast. The UE may not be able to support multiplexing all the G-RNTIs together with large codebook size. |
| Moderator (NTT DOCOMO) | Following agreement was made in GTW session.  **High priority proposal 2-10-2:**  Modify 33-3-3a and 3b as below.   * Further discuss on the consequence  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-3-3a | FDM-ed Type-1 and Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast | 1. Support of FDM-ed Type-1 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast  2. Support of Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast with max number X of G-RNTIs | 33-2a, 33-3-2 | Yes |  | | FFS | Per BC | N/A | N/A |  | Note1: FDM-ed Type-1 HARQ-ACK codebook is generated by concatenating the Type-1 sub-codebook for unicast and the Type-1 sub-codebook for multicast.  Note2: The Type-2 HARQ-ACK codebook is generated by concatenating the Type-2 sub-codebook for unicast and the Type-2 sub-codebook for multicast.  Candidate values of X is {2, 3, 4} with X no larger than max number of G-RNTIs of FG33-2e | Optional with capability signalling | | 33. NR\_MBS | 33-3-3b | Mode 2 TDM-ed Type-1 and Type-2 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast | 1.Support of Mode 2 TDM-ed Type-1 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast  2.Support of Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast with max number X of G-RNTIs | 33-2a | Yes |  | FFS | | Per BC | N/A | N/A |  | Note1: Mode 2 TDM-ed Type-1 HARQ-ACK codebook is generated based on the union TDRA tables from unicast and multicast and the union of k1 sets from unicast and multicast.  Note2: The Type-2 HARQ-ACK codebook is generated by concatenating the Type-2 sub-codebook for unicast and the Type-2 sub-codebook for multicast.  Candidate values of X is {2, 3, 4} with X no larger than max number of G-RNTIs of FG33-2e | Optional with capability signalling | |

### **(D)High priority proposal 2-10-3:**

* **Apply one of the following alternatives for prerequisite FG for FG 33-3-3a**
  + **Alt.1: FG 33-2a or 33-4 or 33-5-1a or 33-5-1f [2]**
  + **Alt.2: FG 33-3-2 [4, 7]**
  + **Alt.3: FG 33-2a, 33-3-2 [8]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | Same logic for proposal **2-5-1:** |
| Samsung | Agree with Huawei |
| Qualcomm | Prefer to separate DG and SPS |
| MTK | Alt 1 is ok for us |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems companies prefer to separate DG and SPS. |
| Ericsson | Alt1. In our understanding, HARQ support for unicast is for both DG and SPS. |
| Qualcomm | Some concerns on Alt1:  It is not clear 33-4 and 33-5-1f can support Type-1 CB yet, which is under discussion in main session.  Based on the following RAN1 agreement, our understanding is that if UE does not support 33-3-2, no need to support FDMed Type-1 codebook.  ***Agreement***  *For the Type-1 codebook construction for FDM-ed unicast and multicast via Opt 4 (from the previous agreement), when UE is configured with multiple G-RNTIs and UE is configured with fdmed-Reception-Multicast, the sub-codebook for multicast consists of the HARQ-ACK bits for all configured G-RNTIs*  For DG and SPS separation, if we are the only company, we can compromise for progress. |

### **(D)High priority proposal 2-10-4:**

* **Apply one of the following alternatives for prerequisite FG for FG 33-3-3b**
  + **Alt.1: FG 33-2a or 33-4 or 33-5-1a or 33-5-1f [2]**
  + **Alt.2: FG 33-3-3 [4, 7]**
  + **Alt.3: FG 33-2a [8]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | Same logic for proposal **2-5-1:** |
| Samsung | Agree with Huawei |
| Qualcomm | Prefer to separate DG and SPS |
| MTK | Alt 1 is ok for us |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems companies prefer to separate DG and SPS. |
| Ericsson | Alt1. In our understanding, HARQ support for unicast is for both DG and SPS. |
| Qualcomm | Similar as 2-10-3, it is not clear 33-4 and 33-5-1f can support Type-1 CB yet, which is under discussion in main session  For DG and SPS separation, if we are the only company, we can compromise for progress. |

### **(D)High priority proposal 2-10-5:**

* **Apply one of the following alternatives for the reporting type of FG 33-3-3a**
  + **Alt.1: Per UE [9]**
  + **Alt 2: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation [3]**
  + **Alt.3: Per Band [4, 7]**
  + **Alt.4: Per BC [2, 8]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | We should be careful to introduce any more FG to solve the reporting granularity issue without necessity. |
| Samsung | Alt.4 |
| ZTE | We prefer Alt.1 or Alt.2. |
| Nokia, NSB | We prefer Alt.1 or Alt.2. |
| MTK | Alt.4 |
| Apple | Alt.4 |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further discussion is necessary. |
| Ericsson | Alt1, considering that the pre-required FGs are per BC. |
| Huawei, HiSilicon | Alt4 |
| Qualcomm | Alt4 |

### **(D)High priority proposal 2-10-6:**

* **Apply one of the following alternatives for the reporting type of FG 33-3-3b**
  + **Alt.1: Per UE [9]**
  + **Alt 2: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation [3]**
  + **Alt.3: Per Band [4, 7]**
  + **Alt.4: Per BC [2, 8]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | We should be careful to introduce any more FG to solve the reporting granularity issue without necessity. |
| Samsung | Alt.4 |
| ZTE | We prefer Alt.1 or Alt.2. |
| Nokia, NSB | We prefer Alt.1 or Alt.2. |
| MTK | Alt.4 |
| Apple | Alt.4 |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further discussion is necessary. |
| Ericsson | Alt1, considering that the pre-required FGs are per BC. |
| Huawei, HiSilicon | Alt4 |
| Qualcomm | Alt4 |

### **Low priority proposal 2-10-7:**

* **Add a note to FG 33-3-3a that “with 33-2a or 33-4 or 33-5-1a or 33-5-1f as prerequisite FG, this FG33-3-3a includes the case of multiplexing with ACK/NACK for multicast dynamic scheduling with HARQ-ACK for unicast, or multiplexing with NACK-only for multicast dynamic scheduling with HARQ-ACK for unicast, or multiplexing with ACK/NACK for multicast SPS scheduling with HARQ-ACK for unicast, or multiplexing with NACK-only for multicast SPS scheduling with HARQ-ACK for unicast.” [2]**
* **Add a note to FG 33-3-3b that “with 33-2a or 33-4 or 33-5-1a or 33-5-1f as prerequisite FG, this FG33-3-3b includes the case of multiplexing with ACK/NACK for multicast dynamic scheduling with HARQ-ACK for unicast, or multiplexing with NACK-only for multicast dynamic scheduling with HARQ-ACK for unicast, or multiplexing with ACK/NACK for multicast SPS scheduling with HARQ-ACK for unicast, or multiplexing with NACK-only for multicast SPS scheduling with HARQ-ACK for unicast.” [2]**
* **Add a note to both FG 33-3-3a and FG 33-3-3b that “when UE supports 33-2a or 33-4 or 33-5-1a or 33-5-1f, at least one of FG33-3-3a or FG33-3-3b should be supported” [2]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | No need for the above notes |
| Huawei, HiSilicon | The note is expected to be helpful to understand how the FGs works for both dynamic and SPS. |
|  |  |

## **2.11 33-3-4: Mode 1 for type1 codebook generation**

In [1], FG 33-3-4 is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-3-4 | Mode 1 for type1 codebook generation | Supports type1-Codebook-Generation-Mode configured as mode 1 | 33-3-3b | Yes |  |  | [Per UE] | [No] | [No] |  | This FG is for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast on PUCCH or PUSCH | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | Furthermore, the currently defined FG33-3-3a/3b/4/5 for multiplexing HARQ-ACK for unicast initially intended for ACK/NACK based feedback for multicast can be expanded to include the case of NACK-only mode1 converted into ACK/NACK bits and also to include the case of multiplexing on PUSCH. The changes can be made to include 33-2a or 33-4 or 33-5-1a or 33-5-1f as prerequisite FG and adding a note that this FG33-3-3a/3b/5 includes the case of multiplexing with ACK/NACK for multicast dynamic scheduling with HARQ-ACK for unicast, or multiplexing with NACK-only for multicast dynamic scheduling with HARQ-ACK for unicast, or multiplexing with ACK/NACK for multicast SPS scheduling with HARQ-ACK for unicast, or multiplexing with NACK-only for multicast SPS scheduling with HARQ-ACK for unicast.  The reporting granularity can be per UE or per BC (as the report for the support of multicast on Pcell).  Since FG33-2a or FG33-4 or FG33-5-1a or FG33-5-1f are defined for multicast HARQ-ACK feedback and FG33-3-3a and FG33-3-3b are separate FG regarding multiplexing HARQ-ACK feedback for unicast and multicast, if UE supports one of HARQ-ACK feedback for multicast but does not support multiplexing HARQ-ACK feedback for unicast, it imposes too much restriction for network scheduling to avoid multiplexing. Given it is mandatory for unicast to support Type1 or Type2 codebook on PUCCH/PUSCH, it is good balance between UE and network to require that when UE supports 33-2a or 33-4 or 33-5-1a or 33-5-1f, at least one of FG33-3-3a or FG33-3-3b should be supported. Such note is added into FG33-3-3a and FG33-3-3b.  ***Proposal 5: Updating FG33-3-3a/3b/4/5 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-3-4 | Mode 1 for type1 codebook generation | Supports type1-Codebook-Generation-Mode configured as mode 1 | 33-3-3b | Yes |  |  | Per BC | N/A | N/A |  | Note1: Mode 1 TDM-ed Type-1 HARQ-ACK codebook is generated based on the union TDRA tables from unicast and multicast and the **intersection** of k1 sets from unicast and multicast.  This FG is for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast on PUCCH or PUSCH | Optional with capability signalling | |
| [3] | ZTE | For all the MBS UE features with FFS for the report type, the following report type can be considered as a middle ground between companies.   * Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2   ***Proposal 9****: Regarding the report type for MBS FG 33-3-3, 33-3-3a, 33-3-3b, 33-3-4, 33-3-5, 33-5-1e, 33-5-1f, 33-5-1g, 33-5-1i, 33-5-2, 33-6-1, 33-6-1a, 33-6-2, 33-6-3, 33-8-1 and 33-9, consider the following as baseline.*   * + *Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2* |
| [4] | Spreadtrum Communications | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-3-4 | Mode 1 for type1 codebook generation | Supports type1-Codebook-Generation-Mode configured as mode 1 | 33-3-3b | Yes |  |  | Per UE | No | No |  | This FG is for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast on PUCCH or PUSCH | Optional with capability signalling | |
| [7] | NTT DOCOMO | FG 33-3-2 should be added as a prerequisite FG for FG 33-3-3a. FG 33-3-3 should be added as a prerequisite FG for FG 33-3-3b. Prerequisite FG for FG 33-3-5 should be “FG 33-3-3a or 33-3-3b or 33-3-4”.  The capability of the number of G-RNTIs is already defined as FG 33-2e. We don’t feel the need to be able to report a different value than FG 33-2e.  A time duration allowed for codebook generation depends on the SCS and can vary from band to band. The reporting type of FGs related to codebook generation should be per band.  **Proposal 5-3: Update FG 33-3-3a, 33-3-3b, 33-3-4 and 33-3-5 as follows:**   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-3-4 | Mode 1 for type1 codebook generation | Supports type1-Codebook-Generation-Mode configured as mode 1 | 33-3-3b | Yes |  |  | Per band | N/A | N/A |  | This FG is for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast on PUCCH or PUSCH | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-3-4 | Mode 1 for type1 codebook generation | Supports type1-Codebook-Generation-Mode configured as mode 1 | 33-3-3b | Yes |  |  | Per BC | N/A | N/A |  | This FG is for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast on PUCCH or PUSCH | Optional with capability signalling | |
| [9] | Nokia, NSB | * **33-3-4:** * Per UE |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

### **(D)High priority proposal 2-11-1:**

* **Apply one of the following alternatives for the reporting type of FG 33-3-4** 
  + **Alt.1: Per UE [4, 9]**
  + **Alt.2: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation [3]**
  + **Alt.3: Per Band [7]**
  + **Alt.4: Per BC [2, 8]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | We should be careful to introduce any more FG to solve the reporting granularity issue without necessity. |
| Samsung | Alt.4 |
| ZTE | We prefer Alt.1 or Alt.2. |
| Nokia, NSB | We prefer Alt.1 or Alt.2. |
| Apple | Alt.4 |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further discussion is necessary. |
| Ericsson | Alt1, considering that the pre-required FGs are per BC. |
| MTK | Alt.4 |
| Huawei, HiSilicon | Alt4 |
| Qualcomm | Alt4 |

### **Low priority proposal 2-11-2:**

* **Add a note that “Mode 1 TDM-ed Type-1 HARQ-ACK codebook is generated based on the union TDRA tables from unicast and multicast and the intersection of k1 sets from unicast and multicast.” [2]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | No need for the note |
|  |  |
|  |  |

## **2.12 33-3-5: Feedback multiplexing for unicast PDSCH and group-common PDSCH for multicast with same priority and different codebook type**

In [1], FG 33-3-5 is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-3-5 | Feedback multiplexing for unicast PDSCH and group-common PDSCH for multicast with same priority and different codebook type | Support of multiplexing HARQ-ACK for unicast and multicast with the same priority and different HARQ-ACK codebook types in the same PUCCH slot | [33-2b] | Yes |  |  | [Per FSPC] | [No] | [No] |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | Furthermore, the currently defined FG33-3-3a/3b/4/5 for multiplexing HARQ-ACK for unicast initially intended for ACK/NACK based feedback for multicast can be expanded to include the case of NACK-only mode1 converted into ACK/NACK bits and also to include the case of multiplexing on PUSCH. The changes can be made to include 33-2a or 33-4 or 33-5-1a or 33-5-1f as prerequisite FG and adding a note that this FG33-3-3a/3b/5 includes the case of multiplexing with ACK/NACK for multicast dynamic scheduling with HARQ-ACK for unicast, or multiplexing with NACK-only for multicast dynamic scheduling with HARQ-ACK for unicast, or multiplexing with ACK/NACK for multicast SPS scheduling with HARQ-ACK for unicast, or multiplexing with NACK-only for multicast SPS scheduling with HARQ-ACK for unicast.  The reporting granularity can be per UE or per BC (as the report for the support of multicast on Pcell).  Since FG33-2a or FG33-4 or FG33-5-1a or FG33-5-1f are defined for multicast HARQ-ACK feedback and FG33-3-3a and FG33-3-3b are separate FG regarding multiplexing HARQ-ACK feedback for unicast and multicast, if UE supports one of HARQ-ACK feedback for multicast but does not support multiplexing HARQ-ACK feedback for unicast, it imposes too much restriction for network scheduling to avoid multiplexing. Given it is mandatory for unicast to support Type1 or Type2 codebook on PUCCH/PUSCH, it is good balance between UE and network to require that when UE supports 33-2a or 33-4 or 33-5-1a or 33-5-1f, at least one of FG33-3-3a or FG33-3-3b should be supported. Such note is added into FG33-3-3a and FG33-3-3b.  ***Proposal 5: Updating FG33-3-3a/3b/4/5 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-3-5 | Feedback multiplexing for unicast PDSCH and group-common PDSCH for multicast with same priority and different codebook type on PUCCH or PUSCH | Support of multiplexing HARQ-ACK for unicast and for multicast with the same priority and different HARQ-ACK codebook types in the same PUCCH ~~slot~~ or PUSCH | ~~[33-2b]~~  33-2a or 33-4 or 33-5-1a or 33-5-1f | Yes |  |  | Per BC | N/A | N/A |  | Note: with 33-2a or 33-4 or 33-5-1a or 33-5-1f as prerequisite FG, this FG33-3-3b includes the case of multiplexing with ACK/NACK for multicast dynamic scheduling with HARQ-ACK for unicast, or multiplexing with NACK-only for multicast dynamic scheduling with HARQ-ACK for unicast, or multiplexing with ACK/NACK for multicast SPS scheduling with HARQ-ACK for unicast, or multiplexing with NACK-only for multicast SPS scheduling with HARQ-ACK for unicast. | Optional with capability signalling | |
| [3] | ZTE | For all the MBS UE features with FFS for the report type, the following report type can be considered as a middle ground between companies.   * Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2   ***Proposal 9****: Regarding the report type for MBS FG 33-3-3, 33-3-3a, 33-3-3b, 33-3-4, 33-3-5, 33-5-1e, 33-5-1f, 33-5-1g, 33-5-1i, 33-5-2, 33-6-1, 33-6-1a, 33-6-2, 33-6-3, 33-8-1 and 33-9, consider the following as baseline.*   * + *Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2* |
| [4] | Spreadtrum Communications | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-3-5 | Feedback multiplexing for unicast PDSCH and group-common PDSCH for multicast with same priority and different codebook type | Support of multiplexing HARQ-ACK for unicast and multicast with the same priority and different HARQ-ACK codebook types in the same PUCCH slot | [33-2b] | Yes |  |  | Per FS | No | No |  |  | Optional with capability signalling | |
| [7] | NTT DOCOMO | FG 33-3-2 should be added as a prerequisite FG for FG 33-3-3a. FG 33-3-3 should be added as a prerequisite FG for FG 33-3-3b. Prerequisite FG for FG 33-3-5 should be “FG 33-3-3a or 33-3-3b or 33-3-4”.  The capability of the number of G-RNTIs is already defined as FG 33-2e. We don’t feel the need to be able to report a different value than FG 33-2e.  A time duration allowed for codebook generation depends on the SCS and can vary from band to band. The reporting type of FGs related to codebook generation should be per band.  **Proposal 5-3: Update FG 33-3-3a, 33-3-3b, 33-3-4 and 33-3-5 as follows:**   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-3-5 | Feedback multiplexing for unicast PDSCH and group-common PDSCH for multicast with same priority and different codebook type | Support of multiplexing HARQ-ACK for unicast and multicast with the same priority and different HARQ-ACK codebook types in the same PUCCH slot | 33-3-3a or 33-3-3b or 33-3-4 | Yes |  |  | Per band | N/A | N/A |  |  | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-3-5 | Feedback multiplexing for unicast PDSCH and group-common PDSCH for multicast with same priority and different codebook type | Support of multiplexing HARQ-ACK for unicast and multicast with the same priority and different HARQ-ACK codebook types in the same PUCCH slot | 33-2a | Yes |  |  | per BC | N/A | N/A |  |  | Optional with capability signalling | |
| [9] | Nokia, NSB | * **33-3-5:** * Per UE or per band, motivation for finer granularity is not clear. If limitations on level of support is needed, then it is preferrable to add those restrictions explicitly in the component description. |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

**(NS)High priority proposal 2-12-1:**

* **Components of FG 33-3-5 are revised as “Support of multiplexing HARQ-ACK for unicast and for multicast with the same priority and different HARQ-ACK codebook types in the same PUCCH slot or PUSCH” [2]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | Firstly we should delete “slot” from ‘the same PUCCH slot’ because mulplexing the same priority HARQ-ACK should be the same PUCCH and more than one PUCCHs in the same slot is not supported. Sorry if it was not proposed in the paper.  Secondly, as mentioned, adding PUSCH is helpful for clarity. |
| Samsung | Prefer no change – “PUCCH slot” is not “PUCCH” and the addition “or PUSCH” makes things more confusing.  An alternative can be “… **types in the same PUCCH slot in a PUCCH or in a PUSCH”** |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further discussion is necessary. |
| Ericsson | OK to add “For”. Regarding the addition of “or PUSCH” we agree with Samsung that the change is not necessary. |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  We can check whether following updated proposal is acceptable. **High priority proposal 2-12-1:** **Components of FG 33-3-5 are revised as “Support of multiplexing HARQ-ACK for unicast and for multicast with the same priority and different HARQ-ACK codebook types in the same PUCCH slot in a PUCCH or in a PUSCH”** |
| NTT DOCOMO | We are fine with the updated proposal. |
| Ericsson | OK with the moderator’s update. |
| Moderator (NTT DOCOMO) | Thank you very much for further feedbacks!  Let’s check in the GTW session if above proposal is agreeable. |
| Moderator (NTT DOCOMO) | Following agreement was made in GTW session.  **High priority proposal 2-12-1:**  **Components of FG 33-3-5 are revised as “Support of multiplexing HARQ-ACK for unicast and for multicast with the same priority and different HARQ-ACK codebook types in a PUCCH or in a PUSCH”** |

**(S)High priority proposal 2-12-2:**

* **Apply one of the following alternatives for prerequisite FG for FG 33-3-5** 
  + **Alt.1: FG 33-2a [8]**
  + **Alt.2: FG 33-3-3a or 33-3-3b or 33-3-4 [7]**
  + **Alt.3: FG 33-2a or 33-4 or 33-5-1a or 33-5-1f [2]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | Slight preference for Alt3. |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further inputs would be necessary. |
| Ericsson | Preference for Alt3. |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  We can check if Alt.3 is acceptable.  **High priority proposal 2-12-2:**  **Prerequisite FG for FG 33-3-5 is “FG 33-2a or 33-4 or 33-5-1a or 33-5-1f”** |
| Moderator (NTT DOCOMO) | Following agreement was made.  **High priority proposal 2-12-2:**  **Prerequisite FG for FG 33-3-5 is “FG 33-2a or 33-4 or 33-5-1a or 33-5-1f”** |

### **(D)****High priority proposal 2-12-3:**

* **Apply one of the following alternatives for the reporting type of FG 33-3-5**
  + **Alt.1: Per UE [9]**
  + **Alt.2: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation [3]**
  + **Alt.3: Per Band [7, 9]**
  + **Alt.4: Per BC [2, 8]**
  + **Alt.5: Per FS [4]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | Alt.4 |
| ZTE | We prefer Alt.1 or Alt.2. |
| Nokia, NSB | We prefer Alt.1 or Alt.2. |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further discussion is necessary. |
| Ericsson | Considering that pre-required FGs are per BC, we are ok with Alt1/Alt2. |

### **Low priority proposal 2-12-4:**

* **Add a note that “with 33-2a or 33-4 or 33-5-1a or 33-5-1f as prerequisite FG, this FG33-3-3b includes the case of multiplexing with ACK/NACK for multicast dynamic scheduling with HARQ-ACK for unicast, or multiplexing with NACK-only for multicast dynamic scheduling with HARQ-ACK for unicast, or multiplexing with ACK/NACK for multicast SPS scheduling with HARQ-ACK for unicast, or multiplexing with NACK-only for multicast SPS scheduling with HARQ-ACK for unicast.” [2]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | No need for the note. |
|  |  |
|  |  |

## **2.13 33-4: NACK-only based HARQ-ACK feedback for multicast with ACK/NACK transforming**

In [1], FG 33-4 is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-4 | NACK-only based HARQ-ACK feedback for multicast with ACK/NACK transforming | 1. Support NACK-only based HARQ-ACK feedback for dynamic scheduling for multicast, including:  a) A single TB with NACK-only feedback transmitted in PUCCH  b) One or multiple TB with NACK-only feedback transmitted in PUCCH by transforming into ACK/NACK bits  [2. Support of shared PUCCH resource configurations with unicast] | 33-2a | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | For NACK-only based feedback, the following two alternatives were agreed with Alt1 and Alt4 corresponding NACK-only mode1 and mode2, respectively:   * *Alt1: Support UE multiplexing the HARQ-ACK bits by transforming NACK-only into ACK/NACK HARQ bits.* * *Alt4: Define combination of NACK-only which corresponds to a specific sequence or a PUCCH transmission.*   Two features groups, i.e., FG33-4 and FG33-4a were agreed in the last meeting for NACK-only based feedback. FG33-4a is for support of NACK-only up to 4 TBs by selecting one of predefined PUCCH resources based on the decoding results of the scheduled TB(s), for which the predefined PUCCH resources are expected to be separately configured for multicast and it should include the case of single TB with NACK-only and include the extended Tproc1 as discussed in [4]. FG33-4 is expected to be the basic feature group for the support of NACK-only based feedback including NACK-only for a single TB case and for the case of more than one TB by transforming into ACK/NACK bits to generate Type-1 or Type-2 HARQ-ACK CB for multicast feedback only, for which PUCCH resources are also expected to be shared with the PUCCH resources configured for unicast given support of separate PUCCH resource configurations from unicast taking extra UE buffer is expected to be a separate FG as defined in FG33-8-1 for ACK/NACK based feedback. In addition, there should be a separate FG for supporting shared PUCCH resource configurations from unicast for NACK-only mode2, i.e., FG33-4b should be added, for which one TB case with shared PUCCH resources with unicast can be not included as one component because it has been included in FG33-4.  Furthermore, support of separately configured PUCCH resources for NACK-only mode1 (i.e., transforming into ACK/NACK based) can be merged into FG33-8-1 with either FG33-2a or FG33-4 as prerequisite FGs for ACK/NACK based and for NACK-only mode1 feedback, respectively, and the revision is proposed in section 3.8. In addition, considering the NACK-only feedback for multicast SPS scheduling discussed in section 3.6, FG33-4a can be expanded to include the cases of dynamic or SPS scheduling by setting FG33-4 or FG33-5-1f as prerequisites FG, respectively, and a corresponding note can be added for clarification.  In addition, DCI-based enabling/disabling NACK-only feedback also needs to configured firstly by RRC signalling. Similar to FG33-2b with FG33-2a as prerequisite FG for ACK/NACK based feedback for dynamic scheduling, FG33-5-1b with FG33-5-1a as prerequisite FG for ACK/NACK based feedback for SPS scheduling, and FG33-5-1g with FG33-5-1f as prerequisite FG for NACK-only based feedback for SPS scheduling, FG33-4 is prerequisite FG for FG33-4-1.  With the above analysed, the FG33-4/4a and FG33-4-1 can be updated as follows:  ***Proposal 6: Updating FG33-4/4a and FG33-4-1 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-4 | Support of NACK-only based HARQ-ACK feedback for multicast with ACK/NACK transforming with shared PUCCH resources configuration with unicast and RRC-based enabling/disabling NACK-only based feedback for dynamic scheduling | 1. Support NACK-only based HARQ-ACK feedback for dynamic scheduling for multicast, including:  a) A single TB with NACK-only feedback transmitted in PUCCH  b) ~~One or~~ multiple TB with NACK-only feedback transmitted in PUCCH by transforming into ACK/NACK bits  2. Support of **shared** PUCCH resource configuration with unicast | 33-2a | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | |
| [4] | Spreadtrum Communications | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-4 | NACK-only based HARQ-ACK feedback for multicast with ACK/NACK transforming | 1. Support NACK-only based HARQ-ACK feedback for dynamic scheduling for multicast, including:  a) A single TB with NACK-only feedback transmitted in PUCCH  b) One or multiple TB with NACK-only feedback transmitted in PUCCH by transforming into ACK/NACK bits  2. Support of shared PUCCH resource configurations with unicast | 33-2a | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | |
| [7] | NTT DOCOMO | When PUCCH-Config for multicast is not configured, PUCCH resources configured by PUCCH-Config for unicast are used as default. Therefore, the support for shared PUCCH resource configuration with unicast is required as a basic feature for NACK-only based feedback.  **Proposal 5-4: Update FG 33-4 as follows:**   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-4 | NACK-only based HARQ-ACK feedback for multicast with ACK/NACK transforming | 1. Support NACK-only based HARQ-ACK feedback for dynamic scheduling for multicast, including:  a) A single TB with NACK-only feedback transmitted in PUCCH  b) One or multiple TB with NACK-only feedback transmitted in PUCCH by transforming into ACK/NACK bits  ~~[~~2. Support of shared PUCCH resource configurations with unicast~~]~~ | 33-2a | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-4 | NACK-only based HARQ-ACK feedback for multicast with ACK/NACK transforming | 1. Support NACK-only based HARQ-ACK feedback for dynamic scheduling for multicast, including:  a) A single TB with NACK-only feedback transmitted in PUCCH  b) One or multiple TB with NACK-only feedback transmitted in PUCCH by transforming into ACK/NACK bits | 33-2a | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

**High priority proposal 2-13-1:**

* **Remove the bracket in components of FG 33-4, i.e., “Support of shared PUCCH resource configurations with unicast” is included in FG 33-4 [2, 4, 7]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | I suppose it should be the common understanding. With that, I wonder whether agreeable to introduce additional FG for separate configuration. |
| Samsung | OK to remove the bracketed text as proposed by Qualcomm. |
| ZTE | OK |
| NTT DOCOMO | OK |
| Nokia, NSB | OK |
| LG Electronics | Ok |
| MTK | Ok |
| Apple | Ok |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems the proposal is agreeable. |
| Moderator (NTT DOCOMO) | Following agreement was made at Tuesday GTW session.  **Agreement:**  Remove the bracket in components of FG 33-4, i.e., “Support of shared PUCCH resource configurations with unicast” is included in FG 33-4 |

### **(N)High priority proposal 2-13-2:**

* **Components of FG 33-4 are revised as**
  + **Component 1(b): ~~One or~~ multiple TB with NACK-only feedback transmitted in PUCCH by transforming into ACK/NACK bits [2]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | The idea of deleting ‘one or’ is because 1st component says A single TB with NACK-only feedback transmitted in PUCCH. With one in the 2nd bullet will mean one TB case will transmit ACK. We are assuming converting into ACK/NACK for one TBs for multiplexing with other UCI/PUSCH will be supported when UE reports the FG for multiplexing. |
| Samsung | Support the proposal – agree with Huawei |
| Qualcomm | Our understanding is that 1TB in Component 1(b) can be the case that NACK-only feedback if colliding with other multicast TBs configured with ACK/NACK-based feedback is using NACK-only mode1.  Currently, the other FGs for multiplexing are specified as for multiplexing unicast and multicast feedback. |
| ZTE | Even if there is only one TB with NACK-only feedback transmitted in PUCCH, it may also be transformed into ACK/NACK bit if the PUCCH is overlapping with PUSCH. Thus, it seems “one” should be kept here. |
| NTT DOCOMO | We agree with ZTE. |
| Nokia, NSB | Do not support |
| LG Electronics | Agree with ZTE |
| MTK | Agree with ZTE’s view |
| Apple | Agree with ZTE |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems there is no consensus on the proposal. |
| Ericsson | Same view as QC. “one or” is needed in Component 1(b). |

## **2.14 33-4a: NACK-only based HARQ-ACK feedback for multicast corresponding to a specific sequence or a PUCCH transmission**

In [1], FG 33-4a is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-4a | NACK-only based HARQ-ACK feedback for multicast corresponding to a specific sequence or a PUCCH transmission | 1. Support NACK-only based HARQ-ACK feedback for dynamic scheduling for multicast, including:  a) Multiple TB with NACK-only feedback transmitted in PUCCH by select one PUCCH resource.  2. Support of separate PUCCH resource configurations from unicast | 33-4 | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | For NACK-only based feedback, the following two alternatives were agreed with Alt1 and Alt4 corresponding NACK-only mode1 and mode2, respectively:   * *Alt1: Support UE multiplexing the HARQ-ACK bits by transforming NACK-only into ACK/NACK HARQ bits.* * *Alt4: Define combination of NACK-only which corresponds to a specific sequence or a PUCCH transmission.*   Two features groups, i.e., FG33-4 and FG33-4a were agreed in the last meeting for NACK-only based feedback. FG33-4a is for support of NACK-only up to 4 TBs by selecting one of predefined PUCCH resources based on the decoding results of the scheduled TB(s), for which the predefined PUCCH resources are expected to be separately configured for multicast and it should include the case of single TB with NACK-only and include the extended Tproc1 as discussed in [4]. FG33-4 is expected to be the basic feature group for the support of NACK-only based feedback including NACK-only for a single TB case and for the case of more than one TB by transforming into ACK/NACK bits to generate Type-1 or Type-2 HARQ-ACK CB for multicast feedback only, for which PUCCH resources are also expected to be shared with the PUCCH resources configured for unicast given support of separate PUCCH resource configurations from unicast taking extra UE buffer is expected to be a separate FG as defined in FG33-8-1 for ACK/NACK based feedback. In addition, there should be a separate FG for supporting shared PUCCH resource configurations from unicast for NACK-only mode2, i.e., FG33-4b should be added, for which one TB case with shared PUCCH resources with unicast can be not included as one component because it has been included in FG33-4.  Furthermore, support of separately configured PUCCH resources for NACK-only mode1 (i.e., transforming into ACK/NACK based) can be merged into FG33-8-1 with either FG33-2a or FG33-4 as prerequisite FGs for ACK/NACK based and for NACK-only mode1 feedback, respectively, and the revision is proposed in section 3.8. In addition, considering the NACK-only feedback for multicast SPS scheduling discussed in section 3.6, FG33-4a can be expanded to include the cases of dynamic or SPS scheduling by setting FG33-4 or FG33-5-1f as prerequisites FG, respectively, and a corresponding note can be added for clarification.  In addition, DCI-based enabling/disabling NACK-only feedback also needs to configured firstly by RRC signalling. Similar to FG33-2b with FG33-2a as prerequisite FG for ACK/NACK based feedback for dynamic scheduling, FG33-5-1b with FG33-5-1a as prerequisite FG for ACK/NACK based feedback for SPS scheduling, and FG33-5-1g with FG33-5-1f as prerequisite FG for NACK-only based feedback for SPS scheduling, FG33-4 is prerequisite FG for FG33-4-1.  With the above analysed, the FG33-4/4a and FG33-4-1 can be updated as follows:  ***Proposal 6: Updating FG33-4/4a and FG33-4-1 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-4a | Support of NACK-only based HARQ-ACK feedback for multicast corresponding to a specific sequence or a PUCCH transmission for dynamic or SPS scheduling | 1. Support NACK-only based HARQ-ACK feedback for dynamic or SPS scheduling for multicast, including:  a) Multiple TB with NACK-only feedback transmitted in PUCCH by select one PUCCH resource.  b) Single TB with NACK-only feedback transmitted in PUCCH  c) Extended Tproc1  2. Support of separate PUCCH resource configurations from unicast or SPS-PUCCH-AN-List configuration from unicast SPS | 33-4 or 33-5-1f | Yes |  |  | Per BC | N/A | N/A |  | Note: with 33-4 or 33-5-1f as prerequisite FG, this FG33-4a includes the cases of support of NACK-only for multicast dynamic scheduling, and/or for multicast SPS scheduling | Optional with capability signalling | | 33. NR\_MBS | 33-4b | Support of NACK-only based HARQ-ACK feedback for multicast corresponding to a specific sequence or a PUCCH transmission for dynamic or SPS scheduling | 1. Support NACK-only based HARQ-ACK feedback for dynamic or SPS scheduling for multicast, including:  a) Multiple TB with NACK-only feedback transmitted in PUCCH by select one PUCCH resource.  b) Extended Tproc1  2. Support of shared PUCCH resource configurations from unicast or SPS-PUCCH-AN-List configuration from unicast SPS | 33-4 or 33-5-1f | Yes |  |  | Per BC | N/A | N/A |  | Note: with 33-4 or 33-5-1f as prerequisite FG, this FG33-4a includes the cases of support of NACK-only for multicast dynamic scheduling, and/or for multicast SPS scheduling | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-4a | NACK-only based HARQ-ACK feedback for multicast corresponding to a specific sequence or a PUCCH transmission | 1. Support NACK-only based HARQ-ACK feedback for dynamic scheduling for multicast, including:  a) Multiple TB with NACK-only feedback transmitted in PUCCH by select one PUCCH resource.  2. Support of separate PUCCH resource configurations from unicast  3. Extended PDSCH processing time by adding d3=N2 for different PRBs of PUCCHs configured for more than one NACK-only feedback | 33-4 | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

### **(N)High priority proposal 2-14-1:**

* **Introduce an FG for supporting shared PUCCH resource configurations from unicast for NACK-only mode2 [2]**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-4b | Support of NACK-only based HARQ-ACK feedback for multicast corresponding to a specific sequence or a PUCCH transmission for dynamic or SPS scheduling | 1. Support NACK-only based HARQ-ACK feedback for dynamic or SPS scheduling for multicast, including:  a) Multiple TB with NACK-only feedback transmitted in PUCCH by select one PUCCH resource.  b) Extended Tproc1  2. Support of shared PUCCH resource configurations from unicast or SPS-PUCCH-AN-List configuration from unicast SPS | 33-4 or 33-5-1f | Yes |  |  | Per BC | N/A | N/A |  | Note: with 33-4 or 33-5-1f as prerequisite FG, this FG33-4a includes the cases of support of NACK-only for multicast dynamic scheduling, and/or for multicast SPS scheduling | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | With FG33-4 as prerequisite which has shared PUCCH resource component does not mean supporting NACK-only in FG33-4a will naturally support shared resources PUCCH as well. |
| Samsung | No need for introducing such FG. There is no impact on UE implementation from whether or not PUCCH resources are shared with unicast. Also, there is no RAN1 agreement on (b). |
| Qualcomm | The FG33-4b needs more clarification. It is not clear if the shared PUCCH resource with unicast can be used for NACK-only mode2, the PUCCH starting time/length will be aligned or not. If not aligned, how to use the shared PUCCH for NACK-only mode2 is not clear to us.  Also, DG and SPS should not be merged. |
| NTT DOCOMO | We agree with Samsung. |
| Nokia, NSB | Do not support |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems there is no consensus on the proposed new FG. |
| Ericsson | Do not support. |

### **(N)High priority proposal 2-14-2:**

* **Components of FG 33-4a are revised as** 
  + **Component 1: Support NACK-only based HARQ-ACK feedback for dynamic or SPS scheduling for multicast, including: [2]**
    - **Prerequisite FG for FG 33-4a is revised as “33-4 or 33-5-1f” [2]**
  + **Add a component “b) Single TB with NACK-only feedback transmitted in PUCCH” [2]**
  + **Add a component “c) Extended Tproc1” [2]**
  + **Add a component “Extended PDSCH processing time by adding d3=N2 for different PRBs of PUCCHs configured for more than one NACK-only feedback” [8]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | Adding **b) Single TB with NACK-only feedback transmitted in PUCCH is because it is for NACK-only with separate PUCCH in FG33-4a** |
| Samsung | Do not agree to add any of the components. For (b), the current “multiple” includes one (and also includes more than one).  For the last two components, there is no RAN1 agreement to support them. |
| Qualcomm | Ok to add single TB with NACK-only feedback with separate PUCCH resource and extended processing time.  But we prefer not to merge DG and SPS. |
| ZTE | The first bullet is ok, the third bullet and 4th bullet need discussion in the main session first. |
| NTT DOCOMO | Component 1: OK  There is no agreement to extend processing time. Need to wait for progress in main session discussions. |
| Nokia, NSB | Do not support |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems further discussion is necessary. |
| Ericsson | Ok with the proposal. we agree that there is an agreement needed for processing time. we assume the component for extended Tproc1 in [2] and [8] is the same, so we can merge the two lines in the proposal. |

### **Low priority proposal 2-14-3:**

* **Add a note that “with 33-4 or 33-5-1f as prerequisite FG, this FG33-4a includes the cases of support of NACK-only for multicast dynamic scheduling, and/or for multicast SPS scheduling” [2]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | No need for the note. |
|  |  |
|  |  |

## **2.15 33-4-1: DCI-based enabling/disabling NACK-only based feedback for dynamic scheduling for multicast**

In [1], FG 33-4-1 is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-4-1 | DCI-based enabling/disabling NACK-only based feedback for dynamic scheduling for multicast | Support of DCI-based enabling/disabling NACK-only based HARQ-ACK feedback configured per G-RNTI by RRC signalling | [33-4] | Yes |  |  | Per band | N/A | N/A |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | In addition, DCI-based enabling/disabling NACK-only feedback also needs to configured firstly by RRC signalling. Similar to FG33-2b with FG33-2a as prerequisite FG for ACK/NACK based feedback for dynamic scheduling, FG33-5-1b with FG33-5-1a as prerequisite FG for ACK/NACK based feedback for SPS scheduling, and FG33-5-1g with FG33-5-1f as prerequisite FG for NACK-only based feedback for SPS scheduling, FG33-4 is prerequisite FG for FG33-4-1.  With the above analysed, the FG33-4/4a and FG33-4-1 can be updated as follows:  ***Proposal 6: Updating FG33-4/4a and FG33-4-1 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-4-1 | DCI-based enabling/disabling NACK-only based feedback for dynamic scheduling for multicast | Support of DCI-based enabling/disabling NACK-only based HARQ-ACK feedback configured per G-RNTI by RRC signaling via DCI format 4\_2 | 33-4 and 33-2f | Yes |  |  | Per band | N/A | N/A |  |  | Optional with capability signalling | |
| [4] | Spreadtrum Communications | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-4-1 | DCI-based enabling/disabling NACK-only based feedback for dynamic scheduling for multicast | Support of DCI-based enabling/disabling NACK-only based HARQ-ACK feedback configured per G-RNTI by RRC signalling | 33-4 | Yes |  |  | Per band | N/A | N/A |  |  | Optional with capability signalling | |
| [7] | NTT DOCOMO | There would be no problem with making FG 33-4 the prerequisite FG for FG 33-4-1. Brackets can be removed.  **Proposal 5-5: Update FG 33-4-1 as follows:**   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-4-1 | DCI-based enabling/disabling NACK-only based feedback for dynamic scheduling for multicast | Support of DCI-based enabling/disabling NACK-only based HARQ-ACK feedback configured per G-RNTI by RRC signalling | ~~[~~33-4~~]~~ | Yes |  |  | Per band | N/A | N/A |  |  | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-4-1 | DCI-based enabling/disabling NACK-only based feedback for dynamic scheduling for multicast | Support of DCI-based enabling/disabling NACK-only based HARQ-ACK feedback configured per G-RNTI by RRC signaling via DCI format 4\_2 | 33-4, 33-2f | Yes |  |  | Per band | N/A | N/A |  |  | Optional with capability signalling | |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

**High priority proposal 2-15-1:**

* **Apply one of following alternatives for prerequisite FG for FG 33-4-1**
  + **Alt.1: FG 33-4 [4, 7]**
  + **Alt.2: FG 33-4 and 33-2f [2, 8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | OK with either Alt. |
| MTK | Alt.2 |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  We can check if Alt.2 is fine for all. **Updated proposal 2-15-1:**  * **The prerequisite FGs for FG 33-4-1 are FG 33-4 and 33-2f** |
| Moderator (NTT DOCOMO) | Following agreement was made at Tuesday GTW session.  **Agreement:**  The prerequisite FGs for FG 33-4-1 are FG 33-4 and 33-2f |

**High priority proposal 2-15-2:**

* **Components of FG 33-4-1 are revised as “Support of DCI-based enabling/disabling NACK-only based HARQ-ACK feedback configured per G-RNTI by RRC signaling via DCI format 4\_2”. [2, 8]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | Should be straightforward. |
| Samsung | No need for the update – it is understood by the specifications. |
| Qualcomm | Ok, which will be similar as agreed FG 33-2b |
| ZTE | OK |
| NTT DOCOMO | OK |
| LG Electronics | OK |
| MTK | OK |
| Apple | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  We can check if the proposal is agreeable as it is straightforward. |
| Moderator (NTT DOCOMO) | Following agreement was made at Tuesday GTW session.  **Agreement:**  Components of FG 33-4-1 are revised as “Support of DCI-based enabling/disabling NACK-only based HARQ-ACK feedback configured per G-RNTI by RRC signaling via DCI format 4\_2” |

## **2.16 33-5-1: SPS group-common PDSCH for multicast**

In [1], FG 33-5-1 is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-5-1 | SPS group-common PDSCH for multicast | 1. Support one SPS group-common PDSCH configuration for multicast  2. Support {2, 4, 8} times semi-static slot-level repetition for SPS group-common PDSCH | 33-2 | Yes |  |  | Per FS | N/A | N/A |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | As discussed in [3] that it is expected that FG33-5-1 is supposed to be SPS group-common PDSCH for multicast for PCell that is reported per FS as agreed. With FG33-2 as the prerequisite FG, FG33-2h currently defined as MBS dynamic scheduling for SCell can be modified to include the cases of both dynamic and SPS scheduling for MBS, since, from UE perspective, if a CC is reported to support MBS for SCell then it is supposed to support both dynamic and SPS scheduling.  ***Proposal 7: Updating 33-5-1/1a/1d/1e/1f/1g/1i/2/33-9 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1 | SPS group-common PDSCH for multicast for PCell | 1. Support one SPS group-common PDSCH configuration for multicast  2. Support {2, 4, 8} times semi-static slot-level repetition for SPS group-common PDSCH | 33-2 | Yes |  |  | Per FS | N/A | N/A |  |  | Optional with capability signalling | |
| [5] | vivo | As RAN2 has agreed that MBS SPS for multicast can be configured on one SCell or PCell, two UE FGs can be added to reflect one SPS group-common PDSCH configuration and multiple SPS group-common PDSCH configurations for SCell, respectively.  *Proposal 2: Add FG 33-5-3 and FG 33-5-4, which include supporting of one and multiple SPS group-common PDSCH configurations for multicast for Scell.*  Furthermore, in Rel-16, it is defined that up to 8 configured SPS configurations in a BWP of a serving cell and up to 32 configured SPS configurations in a cell group are supported in FG 12-2. When multicast is considered, the UE capabilities on multiple SPS configurations are expected to keep the same as existed UE capabilities for unicast only, and thus, the total number of SPS configurations for both multicast and unicast is no larger than 8 per cell, the total number of SPS configurations for both multicast and unicast in a cell group is no larger than 32.  *Proposal 3: The total number of SPS configurations for both multicast and unicast in a cell group is no larger than 32.*   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1 | SPS group-common PDSCH for multicast for Pcell | 1. Support one SPS group-common PDSCH configuration for multicast  2. Support {2, 4, 8} times semi-static slot-level repetition for SPS group-common PDSCH | 33-2 | Yes | Per FS |  | Optional with capability signalling |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-3 | SPS group-common PDSCH for multicast for Scell | 1. Support one SPS group-common PDSCH configuration for multicast for Scell.  2. Support {2, 4, 8} times semi-static slot-level repetition for SPS group-common PDSCH for Scell. | 33-5-1 | Yes | Per FSPC |  | Optional with capability signalling | | 33. NR\_MBS | 33-5-4 | SPS group-common PDSCH for multicast for SCell | 1. Support up to 8 SPS group-common PDSCH configuration per CFR for multicast for Scell.  2. Support M>=1 activated SPS group-common PDSCH configurations per CFR for multicast for Scell.  3. The total number of SPS configurations for both multicast and unicast is no larger than 8 [per cell], and activated SPS group-common PDSCH configurations is no larger than M.  4. The total number of SPS configurations for both multicast and unicast in a cell group is no larger than 32. | 33-5-2 | Yes | Per FSPC | Candidate value set for M is {1, 2, …, 8} | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1 | SPS group-common PDSCH for multicast | 1. Support one SPS group-common PDSCH configuration for multicast  2. Support {2, 4, 8} times semi-static slot-level repetition for SPS group-common PDSCH  3. Support of group-common PDCCH/PDSCH with CRC scrambled by G-CS-RNTI(s) for multicast  4. Support of DCI format 4\_1 with CRC scrambled with G-CS-RNTI for multicast  5. ACK/NABK-based HARQ-ACK feedback for SPS group-common PDCCH activation and SPS release associated with G-CS-RNTI | 33-2 | Yes |  |  | Per FS | N/A | N/A |  |  | Optional with capability signalling | |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

**High priority proposal 2-16-1:**

* **Feature group name of FG 33-5-1 is revised as “SPS group-common PDSCH for multicast for PCell” [2, 5]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | OK |
| Qualcomm | Ok and also add ‘for PCell’ in FG33-5-2 |
| NTT DOCOMO | OK |
| LG Electronics | Ok |
| MTK | Ok |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems proposal is agreeable. |
| Moderator (NTT DOCOMO) | Based on the discussion in GTW session, following alternatives should be discussed together for the proposals 2-5-1, 2-16-1 and 2-16-2.  Alt.1: Introduce a separate new FG for SPS multicast on SCell from FGs for SPS multicast on PCell and DG multicast on SCell  Alt.2: SPS multicast on SCell is merged into the FG for DG multicast on SCell (33-2h)  Alt.3: SPS multicast on SCell is merged into the FG for SPS multicast on PCell (33-5-1)  Further discussion for above alternatives can be done in the proposal 2-5-1. |
| Ericsson | The support for Unicast SPS is not differentiated for PCell or SCell. Therefore our preference is Alt3. If a UE supports multicast on Scell and 33-5-1 is supported, then SPS is supported for multicast on Scell. |
| ZTE | Same view as Ericsson. We can also live with Alt.2. |

**High priority proposal 2-16-2:**

* **Introduce FGs for support of semi-persistent scheduling for multicast on SCell. [5]**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-5-3 | SPS group-common PDSCH for multicast for Scell | 1. Support one SPS group-common PDSCH configuration for multicast for Scell.  2. Support {2, 4, 8} times semi-static slot-level repetition for SPS group-common PDSCH for Scell. | 33-5-1 | Yes | Per FSPC | N/A | N/A |  |  | Optional with capability signalling |
| 33. NR\_MBS | 33-5-4 | SPS group-common PDSCH for multicast for SCell | 1. Support up to 8 SPS group-common PDSCH configuration per CFR for multicast for Scell.  2. Support M>=1 activated SPS group-common PDSCH configurations per CFR for multicast for Scell.  3. The total number of SPS configurations for both multicast and unicast is no larger than 8 [per cell], and activated SPS group-common PDSCH configurations is no larger than M.  4. The total number of SPS configurations for both multicast and unicast in a cell group is no larger than 32. | 33-5-2 | Yes | Per FSPC | [No] | [No] |  | Candidate value set for M is {1, 2, …, 8} | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | OK |
| Qualcomm | Ok to add separate FGs for SCell |
| ZTE | SPS on SCell can be merged with FG for SPS on PCell or scheduling multicast on SCell. If it is merged, then do we need any other separate FG? |
| Nokia, NSB | OK, if 2-16-1 is agreed |
| LG Electronics | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  We can check if the proposal is acceptable. |
| Moderator (NTT DOCOMO) | Based on the discussion in GTW session, following alternatives should be discussed together for the proposals 2-5-1, 2-16-1 and 2-16-2.  Alt.1: Introduce a separate new FG for SPS multicast on SCell from FGs for SPS multicast on PCell and DG multicast on SCell  Alt.2: SPS multicast on SCell is merged into the FG for DG multicast on SCell (33-2h)  Alt.3: SPS multicast on SCell is merged into the FG for SPS multicast on PCell (33-5-1)  Further discussion for above alternatives can be done in the proposal 2-5-1. |
| Ericsson | Support Alt3. |

### **(D)High priority proposal 2-16-3:**

* **Components of FG 33-5-1 are revised as** 
  + **Add a component “Support of group-common PDCCH/PDSCH with CRC scrambled by G-CS-RNTI(s) for multicast” [8]**
  + **Add a component “Support of DCI format 4\_1 with CRC scrambled with G-CS-RNTI for multicast” [8]**
  + **Add a component “ACK/NACK-based HARQ-ACK feedback for SPS group-common PDCCH activation and SPS release associated with G-CS-RNTI” [8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | No need for the last two components. |
| NTT DOCOMO | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further discussion would be necessary. |
| Ericsson | OK |
| Qualcomm | support |
| Moderator (NTT DOCOMO) | Thank you very much for further feedbacks!  Let’s check in the GTW session if above proposal is agreeable. |
| Moderator (NTT DOCOMO) | Based on the discussion in GTW session, further discussion on the following updated proposal is necessary.  **High priority proposal 2-16-3:**   * **Components of FG 33-5-1 are revised as**    + **Add a component “Support of group-common PDCCH/PDSCH with CRC scrambled by G-CS-RNTI(s) for multicast”**   + **Add a component “Support of DCI format 4\_1 with CRC scrambled with G-CS-RNTI for multicast”**   + **Add a component “ACK/NACK-based HARQ-ACK feedback for SPS group-common PDCCH activation and SPS release associated with G-CS-RNTI”** * **Remove “SPS group-common PDSCH activation, and SPS release PDCCH” from component of FG 33-5-1a** |

## **2.17 33-5-1a: Support of ACK/NACK based HARQ-ACK feedback and RRC-based enabling/disabling ACK/NACK-based feedback for SPS group-common PDSCH for multicast**

In [1], FG 33-5-1a is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-5-1a | Support of ACK/NACK based HARQ-ACK feedback and RRC-based enabling/disabling ACK/NACK-based feedback for SPS group-common PDSCH for multicast | Support of ACK/NACK based HARQ-ACK feedback, and support of enabling/disabling ACK/NACK based HARQ-ACK feedback configured by RRC signalling for SPS group-common PDSCH without PDCCH scheduling, SPS group-common PDSCH activation, and SPS release PDCCH | 33-5-1 | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | FG33-5-1a is ACK/NACK based feedback for multicast SPS, which should include the component for support of shared or separate SPS-PUCCH-AN-List configuration from unicast SPS.  ***Proposal 7: Updating 33-5-1/1a/1d/1e/1f/1g/1i/2/33-9 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1a | Support of ACK/NACK based HARQ-ACK feedback and RRC-based enabling/disabling ACK/NACK-based feedback for SPS group-common PDSCH for multicast | 1) Support of ACK/NACK based HARQ-ACK feedback, and support of enabling/disabling ACK/NACK based HARQ-ACK feedback configured by RRC signalling for SPS group-common PDSCH without PDCCH scheduling, SPS group-common PDSCH activation, and SPS release PDCCH  2) Support of shared and separate SPS-PUCCH-AN-List configuration from unicast SPS. | 33-5-1 | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1a | Support of ACK/NACK based HARQ-ACK feedback and RRC-based enabling/disabling ACK/NACK-based feedback for SPS group-common PDSCH for multicast | 1. Support of ACK/NACK based HARQ-ACK feedback, and support of enabling/disabling ACK/NACK based HARQ-ACK feedback configured by RRC signalling for SPS group-common PDSCH without PDCCH scheduling, SPS group-common PDSCH activation, and SPS release PDCCH  2. Support of PTM retransmission for SPS multicast associated with G-CS-RNTI  3. Support of Type-1 and Type-2 HARQ-ACK CB for SPS multicast feedback only  4. Support of shared SPS-PUCCH-AN-List with unicast | 33-5-1 | Yes |  |  | Per BC | N/A | N/A |  | Note: UE is not expected to be scheduled with unicast and multicast HARQ-ACK feedback with same priority in the same SPS-PUCCH-AN-List if UE does not support 33-5-1 | Optional with capability signalling | |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

### **(D)****High priority proposal 2-17-1:**

* **Components of FG 33-5-1a are revised as** 
  + **Add a component “Support of PTM retransmission for SPS multicast associated with G-CS-RNTI” [8]**
  + **Add a component “Support of Type-1 and Type-2 HARQ-ACK CB for SPS multicast feedback only” [8]**
  + **Add a component “Support of shared and separate SPS-PUCCH-AN-List configuration from unicast SPS” [2, 8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | OK for the last component. No need for the first two ones. |
| Qualcomm | For the last subbullet, we support only add ‘Support of shared SPS-PUCCH-AN-list with unicast SPS’, similar as 33-2a. The separate SPS-PUCCH-AN-list is introduced as new FG 33-8-3. |
| NTT DOCOMO | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further discussion would be necessary. |
| Ericsson | OK with the first component and the third component (ok with QC’s rewording). For the second component, it depends on the outcome of the discussion on whether SPS multicast and DG multicast support for HARQ should be in separate FGs. |
| MTK | Seems ok |

### **Low priority proposal 2-17-2:**

* **Add a note that “UE is not expected to be scheduled with unicast and multicast HARQ-ACK feedback with same priority in the same SPS-PUCCH-AN-List if UE does not support 33-5-1” [8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | No need for the note |
|  |  |
|  |  |

## **2.18 33-5-1b: DCI-based enabling/disabling ACK/NACK-based feedback for SPS group-common PDSCH for multicast**

In [1], FG 33-5-1b is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-5-1b | DCI-based enabling/disabling ACK/NACK-based feedback for SPS group-common PDSCH for multicast | Support of DCI-based enabling/disabling ACK/NACK based HARQ-ACK feedback configured per G-CS-RNTI for multicast by RRC signaling | 33-5-1a | Yes |  |  | Per band | N/A | N/A |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1b | DCI-based enabling/disabling ACK/NACK-based feedback for SPS group-common PDSCH for multicast | Support of DCI-based enabling/disabling ACK/NACK based HARQ-ACK feedback configured per G-CS-RNTI for multicast by RRC signaling via DCI format 4\_2 | 33-5-1a, 33-5-1i | Yes |  |  | Per band | N/A | N/A |  |  | Optional with capability signalling | |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

**High priority proposal 2-18-1:**

* **Components of FG 33-5-1b are revised as “Support of DCI-based enabling/disabling ACK/NACK based HARQ-ACK feedback configured per G-CS-RNTI for multicast by RRC signaling via DCI format 4\_2”. [8]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | Should be straightforward. |
| Samsung | No need for the update – it is understood by the specifications. |
| ZTE | OK |
| NTT DOCOMO | OK |
| LG Electronics | OK |
| MTK | OK |
| Apple | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  We can check if the proposal is agreeable as it is straightforward. |
| Moderator (NTT DOCOMO) | Following agreement was made at Tuesday GTW session.  **Agreement:**  Components of FG 33-5-1b are revised as “Support of DCI-based enabling/disabling ACK/NACK based HARQ-ACK feedback configured per G-CS-RNTI for multicast by RRC signaling via DCI format 4\_2”. |

**(S)High priority proposal 2-18-2:**

* **Add FG 33-5-1i as a prerequisite FG for FG 33-5-1b [8]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | ok |
| Samsung | OK |
| NTT DOCOMO | OK |
| MTK | OK |
| Apple | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems the proposal is agreeable. |
| Ericsson | OK |
| Moderator (NTT DOCOMO) | Following agreement was made. **High priority proposal 2-18-2:** **Add FG 33-5-1i as a prerequisite FG for FG 33-5-1b** |

## **2.19 33-5-1d: PTP retransmission for SPS group-common PDSCH for multicast**

In [1], FG 33-5-1d is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-5-1d | PTP retransmission for SPS group-common PDSCH for multicast | Support of PTP retransmission for SPS multicast [on the cell same as multicast initial transmission] | 33-5-1a | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | FG33-5-1d support of PTP retransmission for multicast SPS should include base on retransmission on the cell same as multicast initial transmission, so the [] can be deleted.  ***Proposal 7: Updating 33-5-1/1a/1d/1e/1f/1g/1i/2/33-9 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1d | PTP retransmission for SPS group-common PDSCH for multicast | Support of PTP retransmission for SPS multicast ~~[~~on the cell same as multicast initial transmission~~]~~ | 33-5-1a | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | |
| [3] | ZTE | The third issue is whether to remove the brackets for “[on the cell same as multicast initial transmission]” for 33-5-1d. It is straightforward that the PTP retransmission for SPS multicast is on the cell same as multicast initial transmission unless RAN2 has agreed to introduce this late enhancement.  ***Proposal 11:*** *Remove the brackets of “[on the cell same as multicast initial transmission]” for 33-5-1d.* |
| [4] | Spreadtrum Communications | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1d | PTP retransmission for SPS group-common PDSCH for multicast | Support of PTP retransmission for SPS multicast on the cell same as multicast initial transmission | 33-5-1a | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | |
| [7] | NTT DOCOMO | In FG 33-2d, it is specified that retransmissions are performed in the same cell as the initial transmission. FG 33-5-1d should be described in the same way.  **Proposal 5-6: Update FG 33-5-1d as follows:**   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-5-1d | PTP retransmission for SPS group-common PDSCH for multicast | Support of PTP retransmission for SPS multicast ~~[~~on the ~~cell~~ same cell as multicast initial transmission~~]~~ | 33-5-1a | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1d | PTP retransmission for SPS group-common PDSCH for multicast | Support of PTP retransmission associated with CS-RNTI for SPS multicast on the cell same as multicast initial transmission | 33-5-1a | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

**(S)High priority proposal 2-19-1:**

* **Remove the bracket in Components of FG 33-5-1d [2, 3, 4, 7, 8]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | ok |
| Samsung | OK |
| ZTE | OK |
| NTT DOCOMO | OK |
| Spreadtrum | Ok |
| Nokia, NSB | OK |
| LG Electronics | OK |
| MTK | Ok |
| Apple | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems the proposal is agreeable. |
| Ericsson | OK |
| Moderator (NTT DOCOMO) | Following agreement was made. **High priority proposal 2-19-1:** **Remove the bracket in Components of FG 33-5-1d** |

**(S)High priority proposal 2-19-2:**

* **Components of FG 33-5-1d are revised as “Support of PTP retransmission associated with CS-RNTI for SPS multicast on the cell same as multicast initial transmission”. [8]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | ok |
| Samsung | OK |
| ZTE | OK |
| NTT DOCOMO | OK |
| LG Electronics | OK |
| MTK | Ok |
| Apple | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems the proposal is agreeable. |
| Ericsson | OK |
| Moderator (NTT DOCOMO) | Following agreement was made. **High priority proposal 2-19-2:** **Components of FG 33-5-1d are revised as “Support of PTP retransmission associated with CS-RNTI for SPS multicast on the cell same as multicast initial transmission”.** |

## **2.20 33-5-1e: Dynamic Slot-level repetition for SPS group-common PDSCH for multicast**

In [1], FG 33-5-1e is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-5-1e | Dynamic Slot-level repetition for SPS group-common PDSCH for multicast | Support up to X times dynamic slot-level repetition for SPS group-common PDSCH for multicast. | 33-5-1 | Yes |  |  | [Per UE] | [No] | [No] |  | Candidate values for X is: {8, 16} | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | ***Proposal 7: Updating 33-5-1/1a/1d/1e/1f/1g/1i/2/33-9 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1e | Dynamic Slot-level repetition for SPS group-common PDSCH for multicast | Support up to X times dynamic slot-level repetition for SPS group-common PDSCH for multicast. | 33-5-1 | Yes |  |  | Per BC | N/A | N/A |  | Candidate values for X is: {8, 16} | Optional with capability signalling | |
| [3] | ZTE | For all the MBS UE features with FFS for the report type, the following report type can be considered as a middle ground between companies.   * Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2   ***Proposal 9****: Regarding the report type for MBS FG 33-3-3, 33-3-3a, 33-3-3b, 33-3-4, 33-3-5, 33-5-1e, 33-5-1f, 33-5-1g, 33-5-1i, 33-5-2, 33-6-1, 33-6-1a, 33-6-2, 33-6-3, 33-8-1 and 33-9, consider the following as baseline.*   * + *Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2* |
| [4] | Spreadtrum Communications | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1e | Dynamic Slot-level repetition for SPS group-common PDSCH for multicast | Support up to X times dynamic slot-level repetition for SPS group-common PDSCH for multicast. | 33-5-1 | Yes |  |  | Per FS | No | No |  | Candidate values for X is: {8, 16} | Optional with capability signalling | |
| [7] | NTT DOCOMO | Since the reporting type of FG for dynamic slot-level repetition for dynamically scheduled multicast PDSCH (i.e., FG 33-3-1) is per UE with FDD/TDD/FR1/FR2 differentiation, the type of FG 33-5-1e should also be per UE with FDD/TDD/FR1/FR2 differentiation.  **Proposal 5-7: The reporting type of FG 33-5-1e is per UE with FDD/TDD/FR1/FR2 differentiation.**   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-5-1e | Dynamic Slot-level repetition for SPS group-common PDSCH for multicast | Support up to X times dynamic slot-level repetition for SPS group-common PDSCH for multicast. | 33-5-1 | Yes |  |  | Per UE | Yes | Yes |  | Candidate values for X is: {8, 16} | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1e | Dynamic Slot-level repetition for SPS group-common PDSCH for multicast | Support up to X times dynamic slot-level repetition for SPS group-common PDSCH for multicast. | 33-5-1 | Yes |  |  | Per BC | N/A | N/A |  | Candidate values for X is: {8, 16} | Optional with capability signalling | |
| [9] | Nokia, NSB | * **33-5-1e/f/g/i**: * Per UE |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

### **(D)****High priority proposal 2-20-1:**

* **Apply one of the following alternatives for the reporting type of FG 33-5-1e** 
  + **Alt.1: Per UE [9]**
  + **Alt.2: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation [3, 7]**
  + **Alt.3: Per BC [2, 8]**
  + **Alt.4: Per FS [4]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | Alt3 |
| ZTE | We prefer Alt.1 or Alt.2. |
| Nokia, NSB | Alt.1 or Alt.2 |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further discussion is necessary. |
| Ericsson | Considering the pre-required FGs is per BC, it should be enough with per UE. (alt1/alt2) |
| Qualcomm | Alt3 |

## **2.21 33-5-1f: NACK-only based HARQ-ACK feedback for multicast RRC-based enabling/disabling NACK-only based feedback for SPS group-common PDSCH for multicast**

In [1], FG 33-5-1f is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-5-1f | NACK-only based HARQ-ACK feedback for multicast RRC-based enabling/disabling NACK-only based feedback for SPS group-common PDSCH for multicast | 1) Support NACK-only based HARQ-ACK feedback, and support of enabling/disabling NACK-only based HARQ-ACK feedback configured by RRC signalling for SPS group-common PDSCH without PDCCH scheduling  2) Support of PTM retransmission associated with G-CS-RNTI for SPS multicast | 33-5-1 | Yes |  |  | [Per UE] | [No] | [No] |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | FG33-5-1f is expected to be the basic FG for NACK-only feedback for multicast SPS, as FG33-4 defined as the basic FG for NACK-only feedback for multicast dynamic scheduling and FG33-4a defined as additional UE capability for NACK-only mode2. Furthermore, FG33-4a can be expanded to include the cases of dynamic or SPS scheduling by setting FG33-4 or FG33-5-1f as prerequisites FG, respectively, as proposed in section 3.5. In addition, the components needed to be added include a single TB with NACK-only feedback transmitted in PUCCH, multiple TB with NACK-only feedback transmitted in PUCCH by transforming into ACK/NACK bits to generate Type-1 or Type-2 HARQ-ACK CB for multicast feedback only, support of **shared and separate** SPS-PUCCH-AN-List configuration from unicast SPS, and support of PTM retransmission associated with G-CS-RNTI for SPS multicast.   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1f | NACK-only based HARQ-ACK feedback for multicast with ACK/NACK transforming and RRC-based enabling/disabling NACK-only based feedback for SPS group-common PDSCH for multicast | 1) Support NACK-only based HARQ-ACK feedback, including:  a) A single TB with NACK-only feedback transmitted in PUCCH  b) multiple TB with NACK-only feedback transmitted in PUCCH by transforming into ACK/NACK bits to generate Type-1 or Type-2 HARQ-ACK CB for multicast feedback only  2) Support of **shared ~~or separate~~**SPS-PUCCH-AN-List configuration from unicast SPS.  3) support of enabling/disabling NACK-only based HARQ-ACK feedback configured by RRC signalling for SPS group-common PDSCH without PDCCH scheduling  4) Support of PTM retransmission associated with G-CS-RNTI for SPS multicast | 33-5-1a | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | |
| [3] | ZTE | For all the MBS UE features with FFS for the report type, the following report type can be considered as a middle ground between companies.   * Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2   ***Proposal 9****: Regarding the report type for MBS FG 33-3-3, 33-3-3a, 33-3-3b, 33-3-4, 33-3-5, 33-5-1e, 33-5-1f, 33-5-1g, 33-5-1i, 33-5-2, 33-6-1, 33-6-1a, 33-6-2, 33-6-3, 33-8-1 and 33-9, consider the following as baseline.*   * + *Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2* |
| [4] | Spreadtrum Communications | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1f | NACK-only based HARQ-ACK feedback for multicast RRC-based enabling/disabling NACK-only based feedback for SPS group-common PDSCH for multicast | 1) Support NACK-only based HARQ-ACK feedback, and support of enabling/disabling NACK-only based HARQ-ACK feedback configured by RRC signalling for SPS group-common PDSCH without PDCCH scheduling  2) Support of PTM retransmission associated with G-CS-RNTI for SPS multicast | 33-5-1 | Yes |  |  | Per BC | No | No |  |  | Optional with capability signalling | |
| [7] | NTT DOCOMO | The reporting type of these FGs should be aligned with the corresponding FGs for ACK/NACK-based feedback for SPS group-common PDSCH. In other words, the reporting type of FG 33-5-1f should be per BC as in FG 33-5-1a. Also, the reporting type of FG 33-5-1g should be per band as in FG 33-5-1b.  **Proposal 5-8: The reporting type of FG 33-5-1f is per BC.**   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-5-1f | NACK-only based HARQ-ACK feedback for multicast RRC-based enabling/disabling NACK-only based feedback for SPS group-common PDSCH for multicast | 1) Support NACK-only based HARQ-ACK feedback, and support of enabling/disabling NACK-only based HARQ-ACK feedback configured by RRC signalling for SPS group-common PDSCH without PDCCH scheduling  2) Support of PTM retransmission associated with G-CS-RNTI for SPS multicast | 33-5-1 | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1f | NACK-only based HARQ-ACK feedback for multicast RRC-based enabling/disabling NACK-only based feedback for SPS group-common PDSCH for multicast | 1) Support NACK-only based HARQ-ACK feedback, and support of enabling/disabling NACK-only based HARQ-ACK feedback configured by RRC signalling for SPS group-common PDSCH without PDCCH scheduling  a) A single TB with NACK-only feedback transmitted in PUCCH  b) One or multiple TBs with NACK-only feedback transmitted in PUCCH by transforming into ACK/NACK bits | 33-5-1a | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | | 33. NR\_MBS | 33-5-1j | NACK-only based HARQ-ACK feedback for multicast corresponding to a specific sequence or a PUCCH transmission for SPS group-commmon PDSCH for multicast | 1. Support NACK-only based HARQ-ACK feedback for SPS PDSCH for multicast, including:  a) Multiple TBs with NACK-only feedback transmitted in PUCCH by select one PUCCH resource.  2. Support of separate SPS-PUCCH-AN-List from unicast  3. Extended PDSCH processing time by adding d3=N2 for different PRBs of PUCCHs configured for more than one NACK-only feedback | 33-5-1f | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | |
| [9] | Nokia, NSB | * **33-5-1e/f/g/i**: * Per UE |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

### **(D)High priority proposal 2-21-1:**

* **Introduce an FG for support of NACK-only based HARQ-ACK feedback for multicast corresponding to a specific sequence or a PUCCH transmission for SPS group-commmon PDSCH for multicast [8]**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-5-1j | NACK-only based HARQ-ACK feedback for multicast corresponding to a specific sequence or a PUCCH transmission for SPS group-commmon PDSCH for multicast | 1. Support NACK-only based HARQ-ACK feedback for SPS PDSCH for multicast, including:  a) Multiple TBs with NACK-only feedback transmitted in PUCCH by select one PUCCH resource.  2. Support of separate SPS-PUCCH-AN-List from unicast  3. Extended PDSCH processing time by adding d3=N2 for different PRBs of PUCCHs configured for more than one NACK-only feedback | 33-5-1f | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | Do not support component 3 of the proposed FG (and no corresponding RAN1 agreement) |
| Qualcomm | If one TB is added in 33-4a, also add one TB case for 33-5-1j. |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further discussion is necessary. |
| Ericsson | OK |
| ZTE | The extended timeline should be excluded unless agreements are reached in the maintenance session. |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  We can discuss following updated proposal. **High priority proposal 2-21-1:**  * **Introduce an FG for support of NACK-only based HARQ-ACK feedback for multicast corresponding to a specific sequence or a PUCCH transmission for SPS group-commmon PDSCH for multicast [8]**  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1j | NACK-only based HARQ-ACK feedback for multicast corresponding to a specific sequence or a PUCCH transmission for SPS group-commmon PDSCH for multicast | 1. Support NACK-only based HARQ-ACK feedback for SPS PDSCH for multicast, including:  a) Multiple TBs with NACK-only feedback transmitted in PUCCH by select one PUCCH resource.  2. Support of separate SPS-PUCCH-AN-List from unicast  ~~3. Extended PDSCH processing time by adding d3=N2 for different PRBs of PUCCHs configured for more than one NACK-only feedback~~ | 33-5-1f | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | |

### **(D)High priority proposal 2-21-2:**

* **Components of FG 33-5-1f are revised as** 
  + **Add a component “a) A single TB with NACK-only feedback transmitted in PUCCH” [2, 8]**
  + **Add a component “b) multiple TB with NACK-only feedback transmitted in PUCCH by transforming into ACK/NACK bits to generate Type-1 or Type-2 HARQ-ACK CB for multicast feedback only” [2]**
  + **Add a component “Support of shared or separate SPS-PUCCH-AN-List configuration from unicast SPS” [2]**
  + **Add a component “Support of PTM retransmission associated with G-CS-RNTI for SPS multicast” [2]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | The inclusion of “Type-1” in the second component needs more discussion and a RAN1 conclusion. Same for the last component. |
| Qualcomm | We think 1TB can be added in b) but delete Type-1 CB  Similar as 33-4a, add ‘Support of separate SPS-PUCCH-AN-list configured from unicast SPS’, but needs clarification of shared SPS-PUCCH-AN-List. |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further discussion is necessary. |
| Ericsson | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  We can discuss following updated proposal. **High priority proposal 2-21-2:**  * **Components of FG 33-5-1f are revised as**    + **Add a component “a) A single TB with NACK-only feedback transmitted in PUCCH”**   + **Add a component “b) [A single or] multiple TB with NACK-only feedback transmitted in PUCCH by transforming into ACK/NACK bits to generate ~~Type-1 or~~ Type-2 HARQ-ACK CB for multicast feedback only”**   + **Add a component “Support of [shared or] separate SPS-PUCCH-AN-List configuration from unicast SPS”**   + **[Add a component “Support of PTM retransmission associated with G-CS-RNTI for SPS multicast”]** |

### **(D)****High priority proposal 2-21-3:**

* **Apply one of the following alternatives for the reporting type of FG 33-5-1f**
  + **Alt.1: Per UE [9]**
  + **Alt.2: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation [3]**
  + **Alt.3: Per BC [2, 4, 7, 8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | Alt3 |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further inputs are necessary. |
| Ericsson | Seem per UE is enough since pre-requisite FG is per BC |
| MTK | Alt 3 |
| Qualcomm | Alt3 |

## **2.22 33-5-1g: DCI-based enabling/disabling NACK-only based feedback for SPS group-common PDSCH for multicast**

In [1], FG 33-5-1g is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-5-1g | DCI-based enabling/disabling NACK-only based feedback for SPS group-common PDSCH for multicast | Support of DCI-based enabling/disabling NACK-only based HARQ-ACK feedback configured per G-CS-RNTI for multicast by RRC signaling | 33-5-1f | Yes |  |  | [Per UE] | [No] | [No] |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | ***Proposal 7: Updating 33-5-1/1a/1d/1e/1f/1g/1i/2/33-9 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1g | DCI-based enabling/disabling NACK-only based feedback for SPS group-common PDSCH for multicast | Support of DCI-based enabling/disabling NACK-only based HARQ-ACK feedback configured per G-CS-RNTI for multicast by RRC signaling via DCI format 4\_2 | 33-5-1f and 33-2f | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | |
| [3] | ZTE | For all the MBS UE features with FFS for the report type, the following report type can be considered as a middle ground between companies.   * Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2   ***Proposal 9****: Regarding the report type for MBS FG 33-3-3, 33-3-3a, 33-3-3b, 33-3-4, 33-3-5, 33-5-1e, 33-5-1f, 33-5-1g, 33-5-1i, 33-5-2, 33-6-1, 33-6-1a, 33-6-2, 33-6-3, 33-8-1 and 33-9, consider the following as baseline.*   * + *Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2* |
| [4] | Spreadtrum Communications | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1g | DCI-based enabling/disabling NACK-only based feedback for SPS group-common PDSCH for multicast | Support of DCI-based enabling/disabling NACK-only based HARQ-ACK feedback configured per G-CS-RNTI for multicast by RRC signaling | 33-5-1f | Yes |  |  | Per Band | No | No |  |  | Optional with capability signalling | |
| [7] | NTT DOCOMO | The reporting type of these FGs should be aligned with the corresponding FGs for ACK/NACK-based feedback for SPS group-common PDSCH. In other words, the reporting type of FG 33-5-1f should be per BC as in FG 33-5-1a. Also, the reporting type of FG 33-5-1g should be per band as in FG 33-5-1b.  **Proposal 5-9: The reporting type of FG 33-5-1g is per band.**   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-5-1g | DCI-based enabling/disabling NACK-only based feedback for SPS group-common PDSCH for multicast | Support of DCI-based enabling/disabling NACK-only based HARQ-ACK feedback configured per G-CS-RNTI for multicast by RRC signaling | 33-5-1f | Yes |  |  | Per band | N/A | N/A |  |  | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1g | DCI-based enabling/disabling NACK-only based feedback for SPS group-common PDSCH for multicast | Support of DCI-based enabling/disabling NACK-only based HARQ-ACK feedback configured per G-CS-RNTI for multicast by RRC signaling via DCI format 4\_2 | 33-5-1f, 33-5-1i | Yes |  |  | Per band | N/A | N/A |  |  | Optional with capability signalling | |
| [9] | Nokia, NSB | * **33-5-1e/f/g/i**: * Per UE |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

**High priority proposal 2-22-1:**

* **Components of FG 33-5-1g are revised as “Support of DCI-based enabling/disabling NACK-only based HARQ-ACK feedback configured per G-CS-RNTI for multicast by RRC signaling via DCI format 4\_2” [2, 8]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | ok |
| Samsung | No need – directly understood from specifications |
| ZTE | OK |
| NTT DOCOMO | OK |
| LG Electronics | OK |
| Apple | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  We can check if the proposal is agreeable as it is straightforward. |
| Moderator (NTT DOCOMO) | Following agreement was made at Tuesday GTW session.  **Agreement:**  Components of FG 33-5-1g are revised as “Support of DCI-based enabling/disabling NACK-only based HARQ-ACK feedback configured per G-CS-RNTI for multicast by RRC signaling via DCI format 4\_2” |

### **(D)****High priority proposal 2-22-2:**

* **Add FG 33-2f as a prerequisite FG for FG 33-5-1g [2]**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | ok |
| Samsung | OK |
| NTT DOCOMO | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems the proposal is agreeable. |
| MTK | FG 33-2f mainly focus on the DCI format 4\_2 with CRC scrambled with **G-RNTI for dynamic multicast,** however, the FG 33-5-1g is defined for DCI-based enabling/disabling NACK-only based feedback with **G-CS-RNTI for SPS** group-common PDSCH for multicast, we are not clear why **FG 33-2f can be as a prerequisite FG for FG 33-5-1g, more clarification is needed.** |
| Ericsson | We think the appropriate FG would be 33-5i Multicast SPS scheduling with DCI format 4\_2 |

### **(D)****High priority proposal 2-22-3:**

* **Select one of the following alternatives for the reporting type of FG 33-5-1g**
  + **Alt.1: Per UE [9]**
  + **Alt.2: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation [3]**
  + **Alt.3: Per Band [4, 7, 8]**
  + **Alt.4: Per BC [2]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | Alt4 |
| ZTE | We prefer Alt.1 and Alt.2 |
| Nokia, NSB | Alt1 or Alt2 |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further discussion is necessary. |
| Ericsson | Seem per UE is enough since pre-requisite FG is per BC |

## **2.23 33-5-1i: Multicast SPS scheduling with DCI format 4\_2**

In [1], FG 33-5-1i is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-5-1i | Multicast SPS scheduling with DCI format 4\_2 | Support of DCI format 4\_2 with CRC scrambled with G-CS-RNTI for multicast SPS scheduling  FFS whether to include retransmission scheduled by DCI format 4\_2 with CRC scrambled with G-CS-RNTI | [33-5-1] | Yes |  |  | FFS | FFS | FFS |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | FG33-5-1i FFS whether to include retransmission scheduled by DCI format 4\_2 with CRC scrambled with G-CS-RNTI, it is understood that retransmission by DCI format 4\_2 scheduling can be supported or the initial transmission by DCI format 4\_2 scheduling is supported.  ***Proposal 7: Updating 33-5-1/1a/1d/1e/1f/1g/1i/2/33-9 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1i | Multicast SPS scheduling with DCI format 4\_2 | 1. Support of DCI format 4\_2 with CRC scrambled with G-CS-RNTI for multicast SPS scheduling  2. retransmission scheduled by DCI format 4\_2 with CRC scrambled with G-CS-RNTI  ~~FFS whether to include~~ | ~~[~~33-5-1~~]~~ | Yes |  |  | Per band | N/A | N/A |  |  | Optional with capability signalling | |
| [3] | ZTE | For all the MBS UE features with FFS for the report type, the following report type can be considered as a middle ground between companies.   * Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2   ***Proposal 9****: Regarding the report type for MBS FG 33-3-3, 33-3-3a, 33-3-3b, 33-3-4, 33-3-5, 33-5-1e, 33-5-1f, 33-5-1g, 33-5-1i, 33-5-2, 33-6-1, 33-6-1a, 33-6-2, 33-6-3, 33-8-1 and 33-9, consider the following as baseline.*   * + *Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2*   The fourth issue is whether to include retransmission scheduled by DCI format 4\_2 with CRC scrambled with G-CS-RNTI in 33-5-1i. From our perspective, from UE implementation perspective, retransmission scheduled by DCI format 4\_2 with CRC scrambled with G-CS-RNTI in 33-5-1i is the same as DCI format 4\_2 with CRC scrambled with G-CS-RNTI for multicast SPS scheduling. Thus, it is straightforward to include retransmission scheduled by DCI format 4\_2 with CRC scrambled with G-CS-RNTI in 33-5-1i.  ***Proposal 12:*** *Add one component in 33-5-1i: Support retransmission scheduled by DCI format 4\_2 with CRC scrambled with G-CS-RNTI.* |
| [4] | Spreadtrum Communications | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1i | Multicast SPS scheduling with DCI format 4\_2 | Support of DCI format 4\_2 with CRC scrambled with G-CS-RNTI for multicast SPS scheduling  FFS whether to include retransmission scheduled by DCI format 4\_2 with CRC scrambled with G-CS-RNTI | [33-5-1] | Yes |  |  | Per UE | No | No |  |  | Optional with capability signalling | |
| [7] | NTT DOCOMO | We don’t see the need to separate the support of retransmission scheduled by DCI format 4\_2 from FG 33-5-1i. There would be no problem with making FG 33-5-1 the prerequisite FG for FG 33-5-1i. Brackets can be removed. The reporting type of FG 33-5-1i should be per band like FG for support of DCI format 4\_2 for dynamic scheduling.  **Proposal 5-10: Update FG 33-5-1i as follows:**   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-5-1i | Multicast SPS scheduling with DCI format 4\_2 | 1. Support of DCI format 4\_2 with CRC scrambled with G-CS-RNTI for multicast SPS scheduling 2. ~~FFS whether to include r~~Retransmission scheduled by DCI format 4\_2 with CRC scrambled with G-CS-RNTI | ~~[~~33-5-1~~]~~ | Yes |  |  | Per band | N/A | N/A |  |  | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-1i | Multicast SPS scheduling with DCI format 4\_2 | Support of DCI format 4\_2 with CRC scrambled with G-CS-RNTI for multicast SPS scheduling | 33-5-1 | Yes |  |  | Per band | N/A | N/A |  |  | Optional with capability signalling | |
| [9] | Nokia, NSB | * **33-5-1e/f/g/i**: * Per UE |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

### **(D)****High priority proposal 2-23-1:**

* **Apply one of the following alternatives for Component of FG 33-5-1i.**
  + **Alt.1: Retransmission scheduled by DCI format 4\_2 with CRC scrambled with G-CS-RNTI is included in FG 33-5-1i [2, 3, 7]**
  + **Alt.2: Retransmission scheduled by DCI format 4\_2 with CRC scrambled with G-CS-RNTI is NOT included in FG 33-5-1i [8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | Alt.1 |
| Qualcomm | Our reading is that the PTM retransmission for SPS multicast is in FG33-5-1a, which is not included in 33-5-1 with DCI format 4\_1.  Similar here that no need to include PTM retransmission for SPS multicast for DCI format 4\_2. Note that 33-2 and 33-2f don’t include component of PTM retransmission. |
| ZTE | Alt.1. DCI format 4\_2 can schedule initial transmission (i.e., SPS activation) and retransmission.  If Alt.2 is introduced, how to handle the SPS retransmission scheduled by DCI format 4\_2? |
| NTT DOCOMO | We prefer Alt.1. |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further discussion is necessary. |
| Ericsson | Preference for Alt1 |
| MTK | Slightly prefer Alt 1 |

**(S)High priority proposal 2-23-2:**

* **Prerequisite FG for FG 33-5-1i is FG 33-5-1. [2, 7, 8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | OK |
| NTT DOCOMO | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems the proposal is agreeable. |
| Ericsson | ok |
| MTK | ok |
| Moderator (NTT DOCOMO) | Following agreement was made. **High priority proposal 2-23-2:** **Prerequisite FG for FG 33-5-1i is FG 33-5-1** |

### **(D)****High priority proposal 2-23-3:**

* **Apply one of the following alternatives for the reporting type of FG 33-5-1i**
  + **Alt.1: Per UE [4, 9]**
  + **Alt.2: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation [3]**
  + **Alt.3: Per Band [2, 7, 8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | Alt.3 |
| ZTE | We prefer Alt.1 and Alt.2. |
| Nokia, NSB | Alt.1 or Alt.2 |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further discussion is necessary. |
| Ericsson | Seem per UE is enough since pre-requisite FG is per BC |

## **2.24 33-5-2: Multiple SPS group-common PDSCH configuration**

In [1], FG 33-5-2 is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-5-2 | Multiple SPS group-common PDSCH configuration | 1. Support up to 8 SPS group-common PDSCH configuration per CFR for multicast  2. Support M>=1 activated SPS group-common PDSCH configurations per CFR for multicast  3. The total number of SPS configurations for both multicast and unicast is no larger than 8 [per cell], and activated SPS group-common PDSCH configurations is no larger than M. | 33-2 | Yes |  |  | [Per UE] | [No] | [No] |  | Candidate value set for M is {1, 2, …, 8} | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | ***Proposal 7: Updating 33-5-1/1a/1d/1e/1f/1g/1i/2/33-9 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-2 | Multiple SPS group-common PDSCH configuration | 1. Support up to 8 SPS group-common PDSCH configuration per CFR for multicast  2. Support M>=1 activated SPS group-common PDSCH configurations per CFR for multicast  3. The total number of SPS configurations for both multicast and unicast is no larger than 8 ~~[~~per cell~~]~~, and activated SPS group-common PDSCH configurations is no larger than M. | 33-2 | Yes |  |  | Per BC | N/A | N/A |  | Candidate value set for M is {1, 2, …, 8} | Optional with capability signalling | |
| [3] | ZTE | For all the MBS UE features with FFS for the report type, the following report type can be considered as a middle ground between companies.   * Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2   ***Proposal 9****: Regarding the report type for MBS FG 33-3-3, 33-3-3a, 33-3-3b, 33-3-4, 33-3-5, 33-5-1e, 33-5-1f, 33-5-1g, 33-5-1i, 33-5-2, 33-6-1, 33-6-1a, 33-6-2, 33-6-3, 33-8-1 and 33-9, consider the following as baseline.*   * + *Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2* |
| [4] | Spreadtrum Communications | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-2 | Multiple SPS group-common PDSCH configuration | 1. Support up to 8 SPS group-common PDSCH configuration per CFR for multicast  2. Support M>=1 activated SPS group-common PDSCH configurations per CFR for multicast  3. The total number of SPS configurations for both multicast and unicast is no larger than 8 [per cell], and activated SPS group-common PDSCH configurations is no larger than M. | 33-2 | Yes |  |  | Per band | No | No |  | Candidate value set for M is {1, 2, …, 8} | Optional with capability signalling | |
| [5] | vivo | Furthermore, in Rel-16, it is defined that up to 8 configured SPS configurations in a BWP of a serving cell and up to 32 configured SPS configurations in a cell group are supported in FG 12-2. When multicast is considered, the UE capabilities on multiple SPS configurations are expected to keep the same as existed UE capabilities for unicast only, and thus, the total number of SPS configurations for both multicast and unicast is no larger than 8 per cell, the total number of SPS configurations for both multicast and unicast in a cell group is no larger than 32.  *Proposal 3: The total number of SPS configurations for both multicast and unicast in a cell group is no larger than 32.*   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-2 | Multiple SPS group-common PDSCH configuration for Pcell | 1. Support up to 8 SPS group-common PDSCH configuration per CFR for multicast  2. Support M>=1 activated SPS group-common PDSCH configurations per CFR for multicast  3. The total number of SPS configurations for both multicast and unicast is no larger than 8 [per cell], and activated SPS group-common PDSCH configurations is no larger than M.  4. The total number of SPS configurations for both multicast and unicast in a cell group is no larger than 32. | 33-2 | Yes | [Per UE] | Candidate value set for M is {1, 2, …, 8} | Optional with capability signalling | |
| [7] | NTT DOCOMO | SPS-Config for unicast is a per-cell configuration, so the description “per cell” will be necessary. The reporting type of FG for support of 8 SPS configurations for unicast is per band, the reporting type of FG 33-5-2 should also be per band.  **Proposal 5-11: The reporting type of FG 33-5-2 is per band.**   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-5-2 | Multiple SPS group-common PDSCH configuration | 1. Support up to 8 SPS group-common PDSCH configuration per CFR for multicast  2. Support M>=1 activated SPS group-common PDSCH configurations per CFR for multicast  3. The total number of SPS configurations for both multicast and unicast is no larger than 8 ~~[~~per cell~~]~~, and activated SPS group-common PDSCH configurations is no larger than M. | 33-2 | Yes |  |  | Per band | N/A | N/A |  | Candidate value set for M is {1, 2, …, 8} | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-5-2 | Multiple SPS group-common PDSCH configuration | 1. Support up to 8 SPS group-common PDSCH configuration per CFR for multicast  2. Support M>=1 activated SPS group-common PDSCH configurations per CFR for multicast  3. The total number of SPS configurations for both multicast and unicast is no larger than 8 [per cell], and activated SPS group-common PDSCH configurations is no larger than M. | 33-5-1 | Yes |  |  | Per FS | N/A | N/A |  | Candidate value set for M is {1, 2, …, 8} | Optional with capability signalling | |
| [9] | Nokia, NSB | * **33-5-2**: * Per UE |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

### **(D)High priority proposal 2-24-1:**

* **Remove the bracket in Components of FG 33-5-2 [2, 7]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | OK |
| ZTE | Our understanding is “The total number of SPS configurations for both multicast and unicast is no larger than 8 in a BWP of a serving cell, and activated SPS group-common PDSCH configurations is no larger than M.”, which follows the same wording as in Rel-16 FG12-2.   |  |  |  |  | | --- | --- | --- | --- | | 12. NR\_IIOT | 12-2 | Multiple SPS configurations | 1) Support of up to 8 configured SPS configurations in a BWP of a serving cell and up to 32 configured SPS configurations in a cell group, including separate RRC parameters and separate activation/release for different SPS configurations  2) The max number of active SPS configurations in a BWP of a serving cell  3) The max number of active SPS configurations across all serving cells, and across MCG and SCG in case of NR-DC  4) The related HARQ-ACK enhancements to support multiple active SPS configurations | |
| NTT DOCOMO | OK |
| Nokia, NSB | OK |
| Apple | According to spec 38.331, SPS configuration number is configured per BWP, the component 3 of FG33-5-2 can be updated accordingly.  maxNrofSPS-Config-r16 INTEGER ::= 8 -- Maximum number of SPS configurations per BWP  – *SPS-ConfigIndex*  The IE *SPS-ConfigIndex* is used to indicate the index of one of multiple DL SPS configurations in one BWP.  ***SPS-ConfigIndex* information element**  SPS-ConfigIndex-r16 ::= INTEGER (0.. maxNrofSPS-Config-r16-1) |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further discussion is necessary. |
| Ericsson | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Following updated proposal can be discussed.  **High priority proposal 2-24-1:**  **Components of FG 33-5-2 are revised as**   * **Alt.1: Remove the bracket in Component 3 of FG 33-5-2 i.e., 8 per cell** * **Alt.2: Remove the bracket and modify “per cell” to “in a BWP of a serving cell”** **in Component 3 of FG 33-5-2** |

### **(N)High priority proposal 2-24-2:**

* **Components of FG 33-5-2 are revised as** 
  + **Add a component “The total number of SPS configurations for both multicast and unicast in a cell group is no larger than 32” [5]**

|  |  |
| --- | --- |
| Company | Comment |
| Nokia, NSB | This is not a real component but a note. Still we wonder why it would be needed? |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further inputs are necessary. |
| Ericsson | Since there is only one multicast cell, the note should not be needed, as we already specify that there cannot be more than 8 configuration in the cell. |

**(S)High priority proposal 2-24-3:**

* **Prerequisite FG for FG 33-5-2 is revised to FG 33-5-1 [8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | OK |
| NTT DOCOMO | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems agreeable. |
| Ericsson | OK |
| Moderator (NTT DOCOMO) | Following agreement was made. **High priority proposal 2-24-3:** **Prerequisite FG for FG 33-5-2 is revised to FG 33-5-1** |

### **(D)High priority proposal 2-24-4:**

* **Apply one of the following alternatives for the reporting type of FG 33-5-2**
  + **Alt.1: Per UE [9]**
  + **Alt.2: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation [3]**
  + **Alt.3: Per Band [4, 7]**
  + **Alt.4: Per BC [2]**
  + **Alt.5: Per FS [8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | Alt.4 |
| ZTE | We prefer Alt.1 and Alt.2. |
| Nokia, NSB | Alt.1 or Alt.2 |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further discussion is necessary. |
| Ericsson | Seem per UE is enough since pre-requisite FG is per BC |

## **2.25 33-6-1: DL priority indication for multicast in DCI**

In [1], FG 33-6-1 is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-6-1 | DL priority indication for multicast in DCI | 1. Support of priority indicator field configured in DCI formats 4\_2 with CRC scrambled with G-RNTI for multicast.  2. Supports two HARQ-ACK codebooks with different priorities to be simultaneously constructed different priorities for multicast and multicast at a UE | 33-2 | Yes |  |  | [Per UE] | [No] | [No] |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | For dynamic scheduling, the priority indication can be included in DCI format 4\_2 for multicast. The priority index cannot be directly configured by RRC signalling, although it means low priority when the priority indication is not included in the DCI format. Given FG33-6-1a is for configuring priority for multicast SPS configuration, it is better to make it clear that FG33-6-1 is for indicating priority for multicast dynamic scheduling. In addition, since FG33-2f is for indicating the capability of dynamic multicast with DCI format 4\_2, the prerequisite FG should be FG33-2f instead of FG33-2.  ***Proposal 8: Updating FG33-6-1/1a/2/3 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-6-1 | DL priority indication for multicast in DCI for multicast dynamic scheduling | 1. Support of priority indicator field configured in DCI formats 4\_2 with CRC scrambled with G-RNTI for multicast dynamic scheduling.  2. Supports two HARQ-ACK codebooks with different priorities to be simultaneously constructed different priorities for multicast and multicast at a UE | 33-2f | Yes |  |  | Per UE | No | No |  |  | Optional with capability signalling | |
| [3] | ZTE | For all the MBS UE features with FFS for the report type, the following report type can be considered as a middle ground between companies.   * Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2   ***Proposal 9****: Regarding the report type for MBS FG 33-3-3, 33-3-3a, 33-3-3b, 33-3-4, 33-3-5, 33-5-1e, 33-5-1f, 33-5-1g, 33-5-1i, 33-5-2, 33-6-1, 33-6-1a, 33-6-2, 33-6-3, 33-8-1 and 33-9, consider the following as baseline.*   * + *Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2* |
| [4] | Spreadtrum Communications | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-6-1 | DL priority indication for multicast in DCI | 1. Support of priority indicator field configured in DCI formats 4\_2 with CRC scrambled with G-RNTI for multicast.  2. Supports two HARQ-ACK codebooks with different priorities to be simultaneously constructed different priorities for multicast and multicast at a UE | 33-2 | Yes |  |  | Per UE | No | No |  |  | Optional with capability signalling | |
| [7] | NTT DOCOMO | FG 33-6-1 includes the generation of two HARQ-ACK codebooks. Since the reporting type of FG for support of two unicast HARQ-ACK codebooks with different priorities is per FS, the reporting type of FG 33-6-1 should also be per FS. The type of FG 33-6-2 should be per FS for the same reason.  **Proposal 5-12: Update FG 33-6-1 and 33-6-2 as follows:**   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-6-1 | DL priority indication for multicast in DCI | 1. Support of priority indicator field configured in DCI formats 4\_2 with CRC scrambled with G-RNTI for multicast.  2. Supports two HARQ-ACK codebooks with different priorities to be simultaneously constructed different priorities for multicast and multicast at a UE | 33-2 | Yes |  |  | Per FS | N/A | N/A |  |  | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-6-1 | DL priority indication for multicast in DCI | 1. Support of priority indicator field configured in DCI formats 4\_2 with CRC scrambled with G-RNTI for multicast.  2. Supports two HARQ-ACK codebooks with different priorities to be simultaneously constructed different priorities for multicast and multicast at a UE | 33-2a, 33-2f | Yes |  |  | Per FSPC | N/A | N/A |  |  | Optional with capability signalling | |
| [9] | Nokia, NSB | * **33-6-1/1a:** * Per UE |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

### **(N)High priority proposal 2-25-1:**

* **Components of FG 33-6-1 are revised as** 
  + **Component 1: Support of priority indicator field configured in DCI formats 4\_2 with CRC scrambled with G-RNTI for multicast dynamic scheduling [2]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | No need |
| ZTE | Is the intention of this proposal to say “component of FG33-6-1” instead of FG33-5-2? |
| Nokia, NSB | Not needed |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further discussion is necessary. |
| Ericsson | Not needed |

**(NS)High priority proposal 2-25-2:**

* **Apply one of the following alternatives for prerequisite FG for FG 33-6-1**
  + **Alt.1: FG 33-2 [4, 7]**
  + **Alt.2: FG 33-2f [2]**
  + **Alt.3: FG 33-2a and 33-2f [8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | OK with Alt.3 |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further inputs would be necessary. |
| Ericsson | Alt3. |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  We can check if Alt.3 is agreeable or not. **High priority proposal 2-25-2:** **The prerequisite FG for FG 33-6-1 is FG 33-2a and 33-2f** |
| Moderator (NTT DOCOMO) | Following agreement was made.  **High priority proposal 2-25-2:**  **The prerequisite FG for FG 33-6-1 is FG 33-2a and 33-2f** |

**(S)High priority proposal 2-25-3:**

* **Apply one of the following alternatives for the reporting type of FG 33-6-1**
  + **Alt.1: Per UE [2, 4, 9]**
  + **Alt.2: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation [3]**
  + **Alt.3: Per FS [7]**
  + **Alt.4: Per FSPC [8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | Alt.1 |
| ZTE | We prefer Alt.1 and Alt.2. |
| Nokia, NSB | Alt.1 or Alt.2 |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  We can check whether Alt.1 is acceptable for all. **Updated proposal 2-25-3:**  * **The reporting type of FG 33-6-1 is per UE without FDD/TDD and FR1/FR2 differentiations** |
| Ericsson | Seem per UE is enough since pre-requisite FG is per BC |
| Moderator (NTT DOCOMO) | Following agreement was made. **Updated proposal 2-25-3:**  * **The reporting type of FG 33-6-1 is per UE without FDD/TDD and FR1/FR2 differentiations** |

## **2.26 33-6-1a: DL priority configuration for SPS multicast**

In [1], FG 33-6-1a is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-6-1a | DL priority configuration for SPS multicast | Support of priority configured for multicast HARQ-ACK feedback of SPS multicast | 33-6-1 | Yes |  |  | FFS | FFS | FFS |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | For dynamic scheduling, the priority indication can be included in DCI format 4\_2 for multicast. The priority index cannot be directly configured by RRC signalling, although it means low priority when the priority indication is not included in the DCI format. Given FG33-6-1a is for configuring priority for multicast SPS configuration, it is better to make it clear that FG33-6-1 is for indicating priority for multicast dynamic scheduling. In addition, since FG33-2f is for indicating the capability of dynamic multicast with DCI format 4\_2, the prerequisite FG should be FG33-2f instead of FG33-2.  ***Proposal 8: Updating FG33-6-1/1a/2/3 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-6-1a | DL priority configuration for SPS multicast | Support of priority configured for multicast HARQ-ACK feedback of SPS multicast | 33-6-1 | Yes |  |  | Per UE | No | No |  |  | Optional with capability signalling | |
| [3] | ZTE | For all the MBS UE features with FFS for the report type, the following report type can be considered as a middle ground between companies.   * Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2   ***Proposal 9****: Regarding the report type for MBS FG 33-3-3, 33-3-3a, 33-3-3b, 33-3-4, 33-3-5, 33-5-1e, 33-5-1f, 33-5-1g, 33-5-1i, 33-5-2, 33-6-1, 33-6-1a, 33-6-2, 33-6-3, 33-8-1 and 33-9, consider the following as baseline.*   * + *Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2* |
| [4] | Spreadtrum Communications | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-6-1a | DL priority configuration for SPS multicast | Support of priority configured for multicast HARQ-ACK feedback of SPS multicast | 33-6-1 | Yes |  |  | Per UE | No | No |  |  | Optional with capability signalling | |
| [7] | NTT DOCOMO | The processing of this feature would be band-independent. Reporting type per UE without FDD/TDD/FR1/FR2 differentiation would be sufficient.  **Proposal 5-13: The reporting type of FG 33-6-1a is per UE.**   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-6-1a | DL priority configuration for SPS multicast | Support of priority configured for multicast HARQ-ACK feedback of SPS multicast | 33-6-1 | Yes |  |  | Per UE | No | No |  |  | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-6-1a | DL priority configuration for SPS multicast | Support of priority indicator field configured in DCI formats 4\_2 for multicast HARQ-ACK feedback of SPS multicast | 33-5-1a, 33-5-1i | Yes |  |  | Per FSPC | N/A | N/A |  |  | Optional with capability signalling | |
| [9] | Nokia, NSB | * **33-6-1/1a:** * Per UE |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

**(S)High priority proposal 2-26-1:**

* **Components of FG 33-6-1a are revised as “Support of priority indicator field configured in DCI formats 4\_2 for multicast HARQ-ACK feedback of SPS multicast”**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | No need but OK for clarity. |
| NTT DOCOMO | OK |
| Spreadtrum | Fine |
| LG Electronics | OK |
| Apple | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  It seems agreeable. |
| Ericsson | OK |
| Moderator (NTT DOCOMO) | Following agreement was made. **High priority proposal 2-26-1:**  * **Components of FG 33-6-1a are revised as “Support of priority indicator field configured in DCI formats 4\_2 for multicast HARQ-ACK feedback of SPS multicast”** |

### **(D)High priority proposal 2-26-2:**

* **Apply one of the following alternatives for prerequisite FG for FG 33-6-1a**
  + **Alt.1: FG 33-6-1 [2, 4, 7]**
  + **Alt.2: FG 33-5-1a and 33-5-1i [8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | Alt.1 |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further inputs would be necessary. |
| Ericsson | Alt2 |

**(S)High priority proposal 2-26-3:**

* **Apply one of the following alternatives for the reporting type of FG 33-6-1a**
  + **Alt.1: Per UE [2, 4, 7]**
  + **Alt.2: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation [3]**
  + **Alt.3: Per FSPC [8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | Alt.1 |
| ZTE | We prefer Alt.1 and Alt.2. |
| Nokia, NSB | Alt.1 or Alt.2 |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  We can check whether Alt.1 is acceptable for all. **Updated proposal 2-26-3:**  * **The reporting type of FG 33-6-1a is per UE without FDD/TDD and FR1/FR2 differentiations** |
| Ericsson | Seem per UE is enough since pre-requisite FG is per BC |
| Moderator (NTT DOCOMO) | Following agreement was made. **Updated proposal 2-26-3:**  * **The reporting type of FG 33-6-1a is per UE without FDD/TDD and FR1/FR2 differentiations** |

## **2.27 33-6-2: Two HARQ-ACK codebooks simultaneously constructed for supporting HARQ-ACK codebooks with different priorities for unicast and multicast at a UE**

In [1], FG 33-6-2 is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-6-2 | Two HARQ-ACK codebooks simultaneously constructed for supporting HARQ-ACK codebooks with different priorities for unicast and multicast at a UE | 1. Supports two HARQ-ACK codebooks with different priorities to be simultaneously constructed different priorities for unicast and multicast at a UE. | 33-6-1 | Yes |  |  | [Per UE] | [No] | [No] |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | For dynamic scheduling, the priority indication can be included in DCI format 4\_2 for multicast. The priority index cannot be directly configured by RRC signalling, although it means low priority when the priority indication is not included in the DCI format. Given FG33-6-1a is for configuring priority for multicast SPS configuration, it is better to make it clear that FG33-6-1 is for indicating priority for multicast dynamic scheduling. In addition, since FG33-2f is for indicating the capability of dynamic multicast with DCI format 4\_2, the prerequisite FG should be FG33-2f instead of FG33-2.  ***Proposal 8: Updating FG33-6-1/1a/2/3 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-6-2 | Two HARQ-ACK codebooks simultaneously constructed for supporting HARQ-ACK codebooks with different priorities for unicast and multicast at a UE | 1. Supports two HARQ-ACK codebooks with different priorities to be simultaneously constructed different priorities for unicast and multicast at a UE. | 33-6-1 | Yes |  |  | Per UE | No | No |  |  | Optional with capability signalling | |
| [3] | ZTE | For all the MBS UE features with FFS for the report type, the following report type can be considered as a middle ground between companies.   * Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2   ***Proposal 9****: Regarding the report type for MBS FG 33-3-3, 33-3-3a, 33-3-3b, 33-3-4, 33-3-5, 33-5-1e, 33-5-1f, 33-5-1g, 33-5-1i, 33-5-2, 33-6-1, 33-6-1a, 33-6-2, 33-6-3, 33-8-1 and 33-9, consider the following as baseline.*   * + *Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2* |
| [4] | Spreadtrum Communications | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-6-2 | Two HARQ-ACK codebooks simultaneously constructed for supporting HARQ-ACK codebooks with different priorities for unicast and multicast at a UE | 1. Supports two HARQ-ACK codebooks with different priorities to be simultaneously constructed different priorities for unicast and multicast at a UE. | 33-6-1 | Yes |  |  | Per FS | No | No |  |  | Optional with capability signalling | |
| [7] | NTT DOCOMO | **Proposal 5-12: Update FG 33-6-1 and 33-6-2 as follows:**   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-6-2 | Two HARQ-ACK codebooks simultaneously constructed for supporting HARQ-ACK codebooks with different priorities for unicast and multicast at a UE | 1. Supports two HARQ-ACK codebooks with different priorities to be simultaneously constructed different priorities for unicast and multicast at a UE. | 33-6-1 | Yes |  |  | Per FS | N/A | N/A |  |  | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-6-2 | Two HARQ-ACK codebooks simultaneously constructed for supporting HARQ-ACK codebooks with different priorities for unicast and multicast at a UE | 1. Supports two HARQ-ACK codebooks with different priorities to be simultaneously constructed different priorities for unicast and multicast at a UE. | 33-6-1 | Yes |  |  | Per FSPC | N/A | N/A |  |  | Optional with capability signalling | |
| [9] | Nokia, NSB | * **33-6-2:** * Per UE |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

**(S)High priority proposal 2-27-1:**

* **Apply one of the following alternatives for the reporting type of FG 33-6-2**
  + **Alt.1: Per UE [2, 9]**
  + **Alt.2: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation [3]**
  + **Alt.3: Per FS [4, 7]**
  + **Alt.4: Per FSPC [8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | Alt. 1 |
| ZTE | We prefer Alt.1 and Alt.2. |
| Nokia, NSB | Alt.1 or Alt.2 |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  We can check whether Alt.1 is acceptable for all. **Updated proposal 2-27-1:**  * **The reporting type of FG 33-6-2 is per UE without FDD/TDD and FR1/FR2 differentiations** |
| Ericsson | Seem per UE is enough since pre-requisite FG is per BC |
| Moderator (NTT DOCOMO) | Following agreement was made. **Updated proposal 2-27-1:**  * **The reporting type of FG 33-6-2 is per UE without FDD/TDD and FR1/FR2 differentiations** |

## **2.28 33-6-3: More than one PUCCH for HARQ-ACK transmission for multicast or for unicast and multicast within a slot**

In [1], FG 33-6-3 is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-6-3 | More than one PUCCH for HARQ-ACK transmission for multicast or for unicast and multicast within a slot | 1. Supports two non-overlapping slot-based PUCCHs for ACK/NACK based HARQ-ACK feedback for multicast or for unicast and multicast with different priorities in a slot. | 33-6-1, 33-6-2 | Yes |  |  | [Per UE] | [No] | [No] |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | For dynamic scheduling, the priority indication can be included in DCI format 4\_2 for multicast. The priority index cannot be directly configured by RRC signalling, although it means low priority when the priority indication is not included in the DCI format. Given FG33-6-1a is for configuring priority for multicast SPS configuration, it is better to make it clear that FG33-6-1 is for indicating priority for multicast dynamic scheduling. In addition, since FG33-2f is for indicating the capability of dynamic multicast with DCI format 4\_2, the prerequisite FG should be FG33-2f instead of FG33-2.  ***Proposal 8: Updating FG33-6-1/1a/2/3 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-6-3 | More than one PUCCH for HARQ-ACK transmission for multicast or for unicast and multicast within a slot | 1. Supports two non-overlapping slot-based PUCCHs for ACK/NACK based HARQ-ACK feedback for multicast or for unicast and multicast with different priorities in a slot. | 33-6-1, 33-6-2 | Yes |  |  | Per UE | No | No |  |  | Optional with capability signalling | |
| [3] | ZTE | For all the MBS UE features with FFS for the report type, the following report type can be considered as a middle ground between companies.   * Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2   ***Proposal 9****: Regarding the report type for MBS FG 33-3-3, 33-3-3a, 33-3-3b, 33-3-4, 33-3-5, 33-5-1e, 33-5-1f, 33-5-1g, 33-5-1i, 33-5-2, 33-6-1, 33-6-1a, 33-6-2, 33-6-3, 33-8-1 and 33-9, consider the following as baseline.*   * + *Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2* |
| [4] | Spreadtrum Communications | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-6-3 | More than one PUCCH for HARQ-ACK transmission for multicast or for unicast and multicast within a slot | 1. Supports two non-overlapping slot-based PUCCHs for ACK/NACK based HARQ-ACK feedback for multicast or for unicast and multicast with different priorities in a slot. | 33-6-1, 33-6-2 | Yes |  |  | Per UE | No | No |  |  | Optional with capability signalling | |
| [7] | NTT DOCOMO | Since the reporting type of FG for support of more than one PUCCH for unicast HARQ-ACK transmission within a slot is per FS, the reporting type of FG 33-6-3 should also be per FS.  **Proposal 5-14: The reporting type of FG 33-6-3 is per FS.**   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-6-3 | More than one PUCCH for HARQ-ACK transmission for multicast or for unicast and multicast within a slot | 1. Supports two non-overlapping slot-based PUCCHs for ACK/NACK based HARQ-ACK feedback for multicast or for unicast and multicast with different priorities in a slot. | 33-6-1, 33-6-2 | Yes |  |  | Per FS | N/A | N/A |  |  | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-6-3 | More than one PUCCH for HARQ-ACK transmission for multicast or for unicast and multicast within a slot | 1. Supports two non-overlapping slot-based PUCCHs for ACK/NACK based HARQ-ACK feedback for multicast or for unicast and multicast with different priorities in a slot. | 33-6-1, 33-6-2 | Yes |  |  | Per FSPC | N/A | N/A |  |  | Optional with capability signalling | |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

**(S)High priority proposal 2-28-1:**

* **Apply one of the following alternatives for the reporting type of FG 33-6-3**
  + **Alt.1: Per UE [2, 4]**
  + **Alt.2: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation [3]**
  + **Alt.3: Per FS [7]**
  + **Alt.4: Per FSPC [8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | Alt. 1 |
| ZTE | We prefer Alt.1 and Alt.2. |
| Nokia, NSB | Alt.1 or Alt.2 |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  We can check whether Alt.1 is acceptable for all. **Updated proposal 2-28-1:**  * **The reporting type of FG 33-6-3 is per UE without FDD/TDD and FR1/FR2 differentiations** |
| Ericsson | Seem per UE is enough since pre-requisite FG is per BC |
| Moderator (NTT DOCOMO) | Following agreement was made. **Updated proposal 2-28-1:**  * **The reporting type of FG 33-6-3 is per UE without FDD/TDD and FR1/FR2 differentiations** |

## **2.29 33-8-1: PUCCH resource configuration for multicast feedback for dynamically scheduled multicast**

In [1], FG 33-8-1 is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-8-1 | PUCCH resource configuration for multicast feedback for dynamically scheduled multicast | Support of a PUCCH-Config for multicast HARQ-ACK feedback, separate from that of unicast configurations | 33-2a | Yes |  |  | [Per band or per FSPC] | [No] | [No] |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | Given FG33-8-1 is already defined that was initially intended for at least ACK/NACK based feedback for multicast, such FG can be expanded to include the case for NACK-only mode1. Overall, the change can be made to the prerequisite FG to include FG33-2a or FG33-4 for ACK/NACK based and for NACK-only mode1 feedback, respectively.  ***Proposal 9: Updating FG33-8-1 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-8-1 | PUCCH resource configuration for multicast feedback for dynamically scheduled multicast | Support of a PUCCH-Config for multicast HARQ-ACK feedback, separate from that of unicast configurations | 33-2a or 33-4 | Yes |  |  | Per BC | No | No |  | Note: With 33-2a or 33-4 as prerequisite FG, this FG33-8-1 includes the case of ACK/NACK for multicast or NACK-only mode1 for multicast. | Optional with capability signalling | |
| [3] | ZTE | For all the MBS UE features with FFS for the report type, the following report type can be considered as a middle ground between companies.   * Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2   ***Proposal 9****: Regarding the report type for MBS FG 33-3-3, 33-3-3a, 33-3-3b, 33-3-4, 33-3-5, 33-5-1e, 33-5-1f, 33-5-1g, 33-5-1i, 33-5-2, 33-6-1, 33-6-1a, 33-6-2, 33-6-3, 33-8-1 and 33-9, consider the following as baseline.*   * + *Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2* |
| [4] | Spreadtrum Communications | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-8-1 | PUCCH resource configuration for multicast feedback for dynamically scheduled multicast | Support of a PUCCH-Config for multicast HARQ-ACK feedback, separate from that of unicast configurations | 33-2a | Yes |  |  | Per band | No | No |  |  | Optional with capability signalling | |
| [7] | NTT DOCOMO | We don’t see the need to make the reporting type of FG 33-8-1 finer granularity than per band. Reporting type per band would be sufficient.  **Proposal 5-15: The reporting type of FG 33-8-1 is per band.**   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-8-1 | PUCCH resource configuration for multicast feedback for dynamically scheduled multicast | Support of a PUCCH-Config for multicast HARQ-ACK feedback, separate from that of unicast configurations | 33-2a | Yes |  |  | Per band | N/A | N/A |  |  | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-8-1 | PUCCH resource configuration for multicast feedback for dynamically scheduled multicast | Support of a PUCCH-Config for multicast HARQ-ACK feedback, separate from that of unicast configurations | 33-2a | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | | 33. NR\_MBS | 33-8-2 | Up to 2 PUCCH resources configuration for multicast feedback for dynamically scheduled multicast | Support of a PUCCH-ConfigurationList for multicast HARQ-ACK feedback, separate from that of unicast configurations | 33-8-1, 33-6-1 | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | | 33. NR\_MBS | 33-8-3 | PUCCH resource configuration for multicast feedback for SPS GC-PDSCH | Support of a SPS-PUCCH-AN-List for multicast HARQ-ACK feedback of all multicast SPS configuration(s), separate from that of SPS unicast configurations | 33-5-1a | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | |
| [9] | Nokia, NSB | * **33-8-1:** * Per band as a compromise |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

**(NS)High priority proposal 2-29-1:**

* **Apply one of the following alternatives for prerequisite FG for FG 33-8-1**
  + **Alt.1: 33-2a [4, 7, 8]**
  + **Alt.2: 33-2a or 33-4 [2]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | Alt.1 |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further inputs would be necessary. |
| Ericsson | Alt1 |
| Moderator (NTT DOCOMO) | We can check if Alt.1 is agreeable or not.  **High priority proposal 2-29-1:**  **The prerequisite FG for FG 33-8-1 is 33-2a** |
| Moderator (NTT DOCOMO) | Following agreement was made in GTW session.  **High priority proposal 2-29-1:**  **The prerequisite FG for FG 33-8-1 is 33-2a** |

### **(D)****High priority proposal 2-29-2:**

* **Apply one of the following alternatives for the reporting type of FG 33-8-1** 
  + **Alt.1: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation [3]**
  + **Alt.2: Per Band [4, 7]**
  + **Alt.3: Per BC [2, 8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | Alt.3 |
| ZTE | We prefer Alt.1. Alt.2 is also acceptable. |
| Nokia, NSB | We can accept Alt.2 as a compromise. |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further discussion is necessary. |
| Ericsson | Seem per UE is enough since pre-requisite FG is per BC |
| Qualcomm | Alt3  Alt1 or Alt2 is not enough because maybe not all the bands in the BC of FG33-2a can support this FG. |

**(NS)High priority proposal 2-29-3:**

* **Introduce FG for support of the following. [8]**
  + **Support of a PUCCH-ConfigurationList for multicast HARQ-ACK feedback, separate from that of unicast configurations**
  + **Support of a SPS-PUCCH-AN-List for multicast HARQ-ACK feedback of all multicast SPS configuration(s), separate from that of SPS unicast configurations**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-8-2 | Up to 2 PUCCH resources configuration for multicast feedback for dynamically scheduled multicast | Support of a PUCCH-ConfigurationList for multicast HARQ-ACK feedback, separate from that of unicast configurations | 33-8-1, 33-6-1 | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling |
| 33. NR\_MBS | 33-8-3 | PUCCH resource configuration for multicast feedback for SPS GC-PDSCH | Support of a SPS-PUCCH-AN-List for multicast HARQ-ACK feedback of all multicast SPS configuration(s), separate from that of SPS unicast configurations | 33-5-1a | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling |

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | OK |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further inputs would be necessary. |
| Ericsson | OK |
| Qualcomm | Support |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Let’s check if the proposal is agreeable. **High priority proposal 2-29-3:**  * **Introduce FG for support of the following. [8]**   + **Support of a PUCCH-ConfigurationList for multicast HARQ-ACK feedback, separate from that of unicast configurations**   + **Support of a SPS-PUCCH-AN-List for multicast HARQ-ACK feedback of all multicast SPS configuration(s), separate from that of SPS unicast configurations**  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-8-2 | Up to 2 PUCCH resources configuration for multicast feedback for dynamically scheduled multicast | Support of a PUCCH-ConfigurationList for multicast HARQ-ACK feedback, separate from that of unicast configurations | 33-8-1, 33-6-1 | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | | 33. NR\_MBS | 33-8-3 | PUCCH resource configuration for multicast feedback for SPS GC-PDSCH | Support of a SPS-PUCCH-AN-List for multicast HARQ-ACK feedback of all multicast SPS configuration(s), separate from that of SPS unicast configurations | 33-5-1a | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | |
| Moderator (NTT DOCOMO) | Following agreement was made in GTW session.  **High priority proposal 2-29-3:**  **Introduce FG for support of the followings**   * **Support of a PUCCH-ConfigurationList for multicast HARQ-ACK feedback, separate from that of unicast configurations** * **Support of a SPS-PUCCH-AN-List for multicast HARQ-ACK feedback of all multicast SPS configuration(s), separate from that of SPS unicast configurations**  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-8-2 | Up to 2 PUCCH resources configuration for multicast feedback for dynamically scheduled multicast | Support of a PUCCH-ConfigurationList for multicast HARQ-ACK feedback, separate from that of unicast configurations | 33-8-1, 33-6-1 | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | | 33. NR\_MBS | 33-8-3 | PUCCH resource configuration for multicast feedback for SPS GC-PDSCH | Support of a SPS-PUCCH-AN-List for multicast HARQ-ACK feedback of all multicast SPS configuration(s), separate from that of SPS unicast configurations | 33-5-1a | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | |

### **Low priority proposal 2-29-4:**

* **Add a note that “With 33-2a or 33-4 as prerequisite FG, this FG33-8-1 includes the case of ACK/NACK for multicast or NACK-only mode1 for multicast.” [2]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | No need |
|  |  |
|  |  |

## **2.30 33-9: Support group-common PDSCH RE-level rate matching for multicast**

In [1], FG 33-9 is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-9 | Supporting unicast PDCCH to release SPS group-common PDSCH | Supports unicast PDCCH scrambled with CS-RNTI to release SPS group-common PDSCH | [33-5-1] | Yes |  |  | [Per UE] | [No] | [No] |  |  | Optional with capability signalling |

Following views are provided in contributions for the RAN1#110bis-e meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [2] | Huawei, HiSilicon | ***Proposal 7: Updating 33-5-1/1a/1d/1e/1f/1g/1i/2/33-9 as follows in red:***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-9 | Supporting unicast PDCCH to release SPS group-common PDSCH | Supports unicast PDCCH scrambled with CS-RNTI to release SPS group-common PDSCH | ~~[~~33-5-1~~]~~ | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling | |
| [3] | ZTE | For all the MBS UE features with FFS for the report type, the following report type can be considered as a middle ground between companies.   * Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2   ***Proposal 9****: Regarding the report type for MBS FG 33-3-3, 33-3-3a, 33-3-3b, 33-3-4, 33-3-5, 33-5-1e, 33-5-1f, 33-5-1g, 33-5-1i, 33-5-2, 33-6-1, 33-6-1a, 33-6-2, 33-6-3, 33-8-1 and 33-9, consider the following as baseline.*   * + *Reporting type is per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation, detail signalling is up to RAN2* |
| [4] | Spreadtrum Communications | The Feature group refers to use unicast PDCCH to release SPS group-common PDSCH. In details, it means that one PDCCH scrambled with CS-RNTI is used to release SPS group-common PDSCH. In our mind, only UE supports unicast SPS, CS-RNTI would be configured. Thus, we suggest to add FG 5-18 (i.e., the capability of supporting DL SPS for unicast) as the prerequisite FG of FG33-9.  ***Proposal 2: Support to add FG5-18 as the prerequisite FG of FG33-9.***   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-9 | Supporting unicast PDCCH to release SPS group-common PDSCH | Supports unicast PDCCH scrambled with CS-RNTI to release SPS group-common PDSCH | 33-5-1, FG5-18 | Yes |  |  | Per UE | No | No |  |  | Optional with capability signalling | |
| [7] | NTT DOCOMO | There will be no problem with making 33-5-1 a prerequisite FG for 33-2e. Brackets can be removed. The process of checking if it is a DCI for SPS release would be band-independent. Reporting type per UE without FDD/TDD/FR1/FR2 differentiation would be sufficient.  **Proposal 5-16: Update FG 33-9 as follows:**   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33-9 | Supporting unicast PDCCH to release SPS group-common PDSCH | Supports unicast PDCCH scrambled with CS-RNTI to release SPS group-common PDSCH | ~~[~~33-5-1~~]~~ | Yes |  |  | ~~[~~Per UE~~]~~ | ~~[~~No~~]~~ | ~~[~~No~~]~~ |  |  | Optional with capability signalling | |
| [8] | Qualcomm | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 33. NR\_MBS | 33-9 | Supporting unicast PDCCH to release SPS group-common PDSCH | Supports unicast PDCCH scrambled with CS-RNTI to release SPS group-common PDSCH | 33-5-1 | Yes |  |  | Per BC | N/A[No] | N/A[No] |  |  | Optional with capability signalling | |
| [9] | Nokia, NSB | * **33-9:** * Per UE |

Based on above, following proposal should be discussed at the RAN1#110bis-e meeting.

### **(D)High priority proposal 2-30-1:**

* **Apply one of the following alternatives for prerequisite FG for FG 33-9.**
  + **Alt.1: FG 33-5-1: [2, 7]**
  + **Alt.2: FG 33-5-1 and FG 5-18: [4]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | Alt. 1 |
| Spreadtrum | Alt 2. We are curious that if UE doesn’t support FG5-18, why gNB to configure CS-RNTI? |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further inputs would be necessary. |
| Qualcomm | It seems the pre-requisite FG should be FG 33-5-1 and FG 12-2, where multiple SPS configurations should be supported for at least one unicast SPS and one multicast SPS |
| Ericsson | Agree with Qualcomm views. |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Following updated proposal can be discussed. **High priority proposal 2-30-1:** **Apply one of the following alternatives for prerequisite FG for FG 33-9**   * **Alt.1: FG 33-5-1** * **Alt.2: FG 33-5-1 and FG 5-18** * **Alt.3: FG 33-5-1 and FG 12-2** |

### **(D)High priority proposal 2-30-2:**

* **Apply one of the following alternatives for the reporting type of FG 33-9**
  + **Alt.1: Per UE [4, 7, 9]**
  + **Alt.2: Per UE with [FDD/TDD,] FR1/FR2, licensed/unlicensed, and TN/NTN differentiation [3]**
  + **Alt.3: Per BC [2, 8]**

|  |  |
| --- | --- |
| Company | Comment |
| Samsung | Alt.3 |
| ZTE | We prefer Alt.1 or Alt.2 |
| Spreadtrum | Alt1 or Alt2 |
| Nokia, NSB | Alt.1 or Alt.2 |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  Further discussion is necessary. |
| Ericsson | Seem per UE is enough since pre-requisite FG is per BC |
| Qualcomm | Alt3  Alt1 or Alt2 is not enough because maybe not all the bands in the BC of FG33-5-1 can support this FG. |

# **Conclusions**

Following agreements were made.

**Agreement:**

* Components of FG 33-1 are revised as
  + Component 1: Support of group-common PDCCH/PDSCH for broadcast with CRC scrambled by MCCH-RNTI.
  + Component 2: Support of group-common PDCCH/PDSCH for broadcast with CRC scrambled by G-RNTI(s) for MTCH.
  + Component 6: Support of inter-slot TDM between unicast PDSCH and MCCH group-common PDSCH or MTCH group-common PDSCH, or between MCCH group-common PDSCH and MTCH group-common PDSCH, or among unicast PDSCH and MCCH group-common PDSCH and MTCH group-common PDSCH in different slots
  + Add a component “One G-RNTI per UE is supported for broadcast reception”
  + Add a component “Support of FDMed MCCH and PBCH”
  + Add a component “Support of up to 64QAM for FR1/FR2”

**Agreement:**

* Components of FG 33-2 are revised as
  + Component 1: Support of group-common PDCCH/PDSCH for multicast with CRC scrambled by G-RNTI for PCell.
  + Component 5: Support of inter-slot TDM between ~~unicast PDSCH and~~ group-common PDSCH for multicast and other PDSCHs in different slots.

**Agreement:**

No additional component is added for FG 33-2i, i.e., FFS can be removed

**Agreement:**

Prerequisite FG for FG 33-2j is FG 33-2

**Agreement:**

The feature group name of FG 33-3-2 is revised as “FDM-ed unicast PDSCH and one group-common PDSCH for multicast”

**Agreement:**

Prerequisite FG for FG 33-3-3 is revised as “33-1 and/or 33-2”

**Agreement:**

* The reporting type of FG 33-3-3 is per FSPC

**Agreement:**

* Components of FG 33-3-3a are revised as “Support of FDM-ed Type-1 and Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast on PUCCH or PUSCH”
* Components of FG 33-3-3b are revised as “Support of Mode 2 TDM-ed Type-1 and Type-2 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast on PUCCH or PUSCH”

**Agreement:**

Remove the bracket in components of FG 33-4, i.e., “Support of shared PUCCH resource configurations with unicast” is included in FG 33-4

**Agreement:**

The prerequisite FGs for FG 33-4-1 are FG 33-4 and 33-2f

**Agreement:**

Components of FG 33-4-1 are revised as “Support of DCI-based enabling/disabling NACK-only based HARQ-ACK feedback configured per G-RNTI by RRC signaling via DCI format 4\_2”

**Agreement:**

Components of FG 33-5-1b are revised as “Support of DCI-based enabling/disabling ACK/NACK based HARQ-ACK feedback configured per G-CS-RNTI for multicast by RRC signaling via DCI format 4\_2”.

**Agreement:**

Components of FG 33-5-1g are revised as “Support of DCI-based enabling/disabling NACK-only based HARQ-ACK feedback configured per G-CS-RNTI for multicast by RRC signaling via DCI format 4\_2”

**Agreement:**

Prerequisite FG for FG 33-3-5 is “FG 33-2a or 33-4 or 33-5-1a or 33-5-1f”

**Agreement:**

Add FG 33-5-1i as a prerequisite FG for FG 33-5-1b

**Agreement:**

Remove the bracket in Components of FG 33-5-1d

**Agreement:**

Components of FG 33-5-1d are revised as “Support of PTP retransmission associated with CS-RNTI for SPS multicast on the cell same as multicast initial transmission”.

**Agreement:**

Prerequisite FG for FG 33-5-1i is FG 33-5-1

**Agreement:**

Prerequisite FG for FG 33-5-2 is revised to FG 33-5-1

**Agreement:**

The reporting type of FG 33-6-1 is per UE without FDD/TDD and FR1/FR2 differentiations

**Agreement:**

Components of FG 33-6-1a are revised as “Support of priority indicator field configured in DCI formats 4\_2 for multicast HARQ-ACK feedback of SPS multicast”

**Agreement:**

The reporting type of FG 33-6-1a is per UE without FDD/TDD and FR1/FR2 differentiations

**Agreement:**

The reporting type of FG 33-6-2 is per UE without FDD/TDD and FR1/FR2 differentiations

**Agreement:**

The reporting type of FG 33-6-3 is per UE without FDD/TDD and FR1/FR2 differentiations

**Agreement:**

Introduce a separate new FG for SPS multicast on SCell from FGs for SPS multicast on PCell and DG multicast on Scell

* Add FG 33-2h and 33-5-1 as prerequisite FGs

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-5-3 | One SPS group-common PDSCH configuration for multicast for Scell | 1. Support one SPS group-common PDSCH configuration for multicast for Scell.  2. Support {2, 4, 8} times semi-static slot-level repetition for SPS group-common PDSCH for Scell. | 33-5-1, 33-2h | Yes | Per FSPC | N/A | N/A |  |  | Optional with capability signalling |
| 33. NR\_MBS | 33-5-4 | Up to 8 SPS group-common PDSCH configurations per CFR for multicast for SCell | 1. Support up to 8 SPS group-common PDSCH configuration per CFR for multicast for Scell.  2. Support M>=1 activated SPS group-common PDSCH configurations per CFR for multicast for Scell.  3. The total number of SPS configurations for both multicast and unicast is no larger than 8 [per cell], and activated SPS group-common PDSCH configurations is no larger than M.  4. The total number of SPS configurations for both multicast and unicast in a cell group is no larger than 32. | 33-5-3 | Yes | Per FSPC | N/A | N/A |  | Candidate value set for M is {1, 2, …, 8} | Optional with capability signalling |

**Agreement:**

Modify 33-3-3a and 3b as below.

* Further discuss on the consequence

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. NR\_MBS | 33-3-3a | FDM-ed Type-1 and Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast | 1. Support of FDM-ed Type-1 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast  2. Support of Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast with max number X of G-RNTIs | 33-2a, 33-3-2 | Yes |  | FFS | Per BC | N/A | N/A |  | Note1: FDM-ed Type-1 HARQ-ACK codebook is generated by concatenating the Type-1 sub-codebook for unicast and the Type-1 sub-codebook for multicast.  Note2: The Type-2 HARQ-ACK codebook is generated by concatenating the Type-2 sub-codebook for unicast and the Type-2 sub-codebook for multicast.  Candidate values of X is {2, 3, 4} with X no larger than max number of G-RNTIs of FG33-2e | Optional with capability signalling |
| 33. NR\_MBS | 33-3-3b | Mode 2 TDM-ed Type-1 and Type-2 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast | 1.Support of Mode 2 TDM-ed Type-1 HARQ-ACK codebook for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast  2.Support of Type-2 HARQ-ACK codebooks for multiplexing HARQ-ACK for unicast and HARQ-ACK for multicast with max number X of G-RNTIs | 33-2a | Yes |  | FFS | Per BC | N/A | N/A |  | Note1: Mode 2 TDM-ed Type-1 HARQ-ACK codebook is generated based on the union TDRA tables from unicast and multicast and the union of k1 sets from unicast and multicast.  Note2: The Type-2 HARQ-ACK codebook is generated by concatenating the Type-2 sub-codebook for unicast and the Type-2 sub-codebook for multicast.  Candidate values of X is {2, 3, 4} with X no larger than max number of G-RNTIs of FG33-2e | Optional with capability signalling |

**Agreement:**

Components of FG 33-3-5 are revised as “Support of multiplexing HARQ-ACK for unicast and for multicast with the same priority and different HARQ-ACK codebook types in a PUCCH or in a PUSCH”

**Agreement:**

The prerequisite FG for FG 33-6-1 is FG 33-2a and 33-2f

**Agreement:**

The prerequisite FG for FG 33-8-1 is 33-2a

**Agreement:**

Introduce FG for support of the followings

* Support of a PUCCH-ConfigurationList for multicast HARQ-ACK feedback, separate from that of unicast configurations
* Support of a SPS-PUCCH-AN-List for multicast HARQ-ACK feedback of all multicast SPS configuration(s), separate from that of SPS unicast configurations

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| 33. NR\_MBS | 33-8-2 | Up to 2 PUCCH resources configuration for multicast feedback for dynamically scheduled multicast | Support of a PUCCH-ConfigurationList for multicast HARQ-ACK feedback, separate from that of unicast configurations | 33-8-1, 33-6-1 | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling |
| 33. NR\_MBS | 33-8-3 | PUCCH resource configuration for multicast feedback for SPS GC-PDSCH | Support of a SPS-PUCCH-AN-List for multicast HARQ-ACK feedback of all multicast SPS configuration(s), separate from that of SPS unicast configurations | 33-5-1a | Yes |  |  | Per BC | N/A | N/A |  |  | Optional with capability signalling |

# **References**

[1] R1-2207923 Updated RAN1 UE features list for Rel-17 NR after RAN1 #110 Thursday Moderators (AT&T, NTT DOCOMO, INC.)

[2] R1-2208461 Remaining issues for UE features set 1 topics Huawei, HiSilicon

[3] R1-2208530 Discussion on UE features for topics 1 ZTE

[4] R1-2208538 UE features for R17 NR MBS Spreadtrum Communications

[5] R1-2208622 Remaining issues on UE features for MBS, Coverage enhancement and URLLC vivo

[6] R1-2209528 Views on UE feature Topic 1 MediaTek Inc.

[7] R1-2209886 Discussion on remaining issues regarding Rel-17 RAN1 UE features topics 1 NTT DOCOMO, INC.

[8] R1-2209963 Discussion on Rel-17 UE features topic 1 Qualcomm Incorporated

[9] R1-2210098 Remaining issues for UE features topics 1 Nokia, Nokia Shanghai Bell