**3GPP TSG RAN WG1 #110 R1-2207986**

**Toulouse, France, 22 – 26. August 2022**

**Source: MediaTek**

**Title: [110-NR-7.2.10-CRs] Summary of 2nd round comments on R1-2207005 “On Type-1 HARQ-ACK codebook in PUCCH for SCell dormancy”**

**Agenda item: 7.2.10**

**Document for:** **Discussion and Decision**

Introduction

In RAN1#110 meeting, one contribution [1, MTK] is submitted to clarify the Type-1 HARQ-ACK codebook in PUCCH for SCell dormancy.

As guided by the Chairman, to collect company views, this contribution provides summary of the submitted contributions (Section 5), discussion points (Section 2), 2nd round discussion points (Section 3), and possible RAN1 consensus during this meeting (Section 4, TBD).

Discussion points

Based on the submitted contribution [1, MTK], it is mentioned that

* In 38.331 V16.9.0, UE is not expected to be configured with PDCCH monitoring for an SCell dormant BWP.





* In 38.213 V16.10.0 9.1.2.1, when determining the provided K1 values for Type-1 HARQ-ACK codebook, it is assumed UE would monitor at least one of DCI 1\_0/1\_1/1\_2. However, when an SCell enters a dormant BWP, UE does not monitor any of DCI 1\_0/1\_1/1\_2, and it is not clear which set of K1 values UE should assume.

Hence, [1] has the following text proposal for 38.213 V16.10.0 to address this issue:

------------------------------------------------------------ TP begins-----------------------------------------------------------------------

#### 9.1.2.1 Type-1 HARQ-ACK codebook in physical uplink control channel

For a serving cell $c$, an active DL BWP, and an active UL BWP, as described in clause 12, the UE determines a set of $M\_{A,c}$ occasions for candidate PDSCH receptions for which the UE can transmit corresponding HARQ-ACK information in a PUCCH in slot $n\_{U}$. If serving cell $c$ is deactivated, the UE uses as the active DL BWP for determining the set of $M\_{A,c}$ occasions for candidate PDSCH receptions a DL BWP provided by *firstActiveDownlinkBWP-Id*. The determination is based:

a) on a set of slot timing values $K\_{1}$ associated with the active UL BWP

a) If the UE is configured to monitor PDCCH for DCI format 1\_0 and is not configured to monitor PDCCH for either DCI format 1\_1 or DCI format 1\_2 on serving cell $c$, or the active DL BWP for serving cell $c$ is dormant BWP, $K\_{1}$ is provided by the slot timing values {1, 2, 3, 4, 5, 6, 7, 8}

b) If the UE is configured to monitor PDCCH for DCI format 1\_1 and is not configured to monitor PDCCH for DCI format 1\_2 for serving cell $c$, $K\_{1}$ is provided by *dl-DataToUL-ACK* or *dl-DataToUL-ACK-r16*

c) If the UE is configured to monitor PDCCH for DCI format 1\_2 and is not configured to monitor PDCCH for DCI format 1\_1 for serving cell $c$, $K\_{1}$ is provided by *dl-DataToUL-ACK-DCI-1-2*

d) If the UE is configured to monitor PDCCH for DCI format 1\_1 and DCI format 1\_2 for serving cell $c$, $K\_{1}$ is provided by the union of *dl-DataToUL-ACK* or *dl-DataToUL-ACK-r16* and *dl-DataToUL-ACK-DCI-1-2*

e) If an inapplicable value in *dl-DataToUL-ACK-r16* is provided, the value is excluded from $K\_{1}$

------------------------------------------------------------ TP ends------------------------------------------------------------------------

**Discussion point 1:**

**Do you agree on the following observation from [1]:**

* **In 38.213 V16.10.0 9.1.2.1, when determining the provided K1 values for Type-1 HARQ-ACK codebook, it is assumed UE would monitor at least one of DCI 1\_0/1\_1/1\_2. However, when an SCell enters a dormant BWP, UE does not monitor any of DCI 1\_0/1\_1/1\_2, and it is not clear which** **set of K1 values UE should assume.**

**If your answer is “No”, please elaborate you understanding in the comment (based on current spec) which set of K1 values UE should assume.**

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| --- | --- | --- |
| **Company** | **Yes or No** | **Comment** |
| MTK | Yes | It seems like a spec hole to us and should be fixed. |
| vivo | Comment | It is understandable that the spec may not be very clear in this case, but it seems the spec still workable.According the spec it seems there is no suitable K1 values associated to the dormancy SCell, resulting an empty set of K1. Consequently, no HARQ-ACK bit is associated to this SCell in the generated codebook. But this does not seem to be an issue as no DL transmission is assumed in the dormancy SCell. Although the size of codebook would be changed when the SCell becomes dormancy, considering that the SCell dormancy is acted as DL BWP change, the existing DL BWP change behaviour can still be applied.Is there anything missing here? |
| ZTE | Yes | It seems that there are two different alternatives to address this issue.Alt.1: Defining the K1 set for this case;Alt.2: HARQ-ACK codebook is not generated for dormant BWP.We prefer Alt.1 to align with the basic spirit of type-1 codebook. Regarding the K1 set, we think the K1 set configured for PCell/PUCCH-SCell should be used, instead of {1, 2, 3, 4, 5, 6, 7, 8}. |
| MTK |  | @vivo:* Thanks for the nice comment. If you look at the following spec text from 38.213 9.1.2.1:
	+ “If serving cell $c$ is deactivated, the UE uses as the active DL BWP for determining the set of $M\_{A,c}$ occasions for candidate PDSCH receptions a DL BWP provided by *firstActiveDownlinkBWP-Id*.”
* You can see UE generates Type 1 HARQ-ACK codebook bits even for a deactivated SCell. Hence, to us, it seems UE should generate Type 1 HARQ-ACK codebook bits for an SCell which enters dormancy.

@ZTE:* Thanks for the nice comment. If you look at the spec text from 38.213 9.1.2.1 (as shown in Section 2), UE does not find K1 set values from a different cell, even when an SCell is deactivated. Hence, we think it is more reasonable to define a K1 set from the current listed candidate options in 38.213 9.1.2.1 (i.e., (a) to (d)).
 |
| Intel |  | The proposed CR is actually the worst way to solve the issue, since it means always 8 bits are reported for the cell using dormant active BWP. We think the interpretation from vivo sounds better. There is still an active BWP (though it is dormant) for the cell. K1 set in Type1 codebook generation is empty since no bullet from a)/b)/c)/d) applies.  |
| Qualcomm | Yes | There is a lot of similarity between a deactivated cell and a dormant BWP of an activated cell. For the issue under discussion, can we follow the design for a “deactivated” cell by generating the HARQ-ACK codebook based on information for the DL BWP provided by *firstActiveDownlinkBWP-Id*? |
| Spreadtrum | Yes | We support the proposal. First, we agree that it should generate HARQ-ACK for a dormancy BWP, considering there is HARQ-ACK bits for a deactivated SCell.Second, since dormancy BWP has its own TDRA table and SCS, it is not as same as deactivated SCell which does not contain any of TDRA table, SCS and K1. So only K1 set needs to be defined for a dormancy BWP.So, the proposal is a simple and direct correction for dormancy BWP. |
| Huawei, HiSilicon | Yes | We think it is reasonable to generate a bit for this case instead of letting the codebook size dynamically change. Either the proposal from MTK or QC is fine with us. |
| vivo2 |  | The HARQ-ACK bit is generated for the deactivated SCell, because the SCell activation/deactivation is in MAC/CE, i.e., contained in a PDSCH TB. Thus an ACK/NACK would be generated also for the act/deact command. Noted that the gNB does not know whether the TB is decoded successfully or not, thus the first Activation BWP is used so that the same size of HACK codebook is generated regardless of whether the activation MAC CE is decoded successfully or not. However, the SCell dormancy is a PHY command, there is no need to maintain a same codebook size before and after a DL BWP change according to the current spec. |

**Discussion point 2:**

**If your answer to Discussion point 1 is Yes, can you accept the TP to 38.213 from [1]? If your answer is no, please further elaborate your concern or you have a different TP to address this issue.**

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| --- | --- | --- |
| **Company** | **Yes or No** | **Comment** |
| MTK | Yes | We see the need to fix the spec. |
| Spreadtrum | Yes |  |
| Huawei, HiSilicon | Yes |  |
|  |  |  |

2nd round discussions

**Discussion point 3:**

**From the companies input of Discussion point 1 & 2, there seems to be 4 alternatives to address the issue of “undefined set of K1 values UE should assume for Type-1 HARQ-ACK codebook in PUCCH, when an SCell enters the dormant BWP”:**

* **Alt 1: Adopt the TP to 38.213 from [1, MTK], which assigns the K1 set to be the same as the case “UE is configured to monitor PDCCH for DCI format 1\_0 only”**
	+ **Supported by MTK, Huawei, Spreadtrum**
* **Alt 2: Follow the design for a “deactivated” SCell by generating the HARQ-ACK codebook based on information for the DL BWP provided by *firstActiveDownlinkBWP-Id***
	+ **Supported by QC, Huawei**
* **Alt 3: Do not generate HARQ-ACK bits for the SCell which enters the dormant BWP**
	+ **Supported by vivo, Intel**
* **Alt 4: Use the K1 set configured for PCell/PUCCH-SCell**
	+ **Supported by ZTE**

**Please choose your preferred alternative and elaborate. If your have other suggested solution other than the 4 alternatives listed above, please also elaborate.**

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| --- | --- | --- |
| **Company** | **Preferred alternative** | **Comment** |
| MTK | Alt 1 | When an SCell enters the dormant BWP, it does not monitor any of DCI format 1\_0/1\_1/1\_2, but continues other activities such as CSI measurements, AGC and beam management. **A dormant SCell is still treated as an activated cell**; hence, we think we should **choose an option in current spec** which has a **most similar UE behavior for PDCCH monitoring**. To us, the most similar UE behavior would be **Alt 1**. |
| Nokia | Alt.2 | I looked at RAN1 meetings from the beginning of the WI until January 2021 but did not find this aspect addressed contrary to my memory. When the UE moves out of dormant BWP the active BWP is the same *firstActiveDownlinkBWP-Id*  that is used also during SCell being deactivated. So if we use the deactivated SCell approach the CB size remains unchanged when the SCell is moved out of the dormant BWP. Hence Alt.2 is attractive for simplicity. |
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Resulted RAN1 conclusion/agreement (phase 2)

**Proposal** for online discussions:

**Adopt the CR below in 38.213 V16.10.0 to assign a provide K1 values set when the active DL BWP for a serving cell c is dormant BWP:**

------------------------------------------------------------ TP begins-----------------------------------------------------------------------

#### 9.1.2.1 Type-1 HARQ-ACK codebook in physical uplink control channel

For a serving cell $c$, an active DL BWP, and an active UL BWP, as described in clause 12, the UE determines a set of $M\_{A,c}$ occasions for candidate PDSCH receptions for which the UE can transmit corresponding HARQ-ACK information in a PUCCH in slot $n\_{U}$. If serving cell $c$ is deactivated, the UE uses as the active DL BWP for determining the set of $M\_{A,c}$ occasions for candidate PDSCH receptions a DL BWP provided by *firstActiveDownlinkBWP-Id*. The determination is based:

a) on a set of slot timing values $K\_{1}$ associated with the active UL BWP

a) If the UE is configured to monitor PDCCH for DCI format 1\_0 and is not configured to monitor PDCCH for either DCI format 1\_1 or DCI format 1\_2 on serving cell $c$, or the active DL BWP for serving cell $c$ is dormant BWP, $K\_{1}$ is provided by the slot timing values {1, 2, 3, 4, 5, 6, 7, 8}

b) If the UE is configured to monitor PDCCH for DCI format 1\_1 and is not configured to monitor PDCCH for DCI format 1\_2 for serving cell $c$, $K\_{1}$ is provided by *dl-DataToUL-ACK* or *dl-DataToUL-ACK-r16*

c) If the UE is configured to monitor PDCCH for DCI format 1\_2 and is not configured to monitor PDCCH for DCI format 1\_1 for serving cell $c$, $K\_{1}$ is provided by *dl-DataToUL-ACK-DCI-1-2*

d) If the UE is configured to monitor PDCCH for DCI format 1\_1 and DCI format 1\_2 for serving cell $c$, $K\_{1}$ is provided by the union of *dl-DataToUL-ACK* or *dl-DataToUL-ACK-r16* and *dl-DataToUL-ACK-DCI-1-2*

e) If an inapplicable value in *dl-DataToUL-ACK-r16* is provided, the value is excluded from $K\_{1}$

------------------------------------------------------------ TP ends------------------------------------------------------------------------

Summary of contribution inputs

**Summary for [1, MTK]:**

In [1], it is mentioned that, in 38.331 V16.9.0, UE is not expected to be configured with PDCCH monitoring for an SCell dormant BWP as shown below.





In 38.213 V16.10.0 9.1.2.1, when determining the provided K1 values for Type-1 HARQ-ACK codebook, it is assumed UE would monitor at least one of DCI 1\_0/1\_1/1\_2, as shown below in highlighted sentences:

9.1.2.1 Type-1 HARQ-ACK codebook in physical uplink control channel

For a serving cell $c$, an active DL BWP, and an active UL BWP, as described in clause 12, the UE determines a set of $M\_{A,c}$ occasions for candidate PDSCH receptions for which the UE can transmit corresponding HARQ-ACK information in a PUCCH in slot $n\_{U}$. If serving cell $c$ is deactivated, the UE uses as the active DL BWP for determining the set of $M\_{A,c}$ occasions for candidate PDSCH receptions a DL BWP provided by *firstActiveDownlinkBWP-Id*. The determination is based:

a) on a set of slot timing values $K\_{1}$ associated with the active UL BWP

a) If the UE is configured to monitor PDCCH for DCI format 1\_0 and is not configured to monitor PDCCH for either DCI format 1\_1 or DCI format 1\_2 on serving cell $c$, $K\_{1}$ is provided by the slot timing values {1, 2, 3, 4, 5, 6, 7, 8}

b) If the UE is configured to monitor PDCCH for DCI format 1\_1 and is not configured to monitor PDCCH for DCI format 1\_2 for serving cell $c$, $K\_{1}$ is provided by *dl-DataToUL-ACK* or *dl-DataToUL-ACK-r16*

c) If the UE is configured to monitor PDCCH for DCI format 1\_2 and is not configured to monitor PDCCH for DCI format 1\_1 for serving cell $c$, $K\_{1}$ is provided by *dl-DataToUL-ACK-DCI-1-2*

d) If the UE is configured to monitor PDCCH for DCI format 1\_1 and DCI format 1\_2 for serving cell $c$, $K\_{1}$ is provided by the union of *dl-DataToUL-ACK* or *dl-DataToUL-ACK-r16* and *dl-DataToUL-ACK-DCI-1-2*

e) If an inapplicable value in *dl-DataToUL-ACK-r16* is provided, the value is excluded from $K\_{1}$

;

However, when an SCell enters a dormant BWP, UE does not monitor any of DCI 1\_0/1\_1/1\_2, and it is not clear which set of K1 values UE should assume.

**Observation 1: In 38.331 V16.9.0 [1], UE is not expected to be configured with PDCCH monitoring for an SCell dormant BWP. In 38.213 V16.10.0 [2] 9.1.2.1, when determining the provided K1 values for Type-1 HARQ-ACK codebook, it is assumed UE would monitor at least one of DCI 1\_0/1\_1/1\_2. However, when an SCell enters a dormant BWP, UE does not monitor any of DCI 1\_0/1\_1/1\_2, and it is not clear which set of K1 values UE should assume.**

Hence, [1] has the following text proposal to fix this issue:

Proposal 1: Adopt the CR below in 38.213 V16.10.0 [2] to assign a provide K1 values set when the active DL BWP for a serving cell c is dormant BWP:

9.1.2.1 Type-1 HARQ-ACK codebook in physical uplink control channel

For a serving cell $c$, an active DL BWP, and an active UL BWP, as described in clause 12, the UE determines a set of $M\_{A,c}$ occasions for candidate PDSCH receptions for which the UE can transmit corresponding HARQ-ACK information in a PUCCH in slot $n\_{U}$. If serving cell $c$ is deactivated, the UE uses as the active DL BWP for determining the set of $M\_{A,c}$ occasions for candidate PDSCH receptions a DL BWP provided by *firstActiveDownlinkBWP-Id*. The determination is based:

a) on a set of slot timing values $K\_{1}$ associated with the active UL BWP

a) If the UE is configured to monitor PDCCH for DCI format 1\_0 and is not configured to monitor PDCCH for either DCI format 1\_1 or DCI format 1\_2 on serving cell $c$, or the active DL BWP for serving cell $c$ is dormant BWP, $K\_{1}$ is provided by the slot timing values {1, 2, 3, 4, 5, 6, 7, 8}

b) If the UE is configured to monitor PDCCH for DCI format 1\_1 and is not configured to monitor PDCCH for DCI format 1\_2 for serving cell $c$, $K\_{1}$ is provided by *dl-DataToUL-ACK* or *dl-DataToUL-ACK-r16*

c) If the UE is configured to monitor PDCCH for DCI format 1\_2 and is not configured to monitor PDCCH for DCI format 1\_1 for serving cell $c$, $K\_{1}$ is provided by *dl-DataToUL-ACK-DCI-1-2*

d) If the UE is configured to monitor PDCCH for DCI format 1\_1 and DCI format 1\_2 for serving cell $c$, $K\_{1}$ is provided by the union of *dl-DataToUL-ACK* or *dl-DataToUL-ACK-r16* and *dl-DataToUL-ACK-DCI-1-2*

e) If an inapplicable value in *dl-DataToUL-ACK-r16* is provided, the value is excluded from $K\_{1}$

References

[1] R1-2207005 On Type-1 HARQ-ACK codebook in PUCCH for SCell dormancy, MediaTek, RAN1 #110